



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

Summary of Book Chapters/Edited Books/Book Authored during 2025-26

S.No	Course	Book Authored	Edited Books	Book Chapters	Total
1	BBA / B.COM (H)	6	1	4	11



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

Sl. No.	Name of the teacher	Title of the book/ chapters published	Title of the paper	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
Books								
1	Dr Prashant Kumar	Data Warehouse and Data Mining	NA	NA	2026	978-93-6940-371-4	JIMS, Kalkaji	Bluepen International Publisher
2	Dr Prashant Kumar	Database Management System	NA	NA	2026	978-81-998722-2-6	JIMS, Kalkaji	BR Publication
3	Dr Prashant Kumar	Artificial Intelligence and Its application	NA	NA	2026	978-93-6949-177-2	JIMS, Kalkaji	Bluepen International Publisher
4	Dr Prashant Kumar	Wireless Communication	NA	NA	2026	978-93-6940-950-1	JIMS, Kalkaji	Bluepen International Publisher
5	Dr Prashant Kumar	Computer Networks	NA	NA	2025	978-93-6940-086-7	JIMS, Kalkaji	Bluepen International Publisher
6	Dr. Niti Saxena	Management Dynamics : Managing People for Sustainable Performance	NA	NA	2025	978-81-944-332-6-2	JIMS, Kalkaji	VAAGAI International; Publishing House



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

Sl. No.	Name of the teacher	Title of the book/ chapters published	Title of the paper	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
Edited Books								
1	Dr. Niti Saxena	“GENERATIVE AI IN EDUCATION, RESEARCH & KNOWLEDGE ECONOMY FOR VIKSIT BHARAT@2047”	NA	NA	NA	978-81 997124-6-1	JIMS, Kalkaji	SHARDA PUBLICATIONS
2	Dr. Pallavi Ahuja	“GENERATIVE AI IN EDUCATION, RESEARCH & KNOWLEDGE ECONOMY FOR VIKSIT BHARAT@2047”	NA	NA	NA	978-81-997124-6-1	JIMS, Kalkaji	SHARDA PUBLICATIONS
3	Ms. Pooja Bisht	“GENERATIVE AI IN EDUCATION, RESEARCH & KNOWLEDGE ECONOMY FOR VIKSIT BHARAT@2047”	NA	NA	NA	978-81-997124-6-1	JIMS, Kalkaji	SHARDA PUBLICATIONS



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

Sl. No.	Name of the teacher	Title of the book/ chapters published	Title of the paper	National / International	Year of publication	ISBN/ISSN number of the proceeding	Affiliating Institute at the time of publication	Name of the publisher
Book Chapters								
1	Dr. Ruchi Srivastava	“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”	The power of leadership in net zero transformations: the conceptual framework	NA	Jul-26	9789-81-999-198-2-2	JIMS, Kalkaji	GNIOT MBA Institute, Greater Noida
2	Dr. Shivani	Generative AI Tools From Algorithms to Applications	Generative AI Tools and the Marketing Industry	NA	2025	978-103-274-5909	JIMS, Kalkaji	Routledge (Taylor and Francis Group)
3	Dr. Surbhi Gosain	Generative AI Tools From Algorithms to Applications	Generative AI Tools and the Marketing Industry	NA	2025	978-103-274-5909	JIMS, Kalkaji	Routledge (Taylor and Francis Group)
4	Dr. Niti Saxena	Computational Intelligence Solutions for Real-Life Problems (edited book)	Guardians of the Cyber Realm: How Computational Intelligence Defends?	NA	2025	978-1-99851-100-6	JIMS, Kalkaji	Taylor and Francis (Apple academic press)



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

BOOKS FOR 2025-26

Author's Profile



Mr. Yogesh Kisan Nanaware is currently working as Assistant professor of computer science at Shriram Institute Of Information Technology, Paniv Tal: Malshiras Dist-Solapur He completed M.Sc. (Computer science) from Savitribai Phule Pune University. He qualified MH-SET exam in 2023. He has 17 years experience in reputed college. He has published many papers in different journals and international conference related to Artificial Intelligence. He has also authored a book 'Cryptography and Network security'.



Mrs. Shobha Sopan Ghule is currently working as Assistant professor of computer science at Shriram Institute Of Information Technology, Paniv Tal: Malshiras Dist-Solapur She completed MCA(Computer science) from Punyashlok Ahilyadevi Holkar Solapur University Solapur. She qualified MH-SET exam in 2023. He has 11 year experience in reputed college.



Dr. Prashant Kumar is presently serving as the Head of the Department at JIMS, Kalkaji, New Delhi. He has a rich academic and research background with several publications in reputed national and international journals, including Scopus-indexed journals and IEEE Xplore. His areas of interest span across management, technology, and interdisciplinary research. He is also the author of the book "Computer Networks", "Artificial Intelligence and its Application" published by Bluepen International Publisher. He has also authored one more book on "Database Management System" published by BR Publications. The book reflects his strong academic foundation and commitment to enhancing conceptual clarity and practical understanding of computer applications among students and professionals. Dr. Kumar has actively attended Faculty Development Programs (FDPs), seminars, workshops, and conferences at various reputed institutions, which have significantly contributed to his academic and professional growth. In addition, he has organized FDPs, seminars, and international conferences, providing a valuable platform for academicians, researchers, and industry experts to exchange ideas and insights. With his dedication to academic excellence, research, and knowledge dissemination, Dr. Prashant Kumar continues to play a pivotal role in fostering innovation, learning, and collaboration within the academic community.



ISSN 978-93-6940-371-4



01769369403714

DATA WAREHOUSE AND DATA MINING

DATA WAREHOUSE AND DATA MINING



Mr. YOGESH KISAN NANAWARE
Mrs. SHOBHA SOPAN GHULE
Dr. PRASHANT KUMAR



A Textbook of

Database Management Systems



Dr. Prashant Kumar is presently serving as the Head of the Department at JIMS, Kalkeji, New Delhi. He has a rich academic and research background with several publications in reputed national and international journals, including Scopus-indexed journals and IEEE Xplore. His areas of interest span across management, technology, and interdisciplinary research. He is also the author of the book "Computer Networks", published by Buepen International Publisher. The book reflects his strong academic foundation and commitment to enhancing conceptual clarity and practical understanding of computer applications among students and professionals. Dr. Kumar has actively attended Faculty Development Programs (FDPs), seminars, workshops, and conferences at various reputed institutions, which have significantly contributed to his academic and professional growth. In addition, he has organized FDPs, seminars, and international conferences, providing a valuable platform for academicians, researchers, and industry experts to exchange ideas and insights. With his dedication to academic excellence, research, and knowledge dissemination, Dr. Prashant Kumar continues to play a pivotal role in fostering innovation, learning, and collaboration within the academic community.



Dr. K. S. S. Joseph Sastry is currently serving as a Professor at Ramachandra College of Engineering, Eluru. With 18 years of extensive teaching experience in engineering education, she is a distinguished academican known for her dedication to academic excellence and innovation. She is deeply involved in mentoring students, guiding research activities, and fostering academic growth, consistently contributing to curriculum development and scholarly advancement. Her areas of expertise include Database Management Systems and Machine Learning, in which she actively demonstrates her commitment to advancing knowledge and research. She has also made a notable contribution to academia by authoring the book titled "Artificial Intelligence with Machine Learning Concepts", reflecting her strong research orientation and subject mastery.



Mr. Mallothu Rajaram is an esteemed Assistant Professor in the Department of Computer Science and Engineering at St. Martin's Engineering College, Secunderabad-500 100. He has 16 years of dedicated teaching experience; he holds both an M. Tech and a B. Tech in Computer Science and Engineering. A prolific researcher and innovator, he has published 6 research papers and holds 12 published patents. He is further distinguished by a specialized certification in Embedded Software from NIELIT. Throughout his career, he has actively contributed to the academic community through various conferences, workshops and FDPs. His expertise lies at the intersection of academic rigor and practical technical application. Mr. Rajaram continues to mentor the next generation of engineers while advancing research in his field.



Dr. Love Kumar is an accomplished academican and researcher in computer science whose journey reflects curiosity, innovation, and dedication. He holds a B.Tech in Computer Science & Engineering from U.P. Technical University, Lucknow, an M.Tech from Aligarh Muslim University, and a Ph.D. in Computer Engineering & Applications. With over 14 years of teaching and research experience, he has consistently inspired students by blending strong technical foundations with practical problem-solving. His research interests include IoT, RFID, Digital Image Processing, E-learning, and Mobile Ad Hoc Networks, with contributions comprising over 20 research publications, five patents, and six books. Dr. Kumar has played significant leadership roles as Program Coordinator of IIC, NSS Program Officer, IQAC-NAAC core team member, and advisor to statutory committees. He actively contributes as a reviewer and organizer for national and international journals and conferences. A lifetime member of the Indian Science Congress Association, he has received several awards for excellence in teaching and research.



BR Publications



9 780194 072220

Database Management Systems

Dr. Prashant Kumar
Dr. K. S. S. Joseph Sastry
Mr. Mallothu Rajaram
Dr. Love Kumar



BR Publications

A Textbook of

Database Management Systems



Dr. Prashant Kumar
Dr. K. S. S. Joseph Sastry
Mr. Mallothu Rajaram
Dr. Love Kumar

Author's Profile



Swagat Gourav Biswal is an Electrical Engineering graduate from Odisha University of Technology and Research (2023) with research interests centred on data-driven analysis of power and energy systems. His academic work includes computational modelling and performance analysis of wind-PV integrated DC micro grids and a comparative, data-based evaluation of multilevel inverter topologies to assess efficiency and power quality. He has gained industrial experience at Steel Authority of India Limited, where he worked with PLC- and SCADA-based automation systems, focusing on data acquisition, historical data logging, and operational analysis of industrial processes. He is proficient in MATLAB, Python, and SQL, which he uses for numerical modelling, simulation, data processing, and analytical evaluation of electrical and automation systems.



Dr. Prashant Kumar is presently serving as the Head of the Department at JIMS, Kalkaji, New Delhi. He has a rich academic and research background with several publications in reputed national and international journals, including Scopus-indexed journals and IEEE Xplore. His areas of interest span across management, technology, and interdisciplinary research. He is also the author of the book "Computer Networks", published by Bluepen International Publisher. The book reflects his strong academic foundation and commitment to enhancing conceptual clarity and practical understanding of computer applications among students and professionals. Dr. Kumar has actively attended Faculty Development Programs (FDPs), seminars, workshops, and conferences at various reputed institutions, which have significantly contributed to his academic and professional growth. In addition, he has organized FDPs, seminars, and international conferences, providing a valuable platform for academicians, researchers, and industry experts to exchange ideas and insights. With his dedication to academic excellence, research, and knowledge dissemination, Dr. Prashant Kumar continues to play a pivotal role in fostering innovation, learning, and collaboration within the academic community.



Dr. Ravikumar C earned his post-graduate degree in management with a focus on finance from Kuvempu University in 2003. In the year 2015, he completed his research entitled "Man Power Competency Mapping". Before joining KIAMS, he worked at prestigious institutions including the Institute of Management Studies, University of Kuvempu and Davangere, where he served as an Assistant Professor, as well as the Madanapalle Institute of Technology and Science, GM Institute of Technology, Davangere, where he served as an Associate Professor and Academic Coordinator. He served on the Board of Examination for Management Studies and Chief of Flying Squad Examination at GMT-Visveswaraya Technological University. Taught courses in Business Communication as well as Organization Behavior, Security Analysis and Portfolio Management, Industrial Relations, International Finance, International Business, Strategic Management, Counseling Skills for Managers and Managerial Economics. He has been teaching for more than 18 years, including 5 years of research. To his credit, he has had research articles published in 5 prestigious overseas journals and 4 reputable national journals. His specialties include human resource management and finance.

Other Qualifications Include:

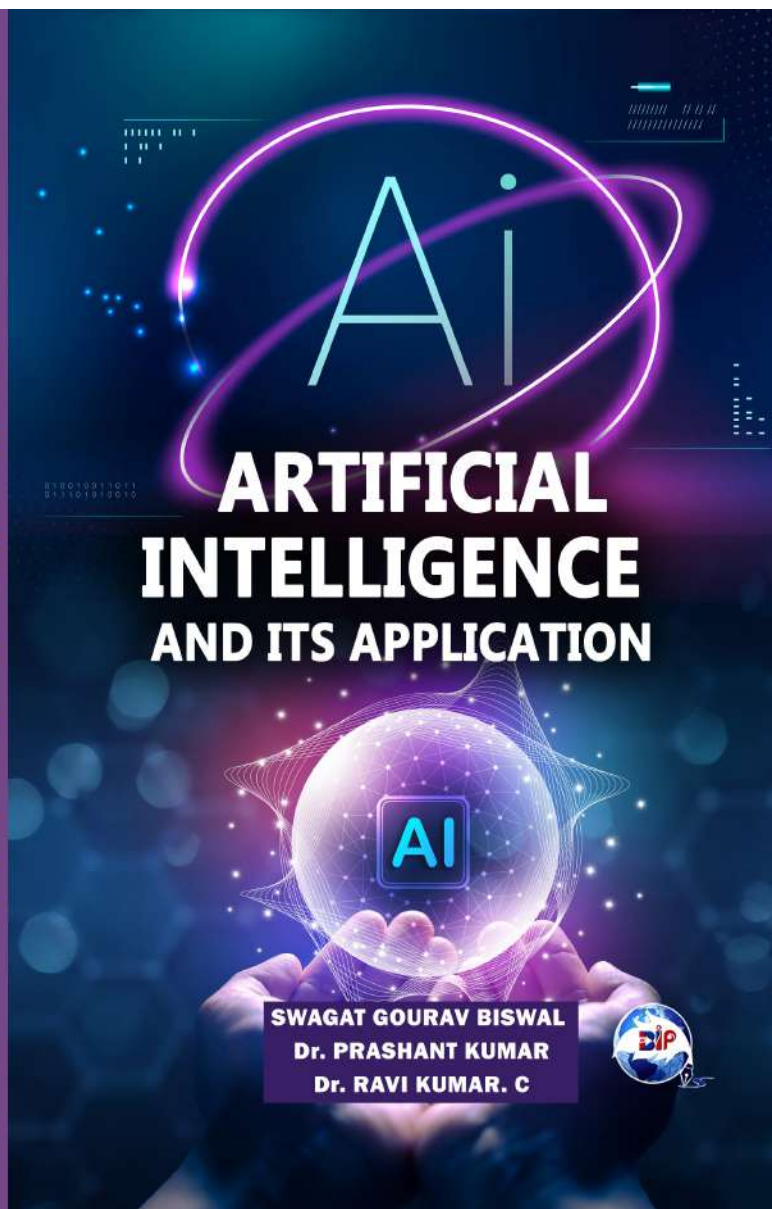
1. Diploma in Personal Management and Industrial Relations (All India Institute of Management Studies - Chennai).
2. Post Graduate Diploma in Human Resource Management (Karnataka State Open University).
3. Diploma in Human Resource Development (Institute of Management and Technology - Chennai).
4. Diploma in Hire Purchase and Leasing (Institute of Management and Technology - Chennai).



ISBN 978-93-6940-177-2



ARTIFICIAL INTELLIGENCE AND ITS APPLICATION

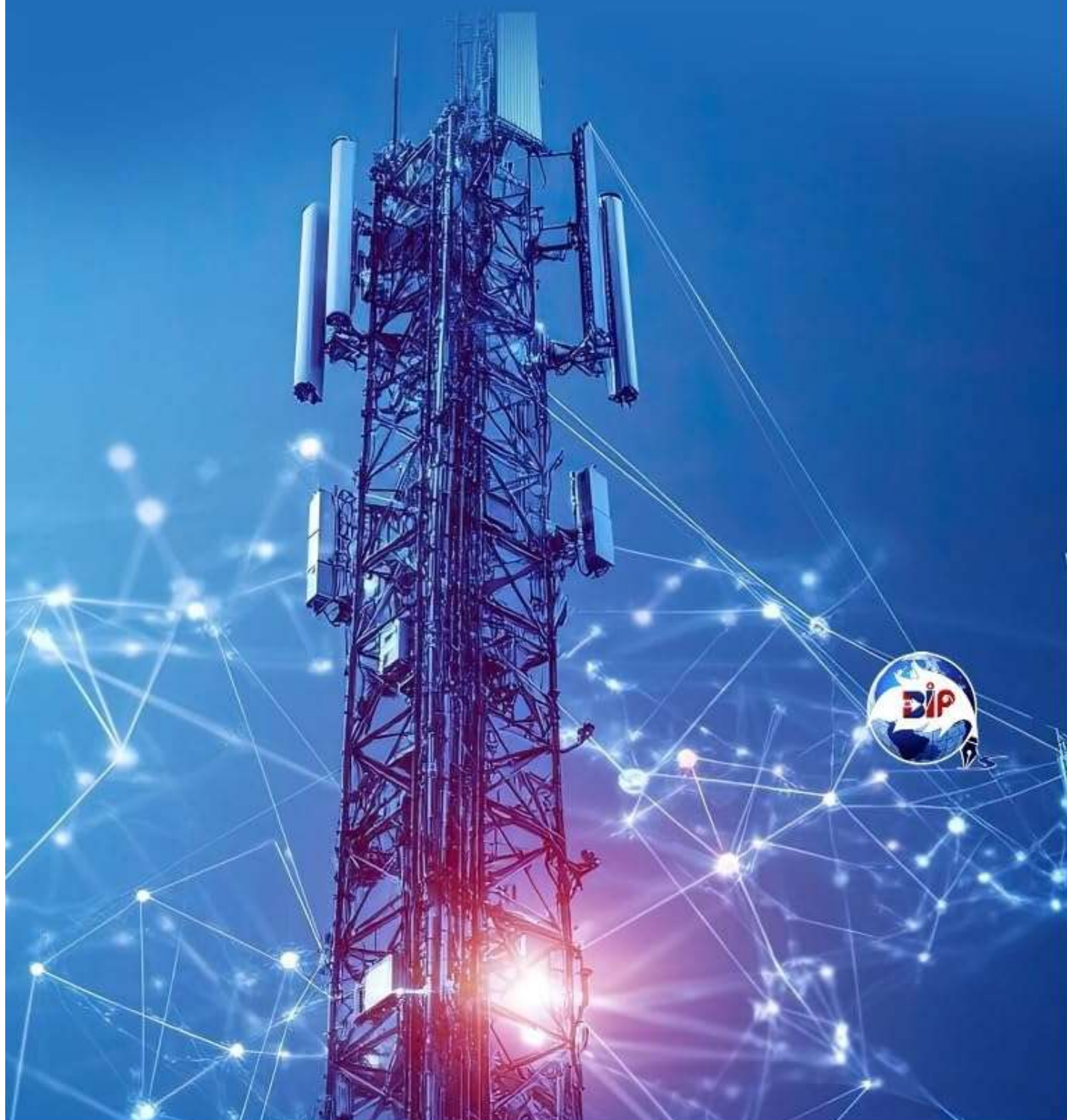


WIRELESS COMMUNICATION

Dr. RITESH SHRIVASTAV

Dr. PRASHANT KUMAR

Dr.G.NIVETHA





COMPUTER NETWORKS

Author's Profile



Dr. Prasanna Kumar G is the Head of the Department of Computer Science and BCA at Government First Grade College, Athani, Belagavi District, Karnataka. He obtained his Ph.D. in Ubiquitous Networks from Sri Jayachamarajendra College of Engineering (SJCE), Mysuru, under Visvesvaraya Technological University (VTU). With over a decade of experience in education, research and administration at the reputed NIE Institute of Technology, Mysuru, Dr. Prasanna Kumar has been actively engaged in teaching, mentoring, and guiding students in emerging areas of computing. His research interests span diverse domains such as Computer Networks, Internet of Things (IoT), Machine Learning, Artificial Intelligence, Blockchain and Cybersecurity. As an educator dedicated to teaching and research, Dr. Prasanna Kumar has authored several scholarly works and continues to pursue innovative academic and research initiatives that integrate technological advancements into real-world applications. He is passionate about promoting digital literacy, encouraging interdisciplinary research and inspiring the next generation of learners to explore, engage and innovate within the field of computer science.



Mr. M. Kishore Kumar, he is currently working as Assistant professor in the department of ECE at Aditya University, Surampalem, Kakinada, and A.P, INDIA. He received his B. Tech., degree from JNTUH in 2002, M. Tech., degree from JNTUK in 2007 and Pursuing Ph.D. degree in the field of image processing from Glocal University, Saharanpur, U.P. He is having 23 years of teaching experience. He has published 1 SCIE paper, 6 Scopus indexed papers, 7 UGC journals and 10 papers presented in national & international conferences. The papers are published in various reputed journals like IEEE access (IEEE), Telecommunication & radio Engineering, International Journal of infrared, Millimeter and Terahertz waves and published 2 patents. He attended more than 10 workshops 30 FDPs related to antennas and wireless communications in various reputed institutions and also he is having 6 NPTEL certification Courses like Digital image processing, Advanced radar systems, IOT, Cloud Computing, Basic Fundamentals and applications of Deep learning and Machine learning and etc., and 2 LinkedIn learning online certification Courses related to Basic electronics and C Programming for embedded applications. He is reviewer for the reputed journals like Multimedia tools and Applications. His areas of interest are underwater image processing, micro strip patch antennas. (sub 6GHz & mm Wave).



Dr. Prashant Kumar* is presently serving as the *Head of the Department at JIMS, Kalkaji, New Delhi. He has a rich academic and research background with several publications in **reputed national and international journals, including **Scopus-indexed journals and IEEE Xplore*. His areas of interest span across management, technology, and interdisciplinary research. He has actively *attended Faculty Development Programs (FDPs), seminars, workshops, and conferences* at various reputed institutions, which have helped him enhance his academic and professional skills. Apart from participating, Dr. Kumar has also *organized FDPs, seminars, and international conferences*, providing a valuable platform for academicians, researchers, and industry experts to exchange knowledge and insights. With his dedication to academic excellence and research contributions, Dr. Prashant Kumar continues to play a pivotal role in fostering innovation, learning, and collaboration in the academic community.



ISBN 978-93-6940-086-7



9 789369 400867 >





CERTIFICATE

OF ACHIEVEMENT

This certificate is proudly presented to

Dr. Niti Saxena

FOR BEING AUTHOR OF THE BOOK

**“MANAGEMENT DYNAMICS: MANAGING PEOPLE FOR SUSTAINABLE
PERFORMANCE”**

UNDER ISBN - 978-81-944332-6-2

M. Saraswathi

SARASWATHI
CEO



B. Krishna

BALA KRISHNAN
Manager

published in - FLIPKART AND GOOGLE BOOKS
<http://vaagaibkpublishing.com>



DR. NITI SAXENA

**VAAGAI INTERNATIONAL PUBLISHING HOUSE
VADASITHUR, KINATHUKADAVU, COIMBATORE - 641202**

PH: +91 8668173421

&

Website: vaagaibkpublishing.com



9 788194 433262



MANAGEMENT DYNAMICS: MANAGING PEOPLE FOR SUSTAINABLE PERFORMANCE

MANAGEMENT DYNAMICS: MANAGING PEOPLE FOR SUSTAINABLE PERFORMANCE

DR. NITI SAXENA



ISBN: 978-81-944332-6-2





Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

Edited BOOKS

FOR 2025-26

Proceedings on
2ND NATIONAL CONFERENCE

**" GENERATIVE AI IN EDUCATION, RESEARCH &
KNOWLEDGE ECONOMY FOR VIKSIT
BHARAT@2047."**



11TH APRIL 2026

**"AI Today. BHARAT
TOMORROW."**

Editor:
Dr. Niti Saxena

Co-Editors:
Dr. Pallavi Ahuja
Ms. Pooja Bisht



Jagannath International Management School

MOR, Pocket-105, Kalkaji, New Delhi-110019

(Affiliated to Guru Gobind Singh Indraprastha University and Approved under Section 2(f) of UGC Act 1956)

Accredited by National Assessment and Accreditation Council (NAAC)

BOOK CHAPTERS FOR 2025-26

CHAPTER 1

THE POWER OF LEADERSHIP IN NET ZERO TRANSFORMATIONS: THE CONCEPTUAL FRAMEWORK

Dr. Ruchi Srivastava¹, Dr. Divya Choudhary², Dr. Meetu Pandey³

¹Professor, JIMS Kalkaji, Delhi, India; ²Assistant Professor, GNIOT, Greater Noida, India;

³Professor, Babu Banarasi Das Institute of Technology & Management, Lucknow, India

Abstract

In the worldwide effort effective leadership is very important for bringing the revolutionary change to attain the net zero emissions. Leaders are the torch bearers who defines the Vision, Mission, organizational objectives, procedures towards the attainment of net zero transformations. The Net Zero Leaders aims to attain net zero emissions by cultivating the sustainable culture, promoting the cooperation and developing the actionable plan to achieve sustainability successfully. The climate crisis has given the warning to all the nations globally which has promoted the need of net zero leaders at global level for long term sustainability. The IPCC (Intergovernmental Panel on Climate Change) has quoted that there is the urgent need to limit the global warming to 1.5 degree Celsius, the net zero transformation is not simply a choice rather it is the need of today's scenario. By aligning the net zero transformation with scientific imperatives, the organizations can achieve their commitment towards sustainable future for everyone. This book chapter will focus on the role of leaderships in bringing and enhancing the net zero transformations for sustainability.

Keywords: Climate Crisis; Net Zero Leaders; Revolutionary; Sustainability; Zero emissions

1. Introduction

The Climate Science indicates that the amount of carbon dioxide added to the atmosphere by human activity is directly correlated with global warming. Therefore, achieving zero CO₂ emissions is necessary to stabilize climate change. The climate is going to change more the longer it takes. It is also necessary to limit emissions of other greenhouse gases, such methane. Several nations have pledged to transition to a net-zero emissions economy.

The reason for this is that climate research has demonstrated that merely lowering carbon emissions is insufficient to stop climate change. In order to achieve "net zero," any emissions must be offset by an equal quantity of atmospheric absorption. Governments pledged to "keep efforts" to keep global warming to 1.5 degrees Celsius and to keep it "well below" 2 degrees Celsius in the Paris Agreement. According to a report on the 1.5°C objective published by the Intergovernmental Panel on Climate

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

Change (IPCC) in October 2018, there is no realistic likelihood of keeping warming to 1.5°C unless global emissions reach net zero by the middle of the century. In the G7, G20 summit in 2021, and the Glasgow Climate Pact, the leaders of wealthy nations have reassured their commitment for achieving the 1.5°C. Achieving net zero is not only a desirable objective but also a requirement for societal well-being, economic growth, and environmental sustainability. With the help of this revolutionary approach, humanity can reduce the dangers associated with climate change and create a resilient, just, and prosperous future.

2. Research Objectives

1. To understand the concept and importance of Net Zero
2. The need for addressing the growing climate crisis
3. The Role of effective Leadership for bringing the revolutionary transformation in business
4. The initiatives taken by the Net Leaders for Zero Emissions

3. Research Methodology

This study is based on a systematic review of secondary data collected from reputed academic journals, scholarly books, institutional reports, and authenticated online sources. The research examines existing literature to assess the influence of carbon dioxide (CO₂) emissions on atmospheric composition and their contribution to global warming. The research article emphasizes the critical need to achieve net-zero carbon emissions by 2050 to mitigate the adverse effects of climate change. It evaluates internationally recognized climate goals and scientific evidence that underscore the urgency of emission reduction.

In order to achieve zero CO₂ emissions, the study examines a number of mitigation tactics and policy initiatives, such as switching to renewable energy sources, improving energy efficiency, adopting low-carbon technologies, and putting regulatory frameworks into place. A descriptive and analytical research approach is employed to synthesize findings from secondary sources, enabling a comprehensive understanding of climate stabilization mechanisms and long-term environmental sustainability.

4. Thematic Literature Review

Theme 1: Leadership as a Catalyst for Climate and Net-Zero Transformation

John Elkington (2020) emphasizes that sustainable leadership integrates environmental, social, and economic goals. His work highlights that leaders must go beyond profit maximization and focus on long-term ecological balance.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

Robin L. L. Pennington (2021) finds that leadership commitment is essential in embedding sustainability into organizational culture. The study shows that without top management support; climate initiatives often fail.

Andrew J. Hoffman (2021) argues that leaders act as change agents who influence corporate responses to climate change. He highlights that leadership vision determines the pace of environmental transformation. Boiral Olivier (2022) finds that transformational leadership positively influences environmental performance by encouraging proactive sustainability initiatives.

Recent literature highlights leadership as a central force in climate mitigation and sustainability transitions. Leadership is conceptualized as the ability to mobilize actors, shape policies, and drive collective action toward emission reduction goals.

This suggests that leadership is not limited to individuals but operates across multiple actors and governance levels.

Theme 2: Transformational and Collective Leadership Approaches

The literature from 2020 onwards shows a shift from traditional leadership models to transformational and collective leadership.

- Transformational leadership emphasizes vision, inspiration, and long-term change.
- Collective leadership focuses on collaboration and shared responsibility.

Research indicates that climate change is a “wicked problem”, requiring adaptive and collaborative leadership rather than hierarchical control. Additionally, place-based and multi-stakeholder leadership approaches are found to be critical for driving local and regional sustainability transitions.

Theme 3: Leadership, Innovation, and Green Transformation

Michael E. Porter (2020) suggests that leadership fosters innovation that aligns environmental goals with competitive advantage. He highlights the concept of shared value in sustainability.

Mark R. Kramer (2020) supports that strategic leadership enables organizations to integrate climate goals with business strategy, leading to long-term growth.

Stefan Schaltegger (2022) finds that leadership drives eco-innovation, which is essential for achieving net-zero targets.

Effective leadership is therefore increasingly defined by action, transparency, and measurable outcomes, rather than vision alone.

Theme 4: Integration of Leadership, Culture, and Technology

Rizvi and Khan (2026) argue that sustainability and climate-ready transformation depend on the alignment of leadership, organizational culture, and digital capabilities. Their study finds that leadership acts as a catalyst, culture as an institutional mechanism, and technology as an accelerator of ESG performance. The research highlights that organizations achieve superior sustainability outcomes only when these three elements are integrated systematically.

Khattak et al. (2026) find that leadership is the foundation of a strong “green culture,” where employees adopt environmentally responsible behaviors when leaders demonstrate sustainability values in practice. The study highlights that trust plays a key role in translating leadership vision into cultural change.

Iyer et al. (2025) emphasize that leadership acts as both a strategic enabler and cultural catalyst in achieving net-zero goals. The study shows that executive commitment influences not only strategic direction but also shapes organizational culture and the adoption of sustainability technologies.

Khan et al. (2025) show that platform leadership significantly enhances green technological innovation. The study highlights that leadership influences innovation indirectly by shaping organizational culture and encouraging knowledge-sharing behaviors.

An integrated systems approach shows that leadership influences climate-ready transformation by aligning technology, culture, and sustainability strategies. This perspective highlights that leadership alone is insufficient without organizational alignment and innovation capacity.

5. Research Gap

Based on the review, the following gaps are identified:

- Lack of integrated conceptual frameworks combining leadership, culture, and technology
- Limited empirical research on leadership in net-zero transitions in developing countries (e.g., India)
- Insufficient focus on behavioral and human aspects of leadership
- Weak linkage between leadership actions and measurable sustainability outcomes

The literature from 2020–2026 establishes that leadership is a critical driver of net-zero transformation, influencing not only strategic direction but also organizational culture and stakeholder engagement. The evolution from traditional leadership models to collective, system-oriented leadership reflects the complexity of sustainability challenges.

However, significant gaps remain in integrating leadership with technological and cultural dimensions, highlighting the need for a comprehensive conceptual framework to guide future research and practice.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

The literature from 2020–2026 establishes that leadership is a critical driver of net-zero transformation, influencing not only strategic direction but also organizational culture and stakeholder engagement. The evolution from traditional leadership models to collective, system-oriented leadership reflects the complexity of sustainability challenges. However, significant gaps remain in integrating leadership with technological and cultural dimensions, highlighting the need for a comprehensive conceptual framework to guide future research and practice.

6. What is Net Zero?

‘Net Zero’ is based on the idea of Net zero emissions. It indicates that there is no net impact because the total amount of greenhouse gases (GHGs) released into the atmosphere is equal to the amount withdrawn. Maintaining this equilibrium is crucial to reducing global warming and managing climate change.

The primary focus of net zero is greenhouse gasses, including: Methane (CH₄), carbon dioxide (CO₂), and nitrous oxide (N₂O). These gases contribute to global warming by trapping heat in the atmosphere.

6.1. Why Net Zero?

In order to address the global climate catastrophe and guarantee a sustainable future, Net Zero is imperative. There are serious threats to ecosystems, economies, and societies due to climate change, which is caused by the excessive emission of greenhouse gases (GHGs) into the atmosphere. Reducing these dangers and promoting long-term economic and environmental balance require achieving net zero emissions. Legal goals have been established by nations such as the UK, Japan, and Canada to achieve net-zero emissions by 2050. Businesses like Microsoft and Amazon have made net-zero commitments; Microsoft wants to be "carbon negative" by 2030.

6.2. Key Reasons for the Need of Net Zero

1.Reducing the effects of climate change

According to the Paris Agreement, net zero is essential to keeping global warming to 1.5°C or 2°C over pre-industrial level as a greater chance of catastrophic effects, such rising sea levels and harsh weather, if these thresholds are exceeded. Unchecked emissions might cause irreparable harm to climate systems, such as ocean currents and polar ice sheets. Preventing these cascade consequences is much easier with net zero.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

2. Keeping Biodiversity and Ecosystems Safe

The Excessive emissions will lead to species extinction, coral bleaching, and deforestation. The net zero will help the ecosystems to exist. Reducing the use of fossil fuels and other net zero tactics will help to protect natural resources by reducing the pollution.

3. Improving Safety and Health for All

The net zero initiative will help in increasing the quality of air by reducing emissions and reducing the particulate matter and other air pollutants from air, which lowers the risk of cardiovascular and respiratory illnesses. The net zero will reduce the diseases brought on by shifting climatic patterns, and heat-related.

4. Stopping Environmental Damage

By stabilizing weather patterns, net zero measures assist reduce the frequency and severity of droughts, floods, and hurricanes. It also ensures the more consistent agricultural output and a water resource is one way to protect food and water security.

5. Performing Moral and Ethical Duties

For future generations to live on a habitable planet, net zero must be achieved. In order to address the climate catastrophe, countries, organizations, and individuals must all work together, which is reflected in the requirement for net zero.

6. To Safeguard Human Health

Lower emissions reduce air pollution, decreasing the incidence of respiratory and cardiovascular diseases. Achieving net zero contributes to healthier living conditions and improved quality of life.

7. To Ensure Intergenerational Equity

Achieving net zero ensures that future generations inherit a stable climate, secure resources, and a livable planet, rather than bearing the burden of environmental degradation.

8. To Avoid Irreversible Climate Tipping Points

Delaying action increases the risk of crossing climate tipping points, beyond which climate change becomes self-reinforcing and uncontrollable.

9. Fulfilling Global Objectives

Numerous nations and organizations have pledged their commitment to global accords including the Sustainable Development Goals (SDGs) and the Paris Agreement. Achieving net zero is essential to reaching these goals

6.3. How Net Zero is Achieved

Net zero is achieved by balancing the amount of greenhouse gases produced with the amount removed from the atmosphere, targeting a net-balance of zero. This is done through deep decarbonization—switching to renewable energy (solar/wind), enhancing energy efficiency, and halting deforestation—combined with carbon removal techniques, such as reforestation or carbon capture technology, to neutralize unavoidable residual emissions.

The Net Zero is achieved by following the three steps which are:

(1) Reducing Emissions (Primary Focus): This is the first and most important step which focuses on following measures which aims to reduce the emissions

- Switching to renewable energy (solar, wind)
- Improving energy efficiency
- Using electric vehicles
- Sustainable industrial practices

The goal is to cut emissions as much as possible in the first step only.

(2) Removing Emissions (Balancing Step): After reductions, some emissions still remain. These are removed through by two methods a) Natural Methods and b) Technological methods

a) Natural Methods:

- Afforestation (planting trees)
- Reforestation
- Soil carbon storage

b) Technological Methods

- Carbon capture and storage (CCS)
- Direct air capture technologies

(c) Offsetting (Supporting Mechanism)

- **Investing in environmental projects:** Companies support projects that reduce or absorb carbon emissions like Forest projects Renewable energy projects, Clean cooking projects in rural areas, Water and soil conservation programs
- **Buying carbon credits:** Carbon credit is like a certificate. 1 Carbon Credit = 1 ton of CO₂ reduced or removed. Companies buy these credits from projects that reduce emissions. This helps balance their own pollution.

NET ZERO MODEL

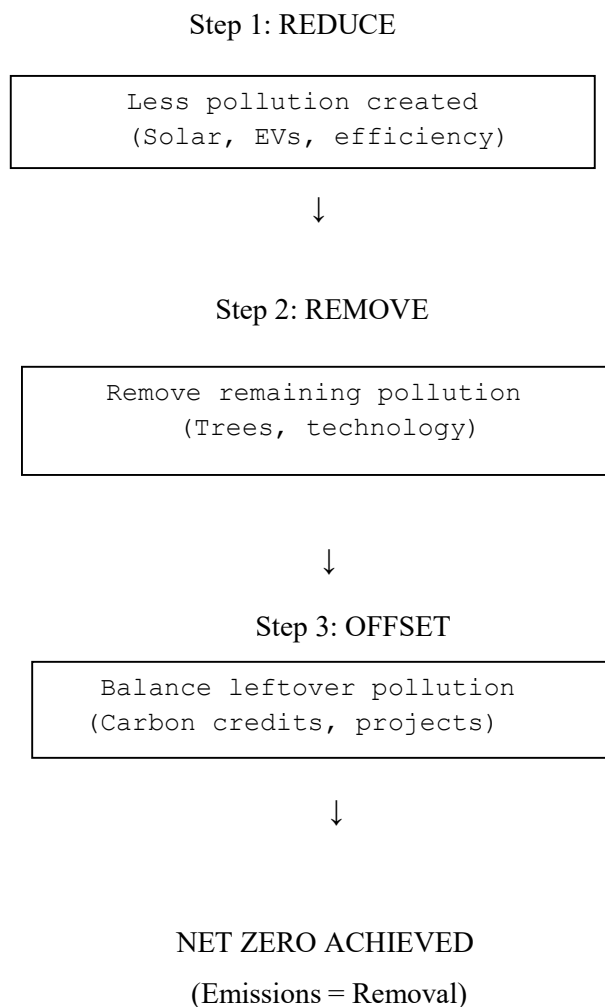


Figure 1: Net Zero Model

6.4. When Must the Earth Achieve Net-Zero Emissions?

As part of the Paris Agreement, nations committed to keeping global warming far below 2 degrees Celsius (3.6 degrees Fahrenheit), ideally at 1.5 degrees Celsius (2.7 degrees Fahrenheit). The pressing need to limit temperature increases is demonstrated by the effects of the current 1.1 degree Celsius (1.98-degree Fahrenheit) warming on the global climate, which include melting ice, catastrophic heat waves, and more powerful storms. From melting glaciers to catastrophic heat waves and more powerful storms, the effects of the present 1.1 degrees Celsius (1.98 degrees Fahrenheit) global warming are already being felt, highlighting how urgent it is to keep temperatures from rising too much.

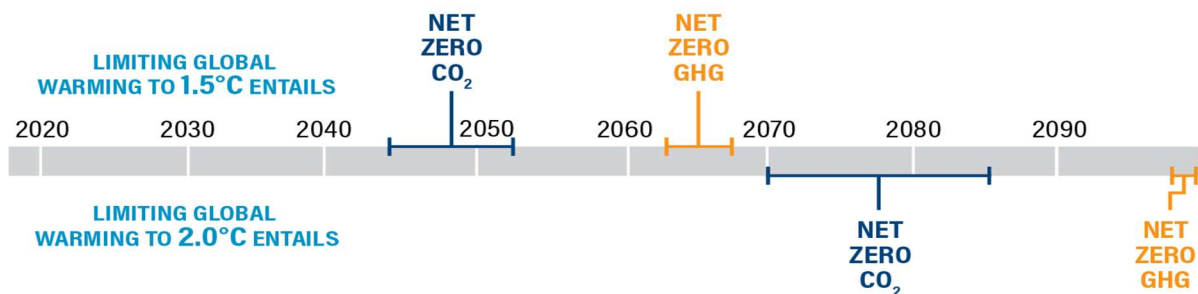
“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

According to the most recent research, achieving net zero CO₂ emissions between 2050 and 2060 is necessary to keep warming to 1.5 degrees Celsius. A risk of momentarily "overshooting," or beyond 1.5 degrees Celsius, is avoided by achieving net zero earlier in that range (nearer to 2050). Achieving net zero later (about 2060) virtually ensures that global temperatures will rise above 1.5 degrees Celsius for a while before carbon removal can bring them back to safer levels.

6.5. The Net Zero Tactics

In order to reach net-zero emissions by 2050, we must take decisive and swift climate action. Now that the global temperature is approaching the critical barrier of 1.5°C, governments and corporations are expected to take the lead in figuring out how to reach net-zero emissions. There are numerous ways for businesses to embrace science-based goals in order to cut emissions and move closer to net-zero. These promises must, however, be successfully implemented. We can manage to reach net-zero CO₂ emissions if we stabilize the global temperatures, this can be possible when we achieve global net-zero carbon emissions by the early 2050s by keeping the global warming to 1.5°C (2.7°F). The timeframe for achieving global net-zero carbon emissions, on the other hand, stretches into the early 2070s if we strive to keep the temperature increase to 2°C (3.6°F).

Global timeline to reach net-zero emissions



Source: IPCC Special Report on Global Warming of 1.5°C

 WORLD RESOURCES INSTITUTE

Figure 2: Global Timeline

6.6. How can net-zero emissions be achieved?

To address this urgent issue, the United Nations organized a global coalition of businesses and actors to begin the "race to net-zero" campaign. According to a McKinsey report, achieving net-zero emissions, \$9.2 trillion annually. However, there are many organizations that are using science-based targets. More than 1,045 companies are committed to science-based targets for emissions reduction.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

It is being observed and found that it is criticized that most businesses that establish science-based goals to achieve net-zero emissions do so in theory but not in reality. This approach makes it possible for certain types of "net-zero greenwashing" to deceive consumers, stakeholders, and investors with good intentions. Regarding the three parameters of disclosures, targets, and actual performance for net zero initiatives, the great majority of large firms are performing below expectations.

6.7. An illustration of a net-zero business

Microsoft is a shining example of one of the many businesses strivings to achieve net-zero. By removing more carbon from the atmosphere than it emits, the IT giant promised to achieve carbon negative by 2030. Additionally, Microsoft wants to eliminate all of the carbon emissions it has produced since its founding in 1975 by the year 2050. Its bold pledge is a great illustration of a thorough strategy for reaching net-zero emissions. The three pillars of Microsoft's approach are electrification, reduction, and carbon capture. It employs a variety of strategies, such as boosting operational energy efficiency, switching to renewable energy, and utilizing carbon capture and storage technology. Microsoft is also spending \$1 billion on technological research and carbon removal solutions through a new Climate Innovation Fund. This is a prime example of the revolutionary business activity needed to reach the global net-zero goals.

How can businesses attain carbon compensation that is consistent with net-zero? Companies are depending on volunteer carbon offsetting as part of their net-zero initiatives, but this approach is unlikely to meet net-zero goals. The Science-based Target Initiative (SBTi) states that before making any payments, SMEs and PMEs must cut their carbon emissions by 80% because doing so would make carbon compensation too simple. For businesses to achieve science-based net-zero, the SBTi mandates 90–95% deep decarbonization by 2050. It emphasizes that any remaining emissions, which shouldn't surpass 5–10% of a company's overall emissions, must be eliminated via carbon removal techniques. Up to 20% carbon removal is allowed for some sectors, such as agriculture, forestry, and land use, following an 80% decarbonization by 2050.

6.8. Net Zero Leaders

The Commitments to sustainability are increasing. In 2022 there were 2079 organizations that were working on major environmental commitments which have moved to 4,204 by the end of 2023. The Net zero leaders are playing a crucial role in reducing the global warming.

The term **Net Zero Leader** refers to an individual, organization, or country that is at the forefront of efforts to achieve **net-zero carbon emissions**, implying that the quantity of greenhouse gases released must be balanced with the quantity extracted from the atmosphere. Some Prominent Net Zero Leaders

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

in countries are United Kingdom, China and United States, in organizations are Microsoft, Amazon and Unilever and as individuals Greta Thunberg, Bill Gates have emerged as a net Zero Leaders. The net zero leaders play a crucial transformative role in shifting to Zero emissions across communities, governments, and various organizations. They have the ability to innovate, persuade, and implement the required changes to combat the climate changes.

6.9. Role of Leadership in Net-Zero Transformation

Leadership plays a central and enabling role in driving net-zero transformations by shaping vision, strategy, culture, and stakeholder engagement. Achieving net-zero is not merely a technological or operational challenge; it is fundamentally a leadership challenge that requires long-term commitment, systemic thinking, and transformational capabilities.

- **Visionary Role**

Leaders articulate a clear net-zero vision aligned with global climate goals and organizational purpose. By setting ambitious yet realistic targets, leaders provide direction and inspire collective action toward decarbonization.

- **Strategic Role**

Leadership integrates net-zero goals into corporate strategy, governance structures, and decision-making processes. This includes allocating resources, prioritizing green investments, and embedding sustainability into core business models.

- **Transformational Role**

Transformational leaders motivate employees to embrace change, innovate, and go beyond compliance. Through role modeling and empowerment, leaders foster a culture that supports sustainable practices and continuous improvement.

- **Cultural and Ethical Role**

Leaders shape an organizational culture that values environmental responsibility, accountability, and ethical conduct. A strong sustainability culture enhances employee engagement and accelerates behavioral change essential for net-zero transitions.

- **Stakeholder Engagement Role**

Effective leadership facilitates collaboration with stakeholders such as employees, investors, suppliers, regulators, and communities. Transparent communication and trust-building enable collective action toward net-zero outcomes.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

- **Governance and Accountability Role**

Leadership ensures the establishment of robust governance mechanisms, performance metrics, and reporting systems to track progress toward net-zero targets and ensure accountability.

7. The Power of Leadership in Net Zero Transformations

- **Setting High Standards for Zero Emissions**

The Nations and businesses dedicated to achieving net-zero objectives encourage others to do the same. The European Union and UK's net-zero target, encourages other countries to follow the same framework. Organizations such as Microsoft and Amazon exhibit leadership by establishing industry standards for net-negative emissions.

- **Promoting Innovation and Clean Technology Investment:**

Sustainable agriculture, electric mobility, carbon capture, and renewable energy are top priorities for net-zero leaders. The Companies like Tesla and Ørsted, are at the forefront of innovations that enable zero-emissions solutions to scale. For promotion of clean technology, the government is funding for the research and development.

- **Influencing Policies and Standards**

The Net Zero Leaders support international accords, legislation, and regulations which aimed at reducing emissions. They establish the 2015 Paris Agreement established a standard for national net-zero commitments and also some individual net zero leaders like COP26 President Alok Sharma and Christiana Figueres assist in coordinating international efforts toward net-zero.

- **Promoting Corporate Responsibility**

The Net Zero Leaders by Using ESG Measures: Environmental, social, and governance (ESG) practices have the companies transparent and accountable. Businesses now adhere to guidelines such as the Science-Based Targets initiative (SBTi) and have embraced greener practices.

- **Creating Job Opportunities**

As we go toward net zero, employment in sustainable manufacturing, green finance, and renewable energy are created as now the companies are investing in green infrastructure and circular economies like electric vehicle ecosystems, massive solar firms etc.

- **Changing Behavior and Increasing Awareness**

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

The net zero leaders at all level play a crucial role in creating the awareness among the general masses on the value of net-zero lifestyles. They educate them in reducing waste, importance of sustainability and supporting clean energy.

- **Working Together Across Boundaries**

Net-zero leaders bring the international alliances where nations and businesses together in common projects such as the UNFCCC's Race to Zero Campaign. Bill Gates established the Breakthrough Energy Coalition, which encourages worldwide innovation in renewable energy.

Conceptual Framework for Achieving Net-Zero Leadership

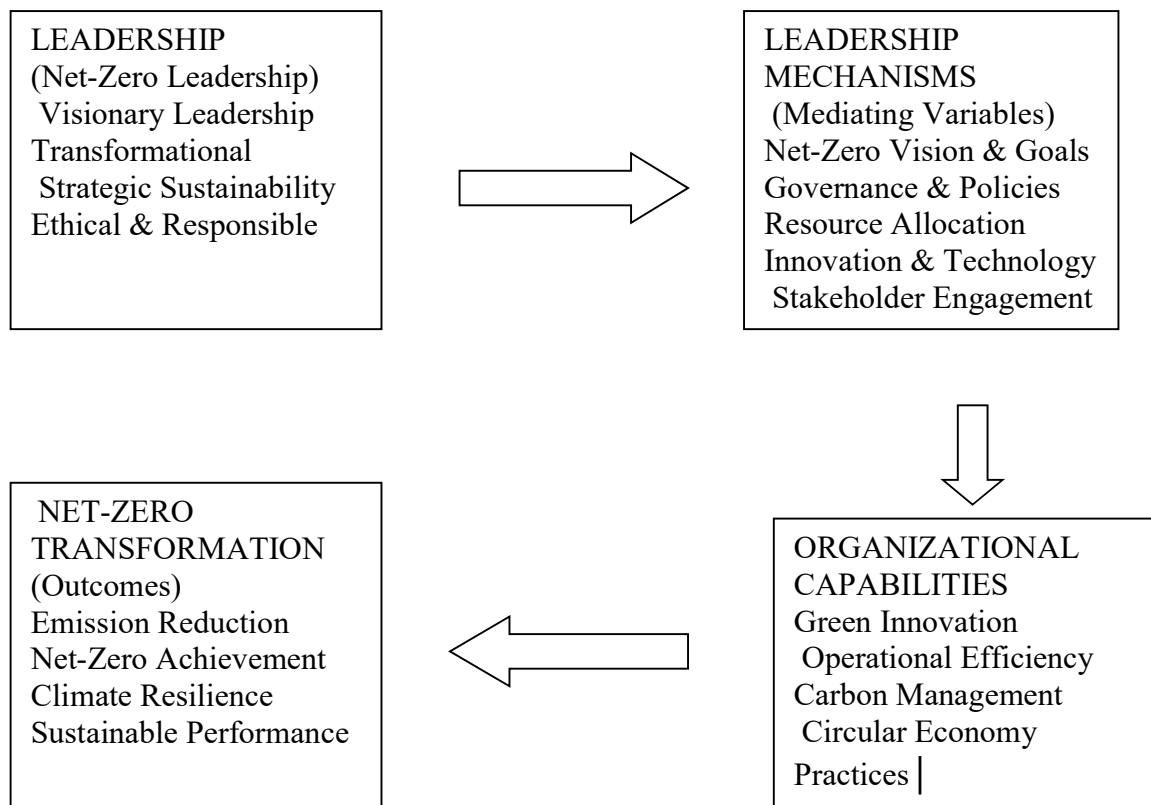


Figure 3: India's Step towards Net Zero Emissions

In the context of addressing climate change, India has made great strides toward taking the lead in the worldwide shift to net-zero emissions. India's broader commitment to the Paris Agreement and its own national sustainable development strategies are reflected in these initiatives. The following are important actions India is taking:

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

- **Dedication to achieving Net Zero by 2070**

At the 26th United Nations Climate Change Conference (COP26) in Glasgow in 2021, India declared its intention to achieve net-zero emissions by 2070. India takes pledge to balance the emissions it emits and the emissions it takes from the atmosphere.

- **Nationally Determined Contributions (NDCs)**

As a result of the Paris Agreement, India has revised its NDCs. The important components are

- 1) Achieving a 50% non-fossil fuel energy capacity share by 2030.
- 2.) By 2030, the GDP's carbon intensity should be 45% lower than it was in 2009.
3. Increase the use of non-fossil energy sources' capacity for renewable energy to 500 GW by 2030
- 4) Increases the forest cover as a natural carbon sink.

- **Making Renewable Energy Investments**

India is among the biggest investors in renewable energy worldwide. With a particular concentration on solar and wind energy, it intends to increase its renewable energy capacity to 500 gigawatts (GW) by 2030. With a number of massive wind and solar projects spread around the nation, India is a major force in the development of renewable energy worldwide.

- **The Green Hydrogen Initiative**

India started the National Green Hydrogen Mission in 2021 with the goal of making the nation a global center for the production and consumption of green hydrogen. This will have a big impact on decarbonizing previously difficult-to-electrify sectors like transportation and heavy manufacturing.

- **Mechanisms Based on the Market and Carbon Pricing**

India has looked into carbon pricing plans in an attempt to reduce greenhouse gas emissions. This entails encouraging emissions reductions and encouraging the use of greener technologies through the use of market-based tools such as carbon credits and trading systems.

- **Encouragement of Electric Vehicles**

India has put in place a variety of laws to promote electric vehicles in an attempt to reduce emissions from the transportation sector. This includes the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) program and the goal of having 30% of all vehicles on Indian roads is electric by 2030.

- **Consider Energy Efficiency**

The Energy Conservation Building Code (ECBC) and the Perform, Achieve and Trade (PAT) Scheme are two of India's national energy efficiency initiatives. The country also participates in the International Partnership for Energy Efficiency Cooperation (IPEEC).

- **Climate Change Finance**

India is trying to receive money and technology transfer from Western countries in order to accomplish its climate commitments. Additionally, as part of the UNFCCC (United Nations Framework Convention on Climate Change), India is advocating for wealthy countries to fulfill their commitment to donate \$100 billion a year to assist developing countries in their transition to a low-carbon economy.

8. The Role of AI in Net Zero Transformation

Net Zero transformation refers to reducing greenhouse gas emissions to as close to zero as possible, with any remaining emissions balanced by removal strategies (like forests or carbon capture). Artificial Intelligence (AI) plays a crucial role in accelerating this transition by improving efficiency, decision-making, and innovation across sectors.

8.1. Key Roles of Artificial Intelligence in Net Zero Transformation

1. Energy Efficiency Optimization: It helps reduce energy consumption by analyzing large datasets and optimizing usage patterns.

- Smart grids use AI to balance electricity supply and demand.
- AI systems optimize heating, cooling, and lighting in buildings.
- Reduces energy wastage in industries

AI-based systems in smart homes automatically adjust electricity usage based on real-time needs.

2. Renewable Energy Integration

Renewable energy sources like solar and wind are variable. AI helps manage this variability.

- Predicts weather patterns for solar and wind energy generation
- Improves storage and distribution of renewable energy
- Enhances grid stability

3. Carbon Emission Monitoring and Reduction

AI enables accurate tracking and reduction of emissions.

- Tracks carbon footprints in real time
- Identifies high-emission processes
- Suggests ways to reduce emissions

Example: AI tools used by companies to monitor factory emissions and reduce pollution.

4. Smart Transportation Systems

AI improves transportation efficiency, reducing fuel consumption and emissions.

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

- Enables route optimization for vehicles
- Supports development of electric and autonomous vehicles
- Reduces traffic congestion

Example: Navigation apps using AI reduce fuel use by suggesting shorter routes.

5. AI supports climate-friendly farming practices.

- Precision farming reduces water and fertilizer use
- Predicts crop yields and weather conditions
- Minimizes environmental impact

Example: AI-driven irrigation systems use water only when needed.

6. Industrial Decarbonization

AI helps industries reduce emissions through process optimization.

- Predictive maintenance reduces energy waste
- Optimizes production processes
- Reduces material wastage

Example: AI detects machine faults early, saving energy and costs.

7. Climate Modeling and Risk Prediction

AI enhances understanding of climate change and supports policy decisions.

- Predicts climate risks and extreme weather events
- Helps governments plan sustainability strategies
- Supports carbon reduction policies

Example: AI models predict floods or droughts, enabling preventive actions.

9. Conclusion

Strong leadership is crucial for bringing about revolutionary change within businesses in the worldwide effort to achieve net zero emissions. Setting the vision, fostering a sustainable culture, and inspiring their firms to move toward a net zero future are all crucial tasks for leaders. In addition to highlighting lessons that other businesses can learn, the leaders are playing a critical role in advancing net-zero transformations and offering practical advice to help leaders who are interested in sustainability thrive.

•As the global climate crisis worsens due to record-breaking temperatures and catastrophic weather events, businesses must step up their efforts to achieve net zero carbon emissions. A sizable percentage

“Harnessing Artificial Intelligence for Organizational Excellence and Sustainable Growth”

of companies are implementing official sustainability plans and integrating them with their main business functions. India is leading the world in reaching net-zero emissions by 2070 thanks to a combination of aggressive regulations, global cooperation, and an emphasis on sustainable practices and renewable energy.

India's emphasis on clean tech investments, renewable energy, and low-carbon infrastructure demonstrates its dedication to lowering its carbon footprint. India is experiencing a revolution in the direction of sustainable transportation. India is on pace to become a global leader in sustainable development thanks to its strong commitment to lowering carbon intensity and boosting the use of non-fossil fuels in electricity generation. India's "Panchamrit," or five fundamental commitments, during COP26 outlined a step-by-step roadmap for a greener India.

References

- Abraham Zhang , Shenghao Xie , Yu Gong , Changjun Li , Yanping Liu (2023), “Barriers to compulsory waste sorting for a circular economy in China”, *Journal of Environmental Management*, Volume 342
- Albert C. Lin(Spring 2022)” Making Net Zero Matter” , *Washington and Lee Law Review*, Volume 79 Issue 2
- Arlow, P. (1991), Personal characteristics in college student's evaluations of business ethics and corporate social responsibility, *Journal of Business Ethics*, Vol. 10, 63–69.
- Chun-Chiang Feng, Kuei-Feng Chang (2022), “Toward green transition in the post Paris Agreement era: The case of Taiwan”.
- Ajay Shankar, Dr Sanchit S Agarwal, Ms TarunaIdnani (2024), “Discussion paper on India’s Journey to Net Zero: A Conceptual Framework for Analysis”
- Davis, J. R. & R. E. Welton (1991), Professional ethics: Business students'perceptions, *Journal of Business Ethics* Vol. 10, 451-63
- Dongmei Han , Fangfei Teng , Ruoya Jia (2023),”Achieving the goal of net-zero requires both resource efficiency and efficient business management”,*Resources Policy*, Volume 86
- Naveen Virmani, Satakshi Agarwal (2022), “Adopting Net-zero in emerging economies”, *Journal of Environmental Management*, Volume 321
- Nirvikar Singh (2022) India’s Strategy for Achieving Net Zero *Energies* 15(16):5852DOI:10.3390/en15165852
- Power, Simon James (2022). How do place-based leaders use strategies to effect change? A case study of the net zero challenge in UK Core cities: A thesis submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy of Cardiff University

Free standard shipping on all orders

VISA

MasterCard

AMERICAN EXPRESS

Apple Pay

G Pay

UICB

Routledge

Taylor & Francis Group

Search by keywords, subject, or ISBN

End of Year Savings • 20% Off All Books & eBooks • Shop Now »

SAVE £30.00

Cover Image Not Available

COMING SOON

1st Edition

Generative AI Tools
From Algorithms to Applications

Edited By [Priyanka Sharma](#), [A.V. Senthil Kumar](#), [Monika Jyotiyana](#), [Adnan Alrabea](#)

Copyright 2026

Hardback

Available for pre-order on March 19, 2026. Item will ship after April 9, 2026

£150.00

GBP £120.00

PURCHASE LOCALLY

<https://www.routledge.com/Generative-AI-Tools-From-Algorithms-to-Applications/Sharma-SenthilKumar-Jyotiyana-Alrabea/p/book/9781032745909>

1/5

ADD TO WISH LIST

ISBN 9781032745909
256 Pages 76 B/W Illustrations
April 9, 2026 by Auerbach Publications

[Request Inspection Copy](#)

 Free Shipping (14-21 Business Days)
[shipping options](#)

Description

Generative AI algorithms have become transformative forces in today's digital landscape, revolutionizing industries from healthcare and finance to creative arts and software development by enabling machines to create human-like content, automate complex tasks, and generate innovative solutions at unprecedented scale and speed. These applications are driving significant productivity gains across organizations, with AI-powered tools like large language models, image generators, and code assistants helping professionals streamline workflows, enhance creativity, and solve problems that were previously time-intensive or required specialized expertise. The strategic importance of generative AI extends beyond operational efficiency, as it represents a fundamental shift toward intelligent automation that is reshaping competitive advantages, creating new business models, and establishing AI literacy as a critical skill for future workforce success. *Generative AI Tools: From Algorithms to Applications* is a reference for researchers that consolidates rapidly evolving methodologies, theoretical foundations, and practical implementations. Highlights include:

- Generative AI tools and the marketing industry
- A comprehensive overview of ChatGPT
- ChatGPT integration in IoT ecosystems

Providing a structured framework for understanding this complex and fast-moving field, the book enables researchers to build upon established knowledge more efficiently, avoid redundant work, and identify promising research directions by offering systematic coverage of current state-of-the-art techniques, their limitations, and emerging challenges that require innovative solutions. Bridging the gap between theoretical concepts and real-world applications, the book helps researchers understand not only how these algorithms work but also their practical implications, ethical considerations, and potential societal impacts, which is crucial for developing responsible and impactful AI research agendas.

Table of Contents

1. The Expanding Horizon of Generative AI: Applications Across Diverse Fields
Ekta Gupta, Priyanka Sharma, and Nikhil Sharma
2. Generative AI Tools and the Marketing Industry
Surbhi Gosain and Shivani Sharma
3. A Comprehensive Review on Intrusion Detection Systems for Internet of Things: From Theory to Implementation Using Machine Learning, Deep Learning and Generative AI Techniques
Naveen Saran, Nishtha Kesswani, and Ravi Saharan
4. Advancements in Chatbot Technology: A Comprehensive Overview of ChatGPT
Pooja Jain, Ankush Tondon, and Basant Agarwal
5. Precision Forecasting for Electric Vehicle Charging Infrastructure Planning in Sustainable Urban Mobility
Digambar Singh Govind, and Manoj Fauzdar
6. A Hybrid Deep Learning-Based vs. Generative AI for Intrusion Detection System in IoT
Monika Vishwakarma and Suparn Padma Patra
7. AI-Driven Harmony: Predictive Maintenance Unleashed with EV Integration in Distribution Networks
Yashvi Mudgal and Rajive Tiwari
8. Occluded Face Recovery Using Generative Adversarial Network (GAN)
Manisha Kumari Meena and Hemant Kumar Meena
9. Segmentation of Lung Regions from Chest X-Rays Using AI-Based Techniques
Sanjive Tyagi, Tarun Kumar, Govind Murari Upadhyay, Arun Kumar Uttam, Pramod Kumar Soni, and Anupam Agarwal
10. Conversational Intelligence at the Edge: ChatGPT Integration in IoT Ecosystems
Monika Jyotiyana, Monika Vishwakarma, and Usha Jain

Editor(s)

Shipping Options

Book Series

This book is included in the following book series:

Related Subjects

- Q Artificial Intelligence
- Q Cognitive Artificial Intelligence.
- Q Computational Linguistic & Language Recognition
- Q Machine Learning - Design
- Q Neural Networks
- Q Data Preparation & Mining
- Q Intelligent Systems
- Q Machine Learning
- Q Computer Science
- Q Databases
- Q Electrical Engineering Communications
- Q Electrical & Electronic Engineering
- Q Engineering & Technology
- Q Systems & Control Engineering
- Q Data Mining and Knowledge Discovery
- Q Machine Learning and Pattern Recognition

Back To Top ^

CONTACT US

- Customer Service
- Editorial Contacts
- eUpdates Sign Up
- Rights and Permissions
- Sales Contacts
- Become an Affiliate Partner 

FAQS

PARTNERS

OUR PRODUCTS

- eBooks
- eBook+
- Book Series
- Online Platforms

CUSTOMER RESOURCES

- Authors
- Booksellers
- Instructors
- Request An Inspection Copy
- Librarians
- Press and Media
- Societies & Associations 
- Students

ABOUT US

- About Routledge
- About Taylor & Francis 
- Taylor & Francis Journals 
- Careers 



[Open Access Books](#)

[Focus Shortform Books](#)

[BLOG](#)



© 2025 Informa UK Limited, an Informa Plc company

POLICIES

- [Accessibility](#)
- [AI Policy](#)
- [Conference Proceedings](#)
- [Inspection Copy T&Cs](#)
- [Privacy Policy](#)
- [Returns & Cancellations](#)
- [Shipping Policy](#)
- [Sustainability](#)
- [Tax Exemptions](#)
- [Terms & Conditions](#)

SOCIAL



SECURE SHOPPING



Free standard shipping on all orders

VISA

MasterCard

AMERICAN EXPRESS

Apple Pay

G Pay

UICB

Routledge

Taylor & Francis Group

Search by keywords, subject, or ISBN

End of Year Savings • 20% Off All Books & eBooks • Shop Now »

SAVE £30.00

Cover Image Not Available

COMING SOON

1st Edition

Generative AI Tools
From Algorithms to Applications

Edited By [Priyanka Sharma](#), [A.V. Senthil Kumar](#), [Monika Jyotiyana](#), [Adnan Alrabea](#)

Copyright 2026

Hardback

Available for pre-order on March 19, 2026. Item will ship after April 9, 2026

£150.00

GBP £120.00

PURCHASE LOCALLY

<https://www.routledge.com/Generative-AI-Tools-From-Algorithms-to-Applications/Sharma-SenthilKumar-Jyotiyana-Alrabea/p/book/9781032745909>

1/5

ADD TO WISH LIST

ISBN 9781032745909
256 Pages 76 B/W Illustrations
April 9, 2026 by Auerbach Publications

[Request Inspection Copy](#)

 Free Shipping (14-21 Business Days)
[shipping options](#)

Description

Generative AI algorithms have become transformative forces in today's digital landscape, revolutionizing industries from healthcare and finance to creative arts and software development by enabling machines to create human-like content, automate complex tasks, and generate innovative solutions at unprecedented scale and speed. These applications are driving significant productivity gains across organizations, with AI-powered tools like large language models, image generators, and code assistants helping professionals streamline workflows, enhance creativity, and solve problems that were previously time-intensive or required specialized expertise. The strategic importance of generative AI extends beyond operational efficiency, as it represents a fundamental shift toward intelligent automation that is reshaping competitive advantages, creating new business models, and establishing AI literacy as a critical skill for future workforce success. *Generative AI Tools: From Algorithms to Applications* is a reference for researchers that consolidates rapidly evolving methodologies, theoretical foundations, and practical implementations. Highlights include:

- Generative AI tools and the marketing industry
- A comprehensive overview of ChatGPT
- ChatGPT integration in IoT ecosystems

Providing a structured framework for understanding this complex and fast-moving field, the book enables researchers to build upon established knowledge more efficiently, avoid redundant work, and identify promising research directions by offering systematic coverage of current state-of-the-art techniques, their limitations, and emerging challenges that require innovative solutions. Bridging the gap between theoretical concepts and real-world applications, the book helps researchers understand not only how these algorithms work but also their practical implications, ethical considerations, and potential societal impacts, which is crucial for developing responsible and impactful AI research agendas.

Table of Contents

1. The Expanding Horizon of Generative AI: Applications Across Diverse Fields
Ekta Gupta, Priyanka Sharma, and Nikhil Sharma
2. Generative AI Tools and the Marketing Industry
Surbhi Gosain and Shivani Sharma
3. A Comprehensive Review on Intrusion Detection Systems for Internet of Things: From Theory to Implementation Using Machine Learning, Deep Learning and Generative AI Techniques
Naveen Saran, Nishtha Kesswani, and Ravi Saharan
4. Advancements in Chatbot Technology: A Comprehensive Overview of ChatGPT
Pooja Jain, Ankush Tondon, and Basant Agarwal
5. Precision Forecasting for Electric Vehicle Charging Infrastructure Planning in Sustainable Urban Mobility
Digambar Singh Govind, and Manoj Fauzdar
6. A Hybrid Deep Learning-Based vs. Generative AI for Intrusion Detection System in IoT
Monika Vishwakarma and Suparn Padma Patra
7. AI-Driven Harmony: Predictive Maintenance Unleashed with EV Integration in Distribution Networks
Yashvi Mudgal and Rajive Tiwari
8. Occluded Face Recovery Using Generative Adversarial Network (GAN)
Manisha Kumari Meena and Hemant Kumar Meena
9. Segmentation of Lung Regions from Chest X-Rays Using AI-Based Techniques
Sanjive Tyagi, Tarun Kumar, Govind Murari Upadhyay, Arun Kumar Uttam, Pramod Kumar Soni, and Anupam Agarwal
10. Conversational Intelligence at the Edge: ChatGPT Integration in IoT Ecosystems
Monika Jyotiyana, Monika Vishwakarma, and Usha Jain

Editor(s)

Shipping Options

Book Series

This book is included in the following book series:

Related Subjects

- Q Artificial Intelligence
- Q Cognitive Artificial Intelligence.
- Q Computational Linguistic & Language Recognition
- Q Machine Learning - Design
- Q Neural Networks
- Q Data Preparation & Mining
- Q Intelligent Systems
- Q Machine Learning
- Q Computer Science
- Q Databases
- Q Electrical Engineering Communications
- Q Electrical & Electronic Engineering
- Q Engineering & Technology
- Q Systems & Control Engineering
- Q Data Mining and Knowledge Discovery
- Q Machine Learning and Pattern Recognition

Back To Top ^

CONTACT US

- Customer Service
- Editorial Contacts
- eUpdates Sign Up
- Rights and Permissions
- Sales Contacts
- Become an Affiliate Partner 

FAQS

PARTNERS

OUR PRODUCTS

- eBooks
- eBook+
- Book Series
- Online Platforms

CUSTOMER RESOURCES

- Authors
- Booksellers
- Instructors
- Request An Inspection Copy
- Librarians
- Press and Media
- Societies & Associations 
- Students

ABOUT US

- About Routledge
- About Taylor & Francis 
- Taylor & Francis Journals 
- Careers 



[Open Access Books](#)

[Focus Shortform Books](#)

[BLOG](#)



© 2025 Informa UK Limited, an Informa Plc company

POLICIES

- [Accessibility](#)
- [AI Policy](#)
- [Conference Proceedings](#)
- [Inspection Copy T&Cs](#)
- [Privacy Policy](#)
- [Returns & Cancellations](#)
- [Shipping Policy](#)
- [Sustainability](#)
- [Tax Exemptions](#)
- [Terms & Conditions](#)

SOCIAL



SECURE SHOPPING



Computational Intelligence Solutions for Real-Life Problems

Theories, Applications, and Advances



Biswadip Basu Mallik | Gunjan Mukherjee | Rahul Kar
Özen Özer | Digvijay Pandey | Binay Kumar Pandey
Editors



CRC Press
Taylor & Francis Group

APPLE ACADEMIC PRESS

COMPUTATIONAL INTELLIGENCE SOLUTIONS FOR REAL-LIFE PROBLEMS

Theories, Applications, and Advances



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

COMPUTATIONAL INTELLIGENCE SOLUTIONS FOR REAL-LIFE PROBLEMS

Theories, Applications, and Advances

Biswadip Basu Mallik, PhD

Gunjan Mukherjee, PhD

Rahul Kar, MSc

Özen Özer, PhD

Digvijay Pandey, PhD

Binay Kumar Pandey, PhD

Editors

AAP | APPLE
ACADEMIC
PRESS

First edition published 2026

Apple Academic Press Inc.

1265 Goldenrod Circle, NE,
Palm Bay, FL 32905 USA

760 Laurentian Drive, Unit 19,
Burlington, ON L7N 0A4, Canada

CRC Press

2385 NW Executive Center Drive,
Suite 320, Boca Raton FL 33431

4 Park Square, Milton Park,
Abingdon, Oxon, OX14 4RN, UK

© 2026 by Apple Academic Press, Inc.

Apple Academic Press exclusively co-publishes with CRC Press, an imprint of Taylor & Francis Group, LLC

Reasonable efforts have been made to publish reliable data and information, but the authors, editors, and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors, editors, and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged, please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, access www.copyright.com or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. For works that are not available on CCC please contact mpkbookspermissions@tandf.co.uk

Trademark notice: Product or corporate names may be trademarks or registered trademarks and are used only for identification and explanation without intent to infringe.

For Product Safety Concerns and Information please contact our EU representative GPSR@taylorandfrancis.com Taylor & Francis Verlag GmbH, Kaufingerstraße 24, 80331 München, Germany

Library and Archives Canada Cataloguing in Publication

.....
CIP data on file with Canada Library and Archives
.....

Library of Congress Cataloging-in-Publication Data

.....
CIP data on file with US Library of Congress
.....

ISBN: 978-1-99851-100-6 (hbk)

ISBN: 978-1-99851-101-3 (ebk)

DOI: 10.1201/9781998511013

About the Editors



Biswadip Basu Mallik, PhD

Professor of Mathematics, Department of Basic Science and Humanities, Institute of Engineering & Management, University of Engineering and Management, Kolkata, India

Biswadip Basu Mallik, PhD, is currently a Professor of Mathematics in the Department of Basic Science & Humanities at the Institute of Engineering & Management (School of University of Engineering and Management), Kolkata, India. With 23 years of experience in teaching and research, he has published numerous research papers and book chapters in scientific journals from esteemed international publishers, including CRC Press, Wiley, Springer, IGI Global, Nova Science, and IEEE. Dr. Basu Mallik has authored five undergraduate-level books on engineering mathematics, quantitative methods, and computational intelligence. He has also published five Indian patents and edited 22 books. His research interests include computational fluid dynamics, mathematical modeling, optimization, and machine learning. He serves as the Series Editor for the book series titled *Mathematics and Computer Science* from Wiley-Scrivener, USA. He is the Managing Editor of the *Journal of Mathematical Sciences & Computational Mathematics* (JMSCM), USA. Additionally, Dr. Basu Mallik is an editorial board member and reviewer for several scientific journals. He holds senior life membership in the Operational Research Society of India (ORSI) and life membership in the Calcutta Mathematical Society (CMS), Indian Statistical Institute (ISI), Indian Science Congress Association (ISCA), and the International Association of Engineers (IAENG).

**Gunjan Mukherjee, PhD**

Associate Professor, Department of Computational Sciences, Brainware University, Kolkata, India

Gunjan Mukherjee, PhD, is currently an Associate Professor in the Department of Computational Sciences at Brainware University, Kolkata, India. His research interests include computer vision, machine learning, soft computing, and image processing. He is a life member of the Computer Society of India (CSI), the Internet Society (ISOC), and the International Association of Engineers (IAENG). He has published numerous research papers in reputed journals and international conferences. Dr. Mukherjee has guided many BTech and MCA students in their project and research work. He is also the author of a school computer book series (Class 3 to 10, under his sole authorship) and a textbook on IT systems theory for engineering students, and is currently working on a book on Python technology (in press). He is associated with a reputed publishing house for the publication of question-answer-based books for diploma and engineering-level students and has served as a reviewer for several technical books. Dr. Mukherjee previously worked as an Assistant Teacher at Sree Aurobindo Institute of Education, an Education Officer at CSI, Kolkata Chapter, a Senior Faculty at NIT Ltd., and a Lecturer at Calcutta Institute of Technology. He has also served as a Visiting Faculty at Aliah University, Techno India College, and JIS College. He completed his BSc in Physics from Calcutta University, MCA from IGNOU, MTech from Calcutta University, and obtained his PhD in Engineering from Jadavpur University.

**Rahul Kar, MSc**

State-Aided Teacher, Department of Mathematics, Kalyani Mahavidyalaya, Nadia, W.B., India

Rahul Kar is pursuing a PhD in Pure Mathematics at the University of Burdwan, West Bengal, India, and is currently working as a SACT-II Mathematics faculty at Kalyani Mahavidyalaya, Kalyani, Nadia, West Bengal. He has completed an MSc in Pure

Mathematics. He has previously worked as a guest faculty member at the Gurunank Institute of Technology and two other colleges. In total, he has eight years of teaching experience. He has published numerous research papers indexed in Scopus. He is also working as an editor for four national and international journals and as a reviewer for five international journals. Additionally, he serves as an editor for 15 mathematics and computer science books. He is an annual member of the Indian Mathematical Society as well as an honorary member of the Carmels Research Institute, Dakar, Senegal.



Özen Özer, PhD

*Associate Professor, Department of Mathematics,
Faculty of Science and Arts, Kırklareli University,
Turkey*

Özen Özer, PhD, is currently working as an Associate Professor in the Department of Mathematics, Faculty of Science and Arts, at Kırklareli University. Her research specialization includes the theory of real quadratic number fields with applications,

Diophantine and Pell equations, Diophantine sets, arithmetic functions, fixed point theory, p -adic analysis, q -analysis, special integer sequences, nonlinear analysis, C -algebra, matrix theory, optimization, approximation theory, cryptography, machine learning, artificial intelligence, differential equations, and statistics. She has published or completed more than 75 research papers in high-quality international journals, as well as numerous national and international scientific projects. She has also written and published books and book chapters on number theory, algebra, applied mathematics, and analysis with international publishing houses. She has participated in various national and international conferences in multiple countries as a keynote speaker. She has worked with more than 75 different publishing houses and journals as a reviewer and has served as a member of editorial boards for books, papers, and conference proceedings. She is open to all kinds of academic and scientific collaborations. She received her BSc and MSc degrees in Mathematics from Trakya University, Edirne (Turkey), and her PhD in Mathematics from Süleyman Demirel University, Isparta (Turkey).

**Digvijay Pandey, PhD**

Senior Lecturer, Department of Technical Education, Kanpur (Government of Uttar Pradesh), India

Digvijay Pandey, PhD, is currently working as a Senior Lecturer in the Department of Technical Education, Kanpur, Government of Uttar Pradesh, India. Before this, he joined Tata Consultancy Services (TCS) in 2012 as an IT analyst and worked on various projects in the United States (US), United Kingdom (UK), and Canada until 2016. He is also a faculty member at the Institute of Engineering and Rural Technology (IERT), Allahabad. He has more than ten years of experience in both teaching and the industry. He has written 14 book chapters and published 60 research papers in ScienceDirect (Elsevier), Science Citation Index (SCI), University Grants Commission (UGC), and Scopus-indexed journals. Additionally, he acts as an editor for a peer-reviewed international journal and a book. He has presented several research papers at national and international conferences. He also chaired a session at the IEEE International Conference on Advanced Trends in Multidisciplinary Research and Innovation (ICATMRI-2020). He has four patents published in The Patent Office Journal, with one currently being processed in the Australian Patent Office Journal. He serves as a reviewer for several prestigious journals, including Scientific Reports (Nature Publications), Clinical and Translational Imaging (Springer), International Journal of Learning, Teaching and Educational Research (Scopus-indexed), and many others. His research interests include medical image processing, image processing, text extraction, information security, and related fields.

**Binay Kumar Pandey, PhD**

Assistant Professor (Senior Scale), Department of Information Technology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Binay Kumar Pandey, PhD, is an Assistant Professor (Senior Scale) at Govind Ballabh Pant

University of Agriculture and Technology in Pantnagar, Uttarakhand, India. He obtained his education qualification in the field of Information Technology, with a focus on bioinformatics, image processing, and high-performance computing. In 2005, he received his BTech from IET Lucknow (Uttar Pradesh Technical University, Uttar Pradesh, Lucknow), India. He started working as an assistant professor in the Department of Information Technology at Govind Ballabh Pant University of Agriculture and Technology in Pantnagar in 2010 and has since worked on a wide range of under- and postgraduate projects. He has over a decade of experience in the fields of teaching and research. He has over 100 publications in prestigious journals, including those from renowned publishers Springer, Inderscience, Taylor & Francis (SCIE/Scopus-indexed journals, and others), as well as three patents published in the Indian official journal of patents and two patents published in the Australian official journal of patents. He is also an editor of scientific books published by international publishers such as Nova Science Publishers. He has received numerous awards, including the PM Scholarship, among others. He chaired a session at the IEEE International Conference on Advent Trends in Multidisciplinary Research and Innovation (ICATMRI-2020) on December 30, 2020, hosted by Pankaj Laddhad Institute of Technology and Management Studies in Buldhana, Maharashtra, India, and is a reviewer for SCI/Scopus-indexed journals published by Springer, Wiley, Inderscience, Tech Science Publishers, Elsevier, and several others. He is an Associate Editor of *SN Social Sciences*, a multidisciplinary journal published by Springer Nature and *Partners Universal International Research Journal* (PUIRJ).



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Contents

Contributors.....xv

Abbreviations xxi

Prefacexxv

1. Precise Pharmaceuticals: Computational Intelligence in Drug Manufacturing..... 1
Akriti Dogra, Bhargavi Posinasetty, Bhawani Sankar Panigrahi,
Susanta Kumar Sahoo, S. Jailani, and G. S. Gayathri

2. The Road Ahead: Charting Future Research Directions in Computational Intelligence..... 19
N. Srikanth Reddy, Anganabha Baruah, Shrinwantu Raha,
S. B. G. Tilak Babu, K. Keshav Kumar, and S. Suganya

3. Electronics Enhanced: Computational Intelligence in Electronic Science 37
Venkat Namdev Ghodke, Ravindra Bhardwaj, J. Suresh, S. B. G. Tilak Babu,
Gopal Ghosh, and Sachin T. Bahade

4. Bountiful Fields: The Agricultural Revolution with Computational Intelligence..... 55
M. Sakthivadivel, Catherine Julie Aarthy C., Ajay Kumar Sharma,
Kamal Gulati, Roop Raj, and Eti Khatri

5. Manufacturing Marvels: A Comprehensive Study on Computational Intelligence..... 73
Ujjwal Agarwal, T. Selvakumar, V. P. Sriram, Kamal Gulati,
L. K. Joshila Grace, and Eti Khatri

6. Designing the Future: The Impact of Computational Intelligence in Industry..... 93
Suchita Walke, M. Vigneshkumar, Vivekanand Pandey, S. B. G. Tilak Babu,
P. Rama Devi, and Rahul Dev Gupta

7. Economic Insights: The Computational Intelligence Perspective on Finance	113
Sudhansu Sekhar Nanda, Sthitipragyan Biswal, Devadutta Indoria, Manesh R. Palav, S. B. G. Tilak Babu, and Anand Patil	
8. Guardians of the Cyber Realm: How Computational Intelligence Defends?	131
V. Vijayalakshmi, Niti Saxena, G. Prasadu, Kamal Gulati, Regonda Nagaraju, and Somya Choubey	
9. Innovating Industrial Design: A Comprehensive Analysis of Computational Intelligence	149
V. Kulkarni Shripad, Poornima B. Kulkarni, Amol Subhash Rajpure, Megha N. Deshmukh, and Narendra P. Deshmukh	
10. Financial Insights Unleashed: Computational Intelligence in Practice.....	167
Priya Makhija, Archana, S. B. G. Tilak Babu, Abhishek Sharma, Ankitha Sharma, and Anand Patil	
11. Security in the Digital Age: The Computational Intelligence Approach	185
Pravin Madhukar Dhanrao, Suchita Walke, Sweta Priya, Manesh R. Palav, Binod Kumar, and Pushpesh	
12. Advancements in AI for Cybersecurity: A Comprehensive Review of the Latest Science and Engineering Trends	203
Srinivasa Rao Gundu, Panem Charanarur, and Biswadip Basu Mallik	
13. Revealing the Next Frontier in Python Code Review: Harnessing Automated Machine Learning with Random Forest for Unmatched Code Quality Evaluation	215
Md. Arshad, Rejuwan Shamim, Trapti Agarwal, and Biswadip Basu Mallik	
14. Harnessing the Power of DNA: Ensuring Secure and Trustworthy Digital Voting	249
Animesh Kairi, Tapas Bhadra, and Biswadip Basu Mallik	
15. Application of Computational Intelligence Through the Lens of CNS Drug Discovery: A Study of AI-Driven Predictive Models.....	263
Sudipta Adhikary, Debanjana Sasmal, Gunjan Mukherjee, Kaushik Banerjee, and Biswadip Basu Mallik	

16. Analyzing the Factors Affecting the Acceptance of Online Shopping: The Impact of Computational Intelligence and AIoT Through Structural Equation Modeling.....	289
Arunika Bhadra, Anisha Biswas, Sourav Gangopadhyay, and Sreejita Bose	
17. Harnessing Computational Intelligence for Cutting-Edge Electronic Science	313
Arnab Basu	
18. Smart Tools for Spotting and Sorting Breast Cancer: Harnessing the Power of Computers and Learning Systems.....	335
Anirban Bera and Souvik Bera	
19. Matching Filter and Quantum Sensors: Study Dark Matter Transients for Computation	351
Digvijay Pandey, S. K. Sahani, Binay Kumar Pandey, K. Sahani, Pankaj Dadheech, and A. Shaji George	
20. Computational Intelligence in Technopreneurial Skills Development in TVET Institutions	397
Edidiong Isonguyo Silas, Williams Kennedy George, Samuel Amos Ikpe, Rosemary Collins Piate, Digvijay Pandey, Binay Kumar Pandey and Pankaj Dadheech	
<i>Index.....</i>	429



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Contributors

Catherine Julie Aarthy C.

Department of Management, MEASI Institute of Management, Tamil Nadu, India

Sudipta Adhikary

Department of Law, Brainware University, Barasat, West Bengal, India

Trpty Agarwal

Maharishi University of Information Technology, Uttar Pradesh, India

Ujjwal Agarwal

College of Computing and Information Sciences, University of Technology and Applied Sciences, Salalah, Oman

Archana

Lucknow, Uttar Pradesh, India

Md. Arshad

Department of Computer Science and Engineering with Data Science, Maharishi University of Information Technology, Uttar Pradesh, India

S. B. G. Tilak Babu

Department of Electronics and Communication Engineering (ECE), Aditya Engineering College, Surampalem, Andhra Pradesh, India

Sachin T. Bahade

Department of Electronics, Nabira Mahavidyalaya, Katol, Maharashtra, India

Kaushik Banerjee

Department of Law, Brainware University, Barasat, West Bengal, India

Anganabha Baruah

Department of Psychology, Christ University, Delhi NCR, Uttar Pradesh, India

Arnab Basu

Department of Basic Science and Humanities, Institute of Engineering & Management, University of Engineering and Management, Kolkata, West Bengal, India

Anirban Bera

Department of Computational Science, Brainware University, Barasat, West Bengal, India

Souvik Bera

Department of Computational Science, Brainware University, Barasat, West Bengal, India

Arunika Bhadra

Department of Hospital Management, Brainware University, Barasat, West Bengal, India

Tapas Bhadra

Department of Computer Science, Aliah University, West Bengal, India

Ravindra Bhardwaj

Department of Physics and Computer Science, Dayalbagh Educational Institute, Agra, Uttar Pradesh, India

Sthitipragyan Biswal

Symbiosis School of Banking and Finance, Symbiosis International (Deemed University), Taluka Mulshi, Pune

Anisha Biswas

Department of Hospital Management, Brainware University, Barasat, West Bengal, India

Sreejita Bose

Department of Hospital Management, Brainware University, Barasat, West Bengal, India

Panem Charanarur

Department of Cyber Security and Digital Forensics, National Forensic Sciences University, Tripura Campus, Tripura, India

Somya Choubey

Department of Commerce, Manipal University Jaipur, Jaipur, Rajasthan, India

Pankaj Dadheech

Department of Computer Science and Engineering, Swami Keshvanand Institute of Technology, Management and Gramothan (SKIT), Ramnagar, Jagatpura, Jaipur, Rajasthan, India

Megha N. Deshmukh

A. G. Patil Institute of Technology, Solapur, Maharashtra, India

Narendra P. Deshmukh

Dattakala Group of Institutions, Dattakala Faculty of Management, Pune, Maharashtra, India

P. Rama Devi

Department of English, Koneru Lakshmaiah Education Foundation (KLEF), Guntur, Andhra Pradesh, India

Pravin Madhukar Dhanrao

Department of Computer Engineering, Sanjivani College of Engineering, Kopergaon, Maharashtra, India

Akriti Dogra

Department of Oral and Maxillofacial Surgery, Manav Rachna Dental College, Faridabad, Haryana, India

Sourav Gangopadhyay

Department of Hospital Management, Brainware University, Barasat, West Bengal, India

G. S. Gayathri

Department of Chemistry, S. A. Engineering College, Chennai, Tamil Nadu, India

A. Shaji George

Almarai Company, EIT, TSM, Riyadh, Kingdom of Saudi Arabia

Williams Kennedy George

Department of Technical Education, School of Vocational and Technical Education, Akwa Ibom State College of Education, Afaha Nsit, Nigeria

Venkat Namdev Ghodke

Department of Electronics and Telecommunication Engineering, AISSMS Institute of Information Technology, Pune, Maharashtra, India

Gopal Ghosh

Department of Computer Science and Engineering, Lovely Professional University, Phagwara, Punjab, India

L. K. Joshila Grace

Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology, Tamil Nadu, India

Kamal Gulati

Amity University, Noida, Uttar Pradesh, India

Srinivasa Rao Gundu

Department of Digital Forensics, School of Sciences, Malla Reddy University, Hyderabad, Telangana, India

Rahul Dev Gupta

Maharishi Markandeshwar (Deemed to be University), Mullana - Ambala, India

Samuel Amos Ikpe

Department of Technical Education, School of Vocational and Technical Education, Akwa Ibom State College of Education, Afaha Nsit, Nigeria

Devadutta Indoria

Department of Commerce, Vikram Dev University, Jeypore, Odisha, India

S. Jailani

Formulation R&D, Alpha Pharma, KAEC-KSA, Annamalai University, Tamil Nadu, India

Animesh Kairi

Department of Information Technology, IEM and UEM Group, Salt Lake, West Bengal, India

Eti Khatri

Department of Management Studies, Nitte Meenakshi Institute of Technology (NMIT), Nitte (Deemed to be University), Bangalore, India

Poornima B. Kulkarni

A. G. Patil Institute of Technology, Solapur, Maharashtra, India

Binod Kumar

Department of Master of Computer Applications (MCA), Rajarshi Shahu College of Engineering, Pune, Maharashtra, India

K. Keshav Kumar

Department of Humanities and Mathematics, G. Narayanamma Institute of Technology and Science (for Women), Hyderabad, Telangana, India

Priya Makhija

Faculty of Management, Center for Management Studies, JAIN (Deemed-to-be University), Bangalore, Karnataka, India

Biswadip Basu Mallik

Department of Basic Science and Humanities, Institute of Engineering & Management, University of Engineering and Management, Kolkata, West Bengal, India

Gunjan Mukherjee

Department of Computational Sciences, Brainware University, Barasat, West Bengal, India

Regonda Nagaraju

Department of Computer Science and Engineering – Artificial Intelligence and Machine Learning (CSE – AI & ML), School of Engineering, Malla Reddy University, Hyderabad, Telangana, India

Sudhansu Sekhar Nanda

Faculty of Management Studies, Sri Sri University, Cuttack, Odisha, India

Manesh R. Palav

Department of Master of Business Administration (MBA), Global Business School and Research Center, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune, Maharashtra, India

Binay Kumar Pandey

College of Technology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India

Digvijay Pandey

Department of Technical Education (Government of Uttar Pradesh), Uttar Pradesh, India

Vivekanand Pandey

Amity University Patna, Patna, Bihar, India

Bhawani Sankar Panigrahi

Department of IT, Vardhaman College of Engineering, Hyderabad, Telangana, India

Anand Patil

School of Business and Management, Christ University, Bangalore, Karnataka, India

Rosemary Collins Piate

Department of Home Economics, School of Vocational and Technical Education, Akwa Ibom State College of Education, Afaha Nsit, Nigeria

Bhargavi Posinasetty

The University of Southern Mississippi, Hattiesburg, MS, USA

G. Prasadu

Department of Information Technology, Sreenidhi Institute of Science and Technology, Hyderabad, Telangana, India

Sweta Priya

Amity School of Communication, Amity University Patna, Patna, Bihar, India

Pushpesh

Manav Rachna International Institute of Research and Studies, MREI Campus, Faridabad, Haryana, India

Shrinwantu Raha

Department of Geography, Bhairab Ganguly College, Belgharia, Kolkata, West Bengal, India

Roop Raj

Department of Economics, Hemvati Nandan Bahuguna Garhwal (HNBG) Central University, Uttarakhand, India

Amol Subhash Rajpure

Vidya Pratishthan's Kamalnayan Bajaj Institute of Engineering and Technology, Baramati, Pune, Maharashtra, India

N. Srikanth Reddy

School of Management, Presidency University, Bangalore, Karnataka, India

K. Sahani

Department of Civil Engineering, Kathmandu University, Dhulikhel, Kathmandu, Nepal

S. K. Sahani

Department of Mathematics, M.I.T. Campus, Tribhuvan University (T.U.), Janakpur, Nepal

Susanta Kumar Sahoo

Department of Computer Science Engineering and Applications, Indira Gandhi Institute of Technology, Sarang, Odisha, India

M. Sakthivadivel

Department of Artificial Intelligence and Machine Learning & Cyber Security, Dr. Mahalingam College of Engineering and Technology, Pollachi, Tamil Nadu, India

Debanjana Sasmal

Department of Law, Brainware University, Barasat, West Bengal, India

Niti Saxena

Jagannath International Management School, New Delhi, India

T. Selvakumar

Department of Artificial Intelligence and Data Science, Dr. Mahalingam College of Engineering and Technology, Pollachi, Tamil Nadu, India

Rejuwan Shamim

Department of Computer Science and Engineering with Data Science, Maharishi University of Information Technology, Uttar Pradesh, India

Abhishek Sharma

Mittal School of Business, Lovely Professional University, Jalandhar, Punjab, India

Ajay Kumar Sharma

College of Economics and Business Administration, University of Technology and Applied Sciences, Salalah, Oman

Ankitha Sharma

Mittal School of Business, Lovely Professional University, Jalandhar, Punjab, India

V. Kulkarni Shripad

A. G. Patil Institute of Technology, Solapur, Maharashtra, India

Eddiong Isonguyo Silas

Department of Technical Education, School of Vocational and Technical Education, Akwa Ibom State College of Education, Afaha Nsit, Nigeria

V. P. Sriram

Department of MBA, Acharya Bangalore B School (ABBS), Bangalore, Karnataka, India

S. Suganya

Department of Electrical and Electronics Engineering, Sethu Institute of Technology, Kariapatti

J. Suresh

Department of Electrical and Electronics Engineering, Ramachandra College of Engineering, Eluru, Andhra Pradesh, India

M. Vigneshkumar

Department of Mechanical Engineering, Sri Krishna College of Engineering and Technology,
Coimbatore, Tamil Nadu, India

V. Vijayalakshmi

Department of Computer Science, Christ College of Science and Management, Karnataka, India

Suchita Walke

Department of Computer Engineering, Pillai College of Engineering and Technology, Mumbai
University, Mumbai, Maharashtra, India

Abbreviations

AAIT	actionable alert identification tool
ACO	ant colony optimization
AD	Alzheimer's disease
ADAS	advanced driver-assistance system
ADME-T	absorption, distribution, metabolism, excretion, and toxicity
AI	artificial intelligence
AML	adversarial machine learning
ANN	Artificial Neural Network
API	Application Programming Interface
APT	advanced persistent threat
AR	augmented reality
ARP Net	Antidepressant Response Prediction Network
AST	abstract syntax tree
BBB	blood-brain barrier
BCI	brain-computer interface
BCO	bee colony optimization
BP	backpropagation
CAD	computer-aided design
CFA	confirmatory factor analysis
CI	computational intelligence
CNC	computer numerical control
CNN	Convolutional Neural Network
CNS	central nervous system
CPS	cyber-physical system
CR	code review
DeFi	decentralized finance
DFT	discrete Fourier transformation
DL	deep learning
DM	dark matter
DNN	Deep Neural Network
DSP	digital signal processing
DTI	drug-target interaction
E2E	end-to-end
EA	evolutionary algorithm
EDA	electronic design automation
ES	evolutionary strategies

FDM	fused deposition modeling
FEAP	family economic development program
FOSS	free and open source software
GA	genetic algorithm
GDPR	general data protection regulation
GIS	geographic information system
GoF	goodness of fit
GPS	global positioning system
HFT	high-frequency trading
IC	integrated circuit
ID	identity card
IDA	international deployment of accelerometer
IDC	center for industrial development
IEI	innovation enterprise institution
IMT	Institute of Management and Technology
IoC	indicators of compromise
IoT	Internet of Things
ISAC	Information Sharing and Analysis Center
ITS	intelligent tutoring system
KMO	Kaiser–Meyer–Olkin measure
KPI	key performance indicator
LSTM	Long Short-Term Memory Network
MAS	multi-agent system
MEMS	microelectromechanical system
MFT	matched-filter technique
ML	machine learning
ML	maximum likelihood
MPI	message passing interface
NACB	Nigerian Agricultural Cooperative Bank
NACRDB	Nigeria Agricultural Cooperatives and Rural Development Bank
NAPEP	national poverty reduction program
NDE	national employment directorate
NEPC	Nigeria Export Promotion Council
NLP	natural language processing
NN	neural network
NSQF	Nigerian Skills Qualification Framework
NUC	National University commission
PBN	People’s Bank of Nigeria
PCA	principal component analysis
PEOU	perceived ease of use
PSO	particle swarm optimization

PU	perceived usefulness
QNN	Quantum Neural Network
RF	radio frequency
RNN	Recurrent Neural Network
RSI	relative strength index
SLA	stereolithography
SNR	signal-to-noise ratio
SVM	support vector machine
TAM	technology acceptance model
T5	text-to-text-transfer-transformer
TC	technical college
TD	topological defect
TRA	theory of reasoned action
TVET	technical and vocational education and training
UEBA	user and entity behavior analysis
UT	ultrasonography
VEI	vocational enterprise institution
VR	virtual reality
VS	virtual screening
WIMP	weakly interacting massive particle
WSN	wireless sensor network
XAI	explainable artificial intelligence



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Preface

This book on computational intelligence covers a wide range of topics relevant to contemporary issues. In conjunction with emerging deep learning concepts, it thoroughly discusses various fields—such as social, economic, agricultural, and industrial domains, along with other ancillary areas concerned with real-life human problems—alongside traditional soft computing approaches. Deep learning is now being utilized not only for decision-making problems but also for exploring machine learning applications. Numerous case examples related to deep learning paradigms are included in this book. Its presentation addresses a broad spectrum of reader inquiries and serves as a guide to contemporary research.

Given the immense diversity and complexity of computational intelligence, the study of this field can be expanded by incorporating key application areas, which are the main focus of this book. The most significant aspects of computational intelligence discussed here include its applications in computer security, manufacturing, industrial design, finance, cybersecurity, and the pharmaceutical sector. This book provides an in-depth exploration of the research potential within computational intelligence, a field that has proven to be highly promising. The primary topics covered include practical considerations and significant aspects of computational intelligence, along with deviations such as error corrections and qubit coherence.

Overall, the book offers readers from diverse backgrounds a clear and concise understanding of the subject matter, making it accessible and comprehensible in its entirety. It will undoubtedly address a broad range of research questions and open new avenues for exploration. The book is designed to be accessible to readers from various academic and professional backgrounds. It serves as a useful resource for master's students and researchers, while also being highly relevant for experts in quantum disciplines. Ultimately, this book aims to comprehensively address key topics in quantum computing as well as its applications across multiple domains.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

CHAPTER 1

Precise Pharmaceuticals: Computational Intelligence in Drug Manufacturing

AKRITI DOGRA,¹ BHARGAVI POSINASETTY,²
BHAWANI SANKAR PANIGRAHI,³ SUSANTA KUMAR SAHOO,⁴
S. JAILANI,⁵ and G. S. GAYATHRI⁶

¹*Department of Oral and Maxillofacial Surgery, Manav Rachna Dental College, Faridabad, Haryana, India*

²*The University of Southern Mississippi, Hattiesburg, MS, USA*

³*Department of IT, Vardhaman College of Engineering, Hyderabad, Telangana, India*

⁴*Department of Computer Science Engineering and Applications, Indira Gandhi Institute of Technology, Sarang, Odisha, India*

⁵*Formulation R&D, Alpha Pharma, KAEC-KSA, Annamalai University, Tamil Nadu, India*

⁶*Department of Chemistry, S. A. Engineering College, Chennai, Tamil Nadu, India*

*Corresponding author

ABSTRACT

Within the context of the pharmaceutical industry, this abstract investigates the revolutionary influence of computational intelligence (CI), with a particular emphasis on the strategic integration of Precise Pharmaceuticals.

Computational Intelligence Solutions for Real-Life Problems: Theories, Applications, and Advances.
Biswadip Basu Mallik, Gunjan Mukherjee, Rahul Kar, Özen Özer, Digvijay Pandey,
Binay Kumar Pandey (Eds.)

© 2026 Apple Academic Press, Inc. Co-published with CRC Press (Taylor & Francis)

DOI: 10.1201/9781998511013-1

The chapter begins with a brief introduction to Precise Pharmaceuticals and then proceeds to discuss the significance of CI in the pharmaceutical manufacturing process. In the next sections, its applications in drug design are discussed in further detail, with a particular emphasis placed on molecular modeling, virtual screening (VS), and improved formulation process optimization. This chapter takes a look at the role that data analysis and machine learning (ML) play, covering topics such as real-time monitoring, predictive analytics, and even process improvement. There is an investigation into the incorporation of artificial intelligence (AI) [1] in clinical trials, which includes patient recruitment, data analysis, and ethical considerations. In its conclusion, the abstract discusses a number of problems, such as ethical and privacy concerns, while also emphasizing advancements and the potential impact on the landscape of drug manufacture.

1.1 INTRODUCTION

The pharmaceutical sector provides a wide range of pharmaceuticals that serve medical requirements worldwide by relying on state-of-the-art technologies, sophisticated procedures, and regulatory compliance. Drug manufacturing is changing as a result of technological advancements, adopting automated processes, artificial intelligence (AI) [2], and personalized medicine strategies. The industry's dedication to innovation is motivated by the shared objective of enhancing patient outcomes and tackling global health issues, in addition to the quest for efficiency. This introduction lays the groundwork for an exploration of the complex world of drug manufacture, focusing on the major procedures, difficulties, and innovations that characterize this vital area of medicine. At the nexus of research, innovation, and healthcare [3], drug manufacturing is essential to the development of pharmaceuticals from idea to market. This complex process entails turning raw ingredients into finished pharmaceuticals while guaranteeing their efficacy, safety, and compliance with strict quality requirements. Drug manufacturing is changing as a result of technological advancements, adopting automated processes, AI [4], and personalized medicine strategies. The industry's dedication to innovation is motivated by the shared objective of enhancing patient outcomes and tackling global health issues, in addition to the quest for efficiency. This groundwork sets the stage for an exploration of the complex world of drug manufacture,

focusing on the major procedures, difficulties, and innovations that characterize this vital area of medicine [5].

1.1.1 *PRECISE PHARMACEUTICALS*

In the pharmaceutical sector, Precise Pharmaceuticals is a dynamic and forward-thinking company that is committed to pushing advances in the industry. Because of its dedication to excellence and its emphasis on making use of cutting-edge technologies, it is well positioned to be at the forefront of both the manufacturing and research of pharmaceuticals. The company was established on the principles of precision and scientific rigor, and it specializes in the design, development, and production of pharmaceuticals with the intention of meeting important medical requirements. The entire pharmaceutical lifecycle is encompassed by its all-encompassing approach, beginning with the original drug discovery and molecular design and continuing all the way to the optimization [6] of production processes. An unwavering commitment to the application [7] of CI is at the core of its business operations. Through the utilization of sophisticated algorithms and machine learning (ML) [8], the organization is able to streamline the process of medication creation, improve formulation procedures, and optimize production methodology. Not only does this dedication to technical innovation speed up the process of developing new pharmaceuticals, but it also guarantees a degree of precision and efficiency that is in line with the standards that are considered to be the most advanced in the drug industry [9]. The company operates with a primary focus on the health and safety of patients [10], adhering to stringent quality control methods throughout each and every stage of the drug manufacturing process [11]. This commitment extends to the incorporation of AI [12] in clinical trials, which are undertaken with the highest precision and ethical concern. In these trials, patient recruitment and data analysis [13] are carried out.

1.1.2 *COMPUTATIONAL INTELLIGENCE (CI) IN DRUG MANUFACTURING*

The significance of CI in drug manufacturing is as shown in Figure 1.1, and it is profound, ushering in a new era of efficiency, precision, and innovation.

CI, encompassing AI and ML applications, has become a linchpin in the pharmaceutical industry, influencing various facets of drug development and production which includes:

1. **Accelerated Drug Design and Discovery:** Molecular Modeling and Simulation: CI facilitates detailed simulations of molecular structures, predicting how different compounds will behave. Precise Pharmaceuticals employs advanced algorithms to expedite the identification of potential drug candidates, reducing the reliance on time-consuming experimental testing. The application of CI in virtual screening (VS) involves the rapid analysis of vast datasets [14] to identify promising compounds. Precise Pharmaceuticals utilizes intelligent algorithms to streamline the drug discovery process, ensuring a more efficient and targeted approach.
2. **Optimization of Formulation Processes:** CI algorithms at Precise Pharmaceuticals enable the continuous adaptation of formulation processes. By analyzing real-time data, the company ensures that formulations remain efficient and responsive to evolving requirements, contributing to enhanced product quality.
3. **Predictive Analytics for Quality Control:** CI's role in predictive analytics allows Precise Pharmaceuticals to proactively identify potential quality issues. Through the analysis of extensive datasets, the company ensures a high standard of product quality, minimizing the risk of defects and reducing waste.
4. **Process Optimization using Machine Learning (ML):** ML, a subset of CI, excels in identifying patterns [15] and trends in manufacturing processes. Precise Pharmaceuticals employs ML algorithms [16] to optimize various manufacturing processes, leading to increased efficiency and reduced production costs.
5. **Real-Time Monitoring and Adaptive Manufacturing:** CI-driven [17] real-time monitoring at Precise Pharmaceuticals allows for immediate adjustments to dynamic conditions. This ensures that manufacturing processes are not only optimized but also responsive to unforeseen challenges, minimizing disruptions and maintaining consistent quality.

6. **Artificial Intelligence (AI) Integration in Clinical Trials:** CI contributes to the optimization [18] of patient recruitment and selection in clinical trials. Precise Pharmaceuticals employs CI algorithms to identify suitable candidates efficiently, enhancing the overall efficiency of trials and ensuring a more targeted approach. CI's data analysis capabilities are harnessed to optimize protocols and streamline the trial process. By extracting valuable insights from trial data, Precise Pharmaceuticals enhances the success rate of clinical trials, contributing to the development of safer and more effective drugs [19].
7. **Addressing Ethical and Regulatory Considerations:** Precise Pharmaceuticals ensures the transparent implementation of CI technologies, addressing ethical and privacy concerns. The company adopts robust data protection measures, aligning its practices with established ethical guidelines and regulatory frameworks, safeguarding patient rights in clinical trials.

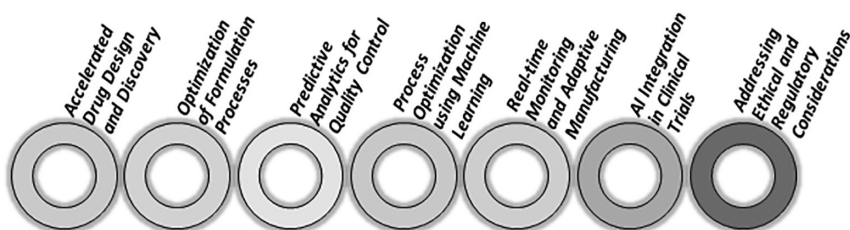


FIGURE 1.1 Significance of CI in drug manufacturing. ↵

1.2 ROLE OF COMPUTATIONAL INTELLIGENCE (CI) IN DRUG DESIGN

1.2.1 MOLECULAR MODELLING AND SIMULATION

Molecular modelling and simulation are essential elements of drug discovery, and Precise Pharmaceuticals uses cutting-edge CI methods to drive creativity in these areas. The company predicts the behavior and interactions of various chemicals by using complex algorithms and simulations to gain a thorough understanding of molecular structures. This method greatly reduces the dependency on conventional, labor-intensive experimental testing, which speeds up the identification of promising

therapeutic candidates. It is able to efficiently explore a large chemical space by limiting options and directing researchers toward the most promising directions, thanks to the precision that molecular modelling [20] offers. This puts the business at the forefront of pharmaceutical research and development and expedites the medication discovery process while also improving resource efficiency. Precise Pharmaceuticals shows that it is dedicated to remaining at the forefront of pharmaceutical innovation by utilizing CI in molecular modeling and simulation [21].

1.2.2 VIRTUAL SCREENING AND DRUG DISCOVERY

At Precise Pharmaceuticals, where state-of-the-art CI tools are utilized to revolutionize the identification of promising drug candidates, VS has emerged as a disruptive approach for drug development. Using advanced algorithms [22], large chemical databases are quickly analyzed with the goal of predicting a compound's potential for future development without requiring significant experimental testing. The use of clever algorithms in VS speeds up the drug discovery process at Precise Pharmaceuticals, offering a more effective [23] and focused method. The company uses CI to effectively assess a wide range of molecular structures and identify compounds with favorable features for potential therapeutic applications. In the highly competitive world of pharmaceutical research, strategic screening not only expedites the identification of promising drug candidates but also optimizes resource allocation. VS is important because it helps expedite the discovery of compounds that have a better chance of succeeding, reducing the need for expensive and time-consuming laboratory studies [24]. This methodology is consistent with Precise Pharmaceuticals' dedication to efficiency and innovation, guaranteeing that the medication development pipeline continues to be flexible and adaptable to new obstacles. Industry trends, the company's use of VS establishes it as a pioneer in leveraging CI to drive more focused and effective drug development initiatives.

1.2.3 OPTIMIZATION OF FORMULATION PROCESSES

Formulation process optimization is an important part of making medicines where new technologies and computer intelligence are coming together to

shape the future of drug creation. This process involves improving and refining the complex steps that turn raw materials into pharmaceutical formulations. This is done to make sure that the end products meet high standards for quality and effectiveness. A big part of how the company improves the formulation process is by using powerful AI algorithms [25]. These programs are always looking at data [26] from different parts of the manufacturing process. They give us information that lets us make changes and improvements in real time. By using computer intelligence, the company not only makes sure that the creation processes work well, but it also changes these processes to meet new and changing needs. Formulation process optimization is important because it has many effects on the industry world. AI is used to make formulations more accurate, which improves the quality of the end product. This optimization is also adaptive, which means that it keeps the company flexible and able to change to new problems. This makes the manufacturing environment more resilient and effective. A good mix between quality and cost-effectiveness is achieved by using AI [27] to improve the formulation process [28]. This method not only makes the manufacturing process more operationally efficient, but it also helps to make the best use of resources [29]. As the industry grows, the strategic use of CI in formulation process optimization shows that the company is dedicated to staying on the cutting edge of technological progress. This will help make the future of pharmaceutical manufacturing more efficient and responsive.

1.3 DATA ANALYSIS AND MACHINE LEARNING (ML) IN DRUG MANUFACTURING

1.3.1 PREDICTIVE ANALYTICS FOR QUALITY CONTROL

At Precise Pharmaceuticals, where a convergence of data-driven [30] insights and advanced CI ensures the production of pharmaceuticals that meet the highest standards of safety and efficacy, predictive analytics for quality control, which stands as a cornerstone of pharmaceutical manufacturing, holds a central position. During the course of the production process, this comprehensive method comprises the proactive analysis of enormous datasets with the objective of predicting and mitigating any quality difficulties. These algorithms make use of historical data, real-time monitoring, and ML. These algorithms provide useful insights that enable

the organization to take preventative steps, thereby reducing the likelihood of faults and guaranteeing that the quality of the product is maintained at a continuously high level. These insights are obtained through the analysis of patterns and trends [31]. The capability of predictive analytics in quality control to uncover abnormalities or deviations before they become problems is one of the most important aspects of this type of analytics. A full grasp of potential variables that could have an effect on product quality is achieved by analyzing huge datasets that include a variety of aspects of the production process [32]. Because of this proactive detection, timely actions are possible, which helps to prevent quality deviations and reduces the possibility of product recalls or production delays. The importance of predictive analytics in quality control involves more than just reducing the likelihood of adverse outcomes. A significant part of the company's dedication to achieving operational excellence is comprised of this component. The ability to anticipate quality concerns in advance not only helps to assure the creation of pharmaceuticals that are both safe and effective, but it also contributes to the efficiency of resource utilization and the reduction of waste. This is in line with the commitment that has been made to manufacturing processes that are both environmentally friendly and economical [33].

1.3.2 PROCESS OPTIMIZATION USING MACHINE LEARNING (ML) ALGORITHMS

The application of ML algorithms to optimize various manufacturing processes is crucial. Because these algorithms are built to learn and adapt from past data, they can recognize patterns in data that might not be immediately obvious to human observers. ML algorithms can find patterns and connections by continuously evaluating this data, providing important insights into the variables affecting the effectiveness of manufacturing operations. Because ML algorithms can change and adapt in real time, it is important to incorporate them into process optimization. Precise Pharmaceuticals' ML algorithms are capable of dynamically adjusting parameters to ensure ongoing optimization in response to changes in manufacturing conditions or the availability of fresh data. This adaptable capacity enhances overall process reliability, lowers production costs, and increases efficiency. The entire manufacturing ecosystem is impacted by ML-driven process optimization. Precise Pharmaceuticals can maximize

resource utilization, reduce waste, and improve the overall sustainability of its operations by locating and optimizing any bottlenecks or inefficiencies. This is consistent with the company's aim to ensure pharmaceutical manufacture is done responsibly and with consideration for the environment, in addition to meeting high standards of quality. Process optimization using ML algorithms is a progressive strategy that puts Precise Pharmaceuticals at the forefront of technical innovation in the pharmaceutical sector [34]. The organization is committed to using ML as it develops to sustain operational excellence, make contributions to the wider pharmaceutical manufacturing field, and ultimately provide high-quality pharmaceutical products that satisfy patients' changing needs across the globe.

1.3.3 REAL-TIME MONITORING AND ADAPTIVE MANUFACTURING

Cutting-edge technology combines to assure the highest efficiency, adaptability, and quality in pharmaceutical manufacturing through real-time monitoring. This dynamic method collects, analyzes, and interprets data [35] from numerous manufacturing stages in real time, enabling quick decision-making and responsive actions. In this real-time monitoring program, advanced sensors, IoT devices [36], and data analytics technologies are used. Together, these technologies record and send real-time data on temperature, pressure, humidity, and other industrial variables. Advanced algorithms process this data to deliver useful insights on operations. Real-time monitoring detects manufacturing process abnormalities quickly by continuously evaluating data streams [37] to spot patterns that may suggest difficulties for rapid intervention. This proactive strategy reduces faults, ensures quality standards, and helps produce safe, effective medications. Pharmaceutical production is dynamic and requires quick responses to changes [38]. It can instantly modify conditions to decrease errors and ensure a smooth manufacturing flow using real-time insights. Through close monitoring of resource use and manufacturing efficiency, Precise Pharmaceuticals can discover and implement improvements quickly. This reduces waste and resource use, making it cost-effective and sustainable. By protecting sensitive data and following regulations, Precise Pharmaceuticals respects high ethical standards. The ethical usage of real-time monitoring technologies is reinforced by transparent stakeholder communication.

1.4 INTEGRATION OF ARTIFICIAL INTELLIGENCE (AI) IN CLINICAL TRIALS

1.4.1 PATIENT RECRUITMENT AND SELECTION

Clinical trials require patient recruitment and selection, which optimizes with innovative methods. The organization efficiently identifies and enrolls suitable volunteers using CI and new methods, improving clinical trial effectiveness. Algorithms and data analytics are used to recruit patients who meet clinical trial criteria. CI analyzes large databases using medical history, demographics, and genetic characteristics to find participants. This focused method speeds up recruitment and ensures a varied and well-suited participant pool, which boosts clinical trial success. Another important step is patient selection, which entails screening and assessing potential participants to verify they satisfy trial standards. To avoid including subjects who may not benefit from the medication or introduce confounding variables, advanced algorithms are used to assess eligibility requirements. This precision in patient selection improves trial reliability and validity. Optimizing patient recruitment and selection has many benefits. It speeds up clinical trials from start to finish. Targeted approaches increase the likelihood of identifying meaningful treatment results, leading to safer and more effective medications [39]. The pharmaceutical industry relies on efficiency because timely research results can affect regulatory approvals and patient access to innovative medications. Ethics are crucial in-patient recruitment and selection. To ensure informed consent, patient privacy, and regulatory compliance, strict ethical standards are followed. Transparent communication with potential participants promotes trust, patient autonomy, and well-being. Patient recruitment and selection are crucial to medical research as the pharmaceutical landscape changes. By using CI and advanced analytics, Precise Pharmaceuticals promotes clinical trial efficiency, ethics, and innovation. This strategy supports the company's research and the objective of providing patients with unique and effective therapies [40].

1.4.2 DATA ANALYSIS FOR TRIAL OPTIMIZATION

A big part of how Precise Pharmaceuticals conducts research and development is analyzing data to make clinical studies better. The company makes

the most of advanced analytical methods and AI to make its clinical trials as efficient and successful as possible. This helps the development of safe and effective medicines. One important part of data analysis in clinical studies is getting useful information from the huge amounts of data that are created during research. Algorithms for CI are used to look at patient data, treatment results, and other important factors. This analysis not only gives a full picture of how the trial is going, but it also finds patterns and trends that can help with making decisions and changing the procedure. To make trial methods work better, the predictive power of data analysis is used [41]. Precise Pharmaceuticals can change trial parameters, dosages, or inclusion criteria before they happen by finding possible problems or areas that could be improved. This proactive approach raises the chances of a successful trial result, lowers the risks, and makes the research process more streamlined and effective. Data analysis is also a key part of figuring out whether experimental treatments are safe and effective. ML techniques and statistical methods are used to look at how well treatments work, what side effects occur, and how patients do. This in-depth study helps us have a better idea of how the pharmaceutical treatments being studied might help people and what risks they might have. For improving trials, data analysis is important for more than just one study [42]. The results of several trials are put together and studied to plan future research, find broad trends, and help decide where to focus their research and development efforts. This process of learning by doing leads to a never-ending cycle of improvement and new ideas [43]. When looking at statistics from clinical trials, ethics must come first. Strict moral guidelines protect patient privacy, ensure informed consent before starting any treatment, and follow all legal requirements. The company's dedication to ethical research practices is further emphasized by its openness about how it uses data and how it analyzes it.

1.4.3 DRUG MANUFACTURING LANDSCAPE

The potential for unparalleled efficiency, precision, and creativity in Precise Pharmaceuticals' drug production processes is enhanced by the ongoing development of AI and ML technologies [44]. Especially in the early phases of drug discovery, CI speeds up the drug development lifecycle. Robust algorithms scrutinize extensive datasets, forecasting

molecular configurations, interplays, and plausible medicinal prospects. By utilizing this potential, Precise Pharmaceuticals can quickly discover drugs that show promise and cut down on the time that is typically needed for exploratory testing. In addition to saving money, the expedited drug development process enables a more flexible reaction to new health issues [45]. Improving formulation procedures is one of the main domains where CI has a significant influence. Algorithms for ML continuously examine data from production processes [46], modifying and improving formulas in real time. This dynamic optimization helps to produce high-quality medications while also improving the manufacturing process's efficiency. A key component of predictive analytics for quality control is CI. AI and ML systems anticipate probable quality problems before they arise by evaluating large datasets. Precise Pharmaceuticals' proactive strategy lowers waste, guarantees a higher standard of product quality, and advances overall operational excellence. In pharmaceutical manufacturing, the capacity to foresee and resolve quality concerns before they affect the finished product is revolutionary. By recognizing patterns and trends in manufacturing processes, ML algorithms allow for ongoing optimization. Precise Pharmaceuticals adopts this strategy, which lowers production costs and increases productivity. Real-time monitoring and adaptive production are made possible by CI, guaranteeing prompt modifications to changing circumstances [47]. This degree of flexibility minimizes interruptions to the manufacturing process and helps to produce a consistent, high-quality product. CI has a revolutionary effect in the field of clinical studies. AI programs [48] simplify trial procedures, maximize patient recruitment, and extract valuable insights from massive datasets. Precise Pharmaceuticals uses these technologies to improve clinical trial efficiency in all areas, including data analysis and patient selection [49]. This leads to stronger research findings, which quicken the rate at which novel therapies can be introduced to the market. Proactively taking ethical and regulatory issues into account is essential when incorporating AI [50] into its manufacturing processes. The organization is dedicated to transparent implementation, handling privacy issues, guaranteeing data security [51], and upholding moral principles and legal requirements. It is critical to navigate these issues, particularly when it comes to sensitive data used in clinical studies and medication research.

1.5 CONCLUSION

Precise Pharmaceuticals' use of CI in drug manufacture is a major pharmaceutical achievement. Precise Pharmaceuticals pushes efficiency, precision, and ethics by strategically using emerging technologies in drug design, formulation, data analysis, ML, and clinical trials. These advances expedite medication development timeframes, streamline formulation, and improve quality control through predictive analytics. New responsiveness through real-time monitoring and adaptive manufacturing ensures high-quality pharmaceutical production. AI improves patient selection, data analysis, ethics, and regulatory compliance in clinical trials. For appropriate CI use in pharmaceuticals, Precise Pharmaceuticals' transparency, ethics, and privacy set a good example. The changing landscape requires constant ethical considerations and proactive problem-solving. Looking ahead, Precise Pharmaceuticals' CI advances position it as a leader and signify a paradigm shift in medication manufacture. Increased efficiency, adaptability, and patient-centric and ethical methods could transform pharmaceutical development. As Precise Pharmaceuticals leads in CI integration, its journey shows how innovation can change pharmaceutical norms and possibilities. To maximize the benefits of CI while limiting hazards, continual awareness, adaptation to evolving trends, and an unshakable commitment to ethics are needed.

KEYWORDS

- **clinical trials**
- **computational intelligence**
- **drug manufacturing**
- **machine learning**
- **molecular modeling**
- **precise pharmaceuticals**
- **predictive analytics**
- **virtual screening**

REFERENCES

1. Gupta, R., Mane, M., Bhardwaj, S., Nandekar, U., Afaq, A., Dhabliya, D., & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433–447). IGI Global.
2. Pandey, B. K., Pandey, D., Wairya, S., & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence*, 13(2), 40–62.
3. Gupta, A., Anand, R., Pandey, D., Sindhwani, N., Wairya, S., Pandey, B. K., & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique. *International Journal of Distributed Systems and Technologies*, 12(4), 1–15.
4. Pandey, D., Pandey, B. K., & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563–1580.
5. Bajwa, J., Munir, U., Nori, A., & Williams, B. (2021). Artificial intelligence in healthcare: Transforming the practice of medicine. *Future Healthcare Journal*, 8, e188–e194.
6. Boopathi, S., Pandey, B. K., & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.
7. Kirubasri, G., Sankar, S., Pandey, D., Pandey, B. K., Singh, H., & Anand, R. (2021). A recent survey on 6G vehicular technology, applications and challenges. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1–5). IEEE.
8. Pandey, D., Nassa, V. K., Jhamb, A., Mahto, D., Pandey, B. K., George, A. H., & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211–234). IGI Global.
9. Sunarti, S., Rahman, F. F., Naufal, M., Risky, M., Febriyanto, K., & Masnina, R. (2021). Artificial intelligence in healthcare: Opportunities and risk for future. *Gaceta Sanitaria*, 35, S67–S70.
10. Singh, S., Madaan, G., Kaur, J., Swapna, H. R., Pandey, D., Singh, A., & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161). IGI Global.
11. Anand, R., Lakshmi, S. V., Pandey, D., & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 1–15.
12. Pandey, B. K., & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO_3 using response surface

- methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
13. Raghavan, R., Verma, D. C., Pandey, D., Anand, R., Pandey, B. K., & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309–42323.
 14. Babu, S. Z. D., Pandey, D., Naidu, G. T., Sumathi, S., Gupta, A., Bader Alazzam, M., & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial intelligence on medical data: Proceedings of International Symposium, ISCM 2021* (pp. 243–251). Springer Nature Singapore.
 15. Meslie, Y., Enbeyle, W., Pandey, B. K., Pramanik, S., Pandey, D., Dadeech, P., & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164–185). IGI Global.
 16. Singh, H., Pandey, B. K., George, S., Pandey, D., Anand, R., Sindhwani, N., & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 185–192). Springer Nature Singapore.
 17. Deepa, R., Anand, R., Pandey, D., Pandey, B. K., & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.
 18. Pandey, D., & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.
 19. Toepper, M. (2017). Dissociating normal aging from Alzheimer's disease: A view from cognitive neuroscience. *Journal of Alzheimer's Disease*, 57, 331–352.
 20. Revathi, T. K., Sathiyabhama, B., Sankar, S., Pandey, D., Pandey, B. K., & Dadeech, P. (2022). An intelligent model for coronary heart disease diagnosis. In *Networking Technologies in Smart Healthcare: Innovations and Analytical Approaches* (p. 234).
 21. Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future Healthcare Journal*, 6, 94–98.
 22. Vinodhini, V., Kumar, M. S., Sankar, S., Pandey, D., Pandey, B. K., & Nassa, V. K. (2022). IoT-based early forest fire detection using MLP and AROC method. *International Journal of Global Warming*, 27(1), 55–70.
 23. Pandey, D., Ogunmola, G. A., Enbeyle, W., Abdullahi, M., Pandey, B. K., & Pramanik, S. (2021). COVID-19: A framework for effective delivering of online classes during lockdown. *Human Arenas*, 5, 322–336.
 24. Fakoor, R., Ladhak, F., Nazi, A., & Huber, M. (2013). Using deep learning to enhance cancer diagnosis and classification. In *Proceedings of the International Conference on Machine Learning* (pp. 3937–3949). ACM.
 25. Anand, R., Khan, B., Nassa, V. K., Pandey, D., Dhabliya, D., Pandey, B. K., & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71–78.
 26. Sharma, S., Pandey, B. K., Pandey, D., Anand, R., Sharma, A., & Saini, S. (2023). Character recognition technique implementation for complicated deteriorated scene. In *2023 6th International Conference on Information Systems and Computer Networks (ISCON)* (pp. 1–4). IEEE.

27. Pandey, B. K., Mane, D., Nassa, V. K. K., Pandey, D., Dutta, S., Ventayen, R. J. M., & Rastogi, R. (2021). Secure text extraction from complex degraded images by applying steganography and deep learning. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 146–163). IGI Global.
28. Pandey, B. K., Pandey, D., & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.
29. Vial, A., Stirling, D., Field, M., Ros, M., Ritz, C., Carolan, M., Holloway, L., & Miller, A. A. (2018). The role of deep learning and radiomic feature extraction in cancer-specific predictive modelling: A review. *Translational Cancer Research*, 7, 803–816.
30. Pandey, B. K., Pandey, D., Wariya, S., & Agarwal, G. (2021). A deep neural network-based approach for extracting textual images from deteriorate images. *EAI Endorsed Transactions on Industrial Networks and Intelligent Systems*, 8(28), e3–e3.
31. Kumar, M. S., Sankar, S., Nassa, V. K., Pandey, D., Pandey, B. K., & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.
32. Esteva, A., Robicquet, A., Ramsundar, B., Kuleshov, V., Depristo, M., Chou, K., Cui, C., Corrado, G., Thrun, S., & Dean, J. (2019). A guide to deep learning in healthcare. *Nature Medicine*, 25, 24–29.
33. Horgan, D., Romao, M., Morré, S. A., & Kalra, D. (2019). Artificial intelligence: Power for civilisation—And for better healthcare. *Public Health Genomics*, 22, 145–161.
34. Hussain, A., Malik, A., Halim, M. U., & Ali, A. M. (2014). The use of robotics in surgery: A review. *International Journal of Clinical Practice*, 68, 1376–1382.
35. Pandey, B. K., Pandey, D., Gupta, A., Nassa, V. K., Dadheech, P., & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.
36. Iyyanar, P., Anand, R., Shanthi, T., Nassa, V. K., Pandey, B. K., George, A. S., & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24–39). IGI Global.
37. Singh, J., Pandey, D., & Singh, A. K. (2023). Event detection from real-time Twitter streaming data using community detection algorithm. *Multimedia Tools and Applications*, 1–28.
38. Khan, Z. H., Siddique, A., & Lee, C. W. (2020). Robotics utilization for healthcare digitization in global COVID-19 management. *International Journal of Environmental Research and Public Health*, 17, 3819.
39. Ribeiro, J., Lima, R., Eckhardt, T., & Paiva, S. (2021). Robotic process automation and artificial intelligence in Industry 4.0—A literature review. *Procedia Computer Science*, 181, 51–58.
40. Paul, D., Sanap, G., Shenoy, S., Kalyane, D., Kalia, K., & Tekade, R. K. (2021). Artificial intelligence in drug discovery and development. *Drug Discovery Today*, 26, 80–93.

41. Bhatt, A. (2021). Artificial intelligence in managing clinical trial design and conduct: Man and machine still on the learning curve? *Perspectives in Clinical Research*, 12, 1.
42. Sahani, K., Khadka, S. S., Sahani, S. K., Pandey, B. K., & Pandey, D. (2023). A possible underground roadway for transportation facilities in Kathmandu Valley: A racking deformation of underground rectangular structures. *Engineering Reports*, e12821.
43. Thakur, A., Mishra, A. P., Panda, B., Rodríguez, C. S., Gaurav, I., & Majhi, B. (2020). Application of artificial intelligence in pharmaceutical and biomedical studies. *Current Pharmaceutical Design*, 26, 3569–3578.
44. Saxena, A., Agarwal, A., Pandey, B. K., & Pandey, D. (2024). Examination of the criticality of customer segmentation using unsupervised learning methods. *Circular Economy and Sustainability*, 4(2), 1–14.
45. Pandey, B. K., Pandey, D., Nassa, V. K., George, S., Aremu, B., Dadeech, P., & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 223–230). Springer Nature Singapore.
46. Tripathi, R. P., Sharma, M., Gupta, A. K., Pandey, D., Pandey, B. K., Shahul, A., & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.
47. Pandey, J. K., Jain, R., Dilip, R., Kumbhkar, M., Jaiswal, S., Pandey, B. K., & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219–243). Springer International Publishing.
48. David, S., Duraipandian, K., Chandrasekaran, D., Pandey, D., Sindhvani, N., & Pandey, B. K. (2023). Impact of blockchain in healthcare system. In *Unleashing the Potentials of Blockchain Technology for Healthcare Industries* (pp. 37–57). Academic Press.
49. Sahu, A., Mishra, J., & Kushwaha, N. (2022). Artificial intelligence (AI) in drugs and pharmaceuticals. *Combinatorial Chemistry & High Throughput Screening*, 25, 1818–1837.
50. Pandey, D., Wairya, S., Sharma, M., Gupta, A. K., Kakkar, R., & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553–566.
51. Kumar Pandey, B., Pandey, D., Nassa, V. K., Ahmad, T., Singh, C., George, A. S., & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.

Precise Pharmaceuticals: Computational Intelligence in Drug Manufacturing

- Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433-447). IGI Global.
- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence*, 13(2), 40-62.
- Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique. *International Journal of Distributed Systems and Technologies*, 12(4), 1-15.
- Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563-1580.
- Bajwa, J. , Munir, U. , Nori, A. , & Williams, B. (2021). Artificial intelligence in healthcare: Transforming the practice of medicine. *Future Healthcare Journal*, 8, e188-e194.
- Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73-95). IGI Global.
- Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications and challenges. In 2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) (pp. 1-5). IEEE.
- Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211-234). IGI Global.
- Sunarti, S. , Rahman, F. F. , Naufal, M. , Risky, M. , Febriyanto, K. , & Masnina, R. (2021). Artificial intelligence in healthcare: Opportunities and risk for future. *Gaceta Sanitaria*, 35, S67-S70.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142-161). IGI Global.
- Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 1-15.
- Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
- Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309-42323.
- Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial intelligence on medical data: Proceedings of International Symposium, ISCM 2021* (pp. 243-251). Springer Nature Singapore.
- Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164-185). IGI Global.
- Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 185-192). Springer Nature Singapore.

Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121-137). CRC Press.

Toepper, M. (2017). Dissociating normal aging from Alzheimer's disease: A view from cognitive neuroscience. *Journal of Alzheimer's Disease* , 57, 331-352.

Revathi, T. K. , Sathiyabhama, B. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Dadeech, P. (2022). An intelligent model for coronary heart disease diagnosis. In *Networking Technologies in Smart Healthcare: Innovations and Analytical Approaches* (p. 234).

Davenport, T. , & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future Healthcare Journal*, 6, 94-98.

Vinodhini, V. , Kumar, M. S. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Nassa, V. K. (2022). IoT-based early forest fire detection using MLP and AROC method. *International Journal of Global Warming*, 27(1), 55-70.

Pandey, D. , Ogunmola, G. A. , Enbeyle, W. , Abdullahi, M. , Pandey, B. K. , & Pramanik, S. (2021). COVID-19: A framework for effective delivering of online classes during lockdown. *Human Arenas*, 5, 322-336.

Fakoor, R. , Ladhak, F. , Nazi, A. , & Huber, M. (2013). Using deep learning to enhance cancer diagnosis and classification. In *Proceedings of the International Conference on Machine Learning* (pp. 3937-3949). ACM.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhabliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71-78.

Sharma, S. , Pandey, B. K. , Pandey, D. , Anand, R. , Sharma, A. , & Saini, S. (2023). Character recognition technique implementation for complicated deteriorated scene. In *2023 6th International Conference on Information Systems and Computer Networks (ISCON)* (pp. 1-4). IEEE.

Pandey, B. K. , Mane, D. , Nassa, V. K. K. , Pandey, D. , Dutta, S. , Ventayen, R. J. M. , & Rastogi, R. (2021). Secure text extraction from complex degraded images by applying steganography and deep learning. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 146-163). IGI Global.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.

Vial, A. , Stirling, D. , Field, M. , Ros, M. , Ritz, C. , Carolan, M. , Holloway, L. , & Miller, A. A. (2018). The role of deep learning and radiomic feature extraction in cancer-specific predictive modelling: A review. *Translational Cancer Research*, 7, 803-816.

Pandey, B. K. , Pandey, D. , Wariya, S. , & Agarwal, G. (2021). A deep neural networkbased approach for extracting textual images from deteriorate images. *EAI Endorsed Transactions on Industrial Networks and Intelligent Systems*, 8(28), e3-e3.

Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223-240). IGI Global.

Esteva, A. , Robicquet, A. , Ramsundar, B. , Kuleshov, V. , Depristo, M. , Chou, K. , Cui, C. , Corrado, G. , Thrun, S. , & Dean, J. (2019). A guide to deep learning in healthcare. *Nature Medicine*, 25, 24-29.

Horgan, D. , Romain, M. , Morré, S. A. , & Kalra, D. (2019). Artificial intelligence: Power for civilisation—And for better healthcare. *Public Health Genomics*, 22, 145-161.

Hussain, A. , Malik, A. , Halim, M. U. , & Ali, A. M. (2014). The use of robotics in surgery: A review. *International Journal of Clinical Practice*, 68, 1376-1382.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21-44). Springer International Publishing.

Iyyanar, P. , Anand, R. , Shanthi, T. , Nassa, V. K. , Pandey, B. K. , George, A. S. , & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities (pp. 24-39). IGI Global.

Singh, J. , Pandey, D. , & Singh, A. K. (2023). Event detection from real-time Twitter streaming data using community detection algorithm. *Multimedia Tools and Applications*, 1-28.

Khan, Z. H. , Siddique, A. , & Lee, C. W. (2020). Robotics utilization for healthcare digitization in global COVID-19 management. *International Journal of Environmental Research and Public Health*, 17, 3819.

Ribeiro, J. , Lima, R. , Eckhardt, T. , & Paiva, S. (2021). Robotic process automation and artificial intelligence in Industry 4.0—A literature review. *Procedia Computer Science*, 181, 51-58.

Paul, D. , Sanap, G. , Shenoy, S. , Kalyane, D. , Kalia, K. , & Tekade, R. K. (2021). Artificial intelligence in drug discovery and development. *Drug Discovery Today*, 26, 80-93.

Bhatt, A. (2021). Artificial intelligence in managing clinical trial design and conduct: Man and machine still on the learning curve? *Perspectives in Clinical Research* , 12, 1.

Sahani, K. , Khadka, S. S. , Sahani, S. K. , Pandey, B. K. , & Pandey, D. (2023). A possible underground roadway for transportation facilities in Kathmandu Valley: A racking deformation of underground rectangular structures. *Engineering Reports*, e12821.

Thakur, A. , Mishra, A. P. , Panda, B. , Rodríguez, C. S. , Gaurav, I. , & Majhi, B. (2020). Application of artificial intelligence in pharmaceutical and biomedical studies. *Current Pharmaceutical Design*, 26, 3569-3578.

Saxena, A. , Agarwal, A. , Pandey, B. K. , & Pandey, D. (2024). Examination of the criticality of customer segmentation using unsupervised learning methods. *Circular Economy and Sustainability*, 4(2), 1-14.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 223-230). Springer Nature Singapore.

Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219-243). Springer International Publishing.

David, S. , Duraipandian, K. , Chandrasekaran, D. , Pandey, D. , Sindhwani, N. , & Pandey, B. K. (2023). Impact of blockchain in healthcare system. In *Unleashing the Potentials of Blockchain Technology for Healthcare Industries* (pp. 37-57). Academic Press.

Sahu, A. , Mishra, J. , & Kushwaha, N. (2022). Artificial intelligence (AI) in drugs and pharmaceuticals. *Combinatorial Chemistry & High Throughput Screening*, 25, 1818-1837.

Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553-566.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1-4), 38-56.

The Road Ahead: Charting Future Research Directions in Computational Intelligence

- Soheilrad, M. , Hizam, H. , Farzan, P. , Hojabri, M. , Fallah, S. N. , & Soheilrad, G. (2013). Wind farm reactive power optimization by using imperialist competitive algorithm. In Proceedings of the 2013 International Conference on Power, Energy and Control (ICPEC), Sri Rangelatchum Dindigul, India, 6-8 February 2013.
- Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.
- Mohsenian-Rad, A. H. , Wong, V. W. S. , Jatskevich, J. , Schober, R. , & Leon-Garcia, A. (2010). Autonomous demand-side management based on game-theoretic energy consumption scheduling for the future smart grid. *IEEE Transactions on Smart Grid*, 1, 320-331.
- Raza, M. Q. , & Khosravi, A. (2015). A review on artificial intelligence-based load demand forecasting techniques for smart grid and buildings. *Renewable and Sustainable Energy Reviews*, 50, 1352-1372.
- Engelbrecht, A. P. (2007). *Computational Intelligence: An Introduction*. John Wiley & Sons.
- Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1-4), 38-56.
- Devasenapathy, D. , Madhumathy, P. , Umamaheshwari, R. , Pandey, B. K. , & Pandey, D. (2024). Transmission-efficient grid-based synchronized model for routing in wireless sensor networks using Bayesian compressive sensing. *SN Computer Science*, 5(1), 1-11.
- Ferreira, V. H. , & da Silva, A. P. A. (2007). Toward estimating autonomous neural network-based electric load forecasters. *IEEE Transactions on Power Systems*, 22, 1554-1562.
- Momoh, J. , Ma, X. , & Tomsovic, K. (1995). Overview and literature survey of fuzzy set theory in power systems. *IEEE Transactions on Power Systems*, 10, 1676-1690.
- Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553-566.
- Logenthiran, T. , Srinivasan, D. , & Shun, T. Z. (2012). Demand-side management in smart grid using heuristic optimization. *IEEE Transactions on Smart Grid*, 3(3), 1244-1252.
- Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433-447). IGI Global.
- Azadeh, A. , Moghadam, R. T. , Ghaderi, S. F. , Tarverdian, S. , & Saberi, M. (2007). Integration of artificial neural networks and genetic algorithm to predict electrical energy consumption. *Applied Mathematics and Computation*, 186, 1731-1741.
- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence (IJDAI)*, 13(2), 40-62.
- Diamantoulakis, D. P. , Kapinas, V. M. , & Karagiannidis, G. K. (2015). Big data analytics for dynamic energy management in smart grids. *Big Data Research*, 2, 94-101.
- Tso, G. K. , & Yau, K. K. (2007). Predicting electricity energy consumption: A comparison of regression analysis, decision tree, and neural networks. *Energy*, 32, 1761-1768.
- Depuru, S. S. S. R. , Wang, L. , & Devabhaktuni, V. (2011). Smart meters for power grid: Challenges, issues, advantages, and status. *Renewable and Sustainable Energy Reviews*, 15, 2736-2742.
- Charytoniuk, W. , Chen, M. , & Van Olinda, P. (1998). Nonparametric regression-based short-term load forecasting. *IEEE Transactions on Power Systems*, 13, 725-730.
- Mohri, M. , Rostamizadeh, A. , & Talwalkar, A. (2012). *Foundations of Machine Learning*. MIT Press.
- Zhu, Y. , & He, Y. (2006). Short-term load forecasting model using fuzzy C-means based radial basis function network. In *Proceedings of the Sixth International Conference on Intelligent Systems Design and Applications (ISDA'06)*, Jinan, China, 16-18 October 2006.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT-Based Smart Applications* (pp. 219-243). Springer International Publishing.

Khosravi, A. , Nahavandi, S. , Creighton, D. , & Srinivasan, D. (2012). Interval type-2 fuzzy logic systems for load forecasting: A comparative study. *IEEE Transactions on Power Systems*, 27, 1274-1282.

Electronics Enhanced: Computational Intelligence in Electronic Science

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 185-192). Singapore: Springer Nature Singapore.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhabliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71-78.

Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.

Seidaliyeva, U. , Akhmetov, D. , Ilipbayeva, L. , & Matson, E. T. (2020). Real-time and accurate drone detection in a video with a static background. *Sensors*, 20, 3856.

Shen, S. , Yang, H. , Yao, X. , Li, J. , Xu, G. , & Sheng, M. (2020). Ship type classification by convolutional neural networks with auditory-like mechanisms. *Sensors*, 20, 253.

Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223-240). IGI Global.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.

Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73-95). IGI Global.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121-137). CRC Press.

Impedovo, D. , Balducci, F. , Dentamaro, V. , & Pirlo, G. (2019). Vehicular traffic congestion classification by visual features and deep learning approaches: A comparison. *Sensors*, 19, 5213.

Han, S. , Yoo, J. , & Kwon, S. (2019). Real-time vehicle-detection method in birdview unmanned-aerial-vehicle imagery. *Sensors*, 19, 3958.

Wu, Z. , Sang, J. , Zhang, Q. , Xiang, H. , Cai, B. , & Xia, X. (2019). Multi-scale vehicle detection for foreground-background class imbalance with improved YOLOv2. *Sensors*, 19, 3336.

Du John, H. V. , Jose, T. , Jone, A. A. A. , Sagayam, K. M. , Pandey, B. K. , & Pandey, D. (2022). Polarization-insensitive circular ring resonator-based perfect metamaterial absorber design and simulation on a silicon substrate. *Silicon*, 14(14), 9009-9020.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Dadheech, P. (2022). Software-defined networking-based ad hoc networks routing protocols. In *Software Defined Networking for Ad Hoc Networks* (pp. 95-123). Cham: Springer International Publishing.

Włodarczyk-Sielicka, M. , Połap, D. , & Sielicka, W. (2019). Automatic classification using machine learning for non-conventional vessels on inland waters. *Sensors*, 19, 3051.

Bruntha, P. M. , Dhanasekar, S. , Hepsiba, D. , Sagayam, K. M. , Neebha, T. M. , Pandey, D. , & Pandey, B. K. (2023). Application of switching median filter with L normbased auto-tuning function for removing random-valued impulse noise. *Aerospace Systems*, 6(1), 53-59.

Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142-161).

Yang, C. , Simon, G. , See, J. , Berger, M. O. , & Wang, W. (2020). WatchPose: A viewaware approach for camera pose data collection in industrial environments. *Sensors*, 20, 3045.

Bessant, Y. A. , Jency, J. G. , Sagayam, K. M. , Jone, A. A. A. , Pandey, D. , & Pandey, B. K. (2023). Improved parallel matrix multiplication using Strassen and Urdhvatiyagbhyam method. *CCF Transactions on High Performance Computing*, 5(3), 1-14.

Zhao, L. , Li, F. , Zhang, Y. , Xu, X. , Xiao, H. , & Feng, Y. (2020). A deep-learningbased 3D defect quantitative inspection system in CC products surface. *Sensors*, 20, 980.

Wu, Y. , Zhang, X. , & Fang, F. (2020). Automatic fabric defect detection using cascaded mixed feature pyramid with guided localization. *Sensors*, 20, 871.

Govindaraj, V. , Dhanasekar, S. , Martinsagayam, K. , Pandey, D. , Pandey, B. K. , & Nassa, V. K. (2023). Low-power test pattern generator using modified LFSR. *Aerospace Systems*, 1-8.

Wu, X. , Liu, Y. , Zhou, X. , & Mou, A. (2019). Automatic identification of tool wear based on convolutional neural network in face milling process. *Sensors*, 19, 3817.

Xing, S. , Lee, M. , & Lee, K. K. (2019). Citrus pests and diseases recognition model using weakly dense connected convolution network. *Sensors*, 19, 3195.

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1-15.

Contreras-Cruz, M. A. , Ramirez-Paredes, J. P. , Hernandez-Belmonte, U. H. , & Ayala-Ramirez, V. (2019). Vision-based novelty detection using deep features and evolved novelty filters for specific robotic exploration and inspection tasks. *Sensors*, 19, 2965.

Wilkowski, A. , Stefańczyk, M. , & Kasprzak, W. (2020). Training data extraction and object detection in surveillance scenario. *Sensors*, 20, 2689.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications, and challenges. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1-5). IEEE.

Anand, R. , Singh, J. , Pandey, D. , Pandey, B. K. , Nassa, V. K. , & Pramanik, S. (2022). Modern technique for interactive communication in LEACH-based ad hoc wireless sensor network. In *Software Defined Networking for Ad Hoc Networks* (pp. 55-73). Cham: Springer International Publishing.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating the role of IoT in the development of smart applications for security enhancement. In *IoT-Based Smart Applications* (pp. 219-243). Cham: Springer International Publishing.

Pobar, M. , & Ivacic-Kos, M. (2020). Active player detection in handball scenes based on activity measures. *Sensors*, 20, 1475.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analyzation of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 243-251). Singapore: Springer Nature Singapore.

Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence (IJDAI)*, 13(2), 40-62.

Pramanik, S. , Pandey, D. , Joardar, S. , Niranjnamurthy, M. , Pandey, B. K. , & Kaur, J. (2023). An overview of IoT privacy and security in smart cities. In *AIP Conference Proceedings*, 2495(1). AIP Publishing.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1-4), 38-56.

Chen, L. , Fu, J. , Wu, Y. , Li, H. , & Zheng, B. (2020). Hand gesture recognition using compact CNN via surface electromyography signals. *Sensors*, 20, 672.

Bountiful Fields: The Agricultural Revolution with Computational Intelligence

Yamaç, S. S. (2021). Artificial intelligence methods reliably predict crop evapotranspiration with different combinations of meteorological data for sugar beet in a semiarid area. *Agricultural Water Management*, 254, 106968.

Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563–1580.

Pandey, B. K. , Mane, D. , Nassa, V. K. K. , Pandey, D. , Dutta, S. , Ventayen, R. J. M. , & Rastogi, R. (2021). Secure text extraction from complex degraded images by applying steganography and deep learning. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 146–163). IGI Global.

Pramanik, S. , Pandey, D. , Joardar, S. , Niranjnamurthy, M. , Pandey, B. K. , & Kaur, J. (2023). An overview of IoT privacy and security in smart cities. In *AIP Conference Proceedings*, 2495(1). AIP Publishing.

Sahani, K. , Khadka, S. S. , Sahani, S. K. , Pandey, B. K. , & Pandey, D. (2023). A possible underground roadway for transportation facilities in Kathmandu Valley: A racking deformation of underground rectangular structures. *Engineering Reports*, e12821.

Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164–185). IGI Global.

Tareke, S. A. , Lelisho, M. E. , Hassen, S. S. , Seid, A. A. , Jemal, S. S. , Teshale, B. M. , & Pandey, B. K. (2022). The prevalence and predictors of depressive, anxiety, and stress symptoms among Tepi town residents during the COVID-19 pandemic lockdown in Ethiopia. *Journal of Racial and Ethnic Health Disparities*, 10(1), 43–55.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications and challenges. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1–5). IEEE.

Hu, T. , Zhang, X. , Bohrer, G. , Liu, Y. , Zhou, Y. , Martin, J. , Li, Y. , & Zhao, K. (2023). Crop yield prediction via explainable AI and interpretable machine learning: Dangers of black box models for evaluating climate change impacts on crop yield. *Agricultural and Forest Meteorology*, 336, 109458.

Pandey, B. K. , Pandey, D. , Wariya, S. , & Agarwal, G. (2021). A deep neural networkbased approach for extracting textual images from deteriorated images. *EAI Endorsed Transactions on Industrial Networks and Intelligent Systems*, 8(28), e3–e3.

Sharma, M. , Pandey, D. , Khosla, D. , Goyal, S. , Pandey, B. K. , & Gupta, A. K. (2022). Design of a GaN-based flip chip light-emitting diode (FC-LED) with Au bumps & thermal analysis with different sizes and adhesive materials for performance considerations. *Silicon*, 14(12), 7109–7120.

Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.

Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211–234). IGI Global.

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1–15.

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 185–192). Springer Nature Singapore.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 223–230). Springer Nature Singapore.

Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique: Prediction of breast cancer. *International Journal of Distributed Systems and Technologies*, 12(4), 1–15.

Son, N. T. , Chen, C. F. , Chen, C. R. , Guo, H. Y. , Cheng, Y. S. , Chen, S. L. , Lin, H. S. , & Chen, S. H. (2020). Machine learning approaches for rice crop yield predictions using time-series satellite data in Taiwan. *International Journal of Remote Sensing*, 41, 7868–7888.

Prasath, B. , & Akila, M. (2023). IoT-based pest detection and classification using deep features with enhanced deep learning strategies. *Engineering Applications of Artificial Intelligence*, 121, 105985.

Sitharthan, R. , Rajesh, M. , Vimal, S. , Kumar, S. , Yuvaraj, S. , Kumar, A. , Raglend, J. , & Vengatesan, K. (2023). A novel autonomous irrigation system for smart agriculture using AI and 6G-enabled IoT network. *Microprocessors and Microsystems*, 101, 104905.

Kumar Kasera, R. , Gour, S. , & Acharjee, T. (2024). A comprehensive survey on IoT- and AI-based applications in different pre-harvest, during-harvest, and post-harvest activities of smart agriculture. *Computers and Electronics in Agriculture*, 216, 108522.

Wakchaure, M. , Patle, B. K. , & Mahindrakar, A. K. (2023). Application of AI techniques and robotics in agriculture: A review. *Artificial Intelligence in Life Sciences*, 3, 100057.

Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.

Vasileiou, M. , Kyrgiakos, L. S. , Kleisiari, C. , Klefodimos, G. , Vlontzos, G. , Belhouchette, H. , & Pardalos, P. M. (2024). Transforming weed management in sustainable agriculture with artificial intelligence: A systematic literature review towards weed identification and deep learning. *Crop Protection*, 176, 106522.

Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309–42323.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 243–251). Singapore: Springer Nature Singapore.

Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.

Montoya-Cavero, L. E. , Díaz de León Torres, R. , Gómez-Espinosa, A. , & Escobedo Cabello, J. A. (2022). Vision systems for harvesting robots: Produce detection and localization. *Computers and Electronics in Agriculture*, 192, 106562.

Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553–566.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219–243). Springer International Publishing.

Saxena, A. , Agarwal, A. , Pandey, B. K. , & Pandey, D. (2024). Examination of the criticality of customer segmentation using unsupervised learning methods. *Circular Economy and Sustainability*, 4(2), 1–14.

- Rai, N. , Zhang, Y. , Ram, B. G. , Schumacher, L. , Yellavajjala, R. K. , Bajwa, S. , & Sun, X. (2023). Applications of deep learning in precision weed management: A review. *Computers and Electronics in Agriculture*, 206, 107698.
- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence (IJDAI)*, 13(2), 40–62.
- Yang, Y. , Han, Y. , Li, S. , Yang, Y. , Zhang, M. , & Li, H. (2023). Vision-based fruit recognition and positioning technology for harvesting robots. *Computers and Electronics in Agriculture*, 213, 108258.
- Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.
- Kong, D. , Wang, J. , Zhang, Q. , Li, J. , & Rong, J. (2023). Research on fruit spatial coordinate positioning by combining improved YOLOv8s and adaptive multi-resolution model. *Agronomy*, 13, 2122.
- Ma, Y. , Zhang, Y. , Jin, X. , Li, X. , Wang, H. , & Qi, C. (2023). A visual method of hydroponic lettuces height and leaves expansion size measurement for intelligent harvesting. *Agronomy*, 13, 1996.
- Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161).
- Abdulkarim, Y. I. , Awl, H. N. , Muhammadsharif, F. F. , Saeed, S. R. , Sidiq, K. R. , Khasraw, S. S. , & Pandey, D. (2023). Metamaterial-based sensors loaded corona-shaped resonator for COVID-19 detection by using microwave techniques. *Plasmonics*, 1(16).
- Xie, Y. , Zhong, X. , Zhan, J. , Wang, C. , Liu, N. , Li, L. , Zhao, P. , Li, L. , & Zhou, G. (2023). ECLPOD: An extremely compressed lightweight model for pear object detection in smart agriculture. *Agronomy*, 13, 1891.

Manufacturing Marvels: A Comprehensive Study on Computational Intelligence

- Singh, J. , Pandey, D. , & Singh, A. K. (2023). Event detection from real-time Twitter streaming data using community detection algorithm. *Multimedia Tools and Applications*, 82(1), 1–28.
- Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.
- Pramanik, S. , Pandey, D. , Joardar, S. , Niranjanaamurthy, M. , Pandey, B. K. , & Kaur, J. (2023). An overview of IoT privacy and security in smart cities. In *AIP Conference Proceedings* (Vol. 2495, No. 1). AIP Publishing.
- Pandey, D. , Pandey, B. K. , & Wariya, S. (2019). Study of various techniques used for video retrieval. *Journal of Emerging Technologies and Innovative Research*, 6(6), 850–853.
- Wang, S. , He, Y. , & Song, M. (2021). Global value chains, technological progress, and environmental pollution: Inequality towards developing countries. *Journal of Environmental Management*, 277, 110999.
- Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433–447). IGI Global.
- Pananond, P. , Gereffi, G. , & Pedersen, T. (2020). An integrative typology of global strategy and global value chains: The management and organization of cross-border activities. *Global Strategy Journal*, 10, 421–443.

Pandey, B. K. , Pandey, D. , Alkhafaji, M. A. , Güneşer, M. T. , & Şeker, C. (2023). A reliable transmission and extraction of textual information using keyless encryption, steganography, and deep algorithm with cuckoo optimization. In *Micro-Electronics and Telecommunication Engineering: Proceedings of 6th ICMETE 2022* (pp. 629–636). Springer Nature Singapore.

Abdulkarim, Y. I. , Awl, H. N. , Muhammadsharif, F. F. , Saeed, S. R. , Sidiq, K. R. , Khasraw, S. S. , & Pandey, D. (2023). Metamaterial-based sensors loaded corona-shaped resonator for COVID-19 detection by using microwave techniques. *Plasmonics*, 18(1), 1–16.

Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.

Devasenapathy, D. , Madhumathy, P. , Umamaheshwari, R. , Pandey, B. K. , & Pandey, D. (2024). Transmission-efficient grid-based synchronized model for routing in wireless sensor networks using Bayesian compressive sensing. *SN Computer Science*, 5(1), 1–11.

Adarov, A. , & Stehrer, R. (2021). Implications of foreign direct investment, capital formation and its structure for global value chains. *The World Economy*, 44, 3246–3299.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhablya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71–78.

Manju, K. , Anand, R. , Pandey, B. K. , Nassa, V. K. , Shahul, A. , George, A. H. , & Dogiwal, S. R. (2023). Determination of early onset glaucoma using OCT image. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 244–255). IGI Global.

Pandey, B. K. , Devi, P. , George, A. S. , Nassa, V. K. , Dadheech, P. , Thankachan, B. , & Dogiwal, S. R. (2023). Review on different types of disturbing noise for degraded complex image. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 15–24). IGI Global.

Yang, B. , Liu, B. , Peng, J. , & Liu, X. (2022). The impact of the embedded global value chain position on energy-biased technology progress: Evidence from China's manufacturing. *Technology in Society*, 71, 102065.

Fernandes, A. M. , Kee, H. L. , & Winkler, D. (2022). Determinants of global value chain participation: Cross-country evidence. *World Bank Economic Review*, 36, 329–360.

Yao, X. , Shah, W. U. H. , Yasmeen, R. , Zhang, Y. , Kamal, M. A. , & Khan, A. (2021). The impact of trade on energy efficiency in the global value chain: A simultaneous equation approach. *Science of the Total Environment*, 765, 142759.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 6(2), e12852.

Tareke, S. A. , Lelisho, M. E. , Hassen, S. S. , Seid, A. A. , Jemal, S. S. , Teshale, B. M. , & Pandey, B. K. (2022). The prevalence and predictors of depressive, anxiety, and stress symptoms among Tepi town residents during the COVID-19 pandemic lockdown in Ethiopia. *Journal of Racial and Ethnic Health Disparities*, 10(1), 1–13.

Carril-Caccia, F. , & Pavlova, E. (2020). Mergers and acquisitions & trade: A global value chain analysis. *The World Economy*, 43, 586–614.

Saxena, A. , Agarwal, A. , Pandey, B. K. , & Pandey, D. (2024). Examination of the criticality of customer segmentation using unsupervised learning methods. *Circular Economy and Sustainability*, 5(2), 1–14.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.

Iyyanar, P. , Anand, R. , Shanthi, T. , Nassa, V. K. , Pandey, B. K. , George, A. S. , & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24–39). IGI Global.

Karishma, B. (2019). Digital Technologies and “value” Capture in Global Value Chains: Empirical Evidence from Indian Manufacturing Firms (WIDER Working Paper). The United Nations University World Institute for Development Economics Research (UNU-WIDER).

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and

steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.

Sahani, K. , Khadka, S. S. , Sahani, S. K. , Pandey, B. K. , & Pandey, D. (2023). A possible underground roadway for transportation facilities in Kathmandu Valley: A racking deformation of underground rectangular structures. *Engineering Reports*, 6(1), e12821.

Vinodhini, V. , Kumar, M. S. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Nassa, V. K. (2022). IoT-based early forest fire detection using MLP and AROC method. *International Journal of Global Warming*, 27(1), 55–70.

Oliveira, L. , Fleury, A. , & Fleury, M. T. (2021). Digital power: Value chain upgrading in an age of digitization. *International Business Review*, 30, 101850.

Cieřlik, E. (2021). Towards the industry 4.0: Have ICT services improved the position of Central and Eastern Europe in global production linkages? *Manufacturing Letters*, 28, 11–16.

Eder, A. , Koller, W. , & Mahlberg, B. (2023). The contribution of industrial robots to labor productivity growth and economic convergence: A production frontier approach. *Journal of Productivity Analysis*, 61(108), 1–25.

Brynjolfsson, E. , Rock, D. , & Syverson, C. (2017). Artificial intelligence and the modern productivity paradox: A clash of expectations and statistics. In *The Economics of Artificial Intelligence: An Agenda*. University of Chicago Press.

Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553–566.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219–243). Springer International Publishing.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications and challenges. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1–5). IEEE.

David, S. , Duraipandian, K. , Chandrasekaran, D. , Pandey, D. , Sindhwani, N. , & Pandey, B. K. (2023). Impact of blockchain in healthcare system. In *Unleashing the Potentials of Blockchain Technology for Healthcare Industries* (pp. 37–57). Academic Press.

Pandey, B. K. , Mane, D. , Nassa, V. K. K. , Pandey, D. , Dutta, S. , Ventayen, R. J. M. , & Rastogi, R. (2021). Secure text extraction from complex degraded images by applying steganography and deep learning. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 146–163). IGI Global.

Sharma, S. , Pandey, B. K. , Pandey, D. , Anand, R. , Sharma, A. , & Saini, S. (2023). Character recognition technique implementation for complicated deteriorated scene. In *2023 6th International Conference on Information Systems and Computer Networks (ISCON)* (pp. 1–4). IEEE.

Sharma, M. , Pandey, D. , Khosla, D. , Goyal, S. , Pandey, B. K. , & Gupta, A. K. (2022). Design of a GaN-based flip chip light emitting diode (FC-LED) with Au bumps & thermal analysis with different sizes and adhesive materials for performance considerations. *Silicon*, 14(12), 7109–7120.

Pandey, B. K. , Pandey, D. , Wariya, S. , & Agarwal, G. (2021). A deep neural networkbased approach for extracting textual images from deteriorated images. *EAI Endorsed Transactions on Industrial Networks and Intelligent Systems*, 8(28), e3.

Revathi, T. K. , Sathiyabhama, B. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Dadheech, P. (2022). An intelligent model for coronary heart disease diagnosis. In *Networking Technologies in Smart Healthcare: Innovations and Analytical Approaches* (p. 234). IGI Global.

Liu, J. , Chang, H. , Forrest, J. Y. L. , & Yang, B. (2020). Influence of artificial intelligence on technological innovation: Evidence from the panel data of China's manufacturing sectors. *Technological Forecasting and Social Change*, 158, 120142.

Designing the Future: The Impact of Computational Intelligence in Industry

- Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1–15.
- Revathi, T. K. , Sathiyabhama, B. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Dadeech, P. (2022). An intelligent model for coronary heart disease diagnosis. In *Networking Technologies in Smart Healthcare: Innovations and Analytical Approaches* (p. 234).
- Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.
- Pramanik, S. , Pandey, D. , Joardar, S. , Niranjnamurthy, M. , Pandey, B. K. , & Kaur, J. (2023). An overview of IoT privacy and security in smart cities. In *AIP Conference Proceedings*, 2495(1). AIP Publishing.
- Mohsenian-Rad, A. H. , Wong, V. W. S. , Jatskevich, J. , Schober, R. , & Leon-Garcia, A. (2010). Autonomous demand-side management based on game-theoretic energy consumption scheduling for the future smart grid. *IEEE Transactions on Smart Grid*, 1(3), 320–331.
- Saxena, A. , Agarwal, A. , Pandey, B. K. , & Pandey, D. (2024). Examination of the criticality of customer segmentation using unsupervised learning methods. *Circular Economy and Sustainability*, 4(2), 1–14.
- Logenthiran, T. , Srinivasan, D. , & Shun, T. Z. (2012). Demand-side management in smart grid using heuristic optimization. *IEEE Transactions on Smart Grid*, 3(3), 1244–1252.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161). IGI Global.
- Bessant, Y. A. , Jency, J. G. , Sagayam, K. M. , Jone, A. A. A. , Pandey, D. , & Pandey, B. K. (2023). Improved parallel matrix multiplication using Strassen and Urdhvatiiryagbhyam method. *CCF Transactions on High Performance Computing*, 5(3), 1–14.
- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence*, 13(2), 40–62.
- Raza, M. Q. , & Khosravi, A. (2015). A review on artificial intelligence-based load demand forecasting techniques for smart grid and buildings. *Renewable and Sustainable Energy Reviews*, 50, 1352–1372.
- Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
- Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219–243). Springer International Publishing.
- Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.
- Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.
- David, S. , Duraipandian, K. , Chandrasekaran, D. , Pandey, D. , Sindhwani, N. , & Pandey, B. K. (2023). Impact of blockchain in healthcare system. In *Unleashing the Potentials of Blockchain Technology for Healthcare Industries* (pp. 37–57). Academic Press.

Diamantoulakis, D. P. , Kapinas, V. M. , & Karagiannidis, G. K. (2015). Big data analytics for dynamic energy management in smart grids. *Big Data Research*, 2(3), 94–101.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.

Tso, G. K. , & Yau, K. K. (2007). Predicting electricity energy consumption: A comparison of regression analysis, decision tree, and neural networks. *Energy*, 32(9), 1761–1768.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Nassa, V. K. , & Dadheech, P. (2022). Software-defined networking-based ad hoc networks routing protocols. In *Software Defined Networking for ad Hoc Networks* (pp. 95–123). Springer International Publishing.

Depuru, S. S. S. R. , Wang, L. , & Devabhaktuni, V. (2011). Smart meters for power grid: Challenges, issues, advantages, and status. *Renewable and Sustainable Energy Reviews*, 15(6), 2736–2742.

Charytoniuk, W. , Chen, M. , & Van Olinda, P. (1998). Nonparametric regression-based short-term load forecasting. *IEEE Transactions on Power Systems*, 13(3), 725–730.

Momoh, J. , Ma, X. , & Tomsovic, K. (1995). Overview and literature survey of fuzzy set theory in power systems. *IEEE Transactions on Power Systems*, 10(3), 1676–1690.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.

Khan, B. , Hasan, A. , Pandey, D. , Ventayen, R. J. M. , Pandey, B. K. , & Gowwrii, G. (2021). Fusion of data mining and artificial intelligence. In *Machine Learning and IoT for Intelligent Systems and Smart Applications* (p. 201).

Raja, D. , Kumar, D. R. , Santhiyakumari, N. , Kumarganesh, S. , Sagayam, K. M. , Thiyaneswaran, B. , & Pandey, D. (2024). A compact dual-feed wide-band slotted antenna for future wireless applications. *Analog Integrated Circuits and Signal Processing*, 118(20), 1–15.

Soheilirad, M. , Hizam, H. , Farzan, P. , Hojabri, M. , Fallah, S. N. , & Soheilirad, G. (2013). Wind farm reactive power optimization by using imperialist competitive algorithm. In *Proceedings of the 2013 International Conference on Power, Energy and Control (ICPEC)* (pp. 1–6). IEEE.

Hong, T. , Wilson, J. , & Xie, J. (2014). Long-term probabilistic load forecasting and normalization with hourly information. *IEEE Transactions on Smart Grid*, 5(1), 456–462.

Dudek, G. (2017). Artificial immune system with local feature selection for shortterm load forecasting. *IEEE Transactions on Evolutionary Computation*, 21(1), 116–130.

Azadeh, A. , Moghadam, R. T. , Ghaderi, S. F. , Tarverdian, S. , & Saberi, M. (2007). Integration of artificial neural networks and genetic algorithm to predict electrical energy consumption. *Applied Mathematics and Computation*, 186(2), 1731–1741.

Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications, and challenges. In *2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO)* (pp. 1–5). IEEE.

Welikala, S. , Dinesh, C. , Ekanayake, M. P. B. , Godaliyadda, R. I. , & Ekanayake, J. (2017). Incorporating appliance usage patterns for non-intrusive load monitoring and load forecasting. *IEEE Transactions on Smart Grid*, 8(6), 2797–2806.

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 185–192). Springer Nature Singapore.

Anand, R. , Singh, J. , Pandey, D. , Pandey, B. K. , Nassa, V. K. , & Pramanik, S. (2022). Modern technique for interactive communication in LEACH-based ad hoc wireless sensor network. In *Software Defined Networking for Ad Hoc Networks* (pp. 55–73). Springer International Publishing.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.

Ferreira, V. H. , & da Silva, A. P. A. (2007). Toward estimating autonomous neural network-based electric load forecasters. *IEEE Transactions on Power Systems*, 22(4), 1554–1562.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analyzation of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 243–251). Springer Nature Singapore.

Engelbrecht, A. P. (2007). *Computational Intelligence: An Introduction*. John Wiley & Sons.

Economic Insights: The Computational Intelligence Perspective on Finance

Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence*, 13(2), 40–62.

Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211–234). IGI Global.

How, M. L. , Cheah, S. M. , Chan, Y. J. , Khor, A. C. , & Say, E. M. P. (2020). Artificial intelligence-enhanced decision support for informing global sustainable development: A human-centric AI-thinking approach. *Information*, 11, 39.

Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164–185). IGI Global.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.

Ziesche, S. , & Yampolskiy, R. (2018). Towards AI welfare science and policies. *Bdcc*, 3, 2.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 223–230). Springer Nature Singapore.

Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique: Prediction of breast cancer. *International Journal of Distributed Systems and Technologies*, 12(4), 1–15.

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1–15.

Veres, C. (2017). Strong cognitive symbiosis: Cognitive computing for humans. *Bdcc*, 1, 6.

Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553–566.

Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.

Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433–447). IGI Global.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1),

e12852.

- Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhvani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 185–192). Springer Nature Singapore.
- Iyyanar, P. , Anand, R. , Shanthi, T. , Nassa, V. K. , Pandey, B. K. , George, A. S. , & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24–39). IGI Global.
- Perry, B. , & Uuk, R. (2019). AI governance and the policymaking process: Key considerations for reducing AI risk. *Bdcc*, 3, 26.
- Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.
- Zeng, D. (2013). From computational thinking to AI thinking. *IEEE Intelligent Systems* , 28, 2–4.
- Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 243–251). Springer Nature Singapore.
- Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhabliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71–78.
- Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563–1580.
- Davis, B. (2008). Complexity and education: Vital simultaneities. *Educational Philosophy and Theory* , 40, 50–65.
- Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.
- Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.
- Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219–243). Springer International Publishing.
- Hill, P. , & Barber, M. (2014). *Preparing for a Renaissance in Assessment* . Pearson.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161).
- Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.
- Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO₃ using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
- Georgiopoulos, M. , DeMara, R. F. , Gonzalez, A. J. , Annie, S. W. , Mansoor, M. , Gelenbe, E. , Kysilka, M. , Secretan, J. , Sharma, C. A. , & Alnsour, A. J. (2009). A sustainable model for integrating current topics in machine learning research into the undergraduate curriculum. *IEEE Transactions on Education*, 52, 503–512.
- Pearl, J. (2010). *Causality: Models, Reasoning, and Inference* (2nd ed.). Cambridge University Press.
- Rad, P. , Roopaei, M. , & Beebe, N. (2018). AI thinking for cloud education platform with personalized learning. In *Proceedings of the 51st Hawaii International Conference on System Sciences* (pp. 3–12).

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.

How, M. L. , & Hung, W. L. D. (2019). Educating AI-thinking in science, technology, engineering, arts, and mathematics (STEAM) education. *Education Sciences*, 9, 184.

Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309–42323.

Korb, K. B. , & Nicholson, A. E. (2010). *Bayesian Artificial Intelligence*. Chapman & Hall/CRC.

Guardians of the Cyber Realm: How Computational Intelligence Defends?

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 185–192). Springer Nature Singapore.

Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309–42323.

Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.

Yang, X. S. (2018). *Optimization Techniques and Applications with Examples*. John Wiley & Sons.

Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553–566.

Yang, X. S. , & Deb, S. (2010). Engineering optimization by cuckoo search. *International Journal of Mathematical Modelling and Numerical Optimization*, 1, 330–343.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhabliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71–78.

Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCMM 2021* (pp. 243–251). Springer Nature Singapore.

Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique: Prediction of breast cancer. *International Journal of Distributed Systems and Technologies*, 12(4), 1–15.

Fujita, H. , Gaeta, A. , Loia, V. , & Orciuoli, F. (2019). Resilience analysis of critical infrastructures: A cognitive approach based on granular computing. *IEEE Transactions on Cybernetics*, 49, 1835–1848.

Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433–447). IGI Global.

Russell, B. , & Van Duren, D. (2018). *Practical Internet of Things security: Design a Security Framework for an Internet Connected Ecosystem* (2nd ed.). Packt Publishing Ltd.

Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence*, 13(2), 40–62.

Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO₃ using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.

Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563–1580.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.

Maynard, P. , McLaughlin, K. , & Sezer, S. (2020). Decomposition and sequential-AND analysis of known cyber-attacks on critical infrastructure control systems. *Journal of Cybersecurity*, 6, tyaa020.

Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161). IGI Global.

Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24–39). IGI Global.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart applications for security enhancement. In *IoT-Based Smart Applications* (pp. 219–243). Springer International Publishing.

Yaacoub, J. P. A. , Salman, O. , Noura, H. N. , Kaaniche, N. , Chehab, A. , & Malli, M. (2020). Cyber-physical systems security: Limitations, issues and future trends. *Microprocessors and Microsystems*, 77, 103201.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.

Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.

Mamta , Gupta, B. B. , Li, K. C. , Leung, V. C. M. , Psannis, K. E. , & Yamaguchi, S. (2021). Blockchain-assisted secure fine-grained searchable encryption for a cloud-based healthcare cyber-physical system. *IEEE/CAA Journal of Automatica Sinica*, 8, 1877–1890.

Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeye, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.

Ch, R. , Srivastava, G. , Nagasree, Y. L. , Ponugumati, A. , & Ramachandran, S. (2022). Robust cyber-physical system enabled smart healthcare unit using blockchain technology. *Electronics* , 11, 3070.

Jacobson, C. (2014). The importance of cyber-physical systems for industry. *ERCIM News* , 97, 4.

Anthi, E. , Williams, L. , Burnap, P. , & Jones, K. (2021). A three-tiered intrusion detection system for industrial control systems. *Journal of Cybersecurity*, 7, tyab006.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 223–230). Springer Nature Singapore.

Nazarenko, A. A. , & Safdar, G. A. (2019). Survey on security and privacy issues in cyber-physical systems. *AIMS Electronics and Electrical Engineering*, 3, 111–143.

Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211–234). IGI Global.

Song, H. , Fink, G. , & Jeschke, S. (2018). *Security and Privacy in Cyber-Physical Systems: Foundations, Principles, and Applications*. John Wiley & Sons.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.

Ye, Y. , Li, T. , Adjeroh, D. , & Iyengar, S. S. (2017). A survey on malware detection using data mining techniques. *ACM Computing Surveys*, 50, 1–40.

Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164–185). IGI Global.

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1–15.

Innovating Industrial Design: A Comprehensive Analysis of Computational Intelligence

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1–15.

Pramanik, S. , Pandey, D. , Joardar, S. , Niranjnamurthy, M. , Pandey, B. K. , & Kaur, J. (2023). An overview of IoT privacy and security in smart cities. In *AIP Conference Proceedings*, 2495(1). AIP Publishing.

How, M. L. , Cheah, S. M. , Khor, A. C. , & Chan, Y. J. (2020). Artificial intelligence-enhanced predictive insights for advancing financial inclusion: A human-centric AI-thinking approach. *Big Data and Cognitive Computing*, 4(1), 8.

Saxena, A. , Sharma, N. K. , Pandey, D. , & Pandey, B. K. (2021). Influence of tourists' satisfaction on future behavioral intentions with special reference to the desert triangle of Rajasthan. *Augmented Human Research*, 6, 1–9.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1–4), 38–56.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21–44). Springer International Publishing.

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 185–192). Springer Nature Singapore.

Crafts, N. F. R. (1996). The First Industrial Revolution: A guided tour for growth economists. *American Economic Review*, 86(2), 197–201.

Ooi, K. B. , Lee, V. H. , Tan, G. H. W. , Hew, T. S. , & Hew, J. J. (2018). Cloud computing in manufacturing: The next industrial revolution in Malaysia? *Expert Systems with Applications*, 93, 376–394.

Mhlanga, D. (2020). Industry 4.0 in finance: The impact of artificial intelligence (AI) on digital financial inclusion. *International Journal of Financial Studies*, 8(4), 45.

- Pandey, B. K. (2023). Improved parallel matrix multiplication using Strassen and Urdhvatiiryagbhyam method. *CCF Transactions on High Performance Computing* , 5(3), 1–14.
- Falah Al-Aroud, S. (2020). The impact of artificial intelligence technologies on audit evidence. *Academy of Accounting and Financial Studies Journal* , 24(1), 1–11.
- Dhanasekar, S. , Martin Sagayam, K. , Pandey, B. K. , & Pandey, D. (2023). Refractive index sensing using metamaterial absorbing augmentation in elliptical graphene arrays. *Plasmonics*, 19(5), 2273–2283.
- Smith, M. J. (2020). Getting value from artificial intelligence in agriculture. *Animal Production Science* , 60(1), 46.
- Du John, H. V. , Ajay, T. , Reddy, G. M. K. , Ganesh, M. N. S. , Hembram, A. , Pandey, B. K. , & Pandey, D. (2023). Design and simulation of SRR-based tungsten metamaterial absorber for biomedical sensing applications. *Plasmonics*, 18(5), 1–10.
- Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating the role of IoT in the development of smart applications for security enhancement. In *IoT-Based Smart Applications* (pp. 219–243). Springer International Publishing.
- Kirubasri, G. , Sankar, S. , Pandey, D. , Pandey, B. K. , Singh, H. , & Anand, R. (2021). A recent survey on 6G vehicular technology, applications and challenges. In 2021 9th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO) (pp. 1–5). IEEE.
- Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121–137). CRC Press.
- Abdulkarim, Y. I. , Awl, H. N. , Muhammadsharif, F. F. , Saeed, S. R. , Sidiq, K. R. , Khasraw, S. S. , & Pandey, D. (2023). Metamaterial-based sensors loaded with a corona-shaped resonator for COVID-19 detection using microwave techniques. *Plasmonics*, 19, 595–610.
- Du John, H. V. , Jose, T. , Jone, A. A. A. , Sagayam, K. M. , Pandey, B. K. , & Pandey, D. (2022). Polarization-insensitive circular ring resonator-based perfect metamaterial absorber design and simulation on a silicon substrate. *Silicon*, 14(14), 9009–9020.
- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence* (IJDAI, 13(2), 40–62.
- Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223–240). IGI Global.
- Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
- Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73–95). IGI Global.
- Banwari, V. (2018). Fourth Industrial Revolution: Role of education and government. *International Journal of Research in Engineering* , 8(3), 47–51.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142–161). IGI Global.
- Haenlein, M. , & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. *California Management Review*, 61(4), 5–14.
- Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.
- Buchanan, B. G. , Sarangi, S. , Armendariz, B. , & Modruch, J. (2005). A (very) brief history of artificial intelligence. *AI Magazine*, 26(4), 53–60.
- Benko, A. , & Sik Lányi, C. (2011). History of artificial intelligence. In *Encyclopedia of Information Science and Technology* (2nd ed., pp. 1759–1762). IGI Global.

Financial Insights Unleashed: Computational Intelligence in Practice

- Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence (IJDAI)*, 13(2), 40-62.
- Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO₃ using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.
3. Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563-1580.
- Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309-42323.
- Rosenberg, L. (2016). Artificial swarm intelligence, a human-in-the-loop approach to A.I. In *Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence (AAAI-16)* (pp. 4381-4382). Phoenix, AZ, USA.
- Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223-240). IGI Global.
- Ziesche, S. , & Yampolskiy, R. (2018). Towards AI welfare science and policies. *Big Data and Cognitive Computing*, 3(1), 2.
- Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.
- Larson, B. (2017). Gender as a variable in natural-language processing: Ethical considerations. In *Proceedings of the First ACL Workshop on Ethics in Natural Language Processing* (pp. 1-11). Valencia, Spain.
- Iyyanar, P. , Anand, R. , Shanthi, T. , Nassa, V. K. , Pandey, B. K. , George, A. S. , & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24-39). IGI Global.
- Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142-161).
- Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.
- Veres, C. (2017). Strong cognitive symbiosis: Cognitive computing for humans. *Big Data and Cognitive Computing*, 1(6).
- Perry, B. , & Uuk, R. (2019). AI governance and the policymaking process: Key considerations for reducing AI risk. *Big Data and Cognitive Computing*, 3(26).
- Zeng, D. (2013). From computational thinking to AI thinking. *IEEE Intelligent Systems*, 28(2), 2-4.
- Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211-234). IGI Global.
17. Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164-185). IGI Global.
- Pandey, D. , Wairya, S. , Sharma, M. , Gupta, A. K. , Kakkar, R. , & Pandey, B. K. (2022). An approach for object tracking, categorization, and autopilot guidance for passive homing missiles. *Aerospace Systems*, 5(4), 553-566.
- Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 15(1), 1-15.

Umbrello, S. (2019). Beneficial artificial intelligence coordination by means of a value-sensitive design approach. *Big Data and Cognitive Computing*, 3(1), 5.

Davis, B. (2008). Complexity and education: Vital simultaneities. *Educational Philosophy and Theory*, 40(50-65).

Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73-95). IGI Global.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analysis of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 243-251). Singapore: Springer Nature Singapore.

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 185-192). Singapore: Springer Nature Singapore.

How, M. L. , & Chan, Y. J. (2020). Artificial intelligence-enabled predictive insights for ameliorating global malnutrition: A human-centric AI-thinking approach. *Ai*, 1(1), 68-91.

Gherheș, V. , & Obrad, C. (2018). Technical and humanities students' perspectives on the development and sustainability of artificial intelligence (AI). *Sustainability*, 10(9), 3066.

Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhabliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433-447). IGI Global.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21-44). Cham: Springer International Publishing.

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT Based Smart Applications* (pp. 219-243). Cham: Springer International Publishing.

30. Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022(1), 8.

Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1-4), 38-56.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 223-230). Singapore: Springer Nature Singapore.

Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique: Prediction of breast cancer. *International Journal of Distributed Systems and Technologies (IJ DST)*, 12(4), 1-15.

Korb, K. B. , & Nicholson, A. E. (2010). *Bayesian Artificial Intelligence*. Chapman & Hall/CRC.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121-137). CRC Press.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhabliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71-78.

Security in the Digital Age: The Computational Intelligence Approach

Pandey, J. K. , Jain, R. , Dilip, R. , Kumbhkar, M. , Jaiswal, S. , Pandey, B. K. , & Pandey, D. (2022). Investigating role of IoT in the development of smart application for security enhancement. In *IoT-Based Smart Applications* (pp. 219-243). Springer International Publishing.

Singh, J. (2014). Real-time big data analytics: Security concerns and challenges with machine learning algorithm. In *Proceedings of the 2014 Conference on IT in Business, Industry and Government: An International Conference by CSI on Big Data (CSIBIG)*. Excellent Publishing House.

Deepa, R. , Anand, R. , Pandey, D. , Pandey, B. K. , & Karki, B. (2022). Comprehensive performance analysis of classifiers in diagnosis of epilepsy. *Mathematical Problems in Engineering*, 2022, 1-10.

Pandey, B. K. , Pandey, D. , Wairya, S. , & Agarwal, G. (2021). An advanced morphological component analysis, steganography, and deep learning-based system to transmit secure textual data. *International Journal of Distributed Artificial Intelligence (IJDAI)*, 13(2), 40-62.

Gupta, A. , Anand, R. , Pandey, D. , Sindhwani, N. , Wairya, S. , Pandey, B. K. , & Sharma, M. (2021). Prediction of breast cancer using extremely randomized clustering forests (ERCF) technique: Prediction of breast cancer. *International Journal of Distributed Systems and Technologies (IJ DST)*, 12(4), 1-15.

Iyyanar, P. , Anand, R. , Shanthi, T. , Nassa, V. K. , Pandey, B. K. , George, A. S. , & Pandey, D. (2023). A real-time smart sewage cleaning UAV assistance system using IoT. In *Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities* (pp. 24-39). IGI Global.

Singh, S. , Madaan, G. , Kaur, J. , Swapna, H. R. , Pandey, D. , Singh, A. , & Pandey, B. K. (2023). Bibliometric review on healthcare sustainability. In *Handbook of Research on Safe Disposal Methods of Municipal Solid Wastes for a Sustainable Environment* (pp. 142-161). IGI Global.

Anand, R. , Lakshmi, S. V. , Pandey, D. , & Pandey, B. K. (2023). An enhanced ResNet-50 deep learning model for arrhythmia detection using electrocardiogram biomedical indicators. *Evolving Systems*, 8(1), 1-15.

David, S. , Durairandian, K. , Chandrasekaran, D. , Pandey, D. , Sindhwani, N. , & Pandey, B. K. (2023). Impact of blockchain in healthcare system. In *Unleashing the Potentials of Blockchain Technology for Healthcare Industries* (pp. 37-57). Academic Press.

Pandey, B. K. , Pandey, D. , Gupta, A. , Nassa, V. K. , Dadheech, P. , & George, A. S. (2023). Secret data transmission using advanced morphological component analysis and steganography. In *Role of Data-Intensive Distributed Computing Systems in Designing Data Solutions* (pp. 21-44). Springer International Publishing.

Choi, H. , & Young, K. J. (2021). Practical approach of security enhancement method based on the protection motivation theory. In *Proceedings of the 2021 21st ACIS International Semi-Virtual Winter Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD-Winter)* (pp. 96-97). ACIS International.

12. Tripathi, R. P. , Sharma, M. , Gupta, A. K. , Pandey, D. , Pandey, B. K. , Shahul, A. , & George, A. H. (2023). Timely prediction of diabetes by means of machine learning practices. *Augmented Human Research*, 8(1), 1.

Babu, S. Z. D. , Pandey, D. , Naidu, G. T. , Sumathi, S. , Gupta, A. , Bader Alazzam, M. , & Pandey, B. K. (2022). Analyzation of big data in smart healthcare. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCM 2021* (pp. 243-251). Springer Nature Singapore.

Kumar, M. S. , Sankar, S. , Nassa, V. K. , Pandey, D. , Pandey, B. K. , & Enbeyle, W. (2021). Innovation and creativity for data mining using computational statistics. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 223-240). IGI Global.

Singh, H. , Pandey, B. K. , George, S. , Pandey, D. , Anand, R. , Sindhwani, N. , & Dadheech, P. (2022). Effective overview of different ML models used for prediction of

COVID-19 patients. In *Artificial Intelligence on Medical Data: Proceedings of International Symposium, ISCOMM 2021* (pp. 185-192). Springer Nature Singapore.

Revathi, T. K. , Sathiyabhama, B. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Dadeech, P. (2022). An intelligent model for coronary heart disease diagnosis. In *Networking Technologies in Smart Healthcare: Innovations and Analytical Approaches* (p. 234). IGI Global.

Sun, Y. , Men, T. , & Huang, G. (2014). Analysis and design of China's e-bank CAPTCHA. In *WIT Transactions on Information and Communication Technologies*, 61, 1343-1350. WIT Press.

Pandey, B. K. , Pandey, D. , & Sahani, S. K. (2024). Autopilot control unmanned aerial vehicle system for sewage defect detection using deep learning. *Engineering Reports*, 7(1), e12852.

Popkova, E. , Alekseev, A. N. , Lobova, S. V. , & Sergi, B. S. (2020). The theory of innovation and innovative development: AI scenarios in Russia. *Technology in Society*, 63, 101390.

Anand, R. , Khan, B. , Nassa, V. K. , Pandey, D. , Dhaliya, D. , Pandey, B. K. , & Dadheech, P. (2023). Hybrid convolutional neural network (CNN) for Kennedy Space Center hyperspectral image. *Aerospace Systems*, 6(1), 71-78.

Pandey, B. K. , & Pandey, D. (2023). Parametric optimization and prediction of enhanced thermoelectric performance in co-doped CaMnO using response surface methodology and neural network. *Journal of Materials Science: Materials in Electronics*, 34(21), 1589.

Gupta, R. , Mane, M. , Bhardwaj, S. , Nandekar, U. , Afaq, A. , Dhaliya, D. , & Pandey, B. K. (2023). Use of artificial intelligence for image processing to aid digital forensics: Legislative challenges. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 433-447). IGI Global.

Pandey, D. , & Pandey, B. K. (2022). An efficient deep neural network with adaptive galactic swarm optimization for complex image text extraction. In *Process Mining Techniques for Pattern Recognition* (pp. 121-137). CRC Press.

Raghavan, R. , Verma, D. C. , Pandey, D. , Anand, R. , Pandey, B. K. , & Singh, H. (2022). Optimized building extraction from high-resolution satellite imagery using deep learning. *Multimedia Tools and Applications*, 81(29), 42309-42323.

25. Kumar Pandey, B. , Pandey, D. , Nassa, V. K. , Ahmad, T. , Singh, C. , George, A. S. , & Wakchaure, M. A. (2021). Encryption and steganography-based text extraction in IoT using the EWCTS optimizer. *The Imaging Science Journal*, 69(1-4), 38-56.

Boopathi, S. , Pandey, B. K. , & Pandey, D. (2023). Advances in artificial intelligence for image processing: Techniques, applications, and optimization. In *Handbook of Research on Thrust Technologies' Effect on Image Processing* (pp. 73-95). IGI Global.

Zhong, X. , & Ji, G. (2011). Retracted Article: Research on the development measures of housing security system. In *Proceedings of the 2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)* (pp. 586-588). IEEE.

Li, F. (2011). The research on information safety problem of digital campus network. In *Proceedings of the 2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC 2011)* (pp. 828-831). IEEE.

Sukhanova, N. V. , Sheptunov, S. A. , & Glashev, R. M. (2019). The neuron network model of human personality for use in robotic systems in medicine and biology. In *Proceedings of the 2019 IEEE International Conference Quality Management, Transport and Information Security, Information Technologies IT and QM and IS* (pp. 11-16). IEEE.

Vinodhini, V. , Kumar, M. S. , Sankar, S. , Pandey, D. , Pandey, B. K. , & Nassa, V. K. (2022). IoT-based early forest fire detection using MLP and AROC method. *International Journal of Global Warming*, 27(1), 55-70.

Sharma, S. , Pandey, B. K. , Pandey, D. , Anand, R. , Sharma, A. , & Saini, S. (2023). Character recognition technique implementation for complicated deteriorated scene. In *2023 6th International Conference on Information Systems and Computer Networks (ISCON)* (pp. 1-4). IEEE.

Pandey, B. K. , Pandey, D. , Nassa, V. K. , George, S. , Aremu, B. , Dadeech, P. , & Gupta, A. (2022). Effective and secure transmission of health information using advanced morphological component analysis and image hiding. In *Artificial Intelligence on Medical*

Data: Proceedings of International Symposium, ISCM 2021 (pp. 223-230). Springer Nature Singapore.

Ekenberg, L. , Danielson, M. , & Boman, M. (1997). Imposing security constraints on agent-based decision support. *Decision Support Systems*, 20, 3-15.

Pandey, B. K. , Pandey, D. , Alkhafaji, M. A. , Güneşer, M. T. , & Şeker, C. (2023). A reliable transmission and extraction of textual information using keyless encryption, steganography, and deep algorithm with cuckoo optimization. In *Micro-Electronics and Telecommunication Engineering: Proceedings of 6th ICMETE 2022* (pp. 629-636). Springer Nature Singapore.

Pandey, D. , Pandey, B. K. , & Wairya, S. (2021). Hybrid deep neural network with adaptive galactic swarm optimization for text extraction from scene images. *Soft Computing*, 25, 1563-1580.

Khelvas, A. , Demyanova, D. , Gilya-Zetinov, A. , Konyagin, E. , Khafizov, R. , & Pashkov, R. (2020). Adaptive distributed video surveillance system. In *Proceedings of the 2020 International Conference on Technology and Entrepreneurship—Virtual (ICTE-V)*.

37. Pandey, D. , Nassa, V. K. , Jhamb, A. , Mahto, D. , Pandey, B. K. , George, A. H. , & Bandyopadhyay, S. K. (2021). An integration of keyless encryption, steganography, and artificial intelligence for the secure transmission of stego images. In *Multidisciplinary Approach to Modern Digital Steganography* (pp. 211-234). IGI Global.

Brahan, J. W. , Lam, K. P. , Chan, H. , & Leung, W. (1998). AICAMS: Artificial intelligence crime analysis and management system. *Knowledge-Based Systems*, 11, 355-361.

Meslie, Y. , Enbeyle, W. , Pandey, B. K. , Pramanik, S. , Pandey, D. , Dadeech, P. , & Saini, A. (2021). Machine intelligence-based trend analysis of COVID-19 for total daily confirmed cases in Asia and Africa. In *Methodologies and Applications of Computational Statistics for Machine Intelligence* (pp. 164-185). IGI Global.

Advancements in AI for Cybersecurity: A Comprehensive Review of the Latest Science and Engineering Trends

Kumar, P. S. , Vijayalakshmi, P. , & Rajendran, V. (2022). Study to distinguish COVID-19 from normal cases using chest X-ray images with convolution neural network. In *Application of Deep Learning Methods in Healthcare and Medical Science* (pp. 121-146). Apple Academic Press.

Reddy, M. S. , Sivaramakrishna, L. , & Reddy, A. V. (2012). The use of an agricultural waste material, Jujuba seeds, for the removal of anionic dye (Congo red) from aqueous medium. *Journal of Hazardous Materials*, 203, 118-127.

Sabnis, R. W. (2010). *Handbook of Biological Dyes and Stains: Synthesis and Industrial Applications*. John Wiley & Sons.

Raymundo, A. S. , Zanarotto, R. , Belisário, M. , Pereira, M. D. G. , Ribeiro, J. N. , & Ribeiro, A. V. F. N. (2010). Evaluation of sugar-cane bagasse as bioadsorbent in the textile wastewater treatment contaminated with carcinogenic Congo red dye. *Brazilian Archives of Biology and Technology*, 53, 931-938.

Hu, Q. H. , Xu, Z. P. , & Qiao, S. Z. (2007). A novel color removal adsorbent from heterocoagulation of cationic and anionic clays. *Journal of Colloid and Interface Science*, 308, 191-199.

Lian, L. , Guo, L. , & Wang, A. (2009). Use of CaCl₂-modified bentonite for removal of Congo red dye from aqueous solutions. *Desalination*, 249(2), 797-801.

Sanghi, R. , & Bhattacharya, B. (2002). Review on decolorization of aqueous dye solutions by low-cost adsorbents. *Coloration Technology*, 118(5), 256-269.

Kumar, A. , Kumar, S. , Kumar, S. , & Gupta, D. V. (2007). Adsorption of phenol and 4-nitrophenol on granular activated carbon in basal salt medium: Equilibrium and kinetics. *Journal of Hazardous Materials*, 147(1, 2), 155-166.

Xin, X. , Si, W. , Yao, Z. , Feng, R. , Du, B. , Yan, L. , & Wei, Q. (2011). Adsorption of benzoic acid from aqueous solution by three kinds of modified bentonites. *Journal of Colloid and Interface Science*, 359(2), 499-504.

Erdem, B. , Özcan, A. , & Özcan, A. S. (2010). Adsorption and solid-phase extraction of 8-hydroxyquinoline from aqueous solutions using natural bentonite. *Applied Surface Science*, 256(17), 5422-5427.

Ayari, F. , Srasra, E. , & Trabelsi-Ayadi, M. (2005). Characterization of bentonitic clays and their use as adsorbent. *Desalination*, 185(1-3), 391-397.

Gottipati, R. , & Mishra, S. (2010). Process optimization of adsorption of Cr(VI) on activated carbons prepared from plant precursors by a two-level full factorial design. *Chemical Engineering Journal*, 160(1), 99-107.

Cronje, K. J. , Chetty, K. , Carsky, M. , Sahu, J. N. , & Meikap, B. C. (2011). Optimization of chromium (VI) sorption potential using developed activated carbon from sugarcane bagasse with chemical activation by zinc chloride. *Desalination*, 275(1-3), 276-284.

Myers, R. H. , & Carter, W. H., Jr . (1973). Response surface techniques for dual response systems. *Technometrics*, 15, 301-317.

15. Box, G. E. , & Hunter, J. S. (1957). Multi-factor experimental designs for exploring response surfaces. *The Annals of Mathematical Statistics*, 28, 195-241.

Box, G. E. , & Hunter, J. S. (1961). The 2^{nk} fractional factorial designs: Part I. *Technometrics*, 3(3), 311-351.

Muthukumar, M. , Mohan, D. , & Rajendran, M. (2003). Optimization of mix proportions of mineral aggregates using Box-Behnken design of experiments. *Cement and Concrete Composites*, 25(7), 751-758.

Tarangini, K. , Kumar, A. , Satpathy, G. R. , & Sangal, V. K. (2009). Statistical optimization of process parameters for Cr (VI) biosorption onto mixed cultures of *Pseudomonas aeruginosa* and *Bacillus subtilis*. *Clean-Soil, Air, Water*, 37(4, 5), 319-327.

Özer, A. , Gürbüz, G. , Çalimli, A. , & Körbahti, B. K. (2008). Investigation of nickel (II) biosorption on *Enteromorpha prolifera*: Optimization using response surface analysis. *Journal of Hazardous Materials*, 152(2), 778-788.

Mahalik, K. , Sahu, J. N. , Patwardhan, A. V. , & Meikap, B. C. (2010). Statistical modelling and optimization of hydrolysis of urea to generate ammonia for flue gas conditioning. *Journal of Hazardous Materials*, 182(1-3), 603-610.

Myers, R. H. , Montgomery, D. C. , & Anderson-Cook, C. M. (2016). *Response Surface Methodology: Process and Product Optimization Using Designed Experiments*. John Wiley & Sons.

Revealing the Next Frontier in Python Code Review: Harnessing Automated Machine Learning with Random Forest for Unmatched Code Quality Evaluation

Russell, R. , Kim, L. , Hamilton, L. , Lazovich, T. , Harer, J. , Ozdemir, O. , & McConley, M. (2018). Automated vulnerability detection in source code using deep representation learning. In 2018 17th IEEE International Conference on Machine Learning and Applications (ICMLA) (pp. 757–762). IEEE.

Ivanovs, M. , Kadikis, R. , Lulla, M. , Rutkovskis, A. , & Elsts, A. (2020). Automated quality assessment of hand washing using deep learning. *arXiv preprint arXiv:2011.11383*.

Sharma, T. , Kechagia, M. , Georgiou, S. , Tiwari, R. , Vats, I. , Moazen, H. , & Sarro, F. (2021). A survey on machine learning techniques for source code analysis. *arXiv preprint arXiv:2110.09610*.

Ali, S. , Zhou, F. , Bailey, A. , Braden, B. , East, J. E. , Lu, X. , & Rittscher, J. (2021). A deep learning framework for quality assessment and restoration in video endoscopy. *Medical Image Analysis*, 68, 101900.

Pereira, S. , Meier, R. , Alves, V. , Reyes, M. , & Silva, C. A. (2018). Automatic brain tumor grading from MRI data using convolutional neural networks and quality assessment. In *Understanding and Interpreting Machine Learning in Medical Image Computing Applications: First International Workshops, MLCN 2018, DLF 2018, and iMIMIC 2018, Held in Conjunction with MICCAI 2018, Granada, Spain, September 16–20, 2018, Proceedings 1*

(pp. 106–114). Springer International Publishing.

Haghighat, M. , Browning, L. , Sirinukunwattana, K. , Malacrino, S. , Khalid Alham, N. , Colling, R. , & Rittscher, J. (2022). Automated quality assessment of large digitized histology cohorts by artificial intelligence. *Scientific Reports*, 12(1), 5002.

Heckman, S. , & Williams, L. (2011). A systematic literature review of actionable alert identification techniques for automated static code analysis. *Information and Software Technology*, 53(4), 363–387.

Shamim, R. , & Lahby, M. (2023). Automated detection and analysis of cyberbullying behavior using machine learning. In *Combating Cyberbullying in Digital Media with Artificial Intelligence* (pp. 116–136). Chapman and Hall/CRC.

Shamim, R. , & Bentalha, B. (2023). Blockchain-enabled machine learning framework for demand forecasting in supply chain management. In *Integrating Intelligence and Sustainability in Supply Chains* (pp. 28–48). IGI Global.

Nair, A. , Meinke, K. , & Eldh, S. (2019). Leveraging mutants for automatic prediction of metamorphic relations using machine learning. In *Proceedings of the 3rd ACM SIGSOFT International Workshop on Machine Learning Techniques for Software Quality Evaluation* (pp. 1–6).

Chen, H. M. , Nguyen, B. A. , Yan, Y. X. , & Dow, C. R. (2020). Analysis of learning behavior in an automated programming assessment environment: A code quality perspective. *IEEE Access*, 8, 167341–167354.

Castro Lechtaler, A. , Liporace, J. C. , Cipriano, M. , García, E. , Maiorano, A. , Malvacio, E. , & Tapia, N. (2015). Automated analysis of source code patches using machine learning algorithms. In *XXI Congreso Argentino de Ciencias de la Computación* (Junín, 2015).

Tufano, R. , Pascarella, L. , Tufano, M. , Poshyvanyk, D. , & Bavota, G. (2021). Towards automating code review activities. In *2021 IEEE/ACM 43rd International Conference on Software Engineering (ICSE)* (pp. 163–174). IEEE.

Tufano, R. (2023). Automating code review. In *2023 IEEE/ACM 45th International Conference on Software Engineering: Companion Proceedings (ICSE-Companion)* (pp. 192–196). IEEE.

Sarker, J. , Turzo, A. K. , Dong, M. , & Bosu, A. (2023). Automated identification of toxic code reviews using ToxiCR. *ACM Transactions on Software Engineering and Methodology*, 32(5).

Siow, J. K. , Gao, C. , Fan, L. , Chen, S. , & Liu, Y. (2020). Core: Automating review recommendation for code changes. In *2020 IEEE 27th International Conference on Software Analysis, Evolution and Reengineering (SANER)* (pp. 284–295). IEEE.

Turzo, A. K. , Faysal, F. , Poddar, O. , Sarker, J. , Iqbal, A. , & Bosu, A. (2023). Towards automated classification of code review feedback to support analytics. *arXiv preprint arXiv:2307.03852*.

Belli, F. , & Crisan, R. (1996). Towards automation of checklist-based code reviews. In *Proceedings of ISSRE'96: 7th International Symposium on Software Reliability Engineering* (pp. 24–33). IEEE.

Vandewinckele, L. , Claessens, M. , Dinkla, A. , Brouwer, C. , Crijns, W. , Verellen, D. , & van Elmp, W. (2020). Overview of artificial intelligence-based applications in radiotherapy: Recommendations for implementation and quality assurance. *Radiotherapy and Oncology*, 153, 55–66.

Majidi, F. , Openja, M. , Khomh, F. , & Li, H. (2022). An empirical study on the usage of automated machine learning tools. In *2022 IEEE International Conference on Software Maintenance and Evolution (ICSME)* (pp. 59–70). IEEE.

Delahanty, R. J. , Kaufman, D. , & Jones, S. S. (2018). Development and evaluation of an automated machine learning algorithm for in-hospital mortality risk adjustment among critical care patients. *Critical Care Medicine*, 46(6), e481–e488.

Shamim, R. (2022). Machine learning's algorithm profoundly impacts predicting the share market stock's price. *IJFMR-International Journal for Multidisciplinary Research*, 4(5).

Teng, F. , Ma, Z. , Chen, J. , Xiao, M. , & Huang, L. (2020). Automatic medical code assignment via deep learning approach for intelligent healthcare. *IEEE Journal of Biomedical and Health Informatics*, 24(9), 2506–2515.

Vallmuur, K. (2015). Machine learning approaches to analyzing textual injury surveillance data: A systematic review. *Accident Analysis & Prevention*, 79, 41–49.

Castillo T. J. M. , Arif, M. , Niessen, W. J. , Schoots, I. G. , & Veenland, J. F. (2020). Automated classification of significant prostate cancer on MRI: A systematic review on the performance of machine learning applications. *Cancers*, 12(6), 1606.

O'Byrne, C. , Abbas, A. , Korot, E. , & Keane, P. A. (2021). Automated deep learning in ophthalmology: AI that can build AI. *Current Opinion in Ophthalmology*, 32(5), 406–412.

Vaccaro, L. , Sansonetti, G. , & Micarelli, A. (2021). An empirical review of automated machine learning. *Computers*, 10(1), 11.

Raman, R. , Shamim, R. , Akram, S. V. , Thakur, L. , Pillai, B. G. , & Ponnusamy, R. (2023). Classification and contrast of supervised machine learning algorithms. In 2023 International Conference on Artificial Intelligence and Smart Communication (AISC) (pp. 629–633). IEEE.

Fujii, G. , Hamada, K. , Ishikawa, F. , Masuda, S. , Matsuya, M. , Myojin, T. , & Ujita, Y. (2020). Guidelines for quality assurance of machine learning-based artificial intelligence. *International Journal of Software Engineering and Knowledge Engineering*, 30(11, 12), 1589–1606.

Chatley, R. , & Jones, L. (2018). Diggit: Automated code review via software repository mining. In 2018 IEEE 25th International Conference on Software Analysis, Evolution and Reengineering (SANER) (pp. 567–571). IEEE.

Harnessing the Power of DNA: Ensuring Secure and Trustworthy Digital Voting

Diffie, W. , & Hellman, M. E. (1976). New directions in cryptography. *IEEE Transactions on Information Theory*, 22(6).

Gehani, A. , LaBean, T. , & Reif, J. (2004). DNA-based cryptography. In *Aspects of Molecular Computing*.

Fujioka, A. , Okamoto, T. , & Ohta, K. (1993). A practical secret voting scheme for large-scale elections. In *Advances in Cryptology—AUSCRYPT'92: Workshop on the Theory and Application of Cryptographic Techniques*, Gold Coast, Queensland, Australia, December 13–16, 1992, Proceedings 3 (pp. 244–251). Springer Berlin Heidelberg.

ElGamal, T. (1985). A public key cryptosystem and a signature scheme based on discrete logarithms. *IEEE Transactions on Information Theory*, 31(4), 469–472.

Choi, Y. , Ryu, T. , Lee, A. C. , Choi, H. , Lee, H. , Park, J. , & Kwon, S. (2019). High information capacity DNA-based data storage with augmented encoding characters using degenerate bases. *Scientific Reports*, 9(1), 6582.

Cui, G. , Qin, L. , Wang, Y. , & Zhang, X. (2008). An encryption scheme using DNA technology. In 2008 3rd International Conference on Bio-Inspired Computing: Theories and Applications (pp. 37–42). IEEE.

PalasNogueira, J. , & de Sá-Soares, F. (2012). Trust in e-voting systems: A case study. In *Knowledge and Technologies in Innovative Information Systems: 7th Mediterranean Conference on Information Systems, MCIS 2012, Guimarães, Portugal, September 8–10, 2012. Proceedings* (pp. 51–66). Springer Berlin Heidelberg.

Mookherji, S. , Vanga, O. , & Prasath, R. (2022). *Blockchain-based e-voting protocols*. In *Blockchain Technology for Emerging Applications* (pp. 239–266). Academic Press.

Khan, K. M. , Arshad, J. , & Khan, M. M. (2020). Investigating performance constraints for blockchain-based secure e-voting system. *Future Generation Computer Systems*, 105, 13–26.

Rexha, B. , Neziri, V. , & Dervishi, R. (2012). Improving authentication and transparency of e-voting system—Kosovo case. *International Journal of Computers and Communications*, 6(1), 84–91.

Küsters, R. , Liedtke, J. , Müller, J. , Rausch, D. , & Vogt, A. (2020). Ordinos: A verifiable tally-hiding e-voting system. In 2020 IEEE European Symposium on Security and Privacy (EuroS&P) (pp. 216–235). IEEE.

Winckler, M. , Bernhaupt, R. , Palanque, P. , Lundin, D. , Leach, K. , Ryan, P. , & Strigini, L. (2009). Assessing the usability of open verifiable e-voting systems: A trial with the system

Prêt à Voter. Proceedings of ICE-GOV, 281–296.

Karayumak, F. , Olembo, M. M. , Kauer, M. , & Volkamer, M. (2011). Usability analysis of Helios—An open-source verifiable remote electronic voting system. In 2011 Electronic Voting Technology Workshop/Workshop on Trustworthy Elections (EVT/WOTE 11).

Amin, S. T. , Saeb, M. , & El-Gindi, S. (2006). A DNA-based implementation of YAEA encryption algorithm. In Computational Intelligence (pp. 120–125).

Alvi, S. T. , Uddin, M. N. , & Islam, L. (2020). Digital voting: A blockchain-based e-voting system using biohash and smart contract. In 2020 Third International Conference on Smart Systems and Inventive Technology (ICSSIT) (pp. 228–233). IEEE.

Adleman, L. M. (1994). Molecular computation of solutions to combinatorial problems. *Science*, 266(5187), 1021–1024.

Apeh, A. J. , Ayo, C. K. , & Adebisi, A. (2021). A scalable blockchain implementation model for nation-wide electronic voting system. In Computational Science and Its Applications—ICCSA 2021: 21st International Conference, Cagliari, Italy, September 13–16, 2021, Proceedings, Part IX 21 (pp. 84–100). Springer International Publishing.

Bornholt, J. , Lopez, R. , Carmean, D. M. , Ceze, L. , Seelig, G. , & Strauss, K. (2016). A DNA-based archival storage system. In Proceedings of the Twenty-First International Conference on Architectural Support for Programming Languages and Operating Systems (pp. 637–649).

Kairi, A. , & Bhadra, T. (2023). Decoding the future using a novel DNA-based cryptosystem. *Journal of European Chemical Bulletin*, 12, 3597–3609.

Application of Computational Intelligence Through the Lens of CNS Drug Discovery: A Study of AI-Driven Predictive Models

Cao, D. S. , Zhou, G. H. , Liu, S. , et al. (2013). Large-scale prediction of human kinase-inhibitor interactions using protein sequences and molecular topological structures. *Analytica Chimica Acta*, 792, 10–18.

Yee, S. W. , Lin, L. , Merski, M. , et al. (2015). Prediction and validation of enzyme and transporter off-targets for metformin. *Journal of Pharmacokinetics and Pharmacodynamics*, 42(5), 463–475.

Axen, S. D. , Huang, X. P. , Caceres, E. L. , Gendele, L. , Roth, B. L. , & Keiser, M. J. (2017). A simple representation of three-dimensional molecular structure. *Journal of Medicinal Chemistry*, 60(17), 7393–7409.

Muegge, I. , & Mukherjee, P. (2016). An overview of molecular fingerprint similarity search in virtual screening. *Expert Opinion on Drug Discovery*, 11(2), 137–148.

Geppert, H. , Vogt, M. , & Bajorath, J. (2010). Current trends in ligand-based virtual screening: Molecular representations, data mining methods, new application areas, and performance evaluation. *Journal of Chemical Information and Modeling*, 50(2), 205–216.

Cao, D. S. , Xu, Q. S. , Liang, Y. Z. , Chen, X. , & Li, H. D. (2010). Prediction of aqueous solubility of druglike organic compounds using partial least squares, back-propagation network, and support vector machine. *Journal of Chemometrics*, 24(9), 584–595.

Chuang, K. V. , Gonsalus, L. M. , & Keiser, M. J. (2020). Learning molecular representations for medicinal chemistry. *Journal of Medicinal Chemistry*, 63, 8705–8722.

Van den Broeck, W. M. M. (2015). Chapter 3. Drug targets, target identification, validation, and screening. In C. G. Wermuth , D. Aldous , P. Raboisson , & D. Rognan (Eds.), *The Practice of Medicinal Chemistry* (4th ed., pp. 45–70). San Diego, CA: Academic Press.

Gashaw, I. , Ellinghaus, P. , Sommer, A. , & Asadullah, K. (2011). What makes a good drug target? *Drug Discovery Today*, 16(23, 24), 1037–1043.

Madhukar, N. S. , Khade, P. K. , Huang, L. , et al. (2019). A Bayesian machine learning approach for drug target identification using diverse data types. *Nature Communications*, 10(1), 5221.

D'Souza, S. , Prema, K. V. , & Balaji, S. (2020). Machine learning models for drug-target interactions: Current knowledge and future directions. *Drug Discovery Today*, 25(4),

- Ghosh, S. , Nie, A. , An, J. , & Huang, Z. (2006). Structure-based virtual screening of chemical libraries for drug discovery. *Current Opinion in Chemical Biology*, 10(3), 194–202.
- Lionta, E. , Spyrou, G. , Vassilatis, D. K. , & Cournia, Z. (2014). Structure-based virtual screening for drug discovery: Principles, applications, and recent advances. *Current Topics in Medicinal Chemistry*, 14(16), 1923–1938.
- Johnson, M. A. , & Maggiora, G. M. (1990). *Concepts and Applications of Molecular Similarity*. Wiley.
- Wang, T. , Wu, M. B. , Lin, J. P. , & Yang, L. R. (2015). Quantitative structure-activity relationship: Promising advances in drug discovery platforms. *Expert Opinion on Drug Discovery*, 10(12), 1283–1300.
- Briard, J. G. , Fernandez, M. , de Luna, P. , Woo, T. K. , & Ben, R. N. (2016). QSAR accelerated discovery of potent ice recrystallization inhibitors. *Scientific Reports*, 6, 26403.
- Zakharov, A. V. , Varlamova, E. V. , Lagunin, A. A. , et al. (2016). QSAR modeling and prediction of drug-drug interactions. *Molecular Pharmaceutics*, 13(2), 545–556.
- Fang, X. , Bagui, S. , & Bagui, S. (2017). Improving virtual screening predictive accuracy of human kallikrein 5 inhibitors using machine learning models. *Computational Biology and Chemistry*, 69, 110–119.
- Chen, J. J. F. , & Visco, D. P. Jr . (2017). Developing an in-silico pipeline for faster drug candidate discovery: Virtual high throughput screening with the signature molecular descriptor using support vector machine models. *Chemical Engineering Science*, 159, 31–42.
- Douali, L. , Villemain, D. , & Cherqaoui, D. (2003). Neural networks: Accurate nonlinear QSAR model for HEPT derivatives. *Journal of Chemical Information and Computer Sciences*, 43(4), 1200–1207.
- Prathipati, P. , Ma, N. L. , & Keller, T. H. (2008). Global Bayesian models for the prioritization of antitubercular agents. *Journal of Chemical Information and Modeling*, 48(12), 2362–2370.
- Sabet, R. , Fassihi, A. , Hemmateenejad, B. , Saghaei, L. , Miri, R. , & Gholami, M. (2012). Computer-aided design of novel antibacterial 3-hydroxypyridine-4-ones: Application of QSAR methods based on the MOLMAP approach. *Journal of Computer-Aided Molecular Design*, 26(3), 349–361.
- Shamsara, J. (2019). A random forest model to predict the activity of a large set of soluble epoxide hydrolase inhibitors solely based on a set of simple fragmental descriptors. *Combinatorial Chemistry & High Throughput Screening*, 22, 555–569.
- Simeon, S. , & Jongkon, N. (2019). Construction of quantitative structure-activity relationship (QSAR) models to predict the potency of structurally diverse Janus kinase 2 inhibitors. *Molecules*, 24(23), 4393.
- Wu, Z. , Ramsundar, B. , Feinberg, E. N. , et al. (2018). MoleculeNet: A benchmark for molecular machine learning. *Chemical Science*, 9(2), 513–530.
- Feinberg, E. N. , Joshi, E. , Pande, V. S. , & Cheng, A. C. (2020). Improvement in ADMET prediction with multitask deep featurization. *Journal of Medicinal Chemistry*, 63(16), 8835–8848.
- Bhatarai, B. , Walters, W. P. , Hop, C. , Lanza, G. , & Ekins, S. (2019). Opportunities and challenges using artificial intelligence in ADME/Tox. *Nature Materials*, 18(5), 418–422.
- Shen, J. , Cheng, F. , Xu, Y. , Li, W. , & Tang, Y. (2010). Estimation of ADME properties with substructure pattern recognition. *Journal of Chemical Information and Modeling*, 50(6), 1034–1041.
- Yang, H. , Sun, L. , Li, W. , Liu, G. , & Tang, Y. (2018). In silico prediction of chemical toxicity for drug design using machine learning methods and structural alerts. *Frontiers in Chemistry*, 6, 30.
- Schneider, G. (2014). Future de novo drug design. *Molecular Informatics*, 33(6, 7), 397–402.
- Struble, T. J. , Alvarez, J. C. , Brown, S. P. , et al. (2020). Current and future roles of artificial intelligence in medicinal chemistry synthesis. *Journal of Medicinal Chemistry*, 63, 8667–8682.
- Gibbs, B. K. , & Sourbier, C. (2018). Detecting the potential pharmacological synergy of drug combination by viability assays in vitro. *Methods in Molecular Biology* (Clifton, N.J.), 1709, 129–137.

Mayr, A. , Klambauer, G. , Unterthiner, T. , & Hochreiter, S. (2016). DeepTox: Toxicity prediction using deep learning. *Frontiers in Environmental Science*, 3, 80.

Avorn, J. (2015). The \$2.6 billion pill—Methodologic and policy considerations. *The New England Journal of Medicine*, 372(20), 1877–1879.

Tan, S. Y. , & Grimes, S. (2010). Paul Ehrlich (1854–1915): Man, with the magic bullet. *Singapore Medical Journal*, 51(11), 842–843.

MadaniTonekaboni, S. A. , SoltanGhoraie, L. , Manem, V. S. K. , & Haibe-Kains, B. (2018). Predictive approaches for drug combination discovery in cancer. *Briefings in Bioinformatics*, 19(2), 263–276.

Mathers, C. (2008). The Global Burden of Disease: 2004 Update. World Health Organization.

Hyman, S. E. (2012). Revolution stalled. *Science Translational Medicine*, 4(155), 155cm111.

Kambeitz, J. , Kambeitz-Illankovic, L. , Leucht, S. , et al. (2015). Detecting neuroimaging biomarkers for schizophrenia: A metaanalysis of multivariate pattern recognition studies. *Neuropsychopharmacology*, 40(7), 1742–1751.

Schnack, H. G. (2019). Improving individual predictions: Machine learning approaches for detecting and attacking heterogeneity in schizophrenia (and other psychiatric diseases). *Schizophrenia Research*, 214, 34–42.

Tandon, N. , & Tandon, R. (2019). Using machine learning to explain the heterogeneity of schizophrenia. Realizing the promise and avoiding the hype. *Schizophrenia Research*, 214, 70–75.

Talpalaru, A. , Bhagwat, N. , Devenyi, G. A. , Lepage, M. , & Chakravarty, M. M. (2019). Identifying schizophrenia subgroups using clustering and supervised learning. *Schizophrenia Research*, 214, 51–59.

Mothi, S. S. , Sudarshan, M. , Tandon, N. , et al. (2019). Machine learning improved classification of psychoses using clinical and biological stratification: Update from the bipolar schizophrenia network for intermediate phenotypes (BSNIP). *Schizophrenia Research*, 214, 60–69.

Tian, S. , Sun, Y. , Shao, J. , et al. (2019). Predicting escitalopram monotherapy response in depression: The role of the anterior cingulate cortex. *Human Brain Mapping*, 41(5), 1249–1260.

Chekroud, A. M. , Zotti, R. J. , Shehzad, Z. , et al. (2016). Crosstrial prediction of treatment outcome in depression: A machine learning approach. *Lancet Psychiatry*, 3(3), 243–250.

Koutsouleris, N. , Kahn, R. S. , Chekroud, A. M. , et al. (2016). Multisite prediction of 4week and 52week treatment outcomes in patients with firstepisode psychosis: A machine learning approach. *Lancet Psychiatry*, 3(10), 935–946.

Chang, B. , Choi, Y. , Jeon, M. , et al. (2019). ARP Net: Antidepressant response prediction network for major depressive disorder. *Genes (Basel)*, 10, 11.

Chekroud, A. M. , Gueorguieva, R. , Krumholz, H. M. , Trivedi, M. H. , Krystal, J. H. , & McCarthy, G. (2017). Re-evaluating the efficacy and predictability of antidepressant treatments: A symptom clustering approach. *JAMA Psychiatry*, 74(4), 370–378.

Pinto, M. , Fernandes, C. , Martins, E. , et al. (2019). Boosting drug discovery for Parkinson's: Enhancement of the delivery of a monoamine oxidaseB inhibitor by brain targeted PEGylated polycaprolactonebased nanoparticles. *Pharmaceutics*, 11(7), 331.

Goedert, M. , & Spillantini, M. G. (2006). A century of Alzheimer's disease. *Science*, 314(5800), 777–781.

Cummings, J. L. , Morstorf, T. , & Zhong, K. (2014). Alzheimer's disease drugdevelopment pipeline: Few candidates, frequent failures. *Alzheimer's Research & Therapy*, 6(4), 37.

Taylor, J. P. , Hardy, J. , & Fischbeck, K. H. (2002). Toxic proteins in neurodegenerative disease. *Science*, 296(5575), 1991–1995.

Analyzing the Factors Affecting the Acceptance of Online Shopping: The Impact of Computational Intelligence and AIoT Through Structural Equation Modeling

- Daley, S. (2018). Examples of artificial intelligence shaking up business as usual. Built In. Available at: <https://builtin.com/artificial-intelligence/examples-ai-in-industry> (accessed on 15 March 2025).
- Maynard, N. (2019). Juniper research: How AI can revive retail?
- Yuan, S. , Musibau, H. O. , Genç, S. Y. , Shaheen, R. , Ameen, A. , & Tan, Z. (2021). Digitalization of economy is the key factor behind fourth industrial revolution: How G7 countries are overcoming the financing issues? Technological Forecasting and Social Change, 165, 120533.
- da Chen, L. , Gillenson, M. L. , & Sherrell, D. L. (2002). Enticing online consumers: An extended technology acceptance perspective. Information and Management, 39(8), 705–719.
- Davies, M. B. , & Hughes, N. (2014). Doing a Successful Research Project: Using Qualitative or Quantitative Methods (2nd ed.). Palgrave Macmillan.
- Mishra, N. , & Mukherjee, S. (2019). Effect of artificial intelligence on customer relationship management of Amazon in Bangalore. International Journal of Management, 10(4), 168–172.
- Sestino, A. , & De Mauro, A. (2022). Leveraging artificial intelligence in business: Implications, applications, and methods. Technology Analysis and Strategic Management, 34(1), 16–29.
- Pusztahelyi, R. (2020). Emotional AI and its challenges in the viewpoint of online marketing. Curentul Juridic, 81(2), 13–31.
- Rust, R. T. , & Huang, M. H. (2014). The service revolution and the transformation of marketing science. Marketing Science, 33(2), 206–221.
- Lai, P. C. (2006). The significance of e-business and knowledge-based customer relationship in the e-marketplace environment. INTI Journal, 2(1), 552–559.
- Lai, P. C. (2010). E-business and E-banking. Japan Society for Software Science and Technology, ITech Research Group.
- Lai, P. C. (2016). Design and security impact on consumers' intention to use single platform e-payment. Interdisciplinary Information Sciences, 22(1), 111–122.
- Campbell, C. , Plangger, K. , Sands, S. , & Kietzmann, J. (2022). Preparing for an era of deepfakes and AI-generated ads: A framework for understanding responses to manipulated advertising. Journal of Advertising, 51(1), 22–38.
- Asling, D. (2017). 19 powerful ways to use artificial intelligence in e-commerce. Linnworks Blog. Available at: <https://blog.linnworks.com/artificial-intelligence-in-ecommerce> (accessed on 15 March 2025).
- Dumitriu, D. , & Popescu, M. A. M. (2020). Artificial intelligence solutions for digital marketing. Procedia Manufacturing, 46, 630–636.
- Weber, F. , & Schütte, R. (2019). A domain-oriented analysis of the impact of machine learning—the case of retailing. Big Data and Cognitive Computing, 3(1), 1–14.
- Kwong, C. K. , Jiang, H. , & Luo, X. G. (2016). AI-based methodology of integrating affective design, engineering, and marketing for defining design specifications of new products. Engineering Applications of Artificial Intelligence, 47, 49–60.
- Helmy Mohamad, A. , Farouk Hassan, G. , & AbdElrahman, A. S. (2022). Impacts of e-commerce on planning and designing commercial activities centers: A developed approach. Ain Shams Engineering Journal, 13(4), 101634.
- Ran, D. , Yingli, W. , & Haoxin, Q. (2021). Artificial intelligence speech recognition model for correcting spoken English teaching. Journal of Intelligent and Fuzzy Systems, 40(2), 3513–3524.
- Sicari, S. , Rizzardi, A. , Grieco, L. A. , & Coen-Porisini, A. (2015). Security, privacy, and trust in Internet of Things: The road ahead. Computer Networks, 76, 146–164.
- Atzori, L. , Iera, A. , & Morabito, G. (2010). The Internet of Things: A survey. Computer Networks, 54(15), 2787–2805.

- Singh, R. (2021). A study of artificial intelligence and e-commerce ecosystem—A customer's perspective. *International Journal of Research in Engineering, Science and Management*, 4(2), 78–87.
- Mariani, M. M. , Perez-Vega, R. , & Wirtz, J. (2022). AI in marketing, consumer research, and psychology: A systematic literature review and research agenda. *Psychology and Marketing*, 39(4), 755–776.
- Teo, T. , Luan, W. S. , & Sing, C. C. (2008). A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: An application of the technology acceptance model (TAM). *Journal of Educational Technology & Society*, 11(4), 265–280.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–339.
- Davis, F. D. , Bagozzi, R. P. , & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14), 1111–1132.
- Ajzen, I. , & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice Hall.
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action Control: From Cognition to Behavior* (pp. 101–128). Springer.
- Gefen, D. , & Straub, D. (2003). Managing user trust in B2C e-services. *e-Service Journal*, 2(2), 7–24.
- Grewal, D. , Lindsey-Mullikin, J. , & Munger, J. (2004). Loyalty in e-tailing: A conceptual framework. *Journal of Relationship Marketing*, 2(3, 4), 31–49.
- Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, 7(3), 101–134.
- Dahlberg, T. , Mallat, N. , & Oorni, A. (2003). Trust enhanced technology acceptance model—Consumer acceptance of mobile payment solutions. *Proceedings of the CIC Roundtable*.
- Chen, L. D. , & Tan, J. (2004). Technology adaptation in e-commerce: Key factors. *European Management Journal*, 22(1), 74–86.
- Yan, Z. , Zhang, P. , & Vasilakos, A. V. (2014). A survey on trust management for the Internet of Things. *Journal of Network and Computer Applications*, 42, 120–134.
- Kaushik, A. K. , & Rahman, Z. (2015). An alternative model of self-service retail technology adoption. *Journal of Services Marketing*, 29(5), 406–420.
- Lin, Z. , & Dong, L. (2018). Clarifying trust in the social Internet of Things. *IEEE Transactions on Knowledge and Data Engineering*, 30(2), 234–248.
- Belanche, D. , Casaló, L. V. , & Flavián, C. (2012). Integrating trust and personal values into the technology acceptance model: The case of e-government services adoption. *Cuadernos de Economía y Dirección de la Empresa*, 15(4), 192–204.
- Falcone, R. , & Sapienza, A. (2018). On the users' acceptance of IoT systems: A theoretical approach. *Information*, 9(3), 53.
- Wilson, N. , Keni, K. , Henriette, P. H. P. , & Tan, P. (2020). The role of perceived usefulness and perceived ease-of-use toward satisfaction and trust which influence computer consumers' loyalty in China. *Gadjah Mada International Journal of Business*, 23(3), 262–294. <https://doi.org/10.22146/gamajib.32106>.
- Castro, M. , & Chambers, E. (2019). Willingness to eat an insect-based product and impact on brand equity: A global perspective. *Journal of Sensory Studies*, 34(2), e12486. <https://doi.org/10.1111/joss.12486>.
- Yoo, W. S. , Lee, Y. , & Park, J. K. (2010). The role of interactivity in e-tailing: Creating value and increasing satisfaction. *Journal of Retailing and Consumer Services*, 17(2), 89–96. <https://doi.org/10.1016/j.jretconser.2009.10.003>.
- Bauer, H. H. , Falk, T. , & Hammerschmidt, M. (2006). eTransQual: A transaction process-based approach for capturing service quality in online shopping. *Journal of Business Research*, 59(7), 866–875. <https://doi.org/10.1016/j.jbusres.2006.01.021>.
- Hsu, C. L. , & Lu, H. P. (2004). Why do people play on-line games? An extended TAM with social influence and flow experience. *Information & Management*, 41(7), 853–868. <https://doi.org/10.1016/j.im.2003.08.014>.

Thong, J. Y. L. , Hong, S. J. , & Tam, K. Y. (2006). The effects of post-adoption beliefs on the expectation-confirmation model for information continuance. *International Journal of Human-Computer Studies*, 64(9), 799–810. <https://doi.org/10.1016/j.ijhcs.2006.05.001>.

Kucukusta, D. , Law, R. , Besbes, A. , & Legoh  rel, P. (2015). Re-examining perceived usefulness and ease of use in online booking: The case of Hong Kong online users. *International Journal of Contemporary Hospitality Management*, 27(2), 185–198. <https://doi.org/10.1108/IJCHM-09-2013-0413>.

Ozturk, A. B. , Bilgihan, A. , Nusair, K. , & Okumus, F. (2016). What keeps the mobile hotel booking users loyal? Investigating the roles of self-efficacy, compatibility, perceived ease of use, and perceived convenience. *International Journal of Information Management*, 36(6), 1350–1359. <https://doi.org/10.1016/j.ijinfomgt.2016.04.005>.

Holdack, E. , Lurie-Stoyanov, K. , & Fromme, H. F. (2020). The role of perceived enjoyment and perceived informativeness in assessing the acceptance of AR wearables. *Journal of Retailing and Consumer Services*, 65, 102259. <https://doi.org/10.1016/j.jretconser.2019.102259>.

Yi, M. Y. , & Hwang, Y. (2003). Predicting the use of web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and technology acceptance model. *International Journal of Human-Computer Studies*, 59(4), 431–449. [https://doi.org/10.1016/S1071-5819\(03\)00114-9](https://doi.org/10.1016/S1071-5819(03)00114-9).

Cha, J. (2010). Factors affecting the frequency and amount of social networking site use: Motivations, perceptions, and privacy concerns. *First Monday*, 15(12). <https://doi.org/10.5210/fm.v15i12.2889>.

Abdullah, F. , Ward, R. , & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' perceived ease of use (PEOU) and perceived usefulness (PU) of e-portfolios. *Computers in Human Behavior*, 63, 75–90. <https://doi.org/10.1016/j.chb.2016.05.014>.

Yusoff, Y. M. , Muhammad, Z. , Salehuddin, M. , Zahari, M. , Pasah, E. S. , & Robert, E. (2009). Individual differences, perceived ease of use, and perceived usefulness in the E-library usage. *Computer and Information Science*, 2(1). <https://doi.org/10.5539/cis.v2n1p107>.

Ibrahim, M. , Shahid, M. K. , & Ahmed, S. F. (2014). The impact of telecom services characteristics on consumer usage in Pakistan. *Advances in Economics and Business*, 2(4), 172–179. <https://doi.org/10.13189/aeb.2014.020403>.

Ratten, V. (2014). A US–China comparative study of cloud computing adoption behavior: The role of consumer innovativeness, performance expectations and social influence. *Journal of Entrepreneurship in Emerging Economies*, 6(1), 53–71. <https://doi.org/10.1108/JEEE-07-2013-0019>.

Haenlein, M. , Anadol, E. , Farnsworth, T. , Hugo, H. , Hunichen, J. , & Welte, D. (2020). Navigating the new era of influencer marketing: How to be successful on Instagram, TikTok, & Co. *California Management Review*, 63(1), 5–25. <https://doi.org/10.1177/0008125620958166>.

Huang, F. , Teo, T. , & Scherer, R. (2022). Investigating the antecedents of university students' perceived ease of using the Internet for learning. *Interactive Learning Environments*, 30(6), 1060–1076. <https://doi.org/10.1080/10494820.2019.1710540>.

Shih, H. P. (2004). An empirical study on predicting user acceptance of e-shopping on the Web. *Information & Management*, 41(3), 351–368. [https://doi.org/10.1016/S0378-7206\(03\)00079-X](https://doi.org/10.1016/S0378-7206(03)00079-X).

GuhaMajumder, M. , Dutta Gupta, S. , & Paul, J. (2022). Perceived usefulness of online customer reviews: A review mining approach using machine learning and exploratory data analysis. *Journal of Business Research*, 150, 147–164. <https://doi.org/10.1016/j.jbusres.2022.06.012>.

Hamid, A. A. , Razak, F. Z. A. , Bakar, A. A. , & Abdullah, W. S. W. (2016). The effects of perceived usefulness and perceived ease of use on continuance intention to use e-government. *Procedia Economics and Finance*, 35, 644–649. [https://doi.org/10.1016/S2212-5671\(16\)00079-4](https://doi.org/10.1016/S2212-5671(16)00079-4).

Fjelland, R. (2020). Why general artificial intelligence will not be realized. *Humanities and Social Sciences Communications*, 7(1), 10. <https://doi.org/10.1057/s41599-020-0494-4>.

Rao, Q. , & Ko, E. (2021). Impulsive purchasing and luxury brand loyalty in WeChat Mini Program. *Asia Pacific Journal of Marketing and Logistics*, 33(10), 2054–2071. <https://doi.org/10.1108/APJML-08-2020-0621>.

Prasetyo, Y. T. , Castillo, A. M. , Salonga, L. J. , Sia, J. A. , & Seneta, J. A. (2020). Factors affecting perceived effectiveness of COVID-19 prevention measures among Filipinos during enhanced community quarantine in Luzon, Philippines: Integrating protection motivation theory and extended theory of planned behavior. *International Journal of Infectious Diseases*, 99, 312–323. <https://doi.org/10.1016/j.ijid.2020.07.074>.

Tandon, U. , Kiran, R. , & Sah, A. (2017). Analyzing customer satisfaction: Users' perspective towards online shopping. *Nankai Business Review International*, 8(3), 266–288. <https://doi.org/10.1108/NBRI-04-2016-0012>.

Kim, D. J. , Ferrin, D. L. , & Rao, H. R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems*, 44(2), 544–564. <https://doi.org/10.1016/j.dss.2007.07.001>.

Gloria, E. , Ichalkaranje, N. , & Lakhmi, C. (2008). *Intelligent Decision Making: An AI-Based Approach* (1st ed., pp. 29–38). Springer.

Huang, M. H. , & Rust, R. T. (2020). A strategic framework for artificial intelligence in marketing. *Journal of the Academy of Marketing Science*, 8, 1–21.

Chung, T. S. , Wedel, M. , & Rust, R. T. (2016). Adaptive personalization using social networks. *Journal of the Academy of Marketing Science*, 44(1), 66–87. <https://doi.org/10.1007/s11747-015-0441-x>.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal of Marketing*, 52(3), 2–22. <https://doi.org/10.1177/002224298805200302>.

Woodruff, R. B. (1997). Customer value: The next source for competitive advantage. *Journal of the Academy of Marketing Science*, 25(2), 139–153. <https://doi.org/10.1007/BF02894350>.

Tian, F. , Fan, J. , Dai, G. , Du, Y. , & Liu, Z. (2018). Thoughts on human-computer interaction in the age of artificial intelligence. *Scientia Sinica Informationis*, 48(4), 361–375. <https://doi.org/10.1360/N112017-00221>.

Rosenberg, D. (2018). How marketers can start integrating AI in their work. *Harvard Business Review Digital Articles*, 5, 2–5.

Almahamid, S. , McAdams, A. C. , Al Kalaldehy, T. , & Al-Sa'eed, M. (2010). The relationship between perceived usefulness, perceived ease of use, perceived information quality, and intention to use e-government. *Journal of Theoretical and Applied Information Technology*, 11(1), 30–44.

Liu, Z. , & Yang, J. Z. (2021). In the wake of scandals: How media use and social trust influence risk perception and vaccination intention among Chinese parents. *Health Communication*, 36(10), 1188–1199. <https://doi.org/10.1080/10410236.2020.1748834>.

Wang, T. , & Chen, R. (2022). It reminds me of my happy childhood: The influence of a brand logo's holiday atmosphere on merchandise-related nostalgic preference. *Journal of Theoretical and Applied Electronic Commerce Research*, 17(3), 1019–1034. <https://doi.org/10.3390/jtaer17030052>.

Siau, K. L. , & Yang, Y. (2017). Impact of artificial intelligence, robotics, and machine learning on sales and marketing. *Mwais*.

Bhatt, A. (2014). Consumer attitude towards online shopping in selected regions of Gujarat. *Journal of Marketing Management*, 2(2), 29–56.

Jusoh, Z. M. , & Ling, G. H. (2012). Factors influencing consumers' attitude towards e-commerce purchases through online shopping. *International Journal of Humanities and Social Science*, 2(4), 223–230.

Trip, S. , Bora, C. H. , Marian, M. , Halmajan, A. , & Drugas, M. I. (2019). Psychological mechanisms involved in radicalization and extremism: A rational emotive behavioral conceptualization. *Frontiers in Psychology*, 10, 437. <https://doi.org/10.3389/fpsyg.2019.00437>.

Chao, C. M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model. *Frontiers in Psychology*, 10, 1652. <https://doi.org/10.3389/fpsyg.2019.01652>.

- Mahmud, A. , Ding, D. , & Hasan, M. M. (2021). Corporate social responsibility: Business responses to coronavirus (COVID-19) pandemic. *SAGE Open*, 11(1). <https://doi.org/10.1177/2158244020988710>.
- To, A. T. , & Trinh, T. H. M. (2021). Understanding behavioral intention to use mobile wallets in Vietnam: Extending the TAM model with trust and enjoyment. *Cogent Business and Management*, 8(1). <https://doi.org/10.1080/23311975.2021.1891661>.
- Bagozzi, R. P. , & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. <https://doi.org/10.1007/BF02723327>.
- Han, H. , Lho, L. H. , Kim, H. C. , & Untaru, E. N. (2021). Sustainable choices and behaviors among eco-friendly museum travelers: Exploring the drivers of sacrifice, visit, pay, and WOM intentions. *International Journal of Environmental Research and Public Health*, 18(2), 1–17. <https://doi.org/10.3390/ijerph18020845>.
- Fornell, C. , & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.1177/002224378101800104>.
- Aranyossy, M. , & Magisztrák, B. (2016). A vásárlói bizalom hatása az e-kereskedelmi vásárlási hajlandóságra. *Marketing & Menedzsment*, 3, 4, 73–87.

Harnessing Computational Intelligence for Cutting-Edge Electronic Science

- Wilamowski, B. M. (2010). Challenges in applications of computational intelligence in industrial electronics. 2010 IEEE International Symposium on Industrial Electronics, Bari, Italy, 15–22. <https://doi.org/10.1109/ISIE.2010.5637934>.
- Engelbrecht, A. P. (2007). *Computational Intelligence: An Introduction*. Wiley.
- Asim, M. , Wang, Y. , Wang, K. , & Huang, P. Q. (2020). A review on computational intelligence techniques in cloud and edge computing. *IEEE Transactions on Emerging Topics in Computational Intelligence*, 4(6), 742–763. <https://doi.org/10.1109/TETCI.2020.3007905>.
- Ahsan, M. , Stoyanov, S. , Bailey, C. , & Albarbar, A. (2020). Developing computational intelligence for smart qualification testing of electronic products. *IEEE Access*, 8, 16922–16933. <https://doi.org/10.1109/ACCESS.2020.2967858>.
- Pukish, M. S. , Reiner, P. , & Wu, X. (2012). Recent advances in the application of real-time computational intelligence to industrial electronics. *IECON 2012–38th Annual Conference on IEEE Industrial Electronics Society*, Montreal, QC, 6305–6314. <https://doi.org/10.1109/IECON.2012.6389018>.
- Liukkonen, M. , Havia, E. , & Hiltunen, Y. (2012). Computational intelligence in mass soldering of electronics – A survey. *Expert Systems with Applications*, 39(10), 9928–9937. <https://doi.org/10.1016/j.eswa.2012.02.100>.
- Raj, J. S. (2019). A comprehensive survey on the computational intelligence techniques and its applications. *Journal of ISMAC*, 1(3), 147–159. <https://doi.org/10.36548/jismac.2019.3.002>.
- Eberhart, R. C. , Shi, Y. , & Kennedy, J. (2001). *Swarm Intelligence*. Morgan Kaufmann.
- Gulati, K. , Boddu, R. S. K. , Kapila, D. , & Bangare, S. L. (2022). A review paper on wireless sensor network techniques in Internet of Things (IoT). *Materials Today*.
- Azar, A. T. , & Vaidyanathan, S. (2014). *Computational Intelligence Applications in Modeling and Control*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-11017-2>.
- Wang, F. Y. , & Liu, D. (2006). *Advances in Computational Intelligence: Theory & Applications*. World Scientific.
- Kruse, R. , Mostaghim, S. , Borgelt, C. , Braune, C. , & Steinbrecher, M. (2022). *Computational Intelligence*. Springer Link.

Smart Tools for Spotting and Sorting Breast Cancer: Harnessing the Power of Computers and Learning Systems

Sharma, S. , Aggarwal, A. , & Choudhury, T. (2018). Breast cancer detection using machine learning algorithms. 2018 International Conference on Computational Techniques, Electronics and Mechanical Systems (CTEMS), 114–118. <https://doi.org/10.1109/CTEMS.2018.8769187>.

B. M. , G. , C. P. , S. , & T. , S. (2013). Breast cancer diagnosis using machine learning algorithms – A survey. International Journal of Distributed and Parallel Systems, 4(3), 105–112. <https://doi.org/10.5121/ijdps.2013.4309>.

Abreu, P. H. , Santos, M. S. , Abreu, M. H. , Andrade, B. , & Silva, D. C. (2017). Predicting breast cancer recurrence using machine learning techniques. ACM Computing Surveys, 49(3), 1–40. <https://doi.org/10.1145/2988544>.

Islam, M. M. , Haque, M. R. , Iqbal, H. , Hasan, M. M. , Hasan, M. , & Kabir, M. N. (2020). Breast cancer prediction: A comparative study using machine learning techniques. SN Computer Science, 1(5), 290. <https://doi.org/10.1007/s42979-020-00305-w>.

Begum, M. S. P. , Suresh, K. , & Ravishankar, K. (2015). Detection of breast masses in digital mammograms using SVM. International Science Press, 8(3), 899–906.

Dalle, J. R. , Leow, W. K. , Racoceanu, D. , Tutac, A. E. , & Putti, T. C. (2008). Automatic breast cancer grading of histopathological images. 2008 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, 3052–3055. <https://doi.org/10.1109/IEMBS.2008.4649847>.

Pedrycz, A. , & Reformat, M. (2006). Hierarchical FCM in a stepwise discovery of structure in data. Soft Computing, 10(3), 244–256. <https://doi.org/10.1007/s00500-005-0478-8>.

Venkatalakshmi, S. , & Janet, J. (2017). ELM-based CAD system to classify mammograms by the combination of CLBP and contourlet. ICTACT Journal on Image and Video Processing, 7(4), 1489–1496. <https://doi.org/10.21917/ijivp.2017.0213>.

Bülbül, M. A. (2023). Optimization of artificial neural network structure and hyperparameters in hybrid model by genetic algorithm: iOS–Android application for breast cancer diagnosis/prediction. Journal of Supercomputing, 80(1). <https://doi.org/10.1007/s11227-023-05635-z>.

Thirumoorthy, K. , & J. B. J. , J. (2023). A two-stage feature selection approach using hybrid quasi-opposition self-adaptive coati optimization algorithm for breast cancer classification. Applied Soft Computing, 146, 110704. <https://doi.org/10.1016/j.asoc.2023.110704>.

Rajasekaran, G. , & Shanmugapriya, P. (2023). Hybrid deep learning and optimization algorithm for breast cancer prediction using data mining. International Journal of Intelligent Systems and Applications in Engineering, 11(1s), 14–22.

<https://ijisae.org/index.php/IJISAE/article/view/2472> (accessed on 15 March 2025).

Matching Filter and Quantum Sensors: Study Dark Matter Transients for Computation

Bertone, G. , Hooper, D. , & Silk, J. (2005). Particle dark matter: Evidence, candidates and constraints. Physics Reports,, 405(5, 6), 279–390. <https://doi.org/10.1016/j.physrep.2004.08.031>.

Degen, C. L. , Reinhard, F. , & Cappellaro, P. (2017). Quantum sensing. Reviews of Modern Physics,, 89(3), 035002. <https://doi.org/10.1103/RevModPhys.89.035002>.

Safronova, M. S. , Budker, D. , DeMille, D. , Kimball, D. F. J. , Derevianko, A. , & Clark, C. W. (2018). Search for new physics with atoms and molecules. Reviews of Modern Physics,, 90(2), 025008. <https://doi.org/10.1103/RevModPhys.90.025008>.

Vilenkin, A. (1985). Cosmic strings and domain walls. *Physics Reports*, 121(5), 263–315. [https://doi.org/10.1016/0370-1573\(85\)90033-X](https://doi.org/10.1016/0370-1573(85)90033-X).

Coleman, S. (1985). Q-balls. *Nuclear Physics B*, 262(2), 263–283. [https://doi.org/10.1016/0550-3213\(85\)90286-X](https://doi.org/10.1016/0550-3213(85)90286-X).

Kusenko, A. (2001). Q-ball candidates for self-interacting dark matter. *Physical Review Letters*, 87, 141301 <https://doi.org/10.1103/PhysRevLett.87.141301>.

Lee, K. , Stein-Schabes, J. A. , Watkins, R. , & Widrow, L. M. (1989). Gauged Q balls. *Physical Review D*, 39, 1665–1673. <https://doi.org/10.1103/PhysRevD.39.1665>.

Liu, J. , Chen, X. , & Ji, X. (2017). Current status of direct dark matter detection experiments. *Nature Physics*, 13, 212–216. <https://doi.org/10.1038/nphys4039>.

Huntemann, N. , Lipphardt, B. , Tamm, C. , Gerginov, V. , Weyers, S. , & Peik, E. (2014). Improved limit on a temporal variation of m_p/m_e from comparisons of Yb^+ and Cs atomic clocks. *Physical Review Letters*, 113, 210802 <https://doi.org/10.1103/PhysRevLett.113.210802>.

Godun, R. M. , Nisbet-Jones, P. B. R. , Jones, J. M. , King, S. A. , Johnson, L. A. M. , Margolis, H. S. , Szymaniec, K. , Lea, S. N. , Bongs, K. , & Gill, P. (2014). Frequency ratio of two optical clock transitions in $^{171}\text{Yb}^+$ and constraints on the time variation of fundamental constants. *Physical Review Letters*, 113, 210801. <https://doi.org/10.1103/PhysRevLett.113.210801>.

Pospelov, M. , Pustelny, S. , Ledbetter, M. P. , Kimball, D. F. J. , Gawlik, W. , & Budker, D. (2013). Detecting domain walls of axionlike models using terrestrial experiments. *Physical Review Letters*, 110, 021803 <https://doi.org/10.1103/PhysRevLett.110.021803>.

Derevianko, A. , & Pospelov, M. (2014). Hunting for topological dark matter with atomic clocks. *Nature Physics*, 10(12), 933–936. <https://doi.org/10.1038/nphys3137>.

Roberts, B. M. , Blewitt, G. , Dailey, C. , Murphy, M. , Pospelov, M. , Rollings, A. , Sherman, J. , Williams, W. , & Derevianko, A. (2017). Search for domain wall dark matter with atomic clocks on board global positioning system satellites. *Nature Communications*, 8(1), 1195. <https://doi.org/10.1038/s41467-017-01440-4>.

Roberts, B. M. , Blewitt, G. , Dailey, C. , & Derevianko, A. (2018). Search for transient ultralight dark matter signatures with networks of precision measurement devices using a Bayesian statistics method. *Physical Review D*, 97(8), 083009. <https://doi.org/10.1103/PhysRevD.97.083009>.

Wcisło, P. , Ablewski, P. , et al. (2018). New bounds on dark matter coupling from a global network of optical atomic clocks. *Science Advances*, 4(12), eaau4869. <https://doi.org/10.1126/sciadv.aau4869>.

Pustelny, S. , Jackson Kimball, D. F. , Pankow, C. , Ledbetter, M. P. , Włodarczyk, P. , Wcisło, P. , Pospelov, M. , Smith, J. R. , Read, J. , Gawlik, W. , & Budker, D. (2013). The global network of optical magnetometers for exotic physics (GNOME): A novel scheme to search for physics beyond the standard model. *Annalen der Physik*, 525(8, 9), 659–670. <https://doi.org/10.1002/andp.201300061>.

Afach, S. , Budker, D. , et al. (2018). Characterization of the global network of optical magnetometers to search for exotic physics (GNOME). *Physics of the Dark Universe*, 22, 162–180. <https://doi.org/10.1016/j.dark.2018.10.002>.

Stadnik, Y. V. , & Flambaum, V. V. (2015). Searching for dark matter and variation of fundamental constants with laser and maser interferometry. *Physical Review Letters*, 114, 161301 <https://doi.org/10.1103/PhysRevLett.114.161301>.

Stadnik, Y. V. , & Flambaum, V. V. (2016). Enhanced effects of variation of the fundamental constants in laser interferometers and application to dark-matter detection. *Physical Review A*, 93, 063630 <https://doi.org/10.1103/PhysRevA.93.063630>.

Grote, H. , & Stadnik, Y. V. (2019). Novel signatures of dark matter in laser-interferometric gravitational-wave detectors. *Physical Review Research*, 1, 033187. <https://doi.org/10.1103/PhysRevResearch.1.033187>.

Romano, J. D. , & Cornish, N. J. (2017). Detection methods for stochastic gravitational-wave backgrounds: A unified treatment. *Living Reviews in Relativity*, 20(1), 1–223. <https://doi.org/10.1007/s41114-017-0004-1>.

Dong, F. , Pierpaoli, E. , Gunn, J. , & Wechsler, R. (2008). Optical cluster finding with an adaptive matched-filter technique: Algorithm and comparison with simulations. *The*

Astrophysical Journal, 676, 868–879. <https://doi.org/10.1086/522490>.

Shaerer, P. (1994). Global seismic event detection using a matched filter on long-period seismograms. *Journal of Geophysical Research*, 99, 13713–13725. <https://doi.org/10.1029/94JB00498>.

Auger, M. , Auty, D. J. , et al. (2012). Search for neutrinoless double-beta decay in ^{136}Xe with EXO-200. *Physical Review Letters*, 109, 032505. <https://doi.org/10.1103/PhysRevLett.109.032505>.

Abbott, B. P. , et al. (2016). Observation of gravitational waves from a binary black hole merger. *Physical Review Letters*, 116, 061102. <https://doi.org/10.1103/PhysRevLett.116.061102>.

Derevianko, A. (2018). Detecting dark-matter waves with a network of precision-measurement tools. *Physical Review A*, 97(4), 042506. <https://doi.org/10.1103/PhysRevA.97.042506>.

Wcisło, P. , Morzyński, P. , Bober, M. , Cygan, A. , Lisak, D. , Ciuryło, R. , & Zawada, M. (2016). Experimental constraint on dark matter detection with optical atomic clocks. *Nature Astronomy*, 1(1), 0009. <https://doi.org/10.1038/s41550-016-0009>.

Sikivie, P. (1982). Axions, domain walls, and the early universe. *Physical Review Letters*, 48, 1156–1159. <https://doi.org/10.1103/PhysRevLett.48.1156>.

Press, W. H. , Ryden, B. S. , & Spergel, D. N. (1989). Dynamical evolution of domain walls in an expanding universe. *The Astrophysical Journal*, 347, 590–604. <https://doi.org/10.1086/168151>.

Vilenkin, A. , & Shellard, E. P. S. (2000). *Cosmic Strings and Other Topological Defects*. Cambridge University Press.

Durrer, R. , Kunz, M. , & Melchiorri, A. (2002). Cosmic structure formation with topological defects. *Physics Reports*, 364(1), 1–81. [https://doi.org/10.1016/S0370-1573\(02\)00014-5](https://doi.org/10.1016/S0370-1573(02)00014-5).

Friedland, A. , Murayama, H. , & Perelstein, M. (2003). Domain walls as dark energy. *Physical Review D*, 67, 043519. <https://doi.org/10.1103/PhysRevD.67.043519>.

Avelino, P. P. , Martins, C. J. A. P. , Menezes, J. , Menezes, R. , & Oliveira, J. C. R. E. (2008). Dynamics of domain wall networks with junctions. *Physical Review D*, 78, 103508. <https://doi.org/10.1103/PhysRevD.78.103508>.

Grabowska, D. M. , Melia, T. , & Rajendran, S. (2018). Detecting dark blobs. *Physical Review D*, 98(11), 115020. <https://doi.org/10.1103/PhysRevD.98.115020>.

Blewitt, G. (2015). *Treatise on Geophysics* (p. 307). Elsevier. <https://doi.org/10.1016/B978-0-444-53802-4.09940-1>.

Bovy, J. , & Tremaine, S. (2012). On the local dark matter density. *The Astrophysical Journal*, 756(1), 89. <https://doi.org/10.1088/0004-637X/756/1/89>.

European GNSS Service Centre . (n.d.). GNSS Constellation Status Online. Retrieved from: <https://www.gsc-europa.eu/system-status/Constellation-Information> (accessed on 15 March 2025).

Kómár, P. , Kessler, E. , & Bishof, M. (2013). A quantum network of clocks. *Nature Physics*, 10, 582–587. <https://doi.org/10.1038/nphys3000>.

Kómár, P. , Topcu, T. , Kessler, E. M. , Derevianko, A. , Vuletić, V. , Ye, J. , & Lukin, M. D. (2016). Quantum network of atom clocks: A possible implementation with neutral atoms. *Physical Review Letters*, 117(6), 060506. <https://doi.org/10.1103/PhysRevLett.117.060506>.

Marsh, D. , & Pop, A. (2015). Axion dark matter, solitons and the cusp–core problem. *Monthly Notices of the Royal Astronomical Society*, 451(3), 2479–2492. <https://doi.org/10.1093/mnras/stv1050>.

Schive, H. Y. , Chiueh, T. , & Broadhurst, T. (2014). Cosmic structure as the quantum interference of a coherent dark wave. *Nature Physics*, 10, 496–499. <https://doi.org/10.1038/nphys2996>.

Hogan, C. J. , & Rees, M. J. (1988). Axion miniclusters. *Physics Letters B*, 205(2), 228–230. [https://doi.org/10.1016/0370-2693\(88\)91655-3](https://doi.org/10.1016/0370-2693(88)91655-3).

Kolb, E. W. , & Tkachev, I. I. (1993). Axion miniclusters and Bose stars. *Physical Review Letters*, 71, 3051–3054. <https://doi.org/10.1103/PhysRevLett.71.3051>.

Dzuba, V. A. , Flambaum, V. V. , & Marchenko, M. V. (2003). Relativistic effects in Sr, Dy, Yb II, and Yb III and search for variation of the fine-structure constant. *Physical Review A*, 68, 022506. <https://doi.org/10.1103/PhysRevA.68.022506>.

Flambaum, V. V. , & Tedesco, A. F. (2006). Dependence of nuclear magnetic moments on quark masses and limits on temporal variation of fundamental constants from atomic clock experiments. *Physical Review C*, 73, 055501. <https://doi.org/10.1103/PhysRevC.73.055501>.

Savalle, E. , Roberts, B. M. , Frank, F. , Pottie, P. E. , McAllister, B. T. , Dailey, C. B. , Derevianko, A. , & Wolf, P. (2019). Novel approaches to dark-matter detection using space-time separated clocks. *arXiv:1902.07192*.

Jet Propulsion Laboratory . (n.d.). Data Freely Available Online. Retrieved from: <ftp://sideshow.jpl.nasa.gov/pub/jpligsac/> (accessed on 15 March 2025).

Rollings, A. (2016). Undergraduate Thesis (Unpublished). University of Nevada, Reno.

Olive, K. A. , & Pospelov, M. (2008). Environmental dependence of masses and coupling constants. *Physical Review D*, 77, 043524. <https://doi.org/10.1103/PhysRevD.77.043524>.

Computational Intelligence in Technopreneurial Skills Development in TVET Institutions

Otamiri, S. , & Ogwe, C. G. (2020). Technopreneurship and youth empowerment in Rivers State, Nigeria. *Journal of Research in Business Management*, 8(5), 23–32. Retrieved from: www.questjournals.org (accessed on 15 March 2025).

Sutrisno,, Cakranegara, P. A. , Asri, F. , Yusuf, M. , & Sahala, J. (2022). Strategi for MSME development using financial technology to increase capital and consumers. *Journal Darma Agung*, 30(2), 677–686.

Sutrisno, S. , Ausat, A. M. A. , Permana, B. , & Harahap, M. A. K. (2023). Do information technology and human resources create business performance: A review. *International Journal of Professional Business Review*, 8(8), e02206. <https://doi.org/10.26668/businessreview/2023.v8i8.2206>.

Michelle, K. , & Tendai, C. (2016). The association of entrepreneurship education and entrepreneurial intention among university students in the Eastern Cape Province of South Africa. *International Journal of Educational Sciences*, 12(3), 200–211. <https://doi.org/10.1080/09751122.2016.11890427>.

Willison, J. , & Buisman-Pijlman, F. (2016). Female entrepreneurship and growth in Cameroon. *International Journal for Researcher Development*, 7(1), 63–83.

Sutrisno, S. , Kuraesin, A. D. , Siminto, S. , Irawansyah, I. , & Ausat, A. M. A. (2023). The role of information technology in driving innovation and entrepreneurial business growth. *Journal MinfoPolgan*, 12(2), 586–597.

Giwa, P. O. (2019). The development of technology entrepreneurship in the context of technology incubators in Lagos, Nigeria (Issue July) [University of London]. Retrieved from: <https://techpoint.africa/2015/04/29/one-africa-media-acquires-100of-jobberman> (accessed on 15 March 2025).

Bhat, I. S. , & Gulzar, F. (2020). An insight into the factors affecting women technopreneurs. *International Journal of Knowledge Management and Practices*, 8(1), 33.

Hidayat, H. , Herawati, S. , Syahmaidi, E. , Hidayati, A. , & Ardi, Z. (2018). Designing of technopreneurship scientific learning framework in vocational-based higher education in Indonesia. *International Journal of Engineering & Technology*, 7(4.9), 123. <https://doi.org/10.14419/ijet.v7i4.9.20632>.

Akinwale, Y. O. , Adepoju, A. O. , & Olomu, M. O. (2017). The impact of technological innovation on SME's profitability in Nigeria. *International Journal of Research, Innovation and Commercialisation*, 1(1), 74–92.

Ayeni, D. O. , & Killian, O. T. P. (2023). Technopreneurship education, occupational counselling, and sustainable development in Nigeria. *British Journal of Multidisciplinary and Advanced Studies: Business and Management Sciences*, 4(4), 34–43.

Eze, C. P. (2013). Empowering the youth through technical and vocational education: A panacea for sustainable national development. *Unizik Orient Journal of Education*, 7(1), 59–64.

Federal Republic of Nigeria . (2013). National Policy on Education (6th ed.). Nigerian Educational Research and Development Council Publishers.

Ramadan, A. , Chen, X. , & Hudson, L. L. (2018). Teachers' skills and ICT integration in technical and vocational education and training (TVET): A case of Khartoum State-Sudan. *World Journal of Education*, 8(3), 31–43.

Danladi, J. , Adamu, A. A. , Usman, N. J. , & Doma, S. Y. (2020). Challenges and opportunities in technical and vocational education (TVET) in Nigeria. *Capital Journal of Educational Studies*, 6(1), 71–82.

Ahmad, S. , Muh, I. , Idrus, M. I. , & Rijal, S. (2023). The role of education in fostering entrepreneurial spirit in the young generation. *Journal of Contemporary Administration and Management*, 1(2), 93–100.

Isdarmini, A. (2020). Strategi pembudayaan technopreneur menuju madrasah hebat di MAN 2 Kulon Progo. *Jurnal Pendidikan Madrasah*, 4(2), 131–142. <https://doi.org/10.14421/jpm.2019.42-01>.

Sudarwati, N. , & Chalimah . (2022). Technopreneurship intention: A study of economic education study program students influenced by entrepreneurial learning. *JPI Journal Pendidikan Indonesia*, 11(4), 698–706. <https://doi.org/10.23887/jpiundiksha.v11i4.46866>.

Iqbal, R. , Doctor, F. , More, B. , Mahmud, S. , & Yousuf, U. (2020). Big data analytics: Computational intelligence techniques and application areas. *Technological Forecasting and Social Change*, 153, 119253 <https://dx.doi.org/10.1016/j.techfore.2018.03.024>.

Fowosire, R. A. , Idris, O. Y. , & Elijah, O. (2017). Technopreneurship: A view of technology, innovations, and entrepreneurship. *Global Journal of Researches in Engineering (F)*, 17(7), 40–46.

Odeyemi, C. A. (2023). Leveraging innovation and technological entrepreneurship in achieving economic growth in Nigeria. *Covenant Journal of Entrepreneurship*, 7(2), 51–58.

Ogundele, A. G. , Waziri, U. M. , & Idris, B. B. (2014). Vocational and technical education in Nigeria: Centenary development and challenges. *International Journal of Educational Research and Information Science*, 1(3), 33–37.

Akanbi, G. O. (2012). Incorporating traditional vocational education into Nigeria's education system: Problems and prospects. *International Journal of Humanities and Social Sciences*, 2(8), 179–187.

Bello, O. , & Muhammad, A. D. K. (2021). Technical and vocational education and training (TVET) sector in Nigeria: Structure, challenges, and repositioning strategies. *International Journal of Research*, 8(10), 127–151.

Kilby, P. (1964). Technical education in Nigeria. *Bulletin of the Oxford University Institute of Economics & Statistics*, 26(2), 181–194.

Akpan, G. A. , Usoro, H. S. , & Ibiritan, S. K. (2013). The evolution of vocational education in Nigeria and its role in national development. Retrieved from: <https://globalacademicgroup.com/journals/> (accessed on 15 March 2025).

Okoye, K. R. E. , & Okwelle, P. C. (2017). New perspectives on technical and vocational education and training in Nigeria. *Journal of Education, Society and Behavioural Science*, 23(4), 1–9.

Oyeleke, O. , & Akinyeye, C. O. (2013). Curriculum development in Nigeria: Historical perspectives. *Journal of Educational and Social Research*, 3(1), 73–80.

Wodi, S. W. , & Dokubo, A. (2012). Innovation and change in technical and vocational education in Nigeria: Challenges for sustainable industrial development. *British Journal of Arts and Social Sciences*, 10(1), 53–61. Retrieved from: www.bjournal.co.uk/paper/BJASS_10_1/BJASS_10_01_05.pdf (accessed on 15 March 2025).

Anibueze, A. U. (2013). Effects of reforms in Nigeria's education sector: Voices of college staff/counseling implications. *IOSR Journal of Humanities and Social Sciences*, 15(6), 68–74.

Ogwo, B. , & Ezekoye, B. (2020). Country study potential for skills partnerships on migration in Nigeria. Retrieved from search.ilo.org

Olabiye, O. , & Chinedu, C. C. (2018). Perception of employers in transforming technical vis-à-vis emerging technology tool for sustainable workforce development in Nigeria. *Path of Science*, 4(4), 50001–55010. <https://doi.org/10.22178/pos.33-6>

- UNESCO . (2015). Youth and Skills: Putting Education to Work, Education for All Global Monitoring Report.
- Ayentimi, D. , Burgess, J. , & Dayaram, K. (2018). Skilled labour shortage. Human Resource Development International,, 21(5), 406–424.
- Okorafor, A. O. , & Nnajiifo, F. N. (2017). TVET policies and practices in Nigeria: Why the gap? European Journal of Education Studies,, 3(4), 612–624.
- Oviawe, J. I. (2018). Revamping technical vocational education and training through public-private partnerships for skill development. Makerere Journal of Higher Education,, 10(1), 73–91.
- Zite, B. N. , & Deebom, M. T. (2017). Enhancing technical vocational education and training (TVET) as a tool for national development in Nigeria: Issues, challenges, and strategies. Journal of Education, Society and Behavioural Science,, 3(2), 1–9.
- Phuthong, T. (2023). Defining technopreneurs' commercialization research process in the emerging Thai economy: Research for constructing grounded theory. TEM Journal,, 12(1), 1142–1155. <https://doi.org/10.18421/TEM122-60>.
- Selladurai, M. (2016). Conceptual framework on technopreneurship. Journal of Social Science,, 8(27), 92–97.
- Touriano, D. , Sutrisno, S. , Kuraesin, A. D. , Santosa, S. , & Ausat, A. M. A. (2023). The role of information technology in improving the efficiency and effectiveness of talent management processes. Journal MinfoPolgan,, 12(2), 539–548.
- Ohara, M. R. (2023). The role of social media in educational communication management. Journal of Contemporary Administration and Management,, 1(2), 70–76. <https://doi.org/10.61100/adman.v1i2.25>
- Sutrisno, S. (2023). Exploring the potential of ChatGPT to improve customer service in MSMEs. Innovative: Journal of Social Science Research,, 3(2), 653–664.
- Harahap, M. A. K. , Sutrisno, S. , Fauzi, F. , Jusman, I. A. , & Ausat, A. M. A. (2023). The impact of digital technology on employee job stress: A business psychology review. Jurnal Pendidikan Tambusai,, 7(1), 3635–3638. Retrieved from: <https://jptam.org/index.php/jptam/article/view/5775> (accessed on 15 March 2025).
- Diawati, P. , Ausat, A. M. A. , & Augustin, J. (2023). Creativity: How to develop an entrepreneurial attitude of creativity. Journal on Education,, 5(4), 11116–11122. <https://jonedu.org/index.php/joe/article/view/2036> (accessed on 15 March 2025).
- Wahyoedi, S. , Suherlan, S. , Rijal, S. , Azzaakiyyah, H. K. , & Ausat, A. M. A. (2023). Implementation of information technology in human resource management. Al-Buhuts,, 19(1), 300–318.
- Atrup, A. , Diawati, P. , Syamsuri, S. , Pramono, S. A. , & Ausat, A. M. A. (2023). The effect of entrepreneurship education and creativity on students' entrepreneurial intention: The perspective of effectuation and cognitive flexibility theory. Jurnal Kependidikan,, 9(2), 38. <https://doi.org/10.33394/jk.v9i2.7822>.
- Hermansyah, A. M. S. (2023). The effect of dividend policy on corporate financial performance. Journal of Contemporary Administration and Management,, 1(1), 5–8. <https://doi.org/10.61100/adman.v1i1.2>.
- Salamah, S. N. (2023). Financial management strategies to improve business performance. Journal of Contemporary Administration and Management,, 1(1), 9–12. <https://doi.org/10.61100/adman.v1i1.3>.
- Sukenti, S. (2023). Financial management concepts: A review. Journal of Contemporary Administration and Management,, 1(1), 13–16. <https://doi.org/10.61100/adman.v1i1.4>.
- Almusaed, A. , Almssad, A. , Yitmen, I. , & Homod, R. Z. (2023). Enhancing student engagement: Harnessing "AIED"'s power in hybrid education: A review analysis. Education Sciences,, 13(7), 632. <https://doi.org/10.3390/educsci13070632>.
- Azzaakiyyah, H. K. , Wanof, M. I. , Suherlan, S. , & Fitri, W. S. (2023). Business philosophy education and improving critical thinking skills of business students. Journal of Contemporary Administration and Management,, 1(1), 1–4. <https://doi.org/10.61100/adman.v1i1.1>.
- Sari, A. R. (2023). The impact of good governance on the quality of public management decision making. Journal of Contemporary Administration and Management,, 1(2), 39–46. <https://doi.org/10.61100/adman.v1i2.21>.

Sudirjo, F. (2023). Marketing strategy in improving product competitiveness in the global market. *Journal of Contemporary Administration and Management*, 1(2), 63–69. <https://doi.org/10.61100/adman.v1i2.24>.

Purnomo, Y. J. (2023). Digital marketing strategy to increase sales conversion on e-commerce platforms. *Journal of Contemporary Administration and Management*, 1(2), 54–62. <https://doi.org/10.61100/adman.v1i2.23>.

Singh, J. , Steele, K. , & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for COVID-19, post-vaccine, & post-pandemic world. *Journal of Educational Technology Systems*, 50(2), 140–171. <https://doi.org/10.1177/00472395211047865>.

Prastyaningtyas, E. W. , Sutrisno, S. , Soeprajitno, E. D. , Ausat, A. M. A. , & Suherlan, S. (2023). Analysing the role of mentors in entrepreneurship education: Effective support and assistance. *Journal on Education*, 5(4), 14571–14577. <https://doi.org/10.31004/joe.v5i4.2511>.

Osugawu, L. (2006). Market orientation in Nigerian companies. *Marketing Intelligence & Planning*, 24(6), 608–631.

Obaji, N. O. , Olugu, M. U. , & Balogun, K. O. (2014). Innovative policies in technology business incubation: Key elements for sustainable entrepreneurship development in Nigeria. *International Journal of Scientific and Research Publications*, 4(11), 1–7. Retrieved from: www.ijsrp.org (accessed on 15 March 2025).

Adeoti, J. (2019). Technopreneurship and national development: Powering businesses and the economy with new technologies. Paper presented at the 31st Convocation Lecture, Federal University of Technology, Akure, Ondo State, Nigeria.

Dada, A. D. (2021). Digital entrepreneurial behaviour of millennials in the Fourth Industrial Revolution in Southwest Nigeria. *African Journal of Science Policy and Innovation Management*, 2(1, 2), 41–60.

Enaifoghe, A. (2021). Digitalization of African economies in the Fourth Industrial Revolution: Opportunities for growth and industrialization. *African Journal of Development Studies*, 11(2), 31–53.

Manda, M. I. , & Dhaou, S. B. (2019). Responding to the challenges and opportunities in the 4th industrial revolution in developing countries. Paper presented at the 12th International Conference.

Lepoutre, J. , & Oguntoye, A. (2018). The (non-) emergence of mobile money systems in Sub-Saharan Africa: A comparative multilevel perspective of Kenya and Nigeria. *Technological Forecasting and Social Change*, 131, 262–275.

Haynes, J. (2018). Between the informal sector and transnational capitalism: Transformations of Nollywood. In A. Companion (Ed.), *A Companion to African Cinema* (pp. 244–268).

Atuahene-Gima, K. , & Amuzu, J. (2019). Farmcrowdy: Digital business model innovation for farming in Nigeria. *Emerald Emerging Markets Case Studies*, 9(2), 1–22.

Gençsü, I. , Walls, G. , Picciariello, A. , & Alasia, I. J. (2022). Nigeria's energy transition: Reforming fossil fuel subsidies and other financing opportunities. Odi.

Wikipedia . (2017). Computational Intelligence. Wikipedia, the free encyclopedia. Retrieved from: https://en.wikipedia.org/wiki/Computational_intelligence (accessed on 15 March 2025).

Wenzel, H. , Smit, D. , & Sardesa, S. (2019). A literature review on machine learning in supply chain management. In W. Kersten , T. Blecker , & C. Ringle (Eds.), *Artificial Intelligence and Digital Transformation in Supply Chain Management: Innovative Approaches for Supply Chains* (Vol. 27, pp. 413–441). Hamburg University of Technology.

Makkar, S. , Devi, G. N. R. , & Solanki, V. K. (2019). Applications of machine learning techniques in supply chain optimization. In: ICICCT 2019-System Reliability, Quality Control, Safety, Maintenance and Management (pp. 861–869).

Zhou, L. , Pan, S. , Wang, J. , & Vasilakos, A. V. (2017). Machine learning on big data: Opportunities and challenges. *Neurocomputing*, 237, 350–361.

Abbas, A. , Zhang, L. , & Khan, S. U. (2015). A survey on context-aware recommender systems based on computational intelligence techniques. *Computing*, 97, 667–690.

Chen, H. (2019). Success factors impacting artificial intelligence adoption: Perspective from the telecom industry in China (Doctoral dissertation, Old Dominion University).

https://digitalcommons.odu.edu/businessadministration_etds/102 (accessed on 15 March 2025).

Thiede, S. , Turetskyy, A. , Loellhoeffel, T. , Kwade, A. , Kara, S. , & Herrmann, C. (2020). Machine learning approach for systematic analysis of energy efficiency potentials in manufacturing processes: A case of battery production. *CIRP Annals*, 69(1), 21–24.

Goksel, N. , & Bozkurt, A. (2019). Artificial intelligence in education: Current insights and future perspectives. In S. Sisman-Ugur & G. Kurubacak (Eds.), *Handbook of Research on Learning in the Age of Transhumanism* (pp. 224–236). IGI Global.

Kolodny, L. (2017). Voiceitt lets people with speech impairments use voice-controlled technology. Retrieved from: <https://techcrunch.com/2017/06/01/voiceitt-letspeoplewith-speech-impairments-use-voice-controlled/> (accessed on 15 March 2025).

Pokrivcakova, S. (2019). Preparing teachers for the application of AI-powered technologies in foreign language education. *Journal of Language and Cultural Education*, 13(7), 135–145. <https://doi.org/10.2478/jolace-2019-0025>.

Leacock, C. , Chodorow, M. , & Gamon, M. (2018). Natural language processing in educational technology. In R. Sottilare , A. Graesser , X. Hu , & B. Goldberg (Eds.), *Design Recommendations for Intelligent Tutoring Systems: Vol. 6, Natural Language Processing* (pp. 243–257). US Army Research Laboratory.

Iyilade, J. (2015). Big data and analytics: Opportunities and challenges. 12th NCS International Conference (pp. 1–43). Akure. Retrieved from: <http://www.ncs.org.ng/wp-content/uploads/2015/08/Big-Data-Analytics-Opportunities-and-ChallengesIyilade.pdf> (accessed on 15 March 2025).

Manzano-León, A. , Camacho-Lazarraga, P. , Guerrero, M. A. , Guerrero-Puerta, L. , Aguilar-Parra, J. M. , Trigueros, R. , & Alias, A. (2021). Between level up and game over: A systematic literature review of gamification in education. *Sustainability*, 13(4), 1–14. <https://doi.org/10.3390/su13042247>.

Roodt, S. , & Rykklief, Y. (2019). Using digital game-based learning to improve the academic efficiency of vocational education students. *International Journal of Game-Based Learning*, 9(4), 45–69. <https://doi.org/10.4018/IJGBL.2019100104>.

Man, C. K. (2021). Game elements, components, mechanics, and dynamics: What are they? Creative Culture (MY). Retrieved from: <https://medium.com/creative-culture-my/game-elements-components-mechanics-and-dynamics-whatare-they-80c0e64d61> (accessed on 15 March 2025).

Gupta, P. , & Goyal, P. (2022). Is game-based pedagogy just a fad? A selfdetermination theory approach to gamification in higher education. *International Journal of Educational Management*, 36(3), 341–356. <https://doi.org/10.1108/IJEM-04-2021-0126>.

Olney, A. M. , DePalma, M. , & Miller, M. T. (2018). Adaptive learning in higher education: A field study of principles and processes. *Journal of Educational Data Mining*, 10(2), 1–30.

Heffernan, N. T. (2016). The rise of the K-12 EdTech sector. In R. N. Taylor , S. J. H. Yang , & H. M. Scharber (Eds.), *The Wiley Handbook of Learning Technology* (pp. 1–18). Wiley.

Roll, I. , & Aleven, V. (2016). Personalized learning: A meta-analysis of the impact of ITS on middle-school science learning. *Journal of Educational Psychology*, 108(3), 1–21.

Dascalu, M. , Dessus, P. , & Trausan-Matu, S. (2019). Artificial intelligence in education: A journey through learning analytics and educational data mining. *International Journal of Artificial Intelligence in Education*, 29(2), 343–369.

Wang, H. , Li, L. , Wang, W. , & Wang, R. (2019). Automated essay scoring versus human scoring: A comparative study. *Journal of Educational Data Mining*, 11(1), 1–17.