

# Developments Towards Next Generation Intelligent Systems for Sustainable Development

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# Table of Contents

<b>Foreword</b> .....	xv
<b>Preface</b> .....	xvi
<b>Acknowledgment</b> .....	xx
<b>Chapter 1</b>	
Blockchain Empowerment for Securing IoT Sensory Data in Next-Gen Intelligent Systems .....	1
<i>R. Logambigai, Vel Tech Rangarajan Dr. Sagunthala R&amp;D Institute of Science and Technology, India</i>	
<i>C. V. Suresh Babu, Hindustan Institute of Technolgy and Science, India</i>	
<b>Chapter 2</b>	
Security and Privacy Considerations in Cloud-Based Data Processing Solutions for Sensitive Data.....	35
<i>Tarun Kumar Vashishth, IIMT University, India</i>	
<i>Vikas Sharma, IIMT University, India</i>	
<i>Kewal Krishan Sharma, IIMT University, India</i>	
<i>Bhupendra Kumar, IIMT University, India</i>	
<i>Sachin Chaudhary, IIMT University, India</i>	
<i>Rajneesh Panwar, IIMT University, India</i>	
<b>Chapter 3</b>	
5G Network Implementation: A Survey on Security Issues, Challenges, and Future Directions .....	62
<i>Sharma Ji, Ajay Kumar Garg Engineering College, India</i>	
<i>Abhishek Kumar Mishra, School of Computer Science and Applications IFTM University, India</i>	

## Chapter 4

Synergizing Federated Learning and In-Memory Computing: An  
Experimental Approach for Drone Integration .....89

*J. K. Periasamy, Department of Computer Science and Engineering, Sri  
Sairam Engineering College, India*

*S. Subhashini, Department of Computer Science and Engineering, B.S.  
Abdur Rahman Crescent Institute of Science and Technology, India*

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Madanapalle Institute of Technology and Science, India*

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Science and Technology, India*

*P. Ajitha, Department of Computer Science and Engineering,  
Sathyabama Institute of Science and Technology, India*

*Sampath Boopathi, Mechanical Engineering, Muthayammal  
Engineering College, India*

## Chapter 5

Trustworthy AI for Optimizing Agriculture: Leveraging IoT Sensory Data .....124

*C. V. Suresh Babu, Hindustan Institute of Technology and Science, India*

*Koti Reddy, Hindustan Institute of Technology and Science, India*

*Gopi Chandu, Hindustan Institute of Technology and Science, India*

*Tati Kowshik, Hindustan Institute of Technology and Science, India*

*Lakshmi Narasimha Rao, Hindustan Institute of Technology and  
Science, India*

## Chapter 6

Cloud Computing and Machine Learning in the Green Power Sector: Data  
Management and Analysis for Sustainable Energy.....148

*Satyanarayana Tirlangi, Department of Mechanical Engineering, Visakha  
Institute of Engineering and Technology, Visakhapatnam, India*

*Shashiraj Teotia, Keral Verma Subharti College of Science, Swami  
Vivekanand Subharti University, Meerut, India*

*G. Padmapriya, Department of Computing Technologies, School  
of Computing, SRM Institute of Science and Technology,  
Kattankulathur, India*

*S. Senthil Kumar, Department of Electrical and Electronics  
Engineering, K.S.R. College of Engineering, Namakkal, India*

*Sunita Dhotre, Department of Computer Engineering, Bharati  
Vidyapeeth University, Pune, India*

*S. Boopathi, Mechanical Engineering, Muthayammal Engineering  
College, Namakkal, India*

## **Chapter 7**

Modern Healthcare Systems: Unveiling the Possibility of AIoT for Remote Patient Monitoring ..... 180

*Kunal, ABES Engineering College, Ghaziabad, India*

*Ayushi Prakash, Ajay Kumar Garg Engineering College, Ghaziabad, India*

*Sandhya Avasthi, ABES Engineering College, Ghaziabad, India*

*Kadambri Agarwal, ABES Engineering College, Ghaziabad, India*

*Mohammad Hussain, Islamic University of Madinah, Saudi Arabia*

## **Chapter 8**

Skin Lesion Detection: An Analysis of Advanced Computational Approaches.....204

*Ayushi Jain, Meerut Institute of Engineering and Technology, India*

*Neha Mittal, Meerut Institute of Engineering and Technology, India*

*Madasu Hanmandlu, MVSR Engineering College, India*

*Arvind Pandey, Buddha Institute of Technology, GIDA, Gorakhpur, India*

## **Chapter 9**

A Deep Learning-Based Efficient Image Captioning Approach for Hindi Language.....225

*Vishal Jayaswal, Ajay Kumar Garg Engineering College, India*

*Rajneesh Rani, National Institute of Technology, Jalandhar, India*

*Jagdeep Kaur, National Institute of Technology, Jalandhar, India*

## **Chapter 10**

NMRA-Facilitated Optimized Deep Learning Framework: A Case Study on IoT-Enabled Waste Management in Smart Cities .....247

*Arunadevi thirumalraj, K. Ramakrishnan College of Technology, India*

*Rakesh Chandrashekar, New Horizon College of Engineering, India*

*Gunapriya, B., New Horizon College of Engineering, India*

*Prabhu kavin Balasubramanian, SRM Institute of Science and Technology, India*

## **Chapter 11**

An Optimized Predictive Model Using Deep Learning: A Case Study of Plant Disease Identification.....269

*Saru Dhir, Amity University, Noida, India*

*Sahil Sharma, Amity University, Noida, India*

**Compilation of References** ..... 285

**About the Contributors** ..... 319

**Index**..... 325

# Detailed Table of Contents

**Foreword** ..... xv

**Preface**..... xvi

**Acknowledgment** ..... xx

## **Chapter 1**

**Blockchain Empowerment for Securing IoT Sensory Data in Next-Gen Intelligent Systems** ..... 1

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*C. V. Suresh Babu, Hindustan Institute of Technolgy and Science, India*

This chapter, titled “Blockchain Empowerment for Securing IoT Sensory Data in Next-Gen Intelligent Systems,” systematically investigates the pivotal role of blockchain in safeguarding IoT sensory data, crucial for next-generation intelligent systems. Beginning with an elucidation of IoT sensory data and its significance, the chapter establishes a foundation for comprehending blockchain’s role in ensuring the security of this sensitive information. Subsequent sections explore how blockchain technology offers a decentralized and secure framework, overcoming challenges posed by traditional centralized data management systems. Real-world examples shed light on the practical implications of immutable data records, emphasizing the contribution of Blockchain to advancing next-gen intelligent systems. Furthermore, the chapter explores additional use cases, emphasizing privacy-preserving techniques that enhance the secure management of IoT sensory data, providing a comprehensive understanding of the intersection between Blockchain and IoT security.



## Chapter 2

### Security and Privacy Considerations in Cloud-Based Data Processing

Solutions for Sensitive Data.....35

*Tarun Kumar Vashishth, IIMT University, India*

*Vikas Sharma, IIMT University, India*

*Kewal Krishan Sharma, IIMT University, India*

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This book chapter explores the crucial aspects of security and privacy considerations in cloud-based data processing solutions for sensitive data. As organizations increasingly leverage cloud computing for their data processing needs, concerns regarding the protection of sensitive information have become paramount. The chapter discusses the challenges and potential threats associated with cloud-based data processing, highlighting the importance of implementing robust security measures to safeguard sensitive data. The chapter delves into various security and privacy considerations that must be addressed when adopting cloud-based data processing solutions. It covers topics such as data encryption, access control mechanisms, secure data transmission, and secure storage. Additionally, it examines the role of authentication and authorization mechanisms, as well as the importance of auditing and monitoring activities to ensure compliance with data protection regulations.

## Chapter 3

### 5G Network Implementation: A Survey on Security Issues, Challenges, and

Future Directions .....62

*Sharma Ji, Ajay Kumar Garg Engineering College, India*

*Abhishek Kumar Mishra, School of Computer Science and Applications*

*IFTM University, India*

Fifth generation (5G) wireless network is a wireless communication standard technology, with substantially faster speeds, extremely low latency, and all-pervasive connectivity. The 5G wireless technology includes strong encryption and authentication systems, the possibility of supply chain threats, and network vulnerability. In this chapter, a brief review of complex environment for 5G networks and the security flaws in the novel technology ideas that 5G will incorporate is presented. Various security issues in Future Generations (XG), post-5G, cellular technology, and potential solutions to the security challenges are also discussed.

## Chapter 4

Synergizing Federated Learning and In-Memory Computing: An Experimental Approach for Drone Integration .....89

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This chapter explores the convergence of cutting-edge technologies, namely, federated learning and in-memory computing, through an experimental approach focused on their integration into drone systems. Federated Learning enables collaborative model training across distributed devices while preserving data privacy, making it suitable for scenarios like drone networks. In-Memory computing leverages fast data processing directly in memory, enhancing real-time analytics and decision-making capabilities. This study presents a novel framework that combines these technologies to enhance the performance of drone missions. The architecture, implementation, and experimental setup, demonstrating improved mission efficiency, data security, and processing speed are also described. The results highlight the potential of this synergy in revolutionizing drone applications across various industries.

## Chapter 5

Trustworthy AI for Optimizing Agriculture: Leveraging IoT Sensory Data ..... 124

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*Koti Reddy, Hindustan Institute of Technology and Science, India*

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The chapter explores the transformative role of trustworthy AI in the agricultural landscape by harnessing the power of IoT sensory data. The journey begins with an exploration of the intersection between AI and IoT in agriculture, emphasizing the pivotal significance of trustworthy AI. The chapter unravels the challenges and opportunities in processing IoT sensory data, shedding light on ways to enhance AI reliability. It then delves into the fusion of soil moisture and weather sensory data,

showcasing the importance of data preprocessing for precise insights. The discussion expands to remote monitoring and control, highlighting user-friendly interfaces and their contribution to sustainable agriculture. Security measures for trustworthiness are addressed, emphasizing data security, privacy, and protection against unauthorized access. The chapter concludes with a recapitulation of Trustworthy AI's pivotal role in agriculture, offering insights into future directions and implications for this dynamic field.

## **Chapter 6**

Cloud Computing and Machine Learning in the Green Power Sector: Data Management and Analysis for Sustainable Energy..... 148

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The green power sector is revolutionizing energy production, grid management, and sustainability by integrating cloud computing and machine learning techniques. This chapter explores data handling processes, including data sources, collection methods, preprocessing, and cloud computing. It discusses machine learning algorithms for predictive modeling and real-time monitoring. Key benefits, challenges, and considerations are discussed, along with case studies of successful cloud adoption in green power projects. The chapter also emphasizes data governance, security, integration techniques, and warehousing solutions for handling growing data requirements. The sector offers efficiency, reliability, and environmental responsibility, but faces challenges like data privacy, scalability, and regulatory compliance.

## Chapter 7

### Modern Healthcare Systems: Unveiling the Possibility of AIoT for Remote Patient Monitoring ..... 180

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*Ayushi Prakash, Ajay Kumar Garg Engineering College, Ghaziabad, India*

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Patient care is transformed when AIOT is included into contemporary healthcare. The influence of AIOT on remote patient monitoring is examined in this chapter, with a focus on how it may improve healthcare outcomes. Real-time monitoring of vital signs, activities, and mental health is made possible by wearable AIOT devices. Data on blood oxygenation, temperature, respiration, and heartbeat are analyzed using sensor nodes and machine learning. Using RPM, the AIOT architecture gathers a variety of biological data and sends it to the IoT cloud for extensive patient monitoring. Examined for their contributions to patient care are a variety of AIOT healthcare products, including wearables, robotic surgical equipment, blood clotting testing devices, linked inhalers, depression monitoring wristwatch applications, and IoT-connected contact lenses. The chapter demonstrates AIOT's potential to improve patient outcomes and support a more efficient and accessible healthcare system by highlighting its role in early identification, particularly for life-threatening disorders.

## Chapter 8

### Skin Lesion Detection: An Analysis of Advanced Computational Approaches.....204

*Ayushi Jain, Meerut Institute of Engineering and Technology, India*

*Neha Mittal, Meerut Institute of Engineering and Technology, India*

*Madasu Hanmandlu, MVSR Engineering College, India*

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In recent times, various imaging methods and deep learning models have been utilized for identification and analyzation of pigmented lesion images. Clinical and pathological methods of recognizing skin tumors are difficult, time consuming, painful, and expensive. In order to address this problem, many computers aided systems were developed and they achieved great success in detecting several lesions. Owing to the complex behavior of skin lesion images the identification of lesions is still challenging. The identification of skin cancer is making major advances by using the improved CAD models. This study presents an asystematic review of the advances made in each step of a CAD based on deep learning. These steps include pre-processing, segmenting, extracting features, classification, and the state of art approaches used in them. The existing models and the publicly available databases

that involve both macroscopic and dermoscopic images are also discussed.

### **Chapter 9**

A Deep Learning-Based Efficient Image Captioning Approach for Hindi Language.....225

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The image caption is a statement that simply conveys the contents of an image. The technique of picture captioning requires both digital image processing and natural language processing. Previously, the majority of research was completed in English language for image captioning. But research work for the Hindi language is much less. Hindi is the national language of India, and the fourth most widely spoken language in the world. The vast majority of Indians speak Hindi. This was the main cause behind the choice to develop a Hindi-language picture captioning algorithm. In this chapter, an effective deep learning-based photo captioning model based on encoder-decoder for the Hindi language is proposed. The encoding process utilizes a convolution neural network (CNN), while the decoding process employs a recurrent neural network (RNN) with an attention mechanism. For the implementation, the Hindi version of the Flickr 8k dataset is used and to evaluate the performance of image captioning, BLEU score is used.

### **Chapter 10**

NMRA-Facilitated Optimized Deep Learning Framework: A Case Study on IoT-Enabled Waste Management in Smart Cities .....247

*Arunadevi thirumalraj, K. Ramakrishnan College of Technology, India*  
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*Gunapriya, B., New Horizon College of Engineering, India*  
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Recycling and landfilling are two of the primary means by which garbage is destroyed in the context of waste management. Many urban areas struggle with improper waste collection, transportation, and disposal. This chapter depicts a competent waste management scheme architecture predicated on internet of things. In addition, two new benchmark datasets to classify waste, which are unified collections of open-source datasets with standardized annotations for all types of waste are presented here. The architecture of the faster region convolutional neural network (FRCNN) is based on the widely used VGG-16 for feature extraction from input images. In addition, the detected garbage is classified into one of seven different types using the naked mole-rat algorithm's (NMRA) hyper-parameter tuning to progress the classification accuracy. The classifier is trained using unlabeled images in a semi-

supervised manner. On the test dataset, the proposed method achieves an average precision of 70% in waste detection and an accuracy of 93% in classification.

## **Chapter 11**

An Optimized Predictive Model Using Deep Learning: A Case Study of  
Plant Disease Identification.....269

*Saru Dhir, Amity University, Noida, India*

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Plant diseases cause disaster to the quantity and quality of agricultural products. It is important to recognize plant pathogens at the initial stage for the sake of global health and well-being. Many researchers have been inspired to improve the performance of plant disease detection systems because of the popularity of deep learning. AlexNet and other similar structural designs were used in most of the studies. In this chapter, four learning techniques are used to evaluate—convolutional neural network, DenseNet, AlexNet and VGG16—designs on a plant-Village dataset for plant disease identification and ordering in this study. In this chapter, the proposed methodology VGG16 with PSO overtakes state-of-the-art results in plant disease ordering with an accuracy percentage.

**Compilation of References** ..... 285

**About the Contributors** ..... 319

**Index**..... 325

# Foreword

Nowadays, due to the need to handle large and complex datasets efficiently and to enable decision-making, advancements in the field of data processing technologies are the need of the era.

In the present era, novel technologies such as Artificial Intelligence, Edge Computing, Federated Learning, Quantum Computing, etc., have unlocked the potential to process continuously generated large volumes of information. The integration of big data frameworks, real-time processing, in-memory computing, AI/ML algorithms, and edge computing has revolutionized data processing capabilities, enabling organizations to build intelligent systems that drive innovation, optimize operations, and deliver personalized experiences.

With the ongoing evolution of technology, we anticipate more progress in data processing, which will drive the development of intelligent systems and influence the future of several industries.

This comprehensive book delves into the significance of data as a valuable asset for businesses across many sectors and discusses how recent technological breakthroughs enable the processing of vast volumes of data and real-time analysis.

This book will be beneficial for scholars, academicians, and industry experts interested in advancing intelligent systems and data processing approaches.

The book is suitable for advanced graduate or upper undergraduate courses and will also be engaging for professionals. Many praise the editors and writers for their foresight in acknowledging the possibilities of this topic and for assembling such a significant collection.

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