

Emerging Frontiers in Computer Science, Mathematics and Commerce *— in the —* Digital Era



Dr. Priyanka

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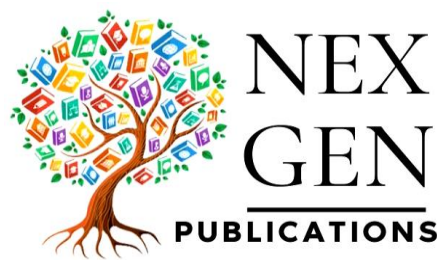


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Emerging Frontiers in Computer Science, Mathematics and Commerce in the Digital Era



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Emerging Frontiers in Computer Science, Mathematics and Commerce in the Digital Era

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Preface

The rapid advancement of digital technologies has transformed research, education, industry, and society, creating new opportunities for interdisciplinary innovation. This edited volume, *Emerging Frontiers in Computer Science, Mathematics, and Commerce in the Digital Era*, brings together peer-reviewed contributions from academicians, researchers, scholars, and industry professionals to explore emerging trends and practical applications across these dynamic fields.

The chapters encompass a wide range of topics, including artificial intelligence, machine learning, deep learning, natural language processing, generative AI, blockchain, cloud and edge computing, cybersecurity, Internet of Things (IoT), big data analytics, financial technology, business intelligence, computational mathematics, optimization techniques, cryptography, graph theory, and intelligent decision-support systems. The volume also highlights interdisciplinary themes such as ethical AI, sustainable computing, human-computer interaction, high-performance computing, and data-driven innovation, reflecting the growing need for collaborative research that transcends traditional academic boundaries.

This book aims to serve as a valuable resource for academicians, researchers, postgraduate students, and industry professionals seeking insights into emerging technologies and their real-world applications. We hope the ideas and findings presented in this volume will inspire future research, encourage interdisciplinary collaboration, and contribute to the development of innovative and sustainable digital solutions.

Editors

Dr. Priyanka

Dr. Hemant Kumar

Acknowledgement

The publication of Emerging Frontiers in Computer Science, Mathematics, and Commerce in the Digital Era represents a collective scholarly endeavour. The editor expresses sincere appreciation to all contributors whose rigorous research and academic commitment form the intellectual foundation of this volume.

Special thanks to my family for their constant encouragement, support, and blessings throughout this journey. I express my heartfelt gratitude to my mother for her unconditional care, motivation, and sacrifices, and to my brothers for their continuous support, inspiration, and belief in me. Their love and encouragement have been a great source of strength and motivation during the completion of this work.

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Special thanks are also extended to the team of NEXGEN Publishing House for their guidance, professionalism, and commitment to quality publication standards. Appreciation is also due to all peer reviewers for their valuable suggestions and constructive feedback.

Finally, sincere thanks are offered to the readers and research community whose continued interest in computational intelligence motivates scholarly exploration and innovation.

Warm Regards,

Editors

Dr. Priyanka

Dr. Hemant Kumar

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CRYPTOCURRENCY SECURITY IN THE AGE OF BLOCKCHAIN-AIOT CONVERGENCE

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ABSTRACT

Cryptocurrency, blockchain, and the convergence of artificial intelligence with the Internet of Things (AIoT) have become layers of a single operational security problem rather than three independent research domains. This chapter reviews how blockchain functions as the trust backbone of AIoT deployments, examines the 2025 cryptocurrency threat landscape—a year in which stolen funds reached an estimated \$3.4 billion, dominated by the \$1.4-billion Bybit breach and a cluster of wallet- and credential-based compromises at exchanges including Cetus, Nobitex, and CoinDCX—and surveys emerging AI-driven defenses, particularly federated learning paired with blockchain-anchored intrusion detection. It then considers the institutional and governance responses these losses have prompted, the structural challenges of scalability, identity management, and adversarial sophistication that remain unresolved, and the research directions most likely to shape the field through 2026. The chapter's central finding is that the cryptographic core of blockchain systems has proven resilient, while the human and device identities that hold its keys remain the dominant point of failure—a lesson with direct implications as AIoT extends autonomous, value-bearing transactions to billions of additional devices.

Keywords: cryptocurrency security, blockchain, AIoT, federated learning, intrusion detection, wallet compromise

1. INTRODUCTION

Cryptocurrency, blockchain, and the fusion of artificial intelligence with the Internet of Things—commonly abbreviated as AIoT—have converged into a single, high-stakes security problem. Blockchain supplies the tamper-resistant ledger that underlies most digital assets; the IoT supplies billions of sensors, wallets, and edge devices that increasingly transact value autonomously; and AI supplies both the analytical engine that can defend this ecosystem and, increasingly, a toolkit exploited by attackers. This chapter examines how these three layers interact, surveys the current threat landscape facing cryptocurrency platforms, reviews AI-driven defenses being deployed at the blockchain-IoT boundary, and outlines the structural challenges that remain unresolved as the field moves through 2025 and into 2026.

2. BLOCKCHAIN AS THE SECURITY BACKBONE OF AIOT

The core appeal of blockchain within AIoT deployments is architectural: a decentralized, append-only ledger removes the single point of failure that

ABOUT THE EDITORS

Dr. Priyanka

M.Sc., Ph.D. in Computer Science and Applications, UGC NET (3 Times), HTET (2 Times). She is currently working as an Assistant Professor in the Department of Information and Communication Technology at Ch. Bansilal University (CBLU), Bhiwani, Haryana. She has academic and research experience in the field of Computer Science and Information Technology, with expertise in Blockchain Technology, Cybersecurity, Artificial Intelligence, Internet of Things (IoT).

She has published numerous research papers in UGC Care, Scopus-indexed, and peer-reviewed journals, including publications in reputed international journals and conference proceedings. She has also contributed several book chapters and holds a published patent in the area of blockchain-based e-commerce security systems.

Dr. Priyanka has actively contributed to academic research, peer review, faculty development programmes, workshops, and international conferences. She has served as a reviewer for reputed journals including Springer Nature and Scopus-indexed journals. She is also serving as an Editorial Board Member of various reputed journals, including the International Journal for Development of Science and Technology (IJ DST) and has served as the Editor of several academic books.

In addition to her research and teaching contributions, she has coordinated various AICTE-associated national-level FDPs and workshops on Generative AI, Application Development with AI, MATLAB Programming, and emerging computing technologies.

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Dr. Hemant has published research papers in UGC CARE-listed, Scopus-indexed, and peer-reviewed journals, and has contributed to national and international conferences. He has actively participated in faculty development programmes, workshops, and research activities, demonstrating a strong commitment to academic excellence and innovation.

ABOUT THE BOOK

Emerging Frontiers in Computer Science, Mathematics, and Commerce in the Digital Era, edited by Dr. Priyanka, presents a comprehensive collection of scholarly contributions that explore the latest advancements in computing, mathematical sciences, and digital commerce. The volume highlights the transformative impact of emerging technologies on research, industry, and society while fostering interdisciplinary collaboration.

The book covers a wide range of contemporary topics, including Artificial Intelligence, Machine Learning, Deep Learning, Blockchain Technology, Cybersecurity, Cloud Computing, Edge Computing, Big Data Analytics, Internet of Things (IoT), Business Intelligence, Financial Technology, Data Science, Cryptography, Optimization Techniques, and Computational Mathematics. It also addresses emerging areas such as ethical AI, sustainable computing, digital transformation, intelligent decision-making, and smart technologies.

Bridging theoretical concepts with practical applications, this edited volume provides valuable insights into how intelligent computing solutions are driving innovation across multiple disciplines. The contributions demonstrate the growing role of computational approaches in addressing complex real-world challenges and promoting technological advancement.

Designed for academicians, researchers, postgraduate students, industry professionals, and policymakers, this book serves as a valuable reference for understanding current developments and future directions in computer science, mathematics, and commerce. By bringing together diverse perspectives from experts in academia and industry, the volume encourages innovation, collaborative research, and the responsible adoption of emerging digital technologies.

This book is an essential resource for readers seeking to explore the evolving landscape of interdisciplinary research and its role in shaping the future of the digital era.

