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Special Issue on

Frontiers in Discrete Mathematics and Modern Cryptographic Applications

Guest Editors

Ahmed J. Obaid

Abid Hussain

Jyoti Sekhar Banerjee

Shaymaa Maki Kadham

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Guest Editors

Ahmed J. Obaid
Department of Computer Science
Faculty of Computer Science and Mathematics
University of Kufa
Kufa
Najaf 54001
Iraq
E-mail: ahmedj.aljanaby@uokufa.edu.iq

Abid Hussain
School of Computer Application & Technology
Career Point University
Kota 324005
Rajasthan
India
E-mail: abid.hussain@cpur.edu.in

Jyoti Sekhar Banerjee
Department of CSE (AI and ML)
Techno Bengal Institute of Technology
Kolkata 700124
West Bengal
India
E-mail: tojyoti2001@yahoo.co.in

Shaymaa Maki Kadham
Department of Mathematics
Faculty of Computer Science and Mathematics
University of Kufa
Kufa
Najaf 54001
Iraq
E-mail: shaimam.altaee@uokufa.edu.iq

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FOREWORD

This special issue titled "Frontiers in Discrete Mathematics and Modern Cryptographic Applications", presents new developments at the interface of discrete mathematical objects and modern cryptographic protocols. The contributions showcase the rigorous foundations of designing secure and efficient cryptographic systems in contemporary cybersecurity contexts.

One of the main themes of this issue is how algebraic and discrete structures can be used in cryptographic design and analysis. Linear algebra continues to play a fundamental role in the design of encryption schemes, coding theory, and secure communication protocols, where matrix operations and invertibility conditions are critical to both correctness and security. Simultaneously, combinatorics and discrete structures are used to develop key, hash function, and block cipher distribution schemes that ensure resistance to evolving cryptanalytic attacks. The issue also explores new directions in which discrete mathematics is applied to support more complex cryptographic tasks. These include lattice-based cryptography, error-correcting codes, and graph-based security models, all of which are becoming increasingly relevant in the context of post-quantum cryptography. These techniques offer strong alternatives to classical systems and address the challenges posed by next-generation computational capabilities.

The applications of mathematical underpinnings are discussed across multiple areas, including secure communication, data protection, and privacy-preserving systems. It covers topics such as wireless network security, cloud and distributed systems, database protection, and secure web technologies, with a special emphasis on integrating cryptographic methods into real-world infrastructures. Special consideration is given to data protection in new contexts such as the Internet of Things (IoT) and next-generation communication networks.

Moreover, this issue focuses on recognizing the necessity of cryptography for maintaining privacy and ensuring trust in electronic systems, such as social networks and online services. Contributions

examine approaches to secure data storage, transmission, and authentication, as well as methods to detect and mitigate vulnerabilities in complex systems.

Each submission underwent a rigorous peer-review process to ensure high academic standards, originality, and relevance to the issue's scope. The chosen articles are valuable contributions to the theoretical advances in discrete mathematics and their practical applications in current cryptography.

We thank each author for his invaluable contribution to advancing our understanding of cybersecurity and cryptography. This special issue underscores the importance of sophisticated cryptographic techniques in strengthening cybersecurity and data protection.

We received 89 paper submissions from researchers worldwide for this special issue, reflecting a broad spectrum of innovative ideas related to the special issue topics. After a rigorous peer-review process that ensured each paper met the highest standards of quality and relevance, 39 papers were accepted for publication. This acceptance rate highlights our commitment to excellence in the research we publish, ensuring that only the most impactful contributions are included in this special issue.

The guest editors especially thank Prof. B. K. Dass, Chief Editor, who supported us in bringing out this special issue of "*Journal of Discrete Mathematical Sciences & Cryptography*", published by Taru Publications, New Delhi, India.

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