Journal of Discrete Mathematical Sciences & Cryptography

Volume 28, Number 4-A, June 2025

Special Issue on

Topology and Linear Algebra in Cryptographic Security : New Frontiers in Cryptanalysis (Part-A)

Guest Editors

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Published by :

Taru Publications

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Journal of Discrete Mathematical Sciences & Cryptography
ISSN 0972-0529 (Print), ISSN 2169-0065 (Online)
Vol. 28 (2025), No. 4-A, pp. iii-iv
DOI : 10.47974/JDMSC-28-4-A-Foreword

FOREWORD

In this special issue titled "Topology and Linear Algebra in Cryptographic Security: New Frontiers in Cryptanalysis", we explore the intricate relationship between advanced cryptographic techniques and their mathematical applications in cybersecurity. This issue encompasses a variety of topics, each contributing to the expansive fields of data protection, privacy, and cyber defense.

Overview of the Topic: Integrating topology and linear algebra into cryptographic security represents a significant advancement in cryptanalysis. Topology provides a framework for understanding the properties of space and continuity, which can be applied in designing cryptographic protocols that are resilient to various forms of attack. Linear algebra, on the other hand, offers powerful tools for constructing encryption algorithms, such as the Hill Cipher, which utilizes matrix operations to secure data.

This issue explores how determinants and matrix operations can enhance encryption techniques and secure data transmission. For instance, determinants play a crucial role in ensuring that encryption matrices are invertible, which is essential for decryption. Additionally, we examine the application of topological coding in asymmetric encryption systems, where the unique properties of topological structures can provide robust security against emerging threats, including those posed by quantum computing.

Another critical area addressed is wireless network security, which explores the challenges and potential solutions for safeguarding communication networks which utilizes wireless technology. Insights into cryptography and anti-hacking systems provide valuable perspectives on cracking cryptographic algorithms and designing robust security measures.

We also investigate social network security and privacy challenges, focusing on user data protection and privacy preservation in online transactions. The "Data Warehouses and Databases" section explores various methods to safeguard large-scale data storage systems.

Delving into the complexities of emerging technologies, we address the unique security requirements of 5G and the Internet of Things (IoT). The article "Security in Cloud, Servers, and Mobile Systems" provides insights on how to protect data across all devices and platforms.

The "Web Data Protection and Privacy" field examines multiple approaches to securing data on the Internet, aiming to uphold user privacy and security. At its core, "Cryptography in Communications" analyzes the diverse applications of cryptographic methods in ensuring communication secrecy.

We received 95 paper submissions from researchers worldwide for this special issue, reflecting a broad spectrum of innovative ideas in "Cutting-Edge Cryptography and Cybersecurity: Innovations and Applications". After a rigorous peer-review process, which ensured that each paper met the highest standards of quality and relevance, 53 papers were accepted for publication in Parts 4-A & 4-B. 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. We are proud to present these selected works, representing the forefront of advancements in the theme of the conference.

We thank each author for his invaluable contribution in advancing our understanding of cybersecurity and cryptography. This special issue underscores the importance of sophisticated cryptographic techniques in enhancing the scope of cybersecurity and data protection. We are particularly grateful to Professor B. K. Dass, Chief Editor, for his continuous encouragement and guidance throughout the process of publishing in the *Journal of Discrete Mathematical Sciences & Cryptography* (*JDMSC*), published by Taru Publications, New Delhi.

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