Unleashing the Potential of Blockchain and Machine Learning: Insights and Emerging Trends From Bibliometric Analysis

Department: School of Cyber Security and Digital Forensics

Program: M.Tech Artificial Intelligence & Data Science (Specialization in Cyber Security Specialization)

Year / Sem: 1st / 2nd - Session: 2024-26

Subject Name: Blockchain Security and Investigation

Subject Code: CTMTAIDS SII P5 EL1

Guided By: Dr. Ahlad Kumar Sir

Presented by: Pratham Badge , Suraj Verma

Enrolment No.: 2401003007003 , 2401003007012

Abstract

- Blockchain: decentralized, immutable ledgers.
- Machine Learning: data-driven predictions & automation.
- Bibliometric analysis of 700 manuscripts from 2017-2022.
- Analyzed trends, hotspots, and future research directions.

Introduction

- Blockchain ensures secure, transparent transactions.

- ML enables intelligent decision-making.

- Integration enhances data privacy and efficiency.

- Applications: IoT, smart contracts, healthcare, finance.

Motivation for Study

- Growing interest in Blockchain + ML integration.

- Need for systematic bibliometric analysis.

- Understanding key contributors, topics, and journals.

- Identify research gaps and future directions.

Research Questions

- How has the research evolved over time?
- What are the key institutions and countries?
- What are the most influential articles and journals?
- What are the emerging trends and hotspots?

Methodology Overview

- Used PRISMA protocol for data selection.
- Tools: Bibliometrix, VOSviewer, CiteSpace.
- 700 articles analyzed (WoS Core, 2017–2022).
- Visualizations created using network and co-occurrence analysis.

Search Strategy

- Database: Web of Science Core Collection.
- Keywords: 'Blockchain' AND 'Machine Learning'.
- Filters: English, journals, reviews, 2017–2022.
- Final dataset: 700 relevant articles.

Publication Trends (2017–2022)
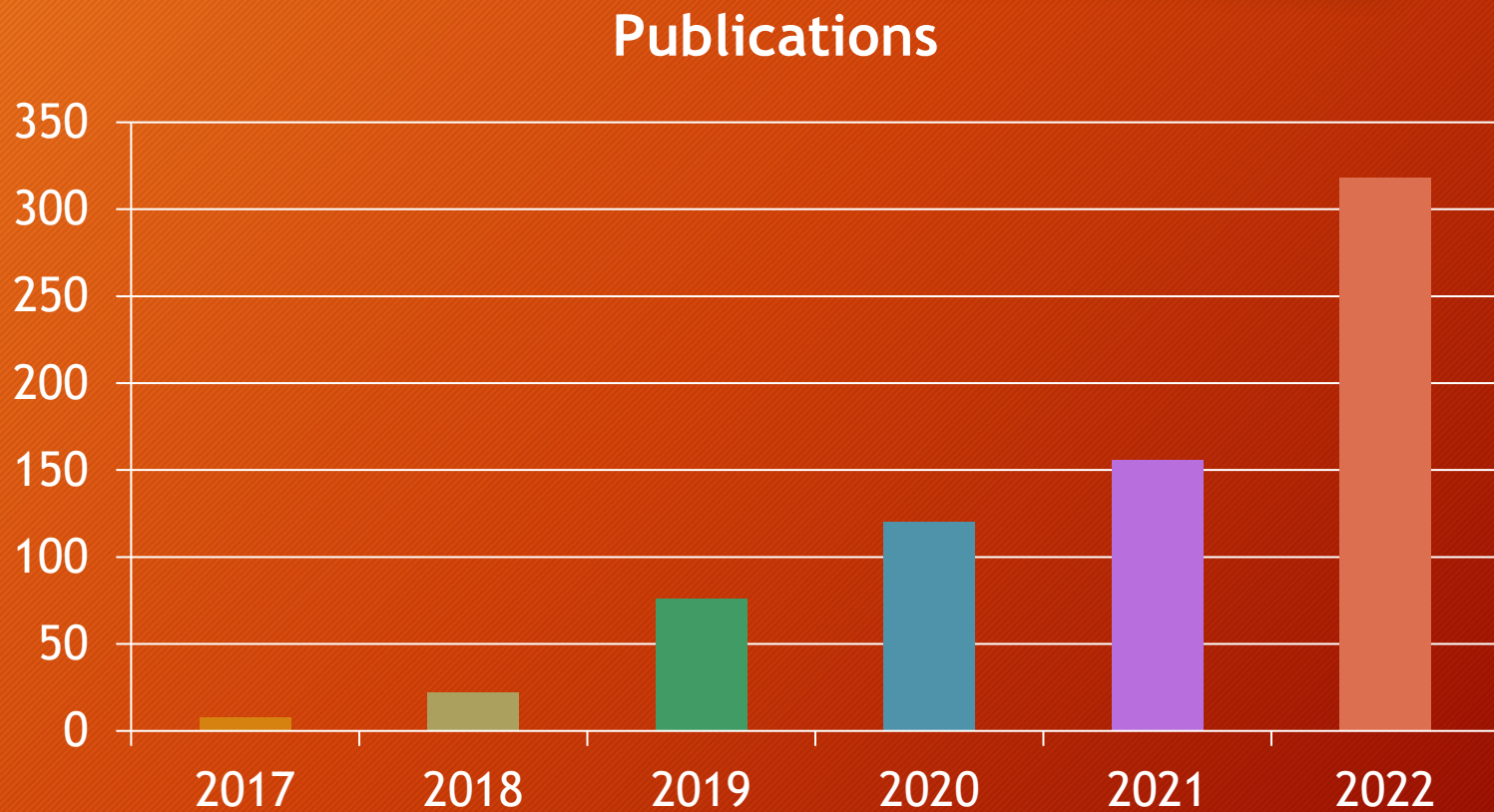
Publications

Research Output by Country

- China: 200 publications (29%).
- India: 98 publications (14%).
- South Korea: 73 publications.
- USA & UK: significant contributions.

Top Contributing Institutions

- King Saud University (26 papers).
- Jeju National University (23).
- Huazhong University of Science (17).
- Asia University and Nirma University show strong collaboration.

Most Influential Authors

- S. Tanwar (16 papers).
- J.H. Park – highest h-index (8).
- Y. Zhang – most cited (608 citations).

Top Journals

- IEEE Access – most publications (61).
- IEEE Internet of Things Journal (24).
- IEEE Network (22).
- Majority are Q1 journals with high impact factors.

Key Research Themes

- AI and Blockchain integration.
- Cybersecurity and data privacy.
- Healthcare applications (COVID-19).
- Smart contracts and decentralized finance.

Keyword Analysis

- Frequent terms: blockchain, ML, AI, IoT, privacy.

- 4 major research clusters.

- Keyword mapping reveals thematic overlaps.

- Future focus: privacy, federated learning, smart cities.

Top Keywords in Literature
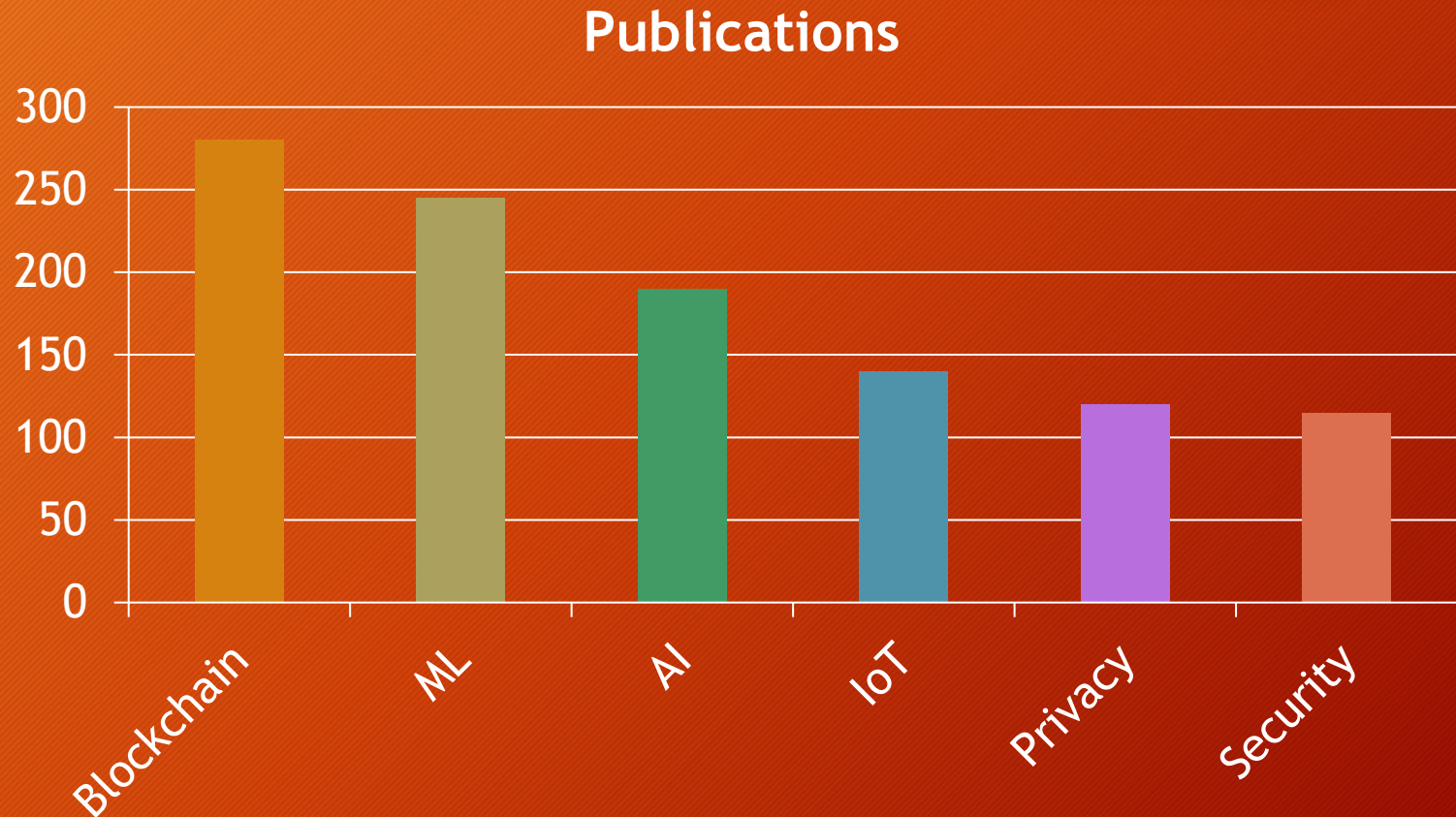
Science Mapping – Author Network

- 38 key authors identified.
- 7 major collaboration clusters.
- Tanwar – central role in co-authorship.
- Clustered by research topic and geography.

Science Mapping – Country Collaboration

- China–USA–India: strongest links.
- High collaboration in East and South Asia.
- Growing international co-authorship trends.
- Limited collaboration in African nations.

Science Mapping – Institutions

- 55 institutions analyzed (min. 5 docs each).
- Asia University, Nirma University lead in collabs.
- Higher intra-country collaborations noted.
- Need for broader international partnerships.

Top Cited Papers

- Chamola et al. (2020) – 353 citations.
- Lu et al. (2020) – 285 citations.
- Major topics: COVID-19, IoT, AI, privacy.
- Foundational to BIoT and secure data sharing.

Emerging Trends

- AI-enabled 5G networks.
- Blockchain in Cyber-Physical Systems.
- Federated Learning and smart contracts.
- Autonomous vehicles and digital identity.

Conclusion & Future Work

- Rapid growth in integrated Blockchain–ML research.

- Valuable insights from bibliometric tools.

- Expand databases (Scopus, IEEE Xplore).

- Monitor newer keywords and topics post-2022.