Contribution ID: **145** Type: **Oral**

Decentralized Anti-Counterfeiting System: Ethereum Smart Contracts and QR Code Integration for Product Authentication

The escalating threat of product counterfeiting demands sophisticated technological interventions to protect consumer interests and manufacturer intellectual property. This research proposes a decentralized authentication ecosystem leveraging distributed ledger technology and machine-readable optical codes for comprehensive counterfeit prevention.

The methodology employs Ethereum blockchain infrastructure to create immutable product registries through smart contract deployment, while QR code technology serves as the consumer-facing authentication interface. The system architecture integrates analytical frameworks including Open Refine for data preprocessing and Elasticsearch for high-performance product information retrieval and comparison. The authentication workflow encompasses cryptographic identifier generation, optical code encoding, blockchain transaction processing, and real-time verification protocols. Advanced data analytics capabilities enable sophisticated pattern recognition for identifying counterfeit products through comparative analysis of product attributes and supply chain metadata. Implementation results validate the framework's effectiveness in establishing tamper-resistant product authentication, demonstrating significant improvements in counterfeit detection accuracy and system reliability. The proposed solution offers scalable deployment across various industry verticals, providing a foundation for next-generation supply chain security and consumer protection mechanisms.

Keywords: Ethereum blockchain, smart contracts, QR code authentication, counterfeit prevention, distributed ledger technology, product verification, anti-counterfeiting systems, cryptographic identifiers, Open Refine, Elasticsearch, supply chain traceability, blockchain security, digital authentication protocols, tamper-resistant systems, real-time verification, data preprocessing, pattern recognition algorithms, optical code technology, decentralized authentication, immutable ledgers, consumer protection, brand security, fraud detection, supply chain integrity, blockchain deployment, product authenticity

Authors: SIMON, Monica (School of Sciences, JAIN (Deemed-to-be University)); DAS, Priyanksha (Jain (Deemed--to-be University)); Mr N, Vishnu Venkatesh (Jain (Deemed-to-be University))

Presenter: DAS, Priyanksha (Jain (Deemed-to-be University))

Track Classification: Forensic Sciences