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BLOCKCHAIN VS. AI: INNOVATIVE SOLUTIONS TO PREVENT PAPER LEAKS

Areshdeep Singh[1], Dr. Rakhi Gupta[2], Nashrah Gowalkar[3]

[1]Master of Science in Information Technology K.C. College, HSNC University, Mumbai 400 020, India.
areshsingh5588@gmail.com

[2]Head of the Department I.T Department K.C. College, HSNC University, Mumbai 400 020, India.
rakhi.gupta@kccollege.edu.in

[3]Asst professorI.T Department K.C. College, HSNC University, Mumbai 400 020, India.
nashrah.gowalker@kccollege.edu.in

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ABSTRACT

This research investigates the issue of exam paper leaks in India, with a comparative analysis of Traditional, Blockchain, and Artificial Intelligence (AI) technologies to determine which offers a more effective solution for preventing such incidents. Exam paper leaks have had significant psychological and academic impacts on students, highlighting the inadequacies of current security measures. This study explores the potential of Blockchain's decentralized, tamper-proof system, AI's capability for predictive analytics and anomaly detection, versus traditional methods that rely on manual oversight and detection of irregularities.

Keywords- Exam paper leaks, Blockchain technology, academic integrity, security protocols, tamper-proof systems, exam security, technological safeguards, India, malpractice prevention, traditional system , Artifical intelligence

1. INTRODUCTION

The issue of paper leaks in India is not a new phenomenon and has been prevalent for several decades. It involves the unauthorised release of exam papers, question papers, or answer keys to students before the actual examination date, undermining the integrity and fairness of the exam process. These leaks are often facilitated by insiders, such as exam officials, invigilators, or teachers, who either grant access to the papers or actively engage in their distribution. The leaked papers are then circulated widely among students, often at a substantial cost, providing unfair advantages to those who obtain them.

The purpose of this research is to address the existing gaps in the literature and provide recommendations for preventing paper leaks in India, by using more accurate technology ensuring the integrity and fairness of the education system.

The research questions for this study are as follows:

(i) how Blockchain will prevent paper leaks in India?

(ii) how Artifical intelligence help to prevent paper leak?

(ii) comparison between both blockchain system, traditional system and Artifical intelligence

These cases highlight the growing challenge of ensuring exam integrity and the need for more robust, technology-driven security solutions.

EXISTING DIFFERENCES BETWEEN TRADITIONAL, BLOCKCHAIN AND AI POWERED SYSTEM

Traditional system: In traditional exam systems, the process of preparing, distributing, and securing exam papers is often centralized, relying on human oversight and physical security measures such as locked storage and restricted access. These systems are vulnerable to paper leaks due to human error, insider threats, or unauthorized access, making it challenging to ensure complete security

Blockchain method: Blockchain-based system offers a decentralized, tamper-proof solution for conducting exams. Exam papers can be stored on a Blockchain network, where each transaction (such as paper creation, distribution, and access) is recorded immutably. This ensures transparency, as every action is traceable and verifiable by authorized participants, significantly reducing the risk of unauthorized tampering or leaks. Blockchain also offers cryptographic security, making it difficult for malicious actors to alter or access sensitive information without detection**Artificial Intelligence (AI) in Exam Systems:** AI enhances exam security by analyzing patterns and detecting anomalies in real time, such as unauthorized access or irregular behaviors. It can predict potential leaks based on historical data and take preemptive action. AI also strengthens authentication processes using biometric and multi-factor verification, reducing human error. By automating security checks and continuously learning, AI adds an intelligent layer of protection, working alongside traditional and blockchain systems to improve security and prevent exam paper leaks efficiently.

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2. RESEARCH GOAL: COMPARISON

Traditional System,Blockchain method and AI powered exam system for conducting exam

Aspect	Traditional	Blockchain	Artifical intelligence
Security	Relies on physical security and manual oversight	Decentralized, tamper-proof with cryptographic security	Automated anomaly detection and predictive analytics
Vulnerability	Prone to human errors, insider leaks, and tampering	Reduced risk due to immutable records and transparency	Detects suspicious activity in real-time
Transparency	Limited transparency, difficult to track changes	Full transparency; all actions are recorded on the ledger	Moderately transparent; relies on AI's decision-making
ccess Control	Controlled manually; prone to unauthorized access	Cryptographically secure, distributed access control	AI-managed access with multi-factor authentication
Scalability	Difficult to scale; requires significant human resources	Easily scalable due to decentralized nature	Scalable with automated monitoring and decision-making
Implementation Cost	Lower initial cost, but higher operational cost for security	Higher initial setup cost, but lower long-term security costs	Moderate setup cost; ongoing cost for AI system maintenance
Error Detection	Depends on human supervision, prone to delays	Errors or tampering instantly flagged by the system	AI predicts potential risks and detects anomalies quickly
Data Integrity	Can be compromised through human error or manipulation	Immutable records ensure data integrity	Ensures integrity by monitoring and validating all activities
Automation	Minimal automation; relies on manual processes	Highly automated, with self-executing smart contracts	AI automates surveillance, access, and risk assessment
Response to Threats	Slow, manual response to security breaches	Immediate detection and prevention through the ledger	Instant threat identification and automated response
Legal Accountability	Difficult to trace responsibility in case of leaks	Clear accountability due to immutable transaction logs	Accountability based on AI’s detection and tracking

3. LITERATURE REVIEW

Several new studies propose innovative solutions to prevent paper leaks. For instance, A. Thomas and K. Pillai (2023) emphasise the role of technology in monitoring exams, suggesting the implementation of biometric verification, AI-based surveillance systems, and secure online platforms for conducting high-stakes exams. Another study by P. Nair and R. Kaushik (2022) advocates the use of blockchain technology to create tamper-proof systems for exams, arguing that decentralising the storage and distribution of exam materials could eliminate the risk of paper leaks

BAR CHART FOR ACCURACY

comparison between traditional method, blockchain method and AI powered system

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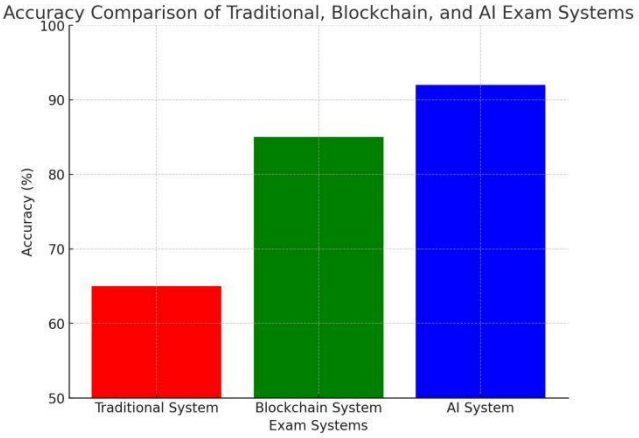

FLOW CHART

Traditional method

Faculty Creates Exam
|
v
Print and Distribute Exam Papers
|
v
Students Receive Papers and Take Exam
|
v
Collect Answer Papers
|
v
Manually Process Results
|
v
Announce Results to Students

Blockchain method

Faculty Creates and Encrypts Exam
|
Distribute Exam Securely via Smart Contracts
|
Students Access and Take Exam via Blockchain
|
v
Submit Exam through Blockchain
|
v
Smart Contracts Process and Store Results
|
v
Students Access Results on Blockchain

AI POWERED SYSTEM

Start: Exam Paper Creation
|
v
Secure Exam Paper Upload
(Digital Storage System)
|

AI Access Control & Verification System
(Multi-factor authentication, Biometric)
|
v
AI-powered Monitoring of Access & Handling
(Real-time anomaly detection)
|
v
AI-Powered Automated Surveillance during Exam
(Facial recognition, behavior analysis, etc.)
|
v
Post-exam Paper Processing
AI monitors upload, grading, and result handling
|
v
AI Security Audit & Report Generation
(Analyzes exam process and flags any discrepancies)
|
v
End of Process

4. RESULTS

Security incident breaches (per 1000 exam)

Traditional Exam System	**15**
Blockchain-Based System	**3**
AI-Powered System	**2**

Overall comparison

security	AI-Powered System
operational cost	Traditional system
scalability	AI-Powered System
detection and response	AI-Powered System
user satisfaction	AI-Powered System

Overall Best System as per indian AI-Powered Exam System

While it has a moderate operational cost compared to traditional methods, the AI-powered system outperforms in key areas such as security, scalability, speed of breach detection, and user satisfaction.

Its advanced technology, automation, and predictive capabilities make it the most efficient and reliable option for conducting secure and scalable exams. Blockchain comes close, especially in transparency and security, but AI's real-time monitoring gives it an edge.

5. CONCLUSION

Summary of Findings: The findings show that traditional exam systems, while low in cost, are prone to security breaches and human errors, with limited scalability and transparency. Blockchain-based systems offer enhanced security and transparency through decentralized, tamper-proof records, though they come with higher setup complexity. AI-powered exam systems stand out as the most advanced, providing real-time monitoring, predictive analytics, and automated processes that enhance security, scalability, and efficiency, despite higher implementation costs and ethical considerations around privacy and bias. Overall, AI offers the most promising solution for secure and scalable exam management.

Recommendations: To implement an effective AI-based exam system, institutions should integrate AI-driven proctoring tools for real-time monitoring and multi-factor authentication for secure access. AI can be used to detect anomalies, automate grading, and employ predictive analytics to prevent potential risks. Ensuring bias reduction in AI algorithms is crucial for fair assessments, and combining AI with Blockchain can further enhance security and transparency. Additionally, continuous updates, ethical guidelines, and human oversight are necessary to maintain the system's reliability. This approach will improve scalability, fairness, and the overall integrity of exams.

Limitations : AI-based exam systems face limitations such as data privacy concerns, potential bias in algorithms, and the need for strong technical infrastructure, which may not be available everywhere. They can also be costly to implement and maintain, and over-reliance on AI might lead to errors like false positives in cheating detection. Additionally, ethical concerns around excessive monitoring and privacy issues must be addressed. Human oversight and careful management are crucial to overcoming these challenges.

Future Scope:

The future scope of AI-powered exam systems is highly promising, with potential advancements in several key areas. AI could enable adaptive testing, personalizing exams based on student performance in real-time, and advanced proctoring, using facial recognition and behavioral analysis to prevent cheating. AI-driven question generation and automated grading, especially for subjective assessments, can improve exam efficiency and fairness. Integration with Blockchain could further enhance security and transparency, while predictive analytics could help identify at-risk students and provide early interventions. These systems will likely support global, scalable exams, offering inclusive and equitable assessments across diverse geographies. As AI continues to evolve, its role in automating logistics, reducing bias, and providing data-driven insights for curriculum improvements will transform the educational landscape.

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