AI-DRIVEN EVENT-BASED CAMERA WITH BLOCKCHAIN-BACKED ANOMALY DETECTION

A Secure and Real-Time Surveillance System for Tamper-Proof Event Logging

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1. Problem Statement

- **Lack of tamper-proof logging**: These systems often rely on centralized storage, making them vulnerable to tampering and providing limited auditability of events [1].
- **Inefficient real-time anomaly detection**: Conventional systems use frame-based processing, which is resource-intensive and introduces latency, reducing the system's responsiveness to critical events [2].
- **Centralized vulnerabilities**: Centralized architectures present single points of failure, making them prone to data loss, manipulation, or system downtime during server outages [3].

2. Objective

- **Design and implement** an **AI-driven event camera system** for **real-time anomaly detection.**
- **Integrate blockchain technology** to achieve **secure, tamper-proof logging** of detected events.
- **Leverage smart contracts** to enable **automated system responses** based on anomaly detection outcomes.
- Establish a **decentralized** and trustless system architecture to eliminate **single points of failure** and enhance **data integrity.**

3. Solution

- Deploys an AI-driven event camera system for real-time anomaly detection, ensuring rapid response to critical events.
- Integrates blockchain technology for secure, tamper-proof logging of detected events, enhancing auditability and trust.
- Utilizes smart contracts to automate system responses, reducing human intervention and improving reliability.
- Establishes a decentralized, trustless architecture to eliminate single points of failure and enhance data integrity.

4. Methodology

🧠 AI for Anomaly Detection

- **Edge AI models** detect **unauthorized movement** or **suspicious activities**.
- **Local data processing** ensures **low-latency, real-time responses.**

🔗 Blockchain Integration

- **Immutable event logging** using **blockchain** to prevent tampering and ensure **data integrity.**
- **Smart contracts** trigger automated actions (e.g., alerts, lockdowns) in response to anomalies.

🌐 Decentralized Architecture

- No central servers, ensuring the system is **resilient** and **eliminates single points of failure.**
- An **auditable event history** is maintained **on-chain**, ensuring transparency and accountability.

5. Working Prototype

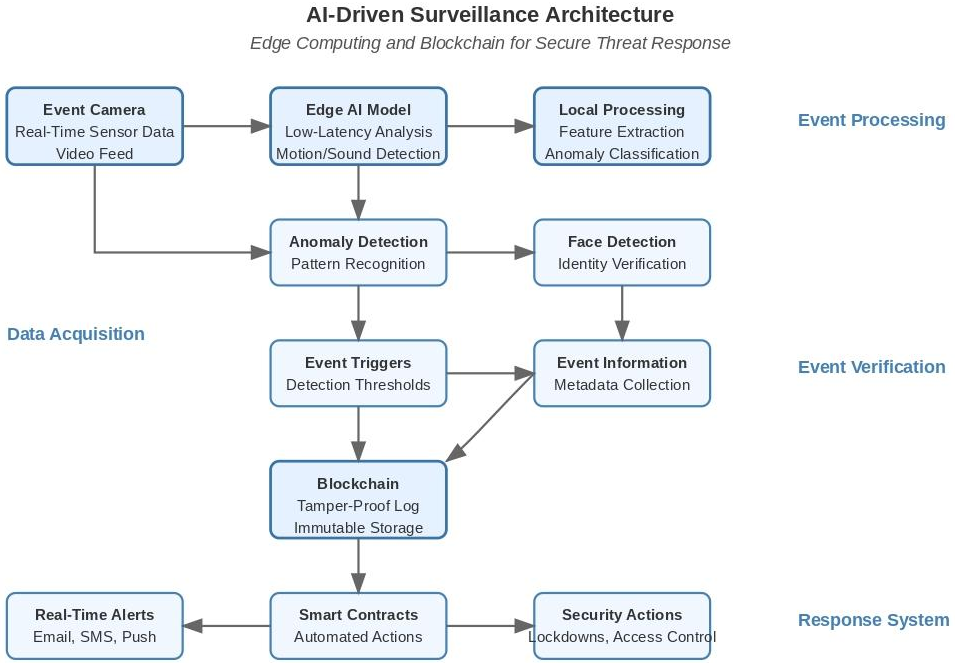

Fig. 1: System Architecture

6. WORKING PROTOTYPE

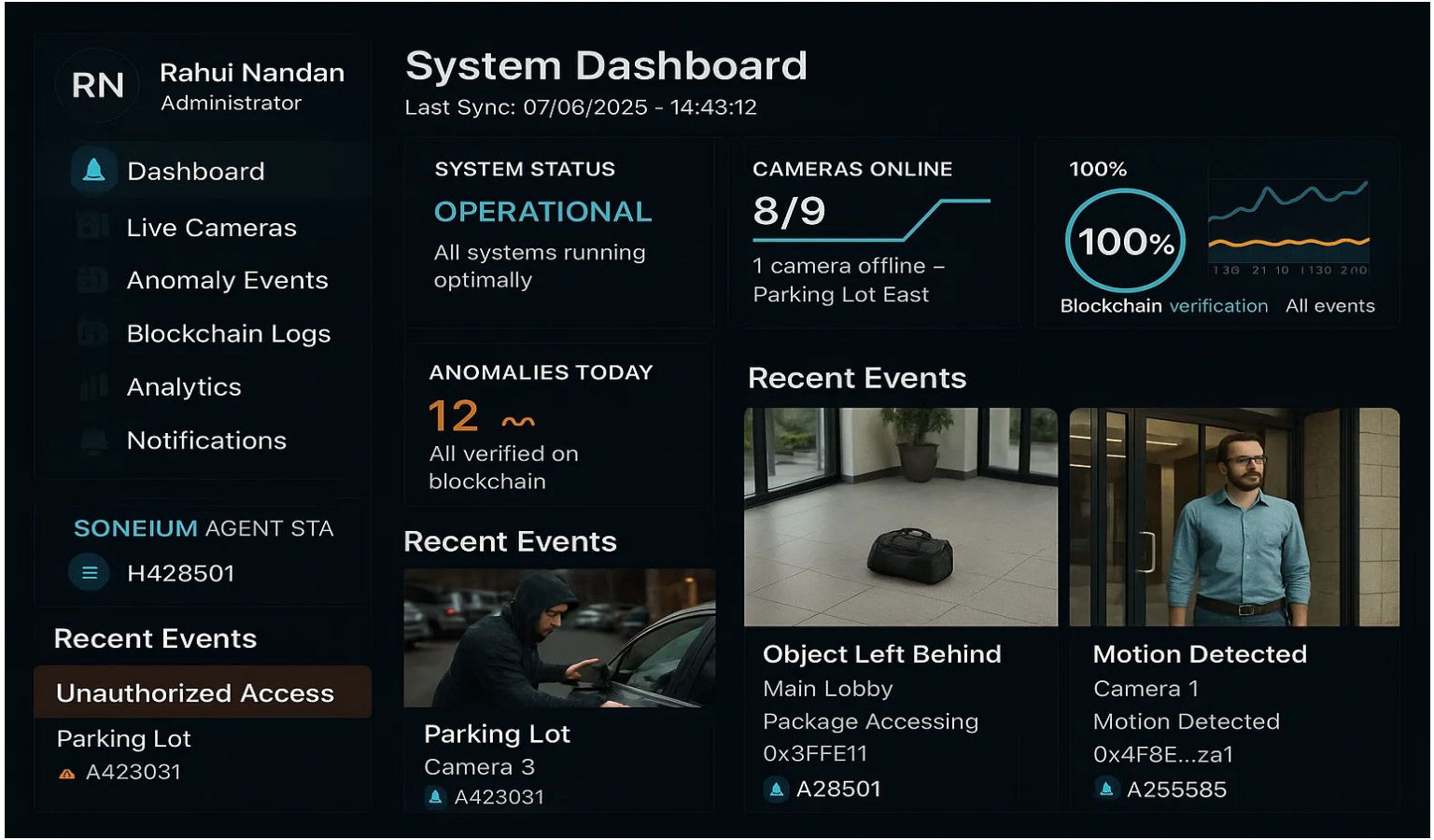

Fig. 2: SecureChain Security Dashboard Wireframe

7. Graphical Representation

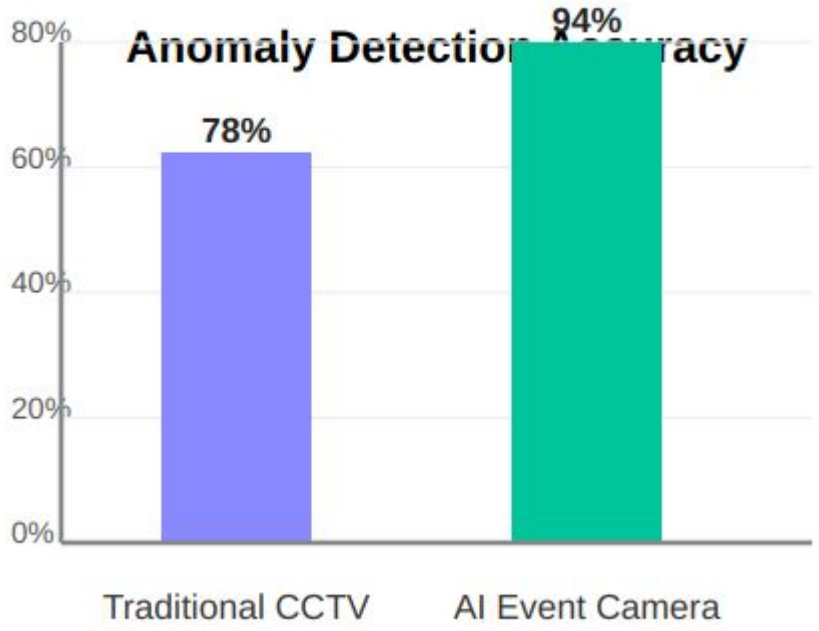

Fig. 3: Detection accuracy comparison [3][4]

8. Analysis & Visualization

Feature	Traditional System	Proposed System
Tamper-proof logs	No	Yes (Blockchain)
Real-time detection	Limited	Yes (Edge AI)
Single point failure	Yes	No (Decentralized)
Auditability	Limited	Full (On-chain history)
Automated response	No	Yes (Smart Contracts)

Table 1: Traditional vs. Proposed System

Metric	Traditional	Proposed	Calculation	Result
Detection Accuracy (%)	78	94	((94-78)/78) × 100	+20.5%
Detection Latency (ms)	800	120	((800-120)/800) × 100	-85%
System Uptime (%)	95	99.9	((99.9-95)/95) × 100	+5.2%
Auditability (Score/10)	3	10	((10-3)/3) × 100	+233%

Table 2: Quantitative Analysis Table (With Calculations)

9. Conclusion

- Enables real-time anomaly detection using AI-driven event cameras.
- Secures event logging with tamper-proof blockchain technology.
- Delivers improved accuracy and significantly reduced latency over traditional systems.
- Provides a scalable, decentralized surveillance solution for enhanced reliability.

References

[1] A. Asker, “An Investigation of Vulnerabilities in Smart Connected Cameras,” M.Sc. thesis, Blekinge Institute of Technology, Sweden, 2020. [Online]. Available: https://www.diva-portal.org/smash/get/diva2%3A1409755/FULLTEXT01.pdf

[2] N. Pathak, M. Younis, and S. S. Kanhere, “Real-Time Anomaly Detection in Cloud and Fog Systems,” *ResearchGate*, Jan. 2024. [Online]. Available: https://www.researchgate.net/publication/388028278_Real-Time_Anomaly_Detection_in_Cloud_and_Fog_Systems

[3] Y. Alshamrani and K. Kim, “A Systematic Review of Centralized and Decentralized Machine Learning Models: Security Concerns, Defenses, and Future Directions,” *ResearchGate*, Feb. 2024. [Online]. Available: https://www.researchgate.net/publication/388531403

Additional Links

- GitHub: https://github.com/RahulRNandan/SecureChain-AI-Driven-Event-Camera-with-Blockchain-Verified-Anomaly-Detection

- Youtube:

  https://youtu.be/4UzvGu8UYHo?si=8qxjBJZfNrFt5ibf

THANK YOU!!