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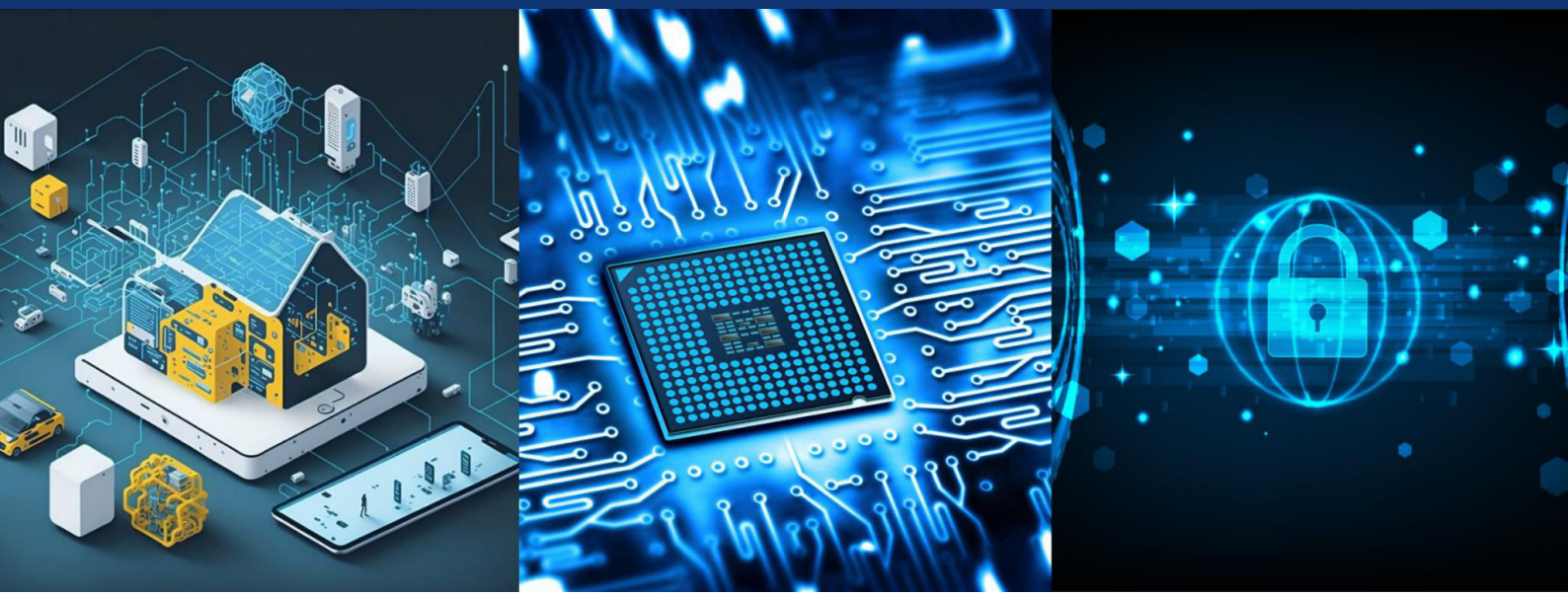

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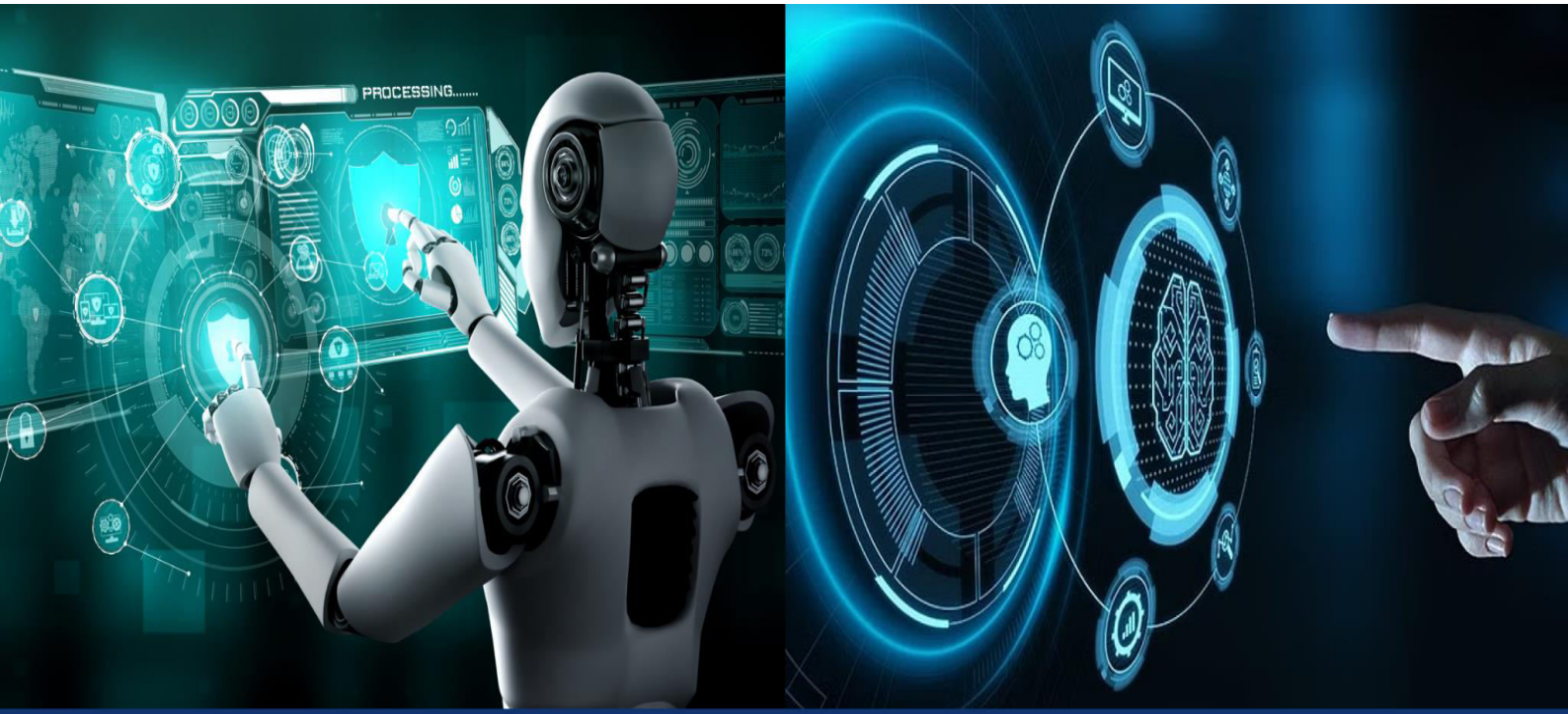

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Face Biometric Authentication System for ATM using Deep Learning

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ABSTRACT: With the growing demand for enhanced security measures in the banking sector, the utilization of biometric authentication systems has gained prominence. Automated Teller Machines also known as ATM's are widely used nowadays by each and everyone. There is an urgent need for improving security in banking region. Due to tremendous increase in the number of criminals and their activities, the ATM has become insecure. ATM system today uses no more than an access card and PIN for identity verification. The recent progress in biometric identification techniques, including finger printing, retina scanning, and facial recognition has made a great effort to rescue the unsafe situation at the ATM. This project proposes and automatic teller machines security model that would combine a physical access card and electronic facial recognition using Deep Convolutional Neural Network. If this technology becomes widely used, faces would be protected as well as their accounts. Face verification link will be generated and sent to user to verify the identity of unauthorized.

KEYWORDS: Face Recognition, ATM Security, Biometric Authentication, Deep Convolutional Neural Networks (DCNN), Anti-Spoofing Techniques, Data Mining, ATM Authentication, Banking Systems, Remote Identity Verification.

I. INTRODUCTION

Automated Teller Machines (ATMs) have become essential for providing convenient, 24/7 banking services. However, traditional ATM security systems that rely on physical cards and PINs are increasingly vulnerable to fraud, including card skimming and unauthorized access. This project introduces an enhanced ATM security model that combines facial recognition using Deep Convolutional Neural Networks (DCNN) with existing card-based systems. By leveraging biometric authentication and machine learning, the system verifies users through unique facial features, significantly reducing fraud risks. Additionally, features like anti-spoofing and a Face Verification Link for remote identity confirmation ensure both robust security and user convenience. This solution aims to provide a safer, more reliable, and efficient ATM transaction experience.

II. SYSTEM MODEL AND ASSUMPTION

The Face Biometric Authentication System for ATMs using Deep Learning introduces a dual-layer security model that integrates traditional card-based access with advanced facial recognition. This hybrid system leverages Deep Convolutional Neural Networks (DCNN) to identify users through their unique facial features. The system assumes that each user will enroll with a facial image during account setup, which is then securely stored in a database. During ATM transactions, a live facial image is captured and compared to the stored data for verification. In case of mismatches or failed recognition, a Face Verification Link is sent to the user for remote identity confirmation. The entire architecture is built using Python with the Flask framework, a MySQL database for secure data management, and a front-end interface developed with HTML, CSS, and Bootstrap. Deep learning and data analysis are handled through powerful libraries like TensorFlow, Keras, Pandas, NumPy, and Matplotlib. The system also incorporates anti-spoofing mechanisms to detect fraudulent attempts using photos or videos, ensuring that only live, genuine users are authenticated.

III. EFFICIENT COMMUNICATION

To ensure smooth and user-friendly communication, the system integrates a Face Verification Link mechanism for remote identity confirmation. This feature enhances user convenience and minimizes transaction interruptions in case of

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authentication failures. If the facial recognition system detects a mismatch, the user immediately receives a verification link via email or a secure app. This link allows them to verify their identity remotely, without needing to revisit the ATM. The system operates in real-time, ensuring that users receive instant feedback during transactions. By incorporating live facial scanning and automated verification processes, the communication between the user and the system becomes both efficient and reliable, reducing manual intervention and enhancing overall user experience.

IV. SECURITY

Security is the cornerstone of the proposed system. By replacing traditional PIN-based verification with facial biometric authentication, the system addresses major vulnerabilities associated with ATM transactions. Common fraud techniques such as card skimming, PIN theft, and card cloning are mitigated through the use of real-time facial recognition. Furthermore, the system employs anti-spoofing technology to detect and prevent unauthorized access through static images or video recordings. The dual-layer authentication—physical card combined with facial verification—adds a strong defense against security breaches. If discrepancies arise, the Face Verification Link provides a secondary level of security by requiring users to confirm their identity through a trusted device. These layered security features not only protect user accounts but also build greater trust in ATM systems by ensuring safer and more secure transactions.

V. RESULT AND DISCUSSION

In This Fig 1 proposes an automatic teller machine multi modal security model that would combine a physical access card and electronic facial recognition using Deep Convolutional Neural Network.

Fig 1. System architecture

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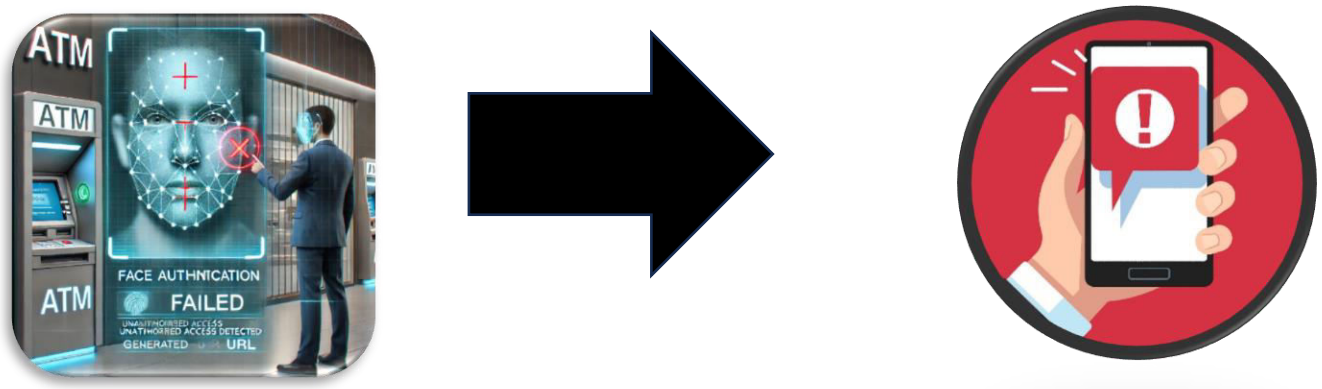

Fig 2. When The Verification is Failed Then an alert URL is sent to the card Admin.

VI. CONCLUSION

The Face Biometric Authentication System for ATMs using Deep Learning enhances security and user convenience by replacing PIN-based authentication with facial recognition. Using deep learning models like CNNs and FaceNet ensures accurate identification, reducing fraud risks such as card skimming .However, challenges like lighting variations and spoofing attacks need further improvements, such as liveness detection. Future advancements can focus on real-time processing and multi-factor authentication for better security. This system represents a significant step toward modernizing ATM security with AI-driven biometric solutions.

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