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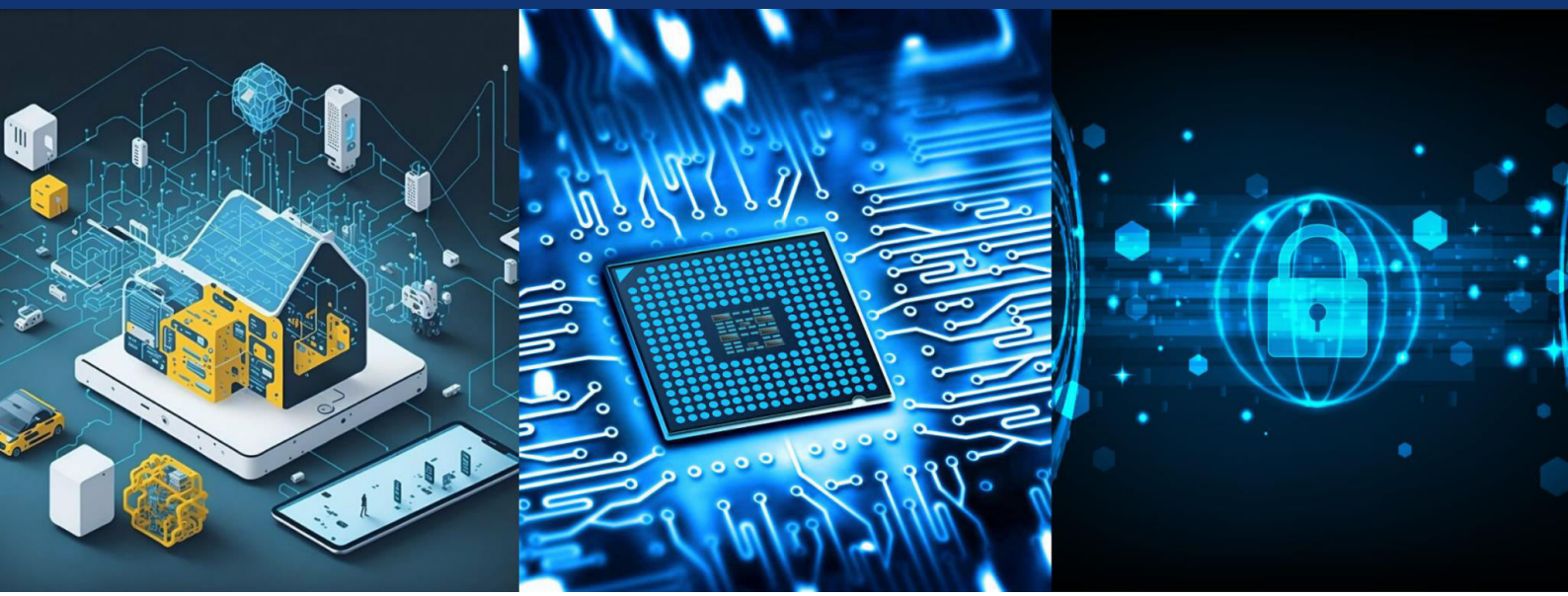

International Journal of Innovative Research in Computer and Communication Engineering

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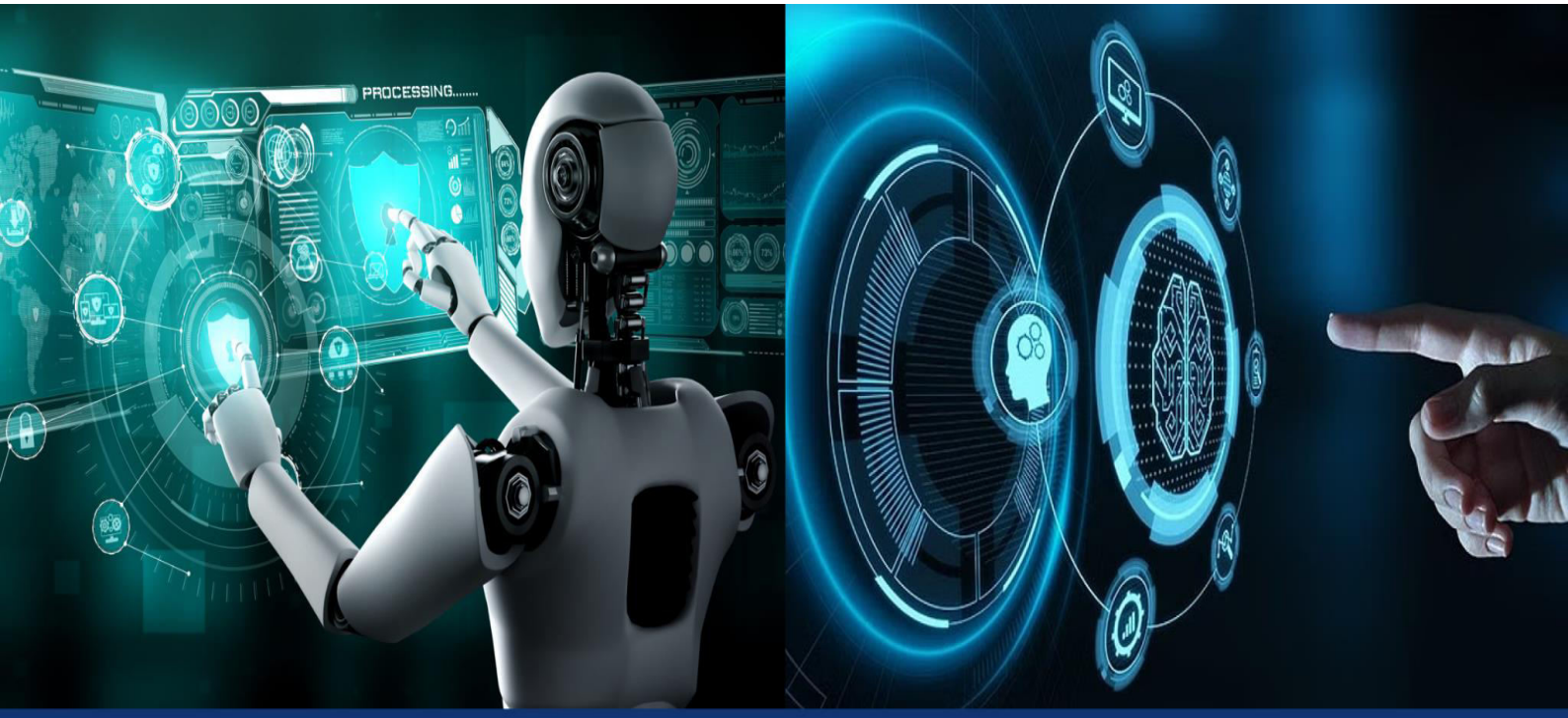

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Advanced ATM Security System and OTP Generation System using Face Recognition

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ABSTRACT - Automated Teller Machines are widely used nowadays by people. But It's hard to carry their ATM card everywhere, people may forget to have their ATM card or forget their PIN number. The ATM card may get damaged and users can have a situation where they can't get access to their money. In our proposed system, use of authentication instead of PIN and ATM card is encouraged. Here, The Face ID is preferred to high priority, as the combination of these biometrics proved to be the best among the identification and verification techniques. The implementation of ATM machines comes with the issue of being accessed by illegitimate users with valid authentication code. This project provides service to the user only when the user is legitimate or the user is verified by the legitimate user of the ATM card. The users are verified by comparing the image taken in front of the ATM machine, to the images which are present in the database. If the user is legitimate the new image is used to train the model for further accuracy. This system uses Open CV to process the image being obtained and Haar Cascade Classifier to detect the faces in the image. The project ATM Security system based on Face recognition, PIN and OTP' consists of conventional features is Personal Identification Number (PIN) along with additional features like face recognition and one-time password (OTP) is send through email.

KEYWORDS: ATM frauds prevention model, ATM transaction security system, face recognition, Haar Cascade Classifier.

I. INTRODUCTION

The proposed ATM Security System based on Face Recognition, PIN, and OTP addresses key limitations of traditional ATMs, such as the dependency on physical cards and vulnerabilities associated with static PIN usage. By leveraging biometric authentication, specifically facial recognition, the system provides a more secure and convenient alternative for user identification. This eliminates common issues like forgotten PINs or damaged cards, offering a seamless experience. Users' facial data is stored securely and matched in real time with images captured at the ATM, ensuring only authorized individuals gain access.. To enhance accuracy and adaptability, the system uses OpenCV and Haar Cascade Classifier for face detection and integrates machine learning algorithms to improve recognition capabilities over time. It includes anti-spoofing measures to prevent unauthorized access through photos or videos, and supports multi-factor authentication (MFA) by combining facial recognition with traditional PIN input and a one-time password (OTP) sent via email. This layered security approach significantly reduces risks like card skimming and impersonation.

II. LITERATURE REVIEW

"Praveen K. B., Kumar P., Prateek J., Pragathi G., Madhuri J., Inventory Management Using Machine Learning, 2020" The discusses the use of machine learning in inventory management systems. It presents the integration of predictive models for demand forecasting and optimizes stock levels. The techniques discussed could be applied to optimize security protocols, such as OTP systems. It also emphasizes the need for continuous system improvements in order to handle evolving needs in a secure and accurate manner

" Liu J., Pang Z., Qi L., Dynamic Pricing and Inventory Management with Demand Learning: A Bayesian Approach, 2022" The research proposes a Bayesian approach to dynamic pricing and inventory management. It focuses

on integrating real-time data to optimize operational decisions. The application of these principles in the security domain, like facial recognition or OTP generation, could allow for adaptive security measures based on user behavior. The framework ensures the system remains robust in unpredictable environments.

" Wenzel H., Smit D., Sardesai S., A Literature Review on Machine Learning in Supply Chain Management, 2020" This review investigates the role of machine learning in enhancing supply chain management systems. It touches on various applications such as predictive analytics and risk management. These concepts can be extended to enhancing ATM security, ensuring that face recognition and OTP systems evolve with increasing security threats. The use of machine learning can help adapt facial recognition systems for better fraud detection.

III. METHODOLOGY

A. EXISTING SYSTEM

The current ATM security systems primarily rely on physical ATM cards and Personal Identification Numbers (PINs) for user authentication and access. While this method has been widely adopted and accepted, it is increasingly vulnerable to security breaches such as card skimming, PIN theft, and card duplication. In many cases, users misplace their cards or forget their PINs, resulting in restricted access to their accounts. Moreover, attackers can easily exploit these vulnerabilities by stealing card data or tricking users into revealing their credentials through phishing or social engineering attacks.

Additionally, there is little to no integration of biometric authentication in conventional ATM machines, which limits the system's ability to verify the actual identity of the user. Once an attacker possesses the physical card and PIN, they are usually granted full access to the account without any further verification. There is also a lack of multi-factor authentication measures like One-Time Passwords (OTP) or face recognition that can act as a second layer of defense. This opens the system up to fraudulent activities and unauthorized transactions, highlighting the need for a more secure and intelligent ATM authentication framework.

B. PROPOSED SYSTEM

The proposed ATM Security System utilizes advanced face recognition technology with OpenCV and Haar Cascade Classifier to capture and process users' facial features during transactions, enhancing security by ensuring access is granted only to legitimate account holders. This biometric verification is combined with traditional Personal Identification Number (PIN) authentication to create a robust multifactor authentication system. Additionally, a one-time password (OTP) is sent to the user's registered email as a dynamic verification step, adding an extra layer of security to prevent unauthorized access even if the PIN is compromised.

This innovative system eliminates the need for physical ATM cards, offering a contactless and user-friendly authentication process that mitigates risks associated with lost or stolen cards. The face recognition algorithm continuously improves its accuracy by learning from user interactions and comparing captured images against a secure database, adapting to changes such as aging or wearing accessories. The integration of face recognition, PIN, and OTP significantly reduces vulnerabilities related to PIN-only systems, such as guessing or sharing.

C. ADVANTAGES

1. Enhanced Security.
2. Convenience and Accessibility.
3. Improved Accuracy.
4. Fraud Prevention.
5. User-Friendly.
6. Cost-Effective and Easily Integrable.
7. Low Maintenance and Minimal Interference.
8. 24/7 Accessibility.

D. DESIGN OF THE SYSTEM

The design of the proposed ATM Security System based on Face Recognition, PIN, and OTP integrates multi-layered authentication to enhance security and user convenience. The system eliminates dependency on physical ATM cards by introducing biometric verification, primarily using facial recognition. Upon initiating a transaction, the user is first

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prompted to enter their Personal Identification Number (PIN) on the ATM interface. Immediately after, the ATM's camera captures a real-time image of the user, which is then processed using OpenCV and the Haar Cascade Classifier to detect and extract facial features. This captured face image is compared against a database of authorized users' images to determine legitimacy.

If the face matches, the system proceeds to the third layer of verification by generating a one-time password (OTP), which is sent to the user's registered email address. Only after the user correctly enters the OTP, access to ATM services is granted. In cases where a legitimate user authorizes another individual (e.g., for emergency access), the system allows verification through the primary user's credentials. Additionally, if the face is verified successfully, the captured image may be used to retrain and improve the model's accuracy over time. This layered architecture provides robust protection against unauthorized access while improving accessibility for users who may forget their ATM card or PIN

Fig.1

IV. IMPLEMENTATION

MODULE DESCRIPTION

1. Input module

The input module of the ATM Security System focuses on capturing multiple forms of data that are required for authentication. The first key input is the user's face image, which is captured by a camera located on the ATM machine. This image is processed in real-time using OpenCV and Haar Cascade Classifier to identify key facial features. The system is designed to handle different lighting conditions and angles, ensuring accurate face detection regardless of the user's position. Once the face is detected, the image is compared to the stored biometric data in the database. This comparison is carried out through advanced image processing techniques to verify the identity of the user. The accuracy of this process is continuously improved through machine learning algorithms that adjust based on previous interactions, ensuring that the system adapts to changes in the user's appearance over time.

2. Preprocessing and Segmentation module

The preprocessing module is responsible for preparing the captured facial images for further analysis and recognition. It involves a series of steps that enhance the quality and clarity of the face images taken by the ATM's camera. Initially, the captured image may contain noise, poor lighting, or variations in resolution due to environmental conditions, such as glare or shadows. The preprocessing module applies various image enhancement techniques such as histogram equalization, which improves the contrast of the image, and noise reduction filters to eliminate any irrelevant visual

information. This ensures that only the necessary facial features are highlighted, making it easier for the system to accurately detect and identify the user's face. The system uses advanced algorithms to normalize the image, accounting for variations in lighting and positioning, which further optimizes the subsequent segmentation and recognition stages.

3. The Dataset Module

The dataset module is a crucial component of the ATM Security System as it stores, manages, and processes the data used for facial recognition and authentication. A primary function of this module is to maintain a secure, well-organized database of user facial images and associated information, such as user IDs, account numbers, and other relevant credentials. The dataset includes a collection of images captured from legitimate users during the registration process. These images serve as reference data for the facial recognition system. The database is structured to store images in a format that allows for quick retrieval and efficient matching during transaction requests. Ensuring the accuracy, security, and scalability of the dataset is vital for the system's ability to accurately authenticate users and prevent unauthorized access.

4.Alert module

The alert module is a critical component of the ATM Security System designed to notify relevant parties about security events or anomalies during the transaction process. This module is responsible for generating real-time alerts to ensure the timely detection of unauthorized attempts or system malfunctions. The system is designed to send notifications to both users and administrators if any suspicious activity is detected, such as failed attempts to authenticate a user, system errors, or potential fraud. For instance, if a user fails multiple attempts at face recognition or enters an incorrect PIN, the alert module triggers a notification to the administrator and sends a warning to the user to prevent unauthorized access. These alerts help maintain a high level of security and ensure that any unusual behavior is swiftly addressed.

V. CONCLUSION

In conclusion, the "ATM Security System based on Face Recognition, PIN, and OTP" a comprehensive and innovative approach to enhance the security of ATM transactions. By integrating cutting-edge biometric technology, traditional PIN authentication, and dynamic OTP verification, the system provides a multi-layered security framework. The unique feature of peer verification by legitimate users further adds an extra layer of trust and reliability. Continuous model training ensures adaptability and accuracy over time. However, ethical considerations and user safety must be paramount, especially in the deployment of incapacitating substances. The proposed system not only addresses the limitations of traditional ATM security methods but also promotes user convenience by reducing reliance on physical cards. The combination of advanced biometrics and dynamic verification mechanisms positions this project at the forefront of secure and user-friendly ATM transactions in the era of digitalization.

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