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AI-Based Digital KYC Verification System

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Abstract: *In this research, an AI-based digital KYC verification system named VerifyAI is proposed to automate identity authentication for online services. Traditional KYC processes rely heavily on manual verification, which often leads to delays and potential human errors.The proposed system utilizes computer vision and artificial intelligence techniques to improve both accuracy and efficiency. Users are required to upload an identity document along with a live selfie image. The system applies Optical Character Recognition (OCR) to extract important details from the document and performs facial comparison between the document image and the captured selfie.To enhance security, a liveness detection mechanism is implemented to ensure the physical presence of the user during verification. Additionally, fraud detection techniques are used to identify possible document manipulation. The system is developed using Python, Flask, and SQLite database. The proposed approach aims to deliver a faster, more secure, and automated KYC verification solution.*

Keywords: Artificial Intelligence, Digital KYC, Computer Vision, OCR, Face Verification, Identity Authentication

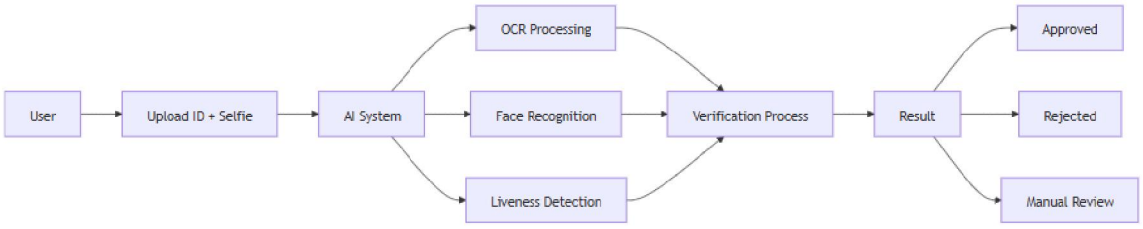
I. INTRODUCTION

In recent years, the rapid growth of digital platforms has increased the demand for secure and efficient identity verification systems. Organizations such as banks, financial institutions, and online service providers must verify user identity before granting access to their services. This verification process is essential for ensuring security, preventing fraud, and maintaining regulatory compliance.

Traditional identity verification methods are often based on manual processes, which can be time-consuming and less efficient when handling large-scale user data. With the increasing number of digital transactions, there is a growing need for automated and intelligent verification systems.

Advancements in artificial intelligence and computer vision have enabled the development of systems that can process document images, extract relevant information, and perform biometric verification. These technologies provide faster and more reliable alternatives to traditional approaches.

The VerifyAI system is proposed as an AI-based digital KYC verification solution that integrates document analysis, facial recognition, and automated validation techniques to improve the efficiency and reliability of identity verification processes.



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II. LITERATURE SURVEY

Many people have worked on creating safety applications for Women. With more people using phones many safety systems have been introduced. These systems have features like emergency messages, location tracking and communication with people.

Some studies have proposed applications with a panic button. When this button is pressed the application sends a message with the Woman's location. This helps people find the Woman and provide assistance.

Other studies focus on GPS-based tracking systems. GPS technology enables the application to determine a woman's exact location and share it with her family members or the relevant authorities. This helps ensure that her location can be quickly identified during an emergency.

PROBLEM STATEMENT

Traditional KYC processes are manual, time-consuming, error-prone, and expensive.

Key problems include:

- Manual document verification takes 2–5 business days
- Human reviewers cannot detect sophisticated document forgeries
- No automated cross-checking of submitted details against document content
- High operational cost due to dedicated compliance teams
- Poor user experience due to lengthy offline processes

Existing System

- Currently, organizations rely on manual or semi-automated KYC processes:
- Users submit identity documents physically or online.
- Human reviewers manually check details on the documents.
- Some institutions use basic software for partial verification.

Limitations of Existing System:

- Slow processing and long waiting time.
- Error-prone due to human dependency.
- Cannot detect face mismatches or spoofing effectively.
- Limited scalability for large number of users.

These limitations highlight the need for an automated AI-based system that can verify documents, detect fraud, and improve operational efficiency

Modules

User Registration Module:

Allows users to create an account and securely store personal information.

Document Upload Module:

Enables users to upload identity documents and selfies.

OCR Module:

Extracts textual information from uploaded documents for cross-verification.

Face Matching Module:

Compares the user's selfie with the photograph on the document.

Liveness Detection Module:

Ensures the user is physically present and prevents spoofing attacks.

Fraud Detection Module:

Detects document tampering, forgery, or manipulation.

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Notification Module:
Sends verification results (Approved / Rejected / Manual Review) to the user and admin dashboard.

III. PROPOSED SYSTEM

verify AI is designed as an automated digital KYC verification system that performs multiple levels of identity validation. The system provides a web-based interface where users can submit their identity documents and capture a selfie image. Once the document is uploaded, OCR technology extracts key information such as name, date of birth, and identification number. The facial verification module then compares the user's selfie with the photograph present on the document.

The system also includes a liveness detection module to confirm that the user is physically present during the verification process. Fraud detection mechanisms analyze the document image to identify possible manipulation or tampering. Through these verification stages, the system ensures that only valid identities are approved.

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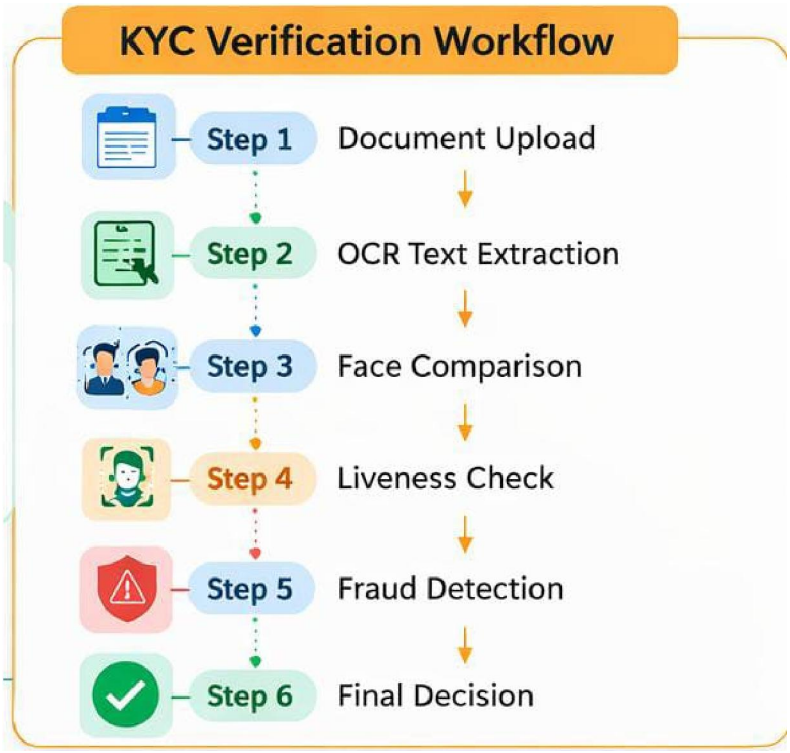

Working of the System

The working of the VerifyAI system follows a structured step-by-step process to perform digital KYC verification.

Step 1: User Registration and Input

The user accesses the system and uploads an identity document such as Aadhaar card, PAN card, or passport. The user also captures a live selfie using a web camera.

Step 2: Document Processing

The uploaded document image is processed using preprocessing techniques such as grayscale conversion and noise removal to enhance image quality.

Step 3: Text Extraction using OCR

The system applies Optical Character Recognition (OCR) to extract important details such as name, date of birth, and identification number from the document.

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Step 4: Face Detection and Matching
The system detects the face in both the document image and the selfie. It then compares both images using similarity measures to verify identity.
Step 5: Liveness Detection
The system analyzes image characteristics such as texture, brightness, and sharpness to ensure that the selfie is captured from a real person and not a spoofed image.
Step 6: Fraud Detection
The system performs image analysis techniques such as error level analysis to identify any tampering or manipulation in the document.
Step 7: Data Verification
Extracted document data is compared with user-provided information to identify mismatches.
Step 8: Result Generation
Based on all verification steps, the system generates the final decision:
If all checks pass → Approved
If major mismatch found → Rejected
If uncertain → Manual Review
.
System Architecture : The system architecture is divided into six main layers.
The architecture of the proposed **VerifyAI system** is designed as a multi-layered framework that integrates user interaction, backend processing, artificial intelligence modules, and data storage.
The system consists of the following main components:
1. User Interface
The user interface allows users to submit identity verification requests by uploading their documents and capturing a live selfie image. It is developed using web technologies such as HTML, CSS, and JavaScript.
2. Application Layer
This layer acts as a communication bridge between the user interface and backend services. It handles request processing and response delivery.
3. Backend Server
The backend is implemented using the Flask framework in Python. It manages data flow, processes user inputs, and invokes AI-based verification modules.
4. AI Verification Modules
The system includes multiple AI modules:
OCR Module for text extraction
Face Matching Module for identity verification
Liveness Detection Module to detect real users
Fraud Detection Module to identify tampered documents
5. Database
SQLite database is used to store user details, extracted data, and verification results securely.
6. Output Layer
The system generates a final verification result such as:
Approved
Rejected
Manual Review

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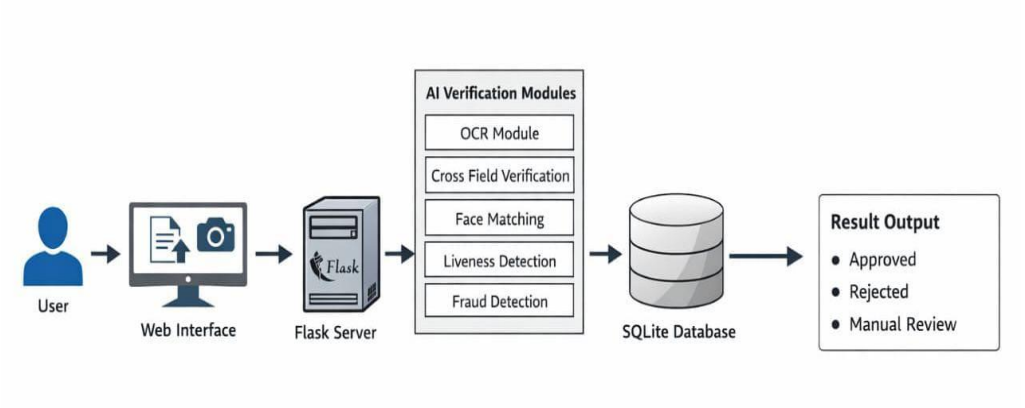
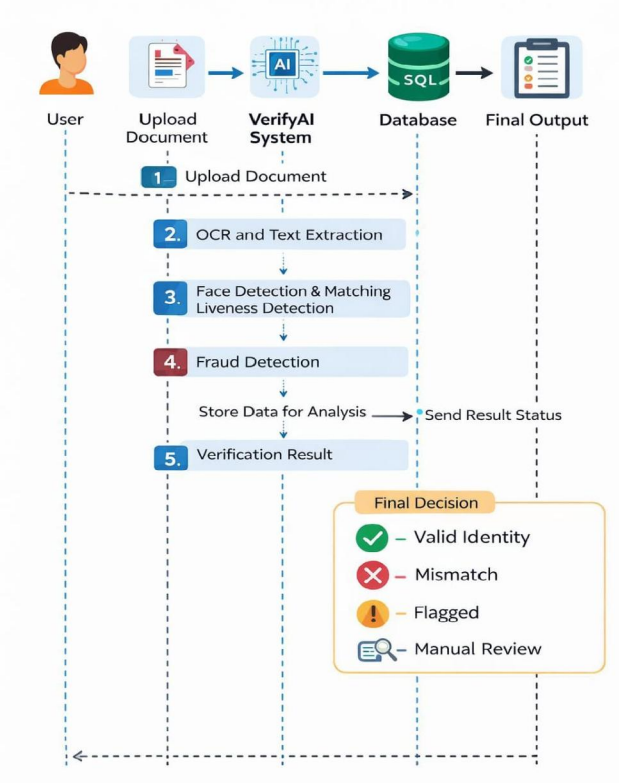
Data Flow Diagram



Sequence Diagram:



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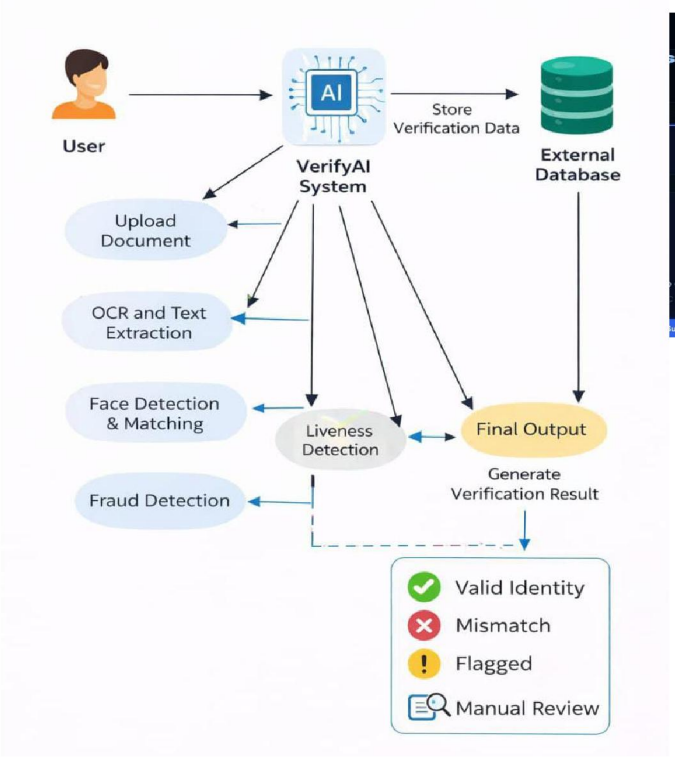
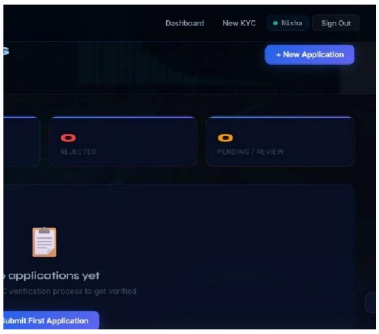
Use case diagram:





IV. AI BASED DIGITAL KYC VERIFICATION SHOWING FACE MATCHING AND DOCUMENT VALIDATION

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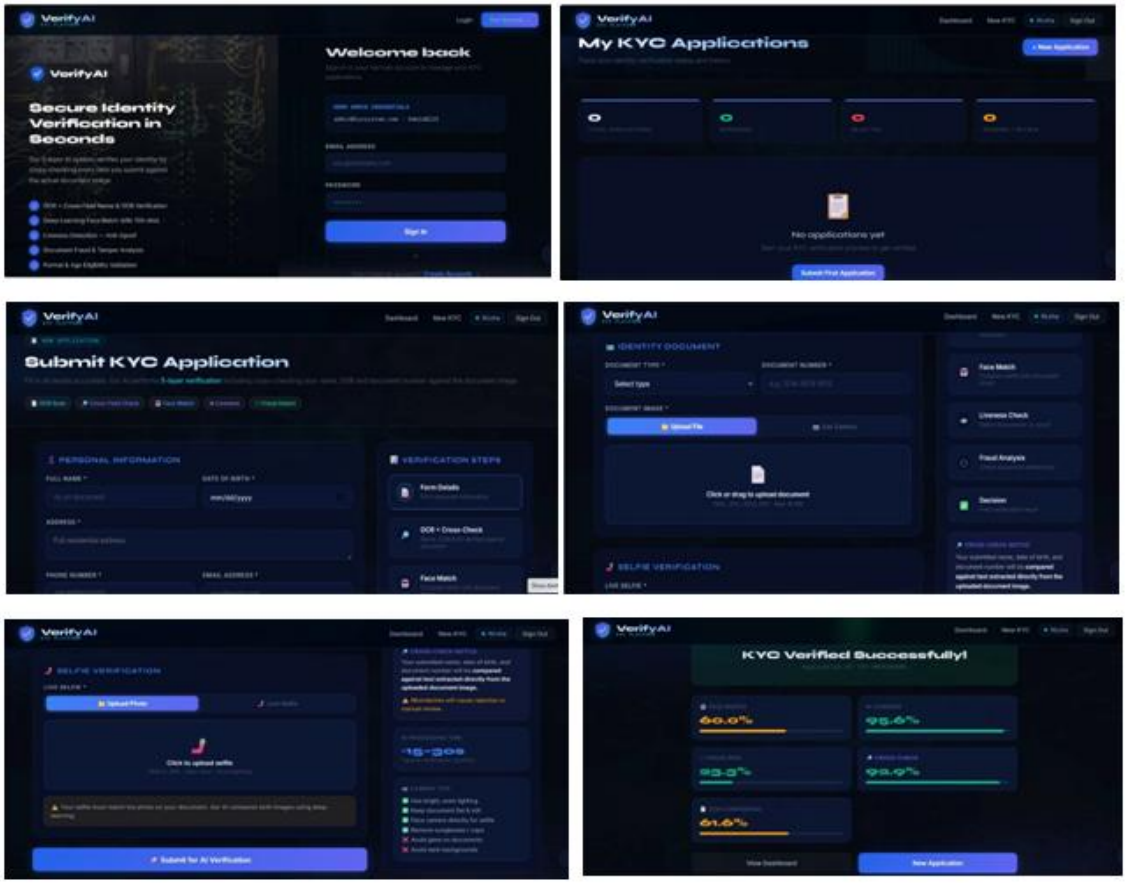

V. FUTURE SCOPE

The proposed VerifyAI system provides an efficient solution for digital KYC verification; however, several enhancements can be implemented to improve its performance and scalability in the future.

Deep Learning Integration

Advanced deep learning models can be incorporated to improve the accuracy of face recognition and document analysis. This will help in handling complex real-world scenarios more effectively.

Video-Based Liveness Detection

The current system uses image-based liveness detection. In future, video-based verification can be implemented to provide stronger protection against spoofing attacks.

Cloud Deployment

The system can be deployed on cloud platforms to support large-scale applications and allow faster processing for multiple users simultaneously.

Multi-Document Support

Future versions of the system can support a wider range of international identity documents, making it suitable for global applications.

Blockchain for Data Security

Blockchain technology can be integrated to ensure secure storage and sharing of user identity data, reducing the risk of data tampering.

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Real-Time API Integration

Integration with government or official verification APIs can improve the authenticity and reliability of the verification process.

Mobile Application Development

A mobile-based version of the system can be developed to provide better accessibility and user convenience.

VI. CONCLUSION

This research presented Verify, an AI-based digital KYC verification system that automates identity verification using computer vision technologies. The system combines OCR, facial recognition, and fraud detection techniques to provide an efficient and secure verification process.

The proposed solution reduces manual effort and enhances verification accuracy. Future improvements may include advanced deep learning models and cloud deployment to support large-scale identity verification systems.

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