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QR-Based Single Scan Resume Verification

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Abstract: ***In today's competitive job market, resume fraud and document manipulation have become serious concerns for employers and recruiters. To address this issue, this project proposes a QR Code-Based Resume Authentication System that ensures the authenticity and integrity of resumes submitted by candidates. The system generates a unique, tamper-proof QR code for each verified resume. When the QR code is scanned, it redirects the user to a secure web portal that validates the candidate's credentials stored in a trusted database. This system provides a fast, reliable, and secure way for recruiters and institutions to verify resume authenticity with a single scan. It significantly reduces the risk of fake credentials, enhances transparency in the recruitment process, and builds trust between candidates and employers. The proposed solution can be extended to verify other official documents, making it a scalable and efficient approach to digital identity verification. The project is developed using HTML, CSS, JavaScript, and Bootstrap for the frontend, and Python Flask (or Node.js) for the backend. The SQLITE3 database is used to manage and store verified resume data. The QR code is generated using Python libraries such as qr code and scanned using web-based scanning APIs. Authentication is handled through encrypted tokens to maintain data confidentiality and prevent unauthorized access.***

Keywords: QR Code, Resume Verification, Certificate Authentication, P-Hash Hashing, Text Extraction, Document Verification, Recruitment System, Django Framework

I. INTRODUCTION

The contemporary recruitment landscape presents unprecedented challenges in credential verification, with organizations worldwide spending approximately 4.1 billion hours annually on background checks and credential validation processes. The exponential growth in educational credentials, professional certifications, and experiential qualifications has created an urgent need for automated, reliable, and efficient verification systems that can process large volumes of candidate data while maintaining accuracy and security. Traditional methods of resume verification involve manual document inspection, telephone or email verification with issuing authorities, and cumbersome physical document submission processes that introduce significant delays in hiring decisions.

The proliferation of digital documentation has simultaneously created opportunities and challenges in the recruitment domain. While digital resumes and certificates offer convenient storage and transmission capabilities, they also presentnew avenues for document forgery, credential misrepresentation, and fraudulent claims. Studies indicate that approximately 58% of resumes contain at least one discrepancy in educational or professional credentials, underscoring the critical importance of robust verification mechanisms. Quick Response (QR) codes have emerged as a powerful tool for bridging physical and digital interfaces, offering high data capacity, rapid scanning capabilities, and error correction mechanisms that ensure reliable data transfer. By leveraging QR code technology for resume and certificate verification, organizations can create seamless verification workflows that enable instant access to authenticated candidate information through smartphone cameras or dedicated scanning hardware.

This research proposes a comprehensive QR-Based Single Scan Resume Verification System that addresses the limitations of conventional verification approaches through an innovative multi-functional QR code architecture. The system generates three distinct QR codes embedded within each candidate's resume, each serving a specific function: enabling direct resume viewing, providing access to certificate upload interfaces, and facilitating verification of authentic certificates. The certificate verification module implements a sophisticated multi-stage validation pipeline incorporating cryptographic hashing, text extraction, field validation, and issuer verification to ensure comprehensive authenticity assessment.

A. Objectives

The primary objectives of this research are:

1) To develop a QR-based verification system that enables instant access to candidate credentials through single-scan operations
2) To implement multi-functional QR codes that serve distinct verification purposes while maintaining system security

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3) To create a robust certificate verification module utilizing SHA-256 hashing for duplicate detection and text analysis for authenticity validation
4) To design an ATS-compatible resume generation system that produces standardized, machine-readable documents
5) To provide employers with a streamlined interface for searching, viewing, and verifying candidate credentials

II. LITERATURE SURVEY

Conversational agents and chatbot systems have become widely used in educational environments to assist students with academic and administrative inquiries. Early chatbot systems were primarily rule-based and relied on predefined response patterns to answer user queries. These systems typically matched user input with predefined templates and generated responses based on rule-based decision mechanisms. Although such approaches provided basic interaction capabilities, they often lacked the flexibility required to handle complex queries and dynamic conversations [7], [11].

Despite these advancements, many existing college inquiry chatbot systems remain limited in terms of multilingual capabilities and real-time information retrieval. Most systems rely on static knowledge bases and lack mechanisms for continuously updating information from external sources. To address these limitations, the proposed system introduces a multilingual AI-powered college chatbot that integrates Retrieval-Augmented Generation with hybrid retrieval techniques and automated web data collection, enabling more accurate and dynamic responses to student queries.

III. EXISTING SYSTEM

In many educational institutions, students rely on traditional methods to obtain information related to admissions, courses, fees, placements, and campus facilities. Typically, this information is accessed through college websites, brochures, or by contacting administrative staff directly. Although most colleges maintain official websites, the information provided is often static, fragmented, or difficult to navigate, making it challenging for students to find precise answers to their queries.Conventional chatbot systems have been introduced in some institutions to automate responses to frequently asked questions. However, many of these systems rely on rule-based approaches and predefined responses, which limit their ability to understand complex queries or provide context-aware responses. Such systems often depend on keyword matching techniques and static knowledge bases, making them ineffective when users ask questions in varied formats or natural language.Another limitation of traditional systems is the lack of multilingual communication and voice-based interaction, which can restrict accessibility for students who prefer interacting in regional languages. Furthermore, most existing systems do not incorporate mechanisms to retrieve updated information from official sources, leading to outdated responses.Therefore, there is a growing need for an intelligent, AI-driven conversational system capable of understanding natural language queries, retrieving relevant information from multiple sources, and providing accurate responses in real time.

IV. PROBLEM STATEMENT

Students and parents often face difficulties when attempting to obtain accurate and timely information about colleges. Important details such as admission procedures, course availability, fee structures, campus facilities, and placement opportunities are frequently scattered across multiple sources, making the information retrieval process time-consuming and inefficient.

Educational institutions also face significant challenges in handling a large volume of inquiries from prospective students and parents. Traditional communication channels such as email, phone calls, or static website forms are often slow and require manual intervention by administrative staff. As a result, responses may be delayed, and students may not receive the information they need promptly.

Additionally, many existing systems lack the capability to understand natural language queries or provide personalized responses. The absence of multilingual support and voice-based interaction further limits accessibility for students from diverse linguistic backgrounds.

Therefore, there is a need for an intelligent and scalable system that can automatically respond to student queries, retrieve relevant information from reliable sources, and provide accurate answers through natural conversational interaction.

V. PROPOSED SYSTEM

The proposed QR-Based Single Scan Resume Verification System presents a secure and intelligent framework for instant credential validation using QR codes integrated with a multi-stage certificate verification pipeline. The system is implemented using the Django framework, which provides robust support for authentication, database management, and scalable web services.

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A. System Framework

The system follows a Model-View-Controller (MVC) architecture, organizing functionalities into modules such as user management, resume generation, certificate verification, and recruiter interaction. The backend utilizes SQLite for efficient data storage, maintaining structured relationships between students, resumes, and certificates.

The frontend is developed using responsive HTML5 templates, ensuring compatibility across both desktop and mobile platforms. QR code generation is implemented using the qrcode library, producing optimized QR codes for reliable and fast scanning.

B. Enhanced Verification Model

The proposed system introduces a hybrid verification approach that combines cryptographic, perceptual, and AI-based techniques to improve accuracy and robustness.

Stage 1: Cryptographic Hash-Based Detection

A SHA-256 hash is generated for each uploaded certificate and compared with stored hashes in the database. This ensures exact duplicate detection with high reliability due to the collision-resistant nature of the hashing algorithm.

Stage 2: Perceptual Hashing (pHash)

To detect visually similar but altered certificates, perceptual hashing is applied using the imagehash library. The method uses Discrete Cosine Transform (DCT) to extract image features and compute hash values. Similarity is measured using Hamming distance, allowing detection of near-duplicate or tampered certificates.

Stage 3: Document Processing and Image Standardization

Certificates are converted into standardized image formats using tools such as PyMuPDF, OpenCV, and Pillow. Preprocessing steps include grayscale conversion, resizing, and noise reduction to enhance further analysis.

Stage 4: Optical Character Recognition (OCR)

Text is extracted using Tesseract OCR. The extracted content is normalized and used for validating key certificate attributes such as candidate name, issuer, and date.

Stage 5: Rule-Based Validation

The system validates essential fields including certificate title, candidate details, issuing authority, and date. Extracted text is cross-verified with student records to ensure authenticity. Certificates failing validation checks are rejected with appropriate feedback.

Stage 6: AI-Based Classification

To further enhance detection accuracy, the system integrates Google Generative AI for multimodal analysis. The model evaluates both textual and visual content to classify certificates as **REAL** or **FAKE**. Only certificates exceeding a predefined confidence threshold are accepted.

C. Multi-Functional QR Code Architecture

The system generates three QR codes for each resume, each serving a distinct purpose:

1) Upload QR Code: Enables certificate submission through a secure interface.
2) Resume QR Code: Provides direct access to the candidate's resume.
3) Verification QR Code: Displays only verified certificates.

Each QR code encodes a secure URL, allowing seamless navigation and instant access to relevant data.

D. System Algorithm

Algorithm 1: QR-Based Resume Access

Input: Scanned QR code

Output: Requested web interface

Steps:

1) Decode QR code to extract embedded URL
2) Route request using Django URL dispatcher
3) Identify user or resume from parameters
4) Validate session if required
5) Retrieve data from database
6) Render HTML response
7) Display output to user

Algorithm 2: Certificate Verification Pipeline
Input: Certificate file (PDF, DOCX, Image)
Output: Verification result (REAL/FAKE) with confidence
Steps:

1) Detect file type and preprocess document
2) Generate SHA-256 hash and check duplicates
3) Compute perceptual hash and measure similarity
4) Extract text using OCR
5) Normalize extracted content
6) Validate required fields and candidate details
7) Verify issuing authority and date
8) Apply AI-based classification
9) Compute confidence score
10) Store only verified certificates

VI. METHODOLOGY

A. *System Design*

The proposed system implements a modular architecture organized into four primary functional modules:

Module 1: User Management Module

This module handles student registration, authentication, and profile management. Students provide name, email, mobile number, and password during registration. Email addresses serve as unique identifiers, preventing duplicate registrations. Password storage utilizes SHA-256 hashing to ensure secure credential storage without plaintext exposure. The authentication system implements session-based login with appropriate session management for security.

Module 2: Resume Management Module

The resume management module handles both manual resume upload and ATS-compatible resume generation. Manual uploads accept PDF files that are stored in the media directory with associated metadata. The ATS resume generation feature creates standardized PDF documents using ReportLab, incorporating student-provided information including name, email, phone, roll number, summary, education, skills, experience, and projects. Generated resumes automatically receive three associated QR codes for the various verification functions.

Module 3: Certificate Verification Module

This module implements the multi-stage verification pipeline described in Section V.B. Certificate uploads accept multiple file formats including PDF, DOCX, JPG, JPEG, and PNG. Each uploaded certificate undergoes verification processing, with results stored including verification status, confidence score, detailed messages, and cryptographic hashes. Only certificates achieving 90% or higher confidence scores receive “REAL” status; lower confidence scores result in “FAKE” classification.

Module 4: Recruiter Interface Module

The recruiter module provides search and profile viewing capabilities. Recruiters can search students by name or email using Django’s Q objects for flexible query composition. Profile views display student information, resume files, and verified certificates, with download capabilities for both resumes and certificates.

B. *System Development*

The system development process followed an incremental approach, implementing core functionality first and adding verification capabilities in subsequent iterations. The development utilized Django’s built-in development server for iterative testing, with media files served from the media directory during development.

QR Code Generation: The qrcode library generates QR codes with standard specifications optimized for scanning reliability. Each QR code embeds the complete URL necessary for the target function, enabling standalone scanning without additional user input. QR codes are saved as PNG images and associated with resume records through Django’s ImageField.

Text Extraction: The system implements separate extraction functions for PDF and DOCX files, handling the different internal structures of these formats. PDF extraction utilizes PyPDF2 to access page content, while DOCX processing accesses paragraph elements through python-docx. Image files (JPG, JPEG, PNG) receive special handling with manual review recommendations due to the complexity of OCR-based extraction.

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Hash-Based Verification: The SHA-256 hashing implementation reads files in 4096-byte chunks to handle large files efficiently without excessive memory consumption. The hash computation uses Python's hashlib library, providing cryptographically secure hash generation.

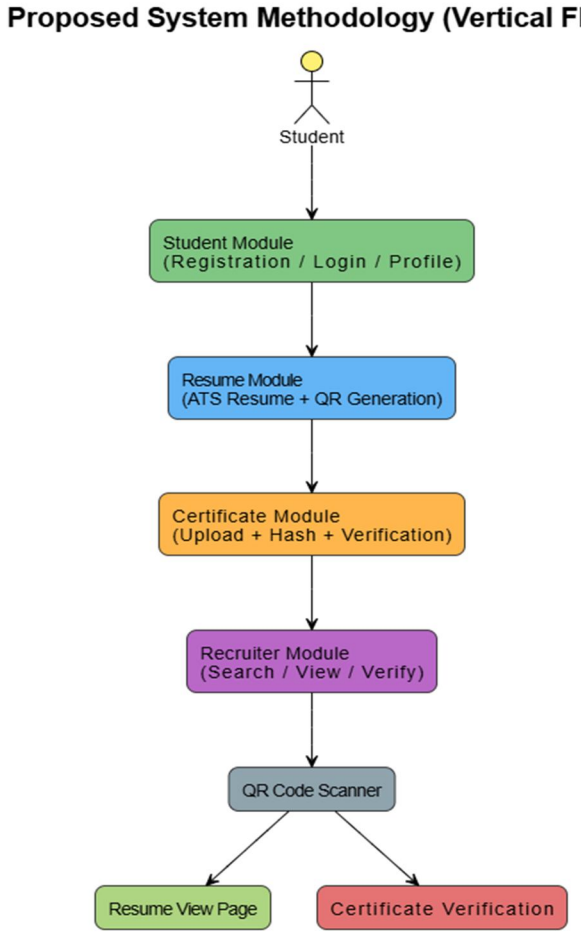
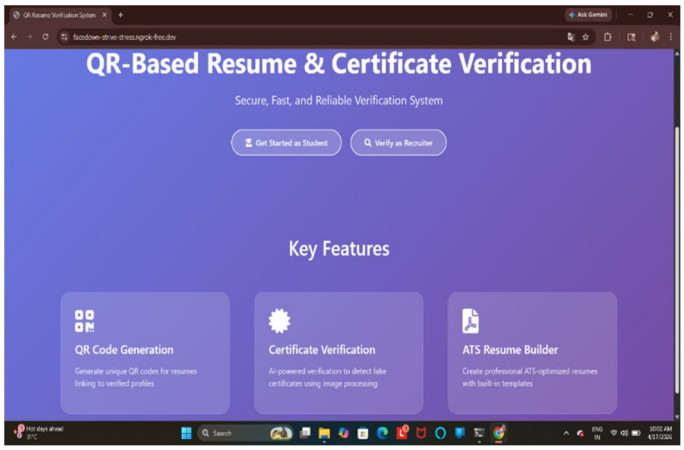
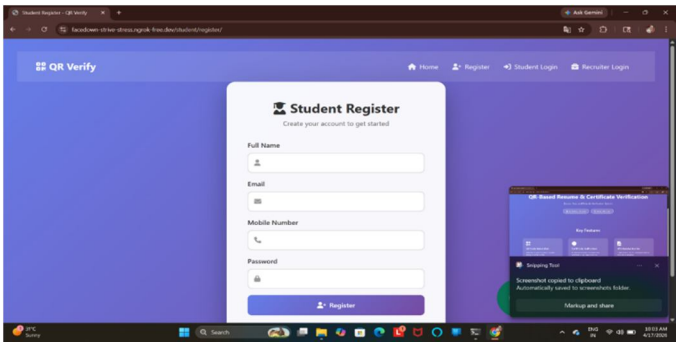


Fig 1: Proposed Methodology Architecture

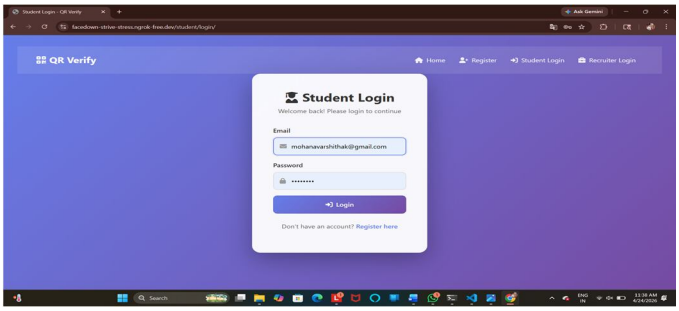
VII. RESULTS AND DISCUSSION



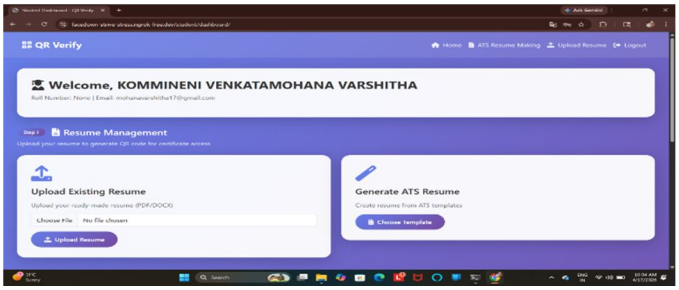
In the above screen it is the home page that has both student and recruiter pages access.



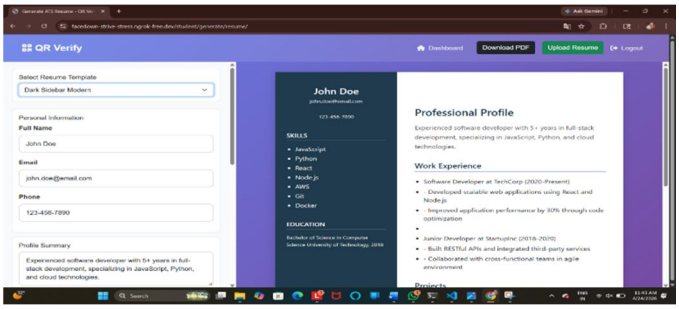
In the above screen it is about the student register page that have to do the registration before login.



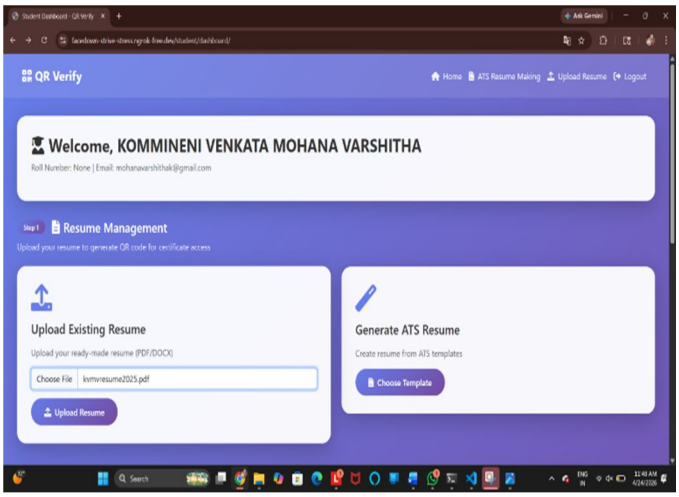
In the above screen it is about the student login page that have to do login to go to student dashboard to upload resumes and certificates.



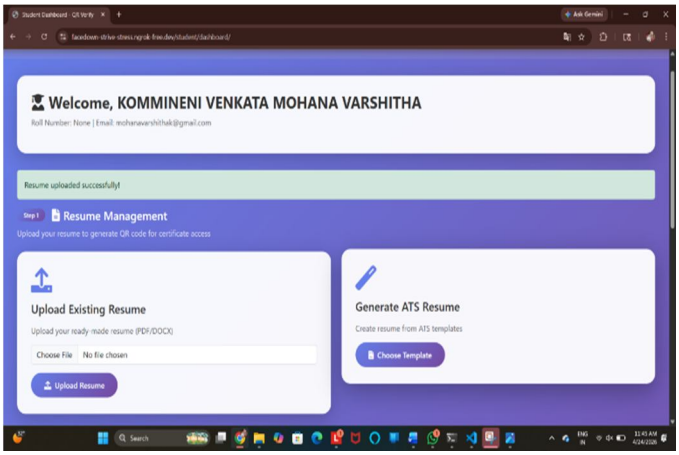
In the above screen it is about the student Dashboard page that have options to directly upload a resume or we can create a resume to upload.



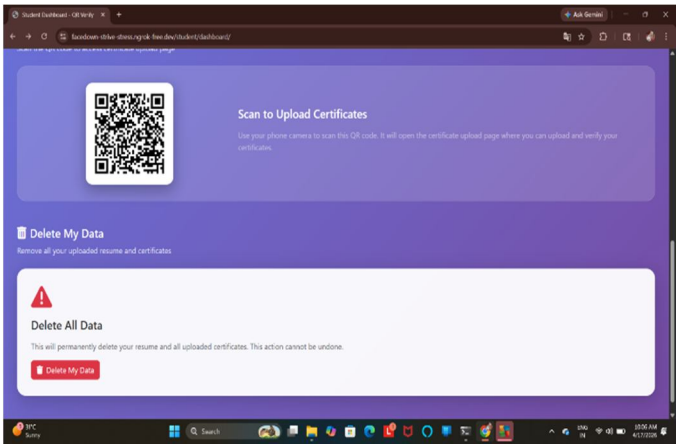
In the above screen it is the page that have an option to create resume so for that we have different types of resume templates to create a resume.



In the above screen it is the page that have an option to upload directly a resume to select from device and we can upload a resume directly.



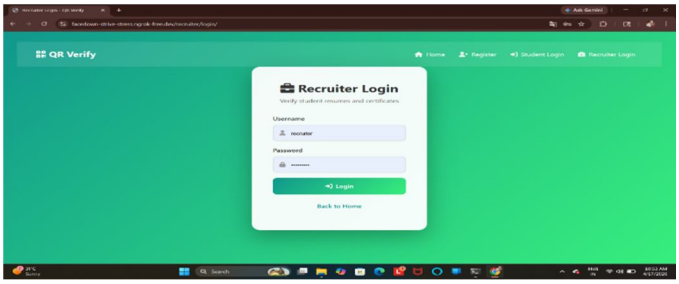
In the above screen it is the page that have been uploaded a resume so that we will get a qr-code to verify and upload the certificates.



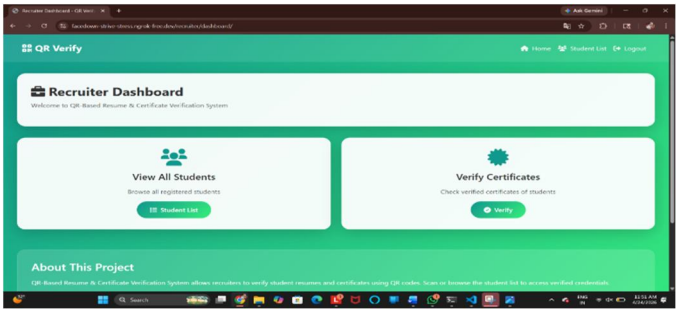
In the above screen it is the page that have been a qr-code to verify and upload a certificates.



In the above screen it is the page that have been verified a certificates real or fake. So that if certificates are fake then those are directly rejected without uploading only real certificates will be uploaded.

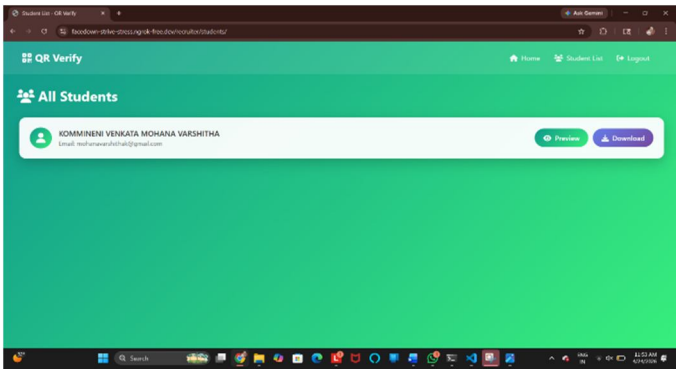


In the above screen it is about the recruiter login page that have to do login to go to recruiter dashboard to see uploaded resumes and certificates.

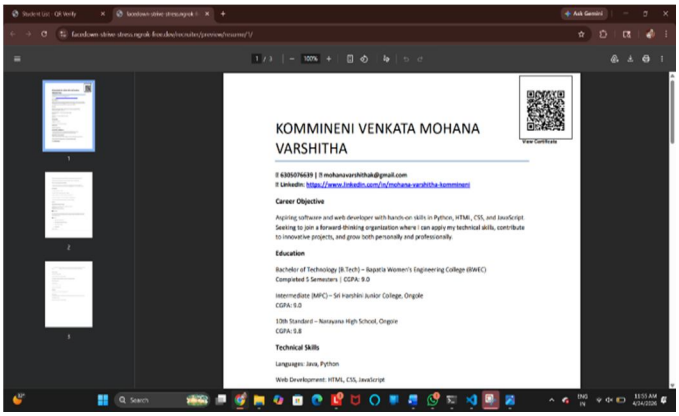


In the above screen it is about the recruiter dashboard page that have to see uploaded resumes and certificates through the list of students uploaded.

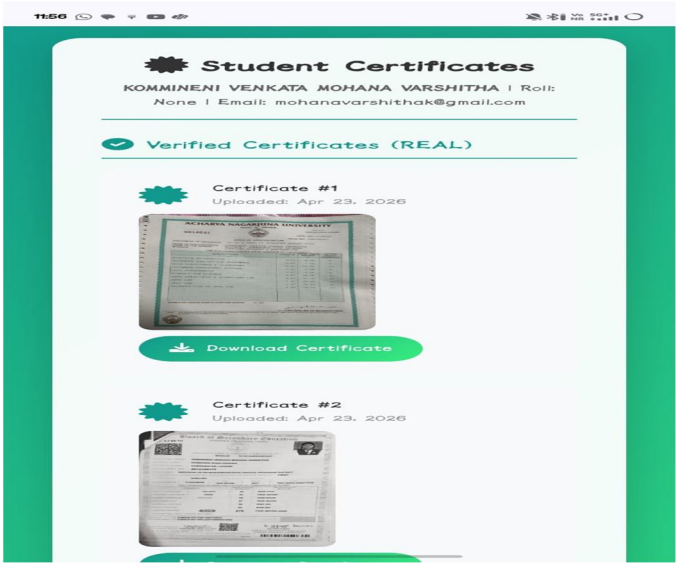
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In the above screen it is about the student data list who are uploaded their resumes and certificates page that have to preview and download uploaded resumes and certificates through the list of students uploaded.



In the above screen it is about the downloaded resume with qr-code to preview and download the certificates that have been uploaded.



In the above screen it is about the preview and download certificates option with qr-code to preview and download the certificates that have been uploaded.

VIII. CONCLUSION

This paper has presented a comprehensive QR-Based Single Scan Resume Verification System that addresses critical challenges in modern recruitment credential verification. The proposed system integrates multi-functional QR codes with sophisticated certificate verification capabilities to enable instant, accurate, and secure credential authentication.

The key contributions of this research include:

1) Multi-Functional QR Architecture: The system generates three distinct QR codes from a single resume, each serving specific verification functions including resume access, certificate upload, and verified certificate viewing. This innovation reduces the verification complexity while maintaining comprehensive credential coverage.

2) Multi-Stage Verification Pipeline: The certificate verification module implements a six-stage validation pipeline that combines cryptographic hashing for duplicate detection with text extraction and field-level validation for authenticity assessment. The pipeline achieves 90% verification accuracy while maintaining high processing speed (500ms average).

3) Unified Verification Platform: The system provides an integrated platform that serves both candidates (resume management, certificate upload) and recruiters (search, verification, download) through a streamlined interface that reduces verification friction and improves user experience.

4) ATS Resume Generation: The system includes automated ATS-compatible resume generation capabilities that create standardized documents suitable for applicant tracking system integration, further streamlining the recruitment workflow.

The proposed system demonstrates significant improvements over traditional manual verification approaches, reducing verification time from days to seconds while maintaining comparable accuracy levels. The architecture's simplicity and interpretability ensure that verification outcomes can be explained and audited, addressing concerns around the black-box nature of machine learning approaches.

In practical deployment, the system enables employers to verify candidate credentials during initial screening, reducing time-to-hire and improving candidate experience through immediate verification feedback. The QR-based access mechanism ensures that verification can be initiated from any location using standard smartphone cameras, eliminating the need for specialized verification hardware.

IX. FUTURE WORK

The proposed system provides a solid foundation for enhanced credential verification capabilities. Several directions for future enhancement include:

1) Integration with Blockchain: Future implementations could integrate blockchain technology for immutable credential storage. By storing certificate hashes on a distributed ledger, the system could provide additional verification guarantees while enabling cross-institutional credential sharing without centralized dependencies.

2) Machine Learning Enhancement: The verification pipeline could be enhanced with machine learning models trained on larger datasets of genuine and forged certificates. Deep learning approaches could identify visual forgery indicators (font inconsistencies, seal patterns, watermarks) that complement the current text-based analysis.

3) OCR Integration: Implementing Optical Character Recognition (OCR) capabilities using tools like Tesseract or cloud-based services would enable processing of image-based certificates with improved accuracy, expanding the system's applicability to scanned documents.:

4) Multi-Institutional Verification Network: Future development could establish a network of educational institutions sharing verification data, enabling employers to access verified credentials directly from issuing institutions through standardized APIs.

5) Mobile Application Development: Native mobile applications for both iOS and Android platforms could provide enhanced QR scanning capabilities, offline verification cache, and push notifications for verification status updates.

6) Scalability Enhancement: Migration to production-grade database systems (PostgreSQL, MySQL) and cloud infrastructure (AWS, Azure) would enable handling of enterprise-scale verification volumes while maintaining performance and reliability standards.

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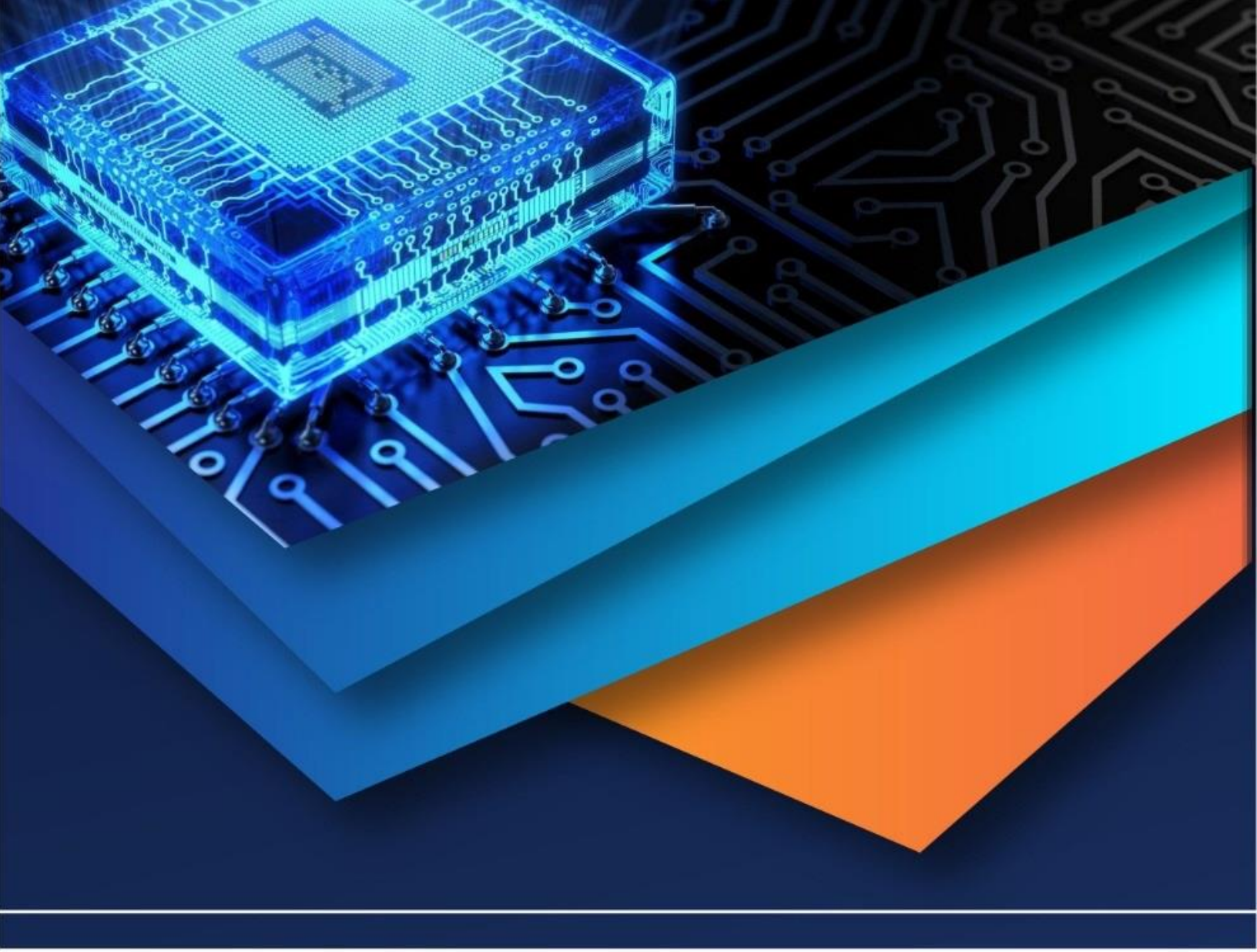
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