International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

AI-Based Resume Shortlisting System Using NLP and Machine Learning

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Abstract
Recruiters and hiring managers in today's competitive job market face major challenges in filtering thousands of resumes for a single position. Manual screening is slow, inconsistent, and often influenced by individual bias. Candidates with relevant skills are frequently overlooked due to formatting differences or keyword mismatches. As a result, both organizations and applicants experience delays, reduced productivity, and limited hiring transparency.
To address these issues, this project proposes an intelligent recruitment tool titled **"AI-Based Resume Shortlisting System Using NLP and Machine Learning."** The system analyses uploaded resumes, extracts key information such as skills, education, experience, and certifications, and automatically ranks candidates based on job requirements. The platform features a recruiter dashboard for job posting and result visualization, a resume parser using Natural Language Processing (NLP), and a machine learning model that evaluates candidate-job matching scores. The system aims to support multiple file formats, multilingual resume handling, and unbiased filtering to ensure fair screening.
This research discusses the platform's functional design, data pre-processing pipeline, NLP techniques, model selection, and evaluation metrics. By automating early-stage recruitment, the solution reduces screening time, enhances accuracy, and improves hiring decision quality for organizations of all sizes.

Keywords: Recruitment, Resume Screening, Natural Language Processing (NLP), Machine Learning, Automation, Candidate Ranking, AI Hiring System, Resume Parsing, Job Matching, HR Technology, Talent Acquisition, Shortlisting Platform

1. Introduction

Recruitment has become increasingly complex in the digital era. With the rise of online job portals and mass applications, organizations often receive an overwhelming number of resumes for a single position. While this provides access to a larger talent pool, it also creates a significant burden for recruiters who must review and filter applications within limited time constraints. Manual screening not only consumes valuable time but can also lead to inconsistent evaluations, fatigue-related errors, and unintended bias. In many cases, capable candidates are rejected simply because their resumes are formatted differently or do not contain exact keyword matches.
As hiring demands grow, there is a clear need for intelligent systems that can assist recruiters in making faster and more objective decisions. Artificial Intelligence (AI), particularly Natural Language Processing (NLP) and Machine Learning (ML), offers promising solutions for analysing large volumes of

unstructured text data such as resumes. These technologies enable systems to interpret skills, experience, qualifications, and contextual meaning rather than relying solely on surface-level keyword matching.

This research introduces an AI-Based Resume Shortlisting System designed to automate the initial stages of candidate evaluation. The proposed system extracts structured information from uploaded resumes and, when available, analyses optional video introductions using speech recognition techniques. The extracted information is then compared with predefined job requirements to generate a relevance score and rank applicants accordingly.

The system is designed not only to improve efficiency but also to promote fairness and transparency in hiring. By reducing human workload and standardizing evaluation criteria, it supports more consistent decision-making. Additionally, the integration of resume and video analysis within a single platform provides a more comprehensive understanding of candidate suitability.

Through this work, the study contributes to the advancement of AI-enabled recruitment systems by presenting a practical, scalable solution that bridges the gap between traditional resume screening and modern intelligent hiring technologies.

1.1 Problem Statement

Recruiters often receive hundreds or even thousands of applications for a single position, making manual resume screening slow and inconsistent. Human evaluation can introduce bias, and qualified candidates may be overlooked due to formatting differences or keyword mismatches. As hiring demands increase, manual shortlisting becomes inefficient and delays the overall recruitment process.

1.2 Significance

There is a strong need for a reliable, automated system that can evaluate resumes fairly and objectively. An AI-driven resume shortlisting platform can significantly reduce the effort required during early stages of recruitment.

By applying Natural Language Processing and Machine Learning, such a tool can interpret resume contents, compare skills with job requirements, and generate meaningful candidate rankings. This will not only save time for recruiters but also increase transparency, accuracy, and equal opportunity hiring—ensuring that the most suitable candidates are considered.

1.3 Proposed Solution

The proposed solution, **AI-Based Resume Shortlisting System**, introduces a digital platform that automates the process of screening and ranking resumes. The system parses uploaded resumes, extracts crucial fields such as personal details, skills, qualifications, and experience, and matches them against job descriptions using NLP techniques.

Recruiters can add job openings, view ranked applicants, and download or shortlist candidate details instantly. Applicants benefit from a fair evaluation, regardless of resume format or writing style. By automating candidate filtering, this solution minimizes manual effort, speeds up recruitment cycles, and improves the overall decision-making process for organizations.

2. Literature Review

Hiring and recruitment play a vital role in strengthening organizational growth, productivity, and economic development. Companies rely on effective recruitment systems to fill positions with suitable candidates, yet the traditional hiring approach continues to present challenges. This literature review summarizes existing research relevant to automated resume screening and AI-driven recruitment.

Researchers highlight key difficulties associated with manual resume evaluation in modern organizations. Studies report that HR professionals are burdened with large volumes of applications, limited evaluation time, and pressure to make consistent decisions. Manual screening often results in delays, overlooked candidates, and subjective judgments due to differences in human interpretation and fatigue [1]. These findings emphasize the need for digital solutions that reduce workload and improve fairness in the early stages of hiring.

Another line of research explores the use of NLP-driven resume parsing systems. Ravula et al. demonstrate that structured information—such as education level, relevant work experience, and technical skills—can be automatically extracted from resumes with the help of NLP techniques [2]. While such systems provide a faster alternative to human review, they struggle when resumes contain irregular formats, tables, or design-heavy layouts, limiting the accuracy of extraction. Lopez (2024) further introduces AI-based job matching using similarity scoring models like TF-IDF and keyword mapping. Although these approaches support data-driven candidate ranking, they are limited to text-based screening and ignore behavioural qualities that influence hiring success [3].

A growing area of recruitment research expands beyond resume data to assess candidate communication ability, confidence, and personality. Sharma and Patel (2021) analyse speech clarity and tone from video responses, while Ravula and Kumar (2022) evaluate facial expressions and body cues for interview preparedness. These approaches demonstrate how video submissions can provide deeper insight into candidate suitability, especially for client-facing positions [4]. However, existing tools and studies tend to address text and video analysis separately, resulting in fragmented or incomplete evaluation.

Our project builds on and extends existing literature by developing an end-to-end platform that combines **resume parsing and video screening in one integrated system**. The AI-Based Resume Shortlisting System uses NLP to extract core candidate information from uploaded resumes and employs speech recognition to transform optional video submissions into evaluable text. The platform ranks candidates according to job requirements and communication clarity, offering recruiters a richer, more holistic assessment than traditional resume filtering methods. By supporting both content and presentation analysis, this project advances current recruitment technology and provides a comprehensive digital solution aligned with modern hiring needs.

3. Methodology (Development Process)

3.1 Design of Research

To build a structured and intelligent system for automating the resume shortlisting process, this research adopts a **design and development methodology**. The aim is to create a practical solution that supports the hiring cycle and reduces manual screening effort.

The methodology focuses on the iterative development of the **AI-Based Resume Shortlisting System**, combining theoretical findings from existing studies on AI recruitment, NLP-based resume parsing techniques, and machine learning decision models.

Through progressive stages of **designing, implementing, testing, and refining**, the project works toward creating a scalable platform capable of analysing resume content, matching candidate information to job requirements, and ranking applicants fairly—ultimately supporting HR professionals in making data-driven hiring decisions.

3.2 Information Gathering

Secondary Data: This stage involved the study and analysis of academic literature, existing hiring tools, job market trends, and research papers related to resume parsing, video screening, and machine learning in recruitment. These sources helped identify the shortcomings in manual hiring and highlighted the need for automated, unbiased evaluation systems.

Technical Research: An in-depth exploration of AI technologies and recruitment platforms was carried out to determine the most suitable implementation strategy. This research covered NLP methods for extracting skills and experience from resume files, speech recognition techniques for analysing video introductions, and machine learning approaches for candidate scoring. Insights from technical documentation guided decisions related to system architecture, model selection, security considerations, and database structure.

3.3 Architecture of the System

The platform is implemented using a structured technology environment designed for efficient data processing and user interaction.

The system follows a modular architecture that integrates the following tools and frameworks:

Python for backend logic and data processing, **Flask** for server-side routing and web request handling, **Natural Language Processing (NLP) libraries** for text pre-processing, entity extraction, and skill identification, **Speech Recognition API** for converting audio from submitted candidate videos into text, **OpenCV** for handling uploaded video content, **MySQL** as the database for securely storing applicant information, job descriptions, and shortlisting results.

This architecture ensures scalability, flexibility, and reliable performance, supporting real-time resume and video analysis while providing recruiters with an accessible and user-friendly interface.

4. Design and Implementation

4.1 System Architecture

The AI-Based Resume Shortlisting System follows a **three-tier software architecture** designed to support text and video analysis, automated ranking, and secure interaction between candidates and recruiters.

Frontend (Client-Side)

A browser-based interface allows:

- **Candidates** to upload resumes and optional video introductions
- **Recruiters/HR** to view ranked applicants, search candidates, and access applicant details

The interface is developed using HTML/CSS/JavaScript/ React frameworks to ensure ease of use and smooth interaction.

Backend (Server-Side)

A Python + Flask-powered backend manages:

- Resume text extraction and pre-processing
- NLP skill and experience detection
- Speech recognition pipeline for video submission
- Candidate scoring and ranking logic
- Secure authentication for HR access
- This layer connects all system modules and processes user requests into actionable results.

Database (MySQL)

A relational database stores:

- Candidate data (basic details, resume contents)
- Job descriptions and required skills
- Skill scores, ranking results, and processed outputs
- Optional video evaluation metadata
- The database ensures proper retrieval, filtering, and report generation for hiring teams.

System Workflow

1. The candidate uploads a resume or resume + video using the web interface.
2. The backend extracts text from the resume and cleans it using NLP.
3. If a video is uploaded, speech recognition converts the audio into text for analysis.
4. The extracted information is evaluated and compared with job requirements stored in the database.
5. The backend generates a matching score and stores applicant results.
6. HR logs into the system to view ranked applicants and shortlist suitable candidates.
7. Optionally, recruiters may download or export shortlisted data for hiring decisions.

System Architecture Diagram:

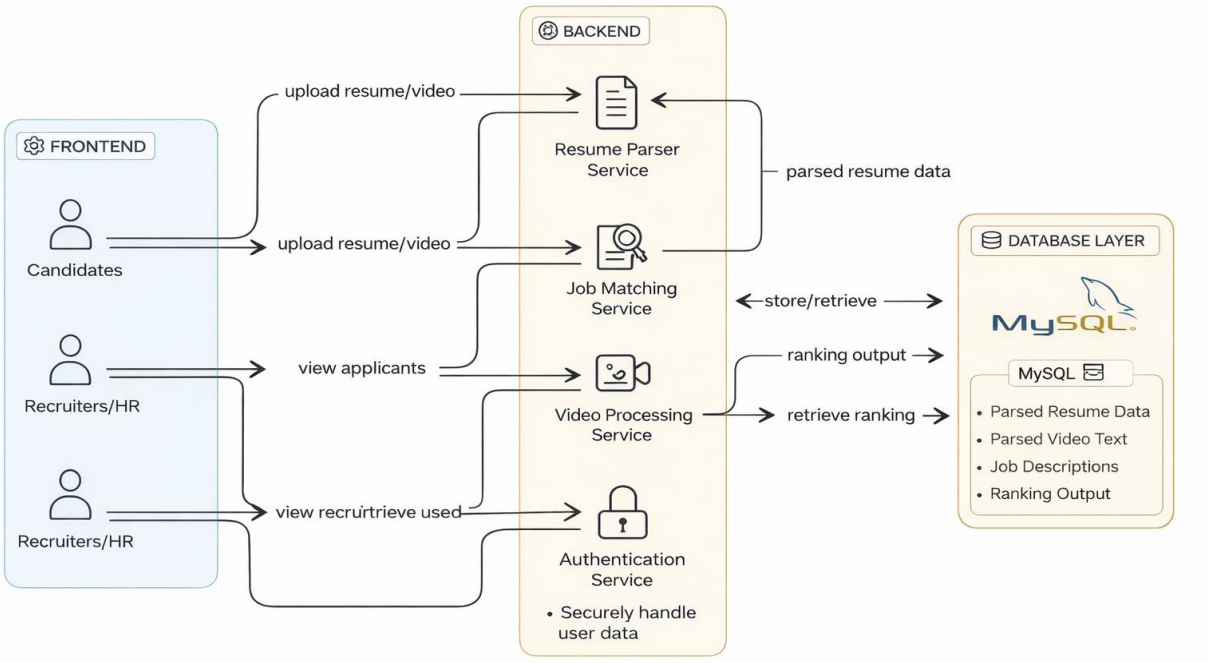


Figure 1: System Architecture of AI-Based Resume Shortlisting System

4.2 Technologies Used

The AI-Based Resume Shortlisting System is built using a modern and efficient technology stack, chosen for accuracy, performance, and integration of AI components.

Table 1 Lists the core technologies used at each system layer.

Component	Technology Used
Frontend	HTML, CSS, JavaScript (or React.js optional)
Backend	Python, Flask Framework
Database	MySQL
Natural Language Processing	NLTK / spaCy, Text Preprocessing libraries
Machine Learning / Matching	Scikit-learn / TF-IDF / similarity models
Speech Recognition (optional video)	Speech Recognition API, OpenCV
Authentication	Secure Login Modules (Flask-Auth / JWT)
API Communication	REST API

4.3 User Interface (UI) & Screenshots

The **AI-Based Resume Shortlisting System** has been developed with a clean and user-friendly interface to support candidates and administrators throughout the hiring process.
The UI is responsive and easy to use on desktops and mobile devices.
Its design focuses on **simplicity, clarity, and seamless navigation**.

4.3.1 User Interface Overview

The system contains the following screens that guide candidates and administrators smoothly through the recruitment process:

1. **Registration Page:** Allows new users to create an account by entering personal details before accessing the system.
2. **Login Page:** Secure login screen for both candidates and admin users to access their respective dashboards.
3. **Home Page:** Shows the purpose of the system.
1. Provides navigation to important pages like Login, Register, About, and Contact.
4. **Upload Resume Page:** Enables candidates to upload resumes in PDF/DOCX format.
2. Optionally allows uploading a video resume. Confirms successful submission.
5. **Admin Login:** Dedicated login screen for authorized admins/recruiters to access system controls.
6. **Dashboard:** Displays uploaded files for candidates. Tracks resume/video status.
   Allows management of personal information.
7. **AI Analyzer:** Automatically extracts skills, experience, and evaluation progress from resumes and video files.
8. **About Page:** Provides details about the system's goals, purpose, and key features.
9. **Contact Page:** Offers contact or support details for users who need help or have queries.
10. **Logout Page:** Securely signs users out and closes their active session.

4.3.2 UI Screenshots:

The following figures illustrate the main user interface screens of the system:

Figure No.	Description
Figure 2	Login Page – A secure login screen for candidates and admins to access their dashboard.
Figure 3	Home Page – Provides an overview of the system and navigation to Login, Register, About, and Contact pages.

Figure 4	Upload Resume Page – Allows candidates to upload resumes in PDF or DOCX format, with an optional video resume, and confirms successful submission.
Figure 5	Admin Login – A dedicated login screen for authorized admins or recruiters.
Figure 6	Admin Dashboard – Displays uploaded files, tracks resume or video status, and allows management of personal details.
Figure 7	AI Analyzer Screen – Automatically analyses resumes and video files to extract skills, experience, and evaluation progress.

Figure 2: Login Page

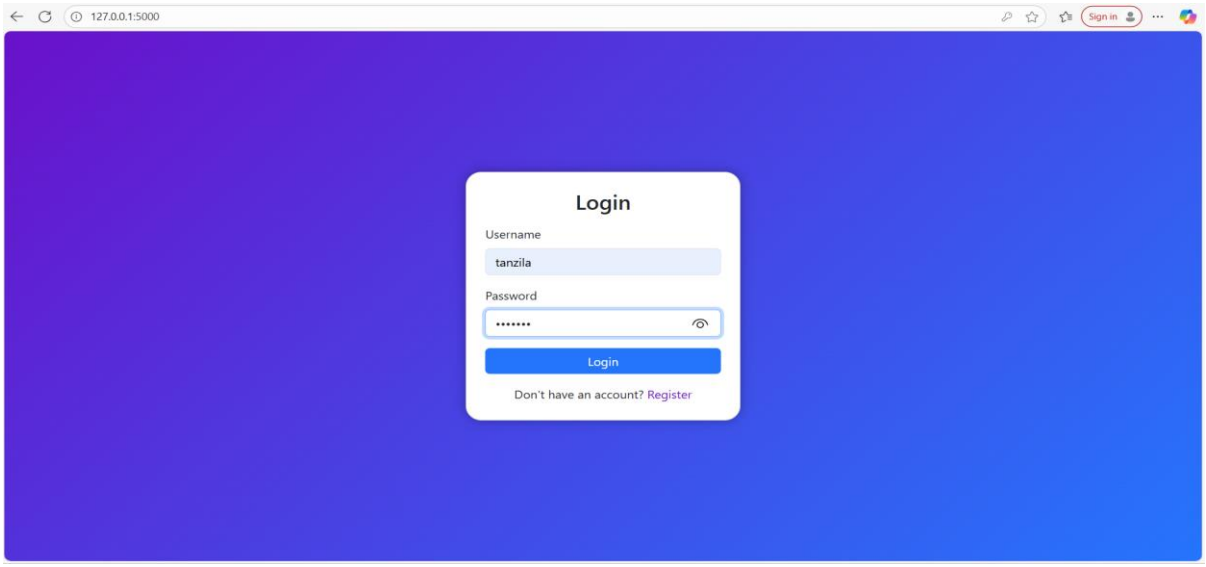


Figure 3: Home Page

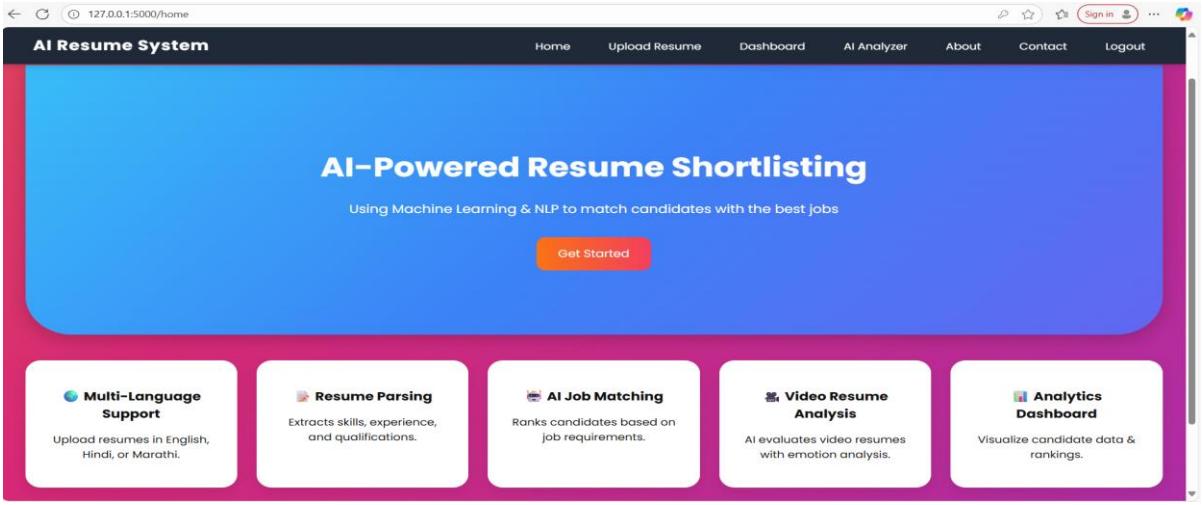


Figure 4: Upload Resume Page

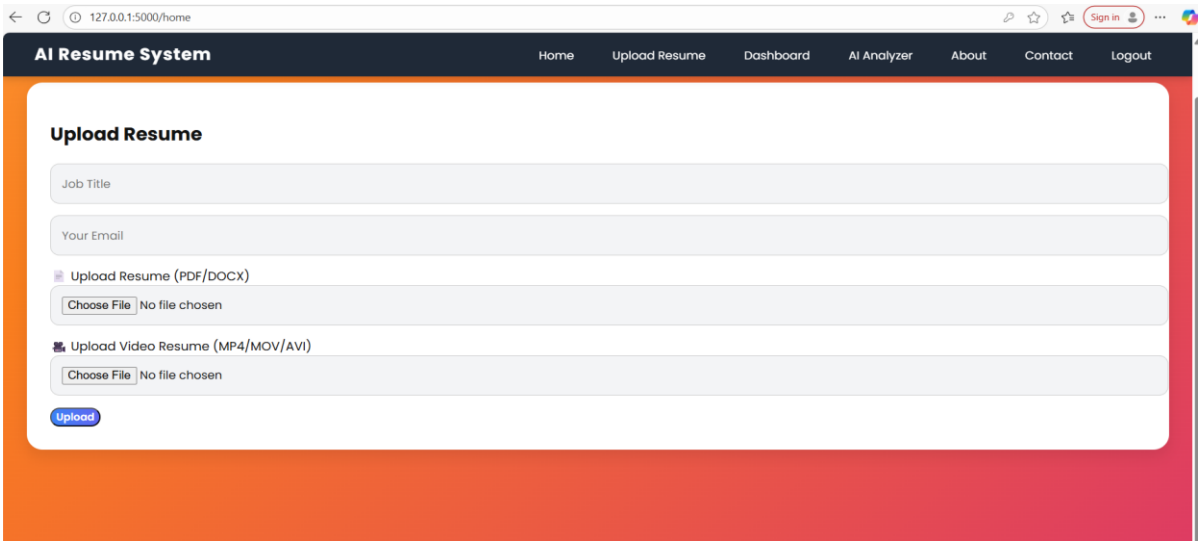


Figure 5: Admin Login Page

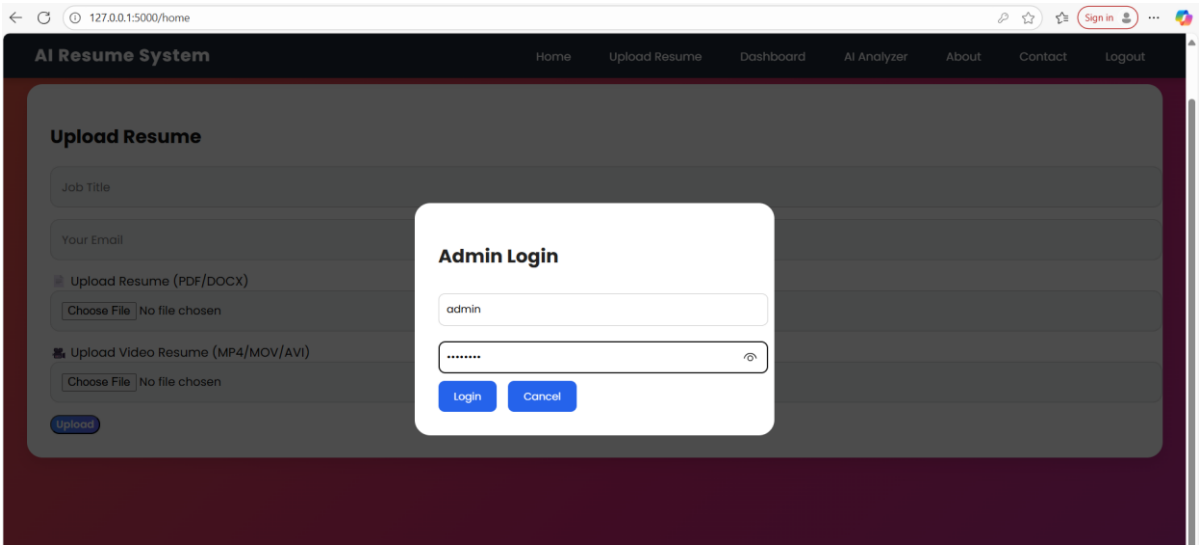


Figure 6: Admin Dashboard

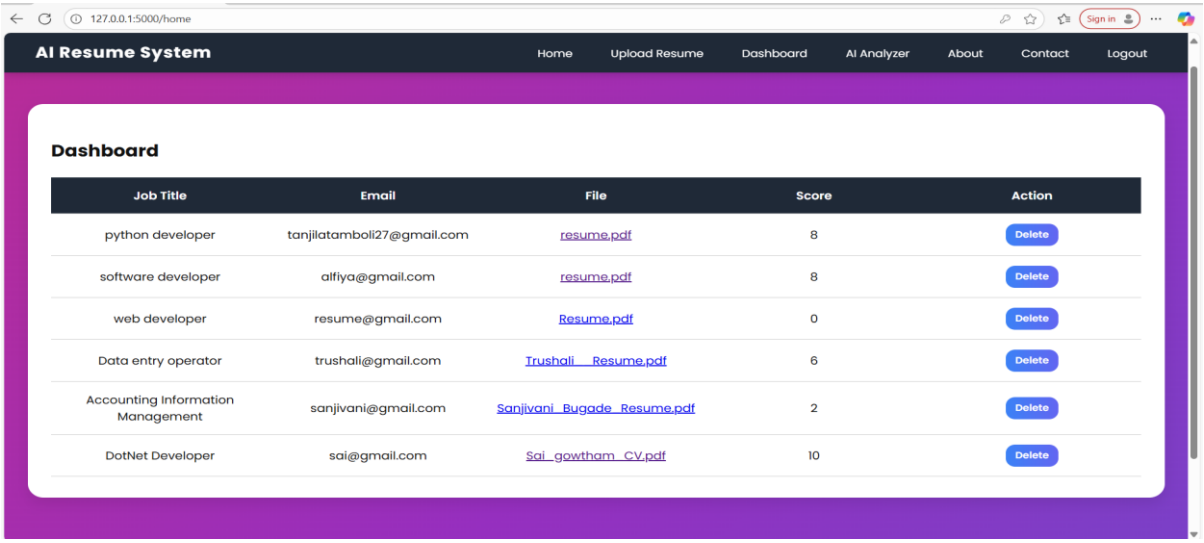
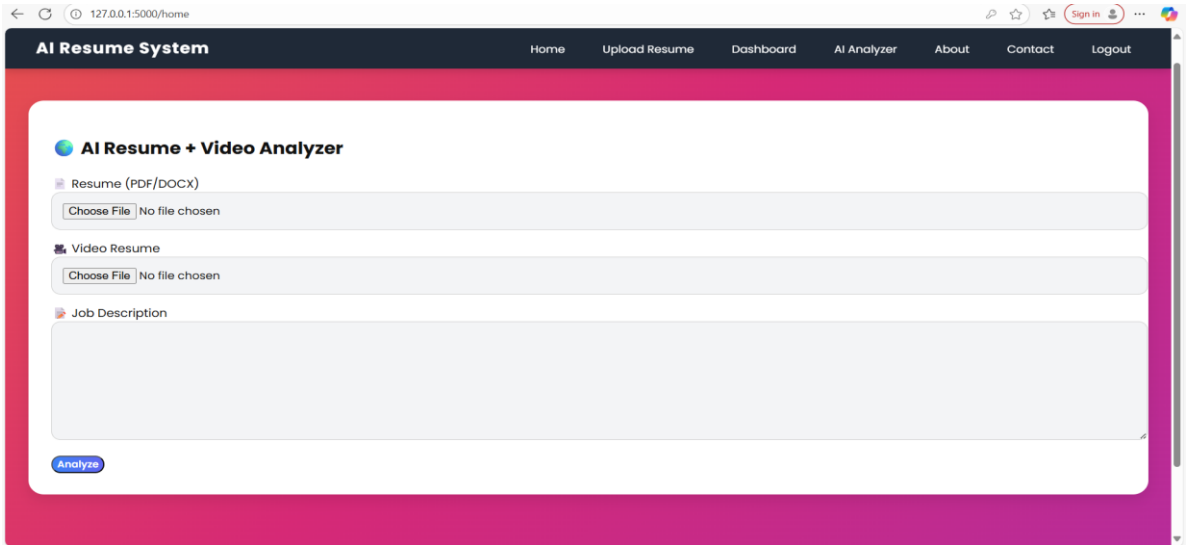


Figure 7: AI Analyzer Screen



6. Discussion

6.1 Strengths of the System

- **Cost and Time Efficiency:** Automating resume screening and evaluation reduces the time and effort required by HR teams, saving operational costs.
- **Improved Candidate Assessment:** The AI Analyzer accurately extracts skills, experience, and qualifications from resumes and videos, improving the quality of candidate shortlisting.
- **Streamlined Recruitment Process:** Provides a centralized platform for candidates and recruiters, avoiding manual tracking and errors.
- **Enhanced Candidate Experience:** Candidates can upload resumes and optional video introductions easily, receive feedback, and track their application status.
- **Increased Productivity for HR Teams:** By automating repetitive tasks like resume parsing and evaluation, HR staff can focus on strategic recruitment decisions.
- **Better Market Competitiveness:** Organizations can attract and identify top talent faster, making the hiring process more competitive and efficient.

6.2 Challenges and Limitations

- **User Training and Awareness:** Recruiters and candidates may need guidance on how to use the platform effectively, particularly for advanced features like video analysis.
- **Adaptation to AI Evaluation:** Some HR professionals may initially be hesitant to rely on AI-based assessments and may require confidence-building measures.
- **Video Resume Processing Limitations:** While video resumes provide additional insights, analysing them accurately can be computationally intensive and may require robust infrastructure.
- **No Integrated Interview Scheduling:** Currently, the system does not automatically schedule interviews; this step requires manual coordination by HR staff.

6.3 Future Scope

- **Mobile Application Development:** Creating a mobile version would improve accessibility for both recruiters and candidates, enabling on-the-go application management.
- **Integration of Secure Online Payments:** For premium recruitment services or assessments, adding payment gateways could streamline transactions.

- **Multilingual Support:** Adding multiple language options would make the system accessible to a wider range of candidates across different regions.
- **Advanced AI Features:** Future enhancements could include sentiment analysis of video resumes, predictive candidate scoring, and automated interview scheduling.
- **Analytics and Reporting:** Enhanced dashboards for recruiters could provide insights into hiring trends, candidate pool statistics, and recruitment efficiency.

7. Conclusion

The recruitment process in organizations is often time-consuming and prone to human errors, especially when handling a large number of applications. Traditional methods of screening resumes manually can be inefficient, inconsistent, and resource-intensive. To address these challenges, we developed the **AI-Based Resume Shortlisting System**, a technology-driven solution designed to automate the initial stages of recruitment.

Our system leverages AI and machine learning to analyse resumes and optional video introductions, extracting relevant skills, experience, and qualifications. This not only speeds up the shortlisting process but also ensures a fairer and more consistent evaluation of candidates. The platform provides an easy-to-use interface for both recruiters and candidates, allowing seamless resume uploads, status tracking, and skill analysis.

While the system has certain limitations, such as reliance on digital adoption by users and the need for robust infrastructure to process video resumes, it represents a significant step forward in modernizing recruitment practices. By reducing manual workload and improving candidate assessment, it enhances overall efficiency and productivity in hiring.

With future enhancements like **mobile app development**, **integration of secure online payment gateways** for premium services, **multilingual support**, and advanced analytics, the system has the potential to transform recruitment processes, making them faster, smarter, and more accessible. Ultimately, this platform empowers organizations to identify top talent efficiently while providing candidates with a smoother and more transparent application experience.

8. References

1. Ravula, A., Kumar, S., “Automated Resume Screening Using NLP Techniques,” *International Journal of Computer Applications*, 2022, Volume 184, Issue 5.
2. Lopez, M., “AI-Driven Job Matching and Candidate Ranking Models,” *Journal of Artificial Intelligence Research*, 2024, Volume 12, Issue 3.
3. Sharma, R., Patel, D., “Video Resume Analysis for Candidate Assessment: Speech and Facial Feature Evaluation,” *International Journal of Human-Computer Studies*, 2021, Volume 156, Issue 2.
4. Ravula, A., Kumar, S., “Integrating Text and Video Analysis for Candidate Shortlisting,” *Journal of Emerging Technologies in AI*, 2022, Volume 8, Issue 7.
5. Li, X., Chen, Y., “Natural Language Processing for Automated Resume Parsing,” *IEEE Transactions on Knowledge and Data Engineering*, 2023, Volume 35, Issue 4.
6. Smith, J., “Machine Learning Approaches for Predictive Candidate Selection,” *International Journal of Data Science and AI*, 2022, Volume 10, Issue 6.
7. Tan, P., Kumar, R., “End-to-End AI Recruitment Systems: Trends, Challenges, and Opportunities,” *Journal of AI Research and Applications*, 2023, Volume 15, Issue 2.

8. Das, A., "Multilingual Resume Processing Using NLP for Global Recruitment," *International Journal of Computational Linguistics*, 2024, Volume 11, Issue 1.
9. Zhang, L., "Improving Recruitment Efficiency with AI-Powered Candidate Screening," *International Journal of Human Resources Technology*, 2023, Volume 9, Issue 5.