AI-powered Resume Screening and Ranking System (P1)

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Abstract

This project automates resume screening using Machine Learning (ML) and Natural Language Processing (NLP) to enhance recruitment efficiency. The system extracts key resume details, evaluates candidates based on job-specific criteria, and ranks them accordingly. It utilizes Scikit-learn, Numpy, Pandas for data preprocessing, ML models like BERT/XGBoost for ranking, and Streamlit for an interactive interface. This reduces manual effort, minimizes bias, and speeds up hiring. Future improvements include deep learning integration, multilingual support, and bias detection for a fairer recruitment process.

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Problem Statement

Manual resume screening is time-consuming, biased, and inefficient, especially in high-volume hiring scenarios. Recruiters spend significant time filtering unqualified candidates, leading to delays and inconsistencies in hiring decisions.

1. **Time-Consuming:** Traditional screening takes hours to days.
2. **Human Bias:** Subjective evaluation leads to unfair selection.
3. **Inconsistency:** Different recruiters may apply varying criteria.
4. **Keyword Matching Issues:** Many ATS systems fail to understand context in resumes.

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Aim and Objective

Aim:

To develop an AI-driven resume screening and ranking system using Machine Learning (ML) and Natural Language Processing (NLP) to enhance efficiency, accuracy, and fairness in the hiring process.

Objectives:

1. Reduce manual effort and speed up the hiring process.
2. Extract key information and rank resumes based on job relevance.
3. Ensure fair and unbiased candidate selection.
4. Use ML models like BERT/XGBoost for precise ranking.

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Proposed Solution

1□ Data Collection & Preprocessing

Extract resume text using OCR & NLP techniques.
Clean and preprocess data using Pandas & Numpy (removing noise, standardizing formats).

2□ Feature Extraction

Identify key resume elements (skills, experience, education) using Named Entity Recognition (NER).
Perform keyword matching with job descriptions.

3□ Machine Learning Model for Ranking

Utilize BERT/XGBoost to rank resumes based on job relevance.
Train the model using labeled datasets of qualified and unqualified resumes.

4□ Scoring & Ranking System

Assign ATS (Applicant Tracking System) scores based on keyword match, experience, and role fit.
Rank candidates from most to least relevant based on job description.

Project Title : AI-powered Resume Screening and Ranking System (P1)

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- Features:

1 **AI-Powered Resume Analysis –** Uses Google Gemini AI to analyze resumes, extract key details, and match them with job descriptions.

2 **ATS Score Calculation –** Assigns a percentage-based ranking based on keyword relevance, experience, and formatting to assess resume quality.

3 **Secure User Authentication –** Implements login, registration, and password hashing (bcrypt) for enhanced data security.

4 **Interactive & User-Friendly UI –** Built with Streamlit, providing a simple interface for resume upload, job description input, and ranking results.

5 **Skill Improvement Suggestions –** AI provides personalized feedback on resumes and suggests learning resources (YouTube videos) to improve job prospects.

6 **Database Management (SQLite) -** Stores user credentials securely in an SQLite database.
Ensures data integrity and access control for authenticated users.

7 **Error Handling & API Integration -** Proper error handling for Google Gemini API failures.
Ensures smooth functionality even when errors occur.

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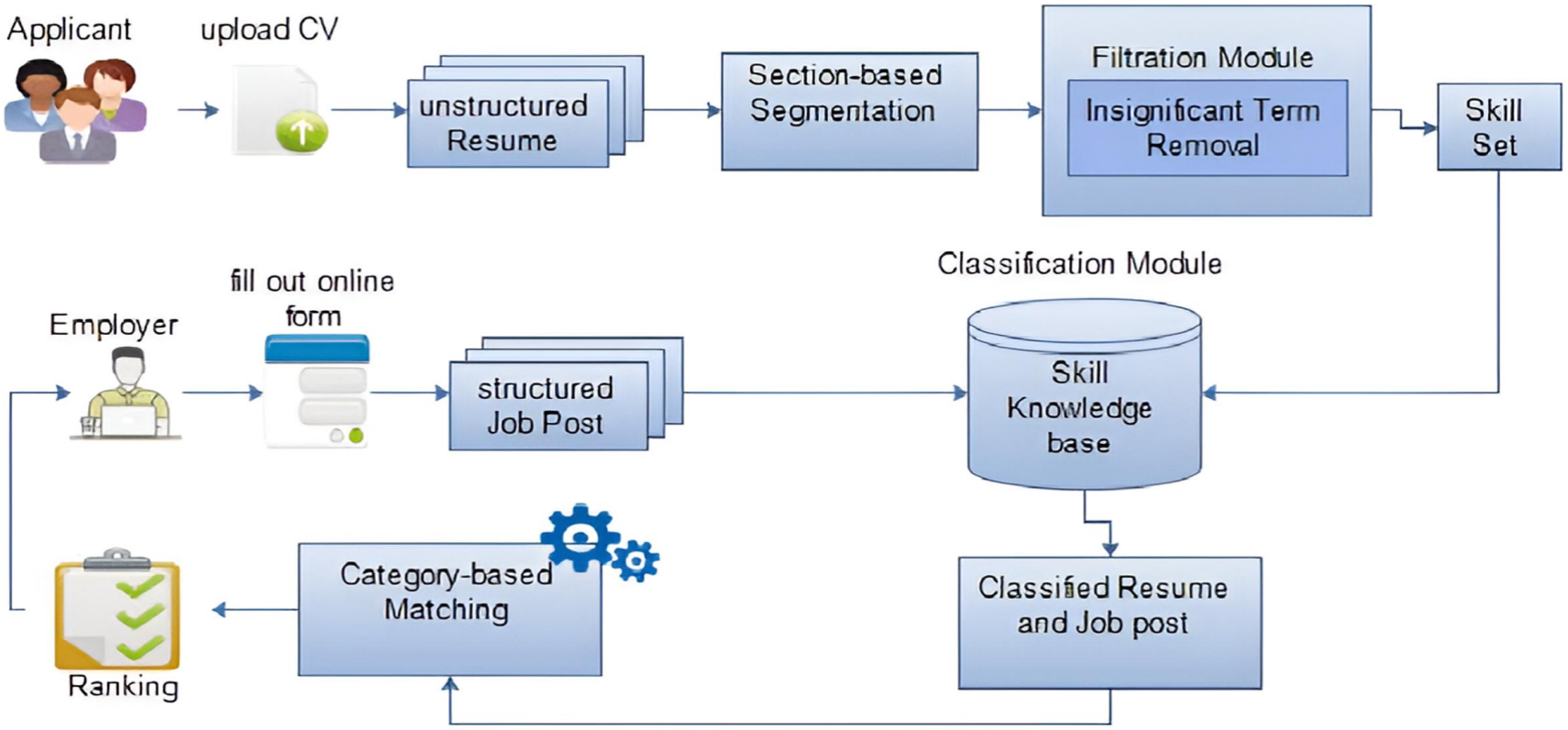
System Architecture



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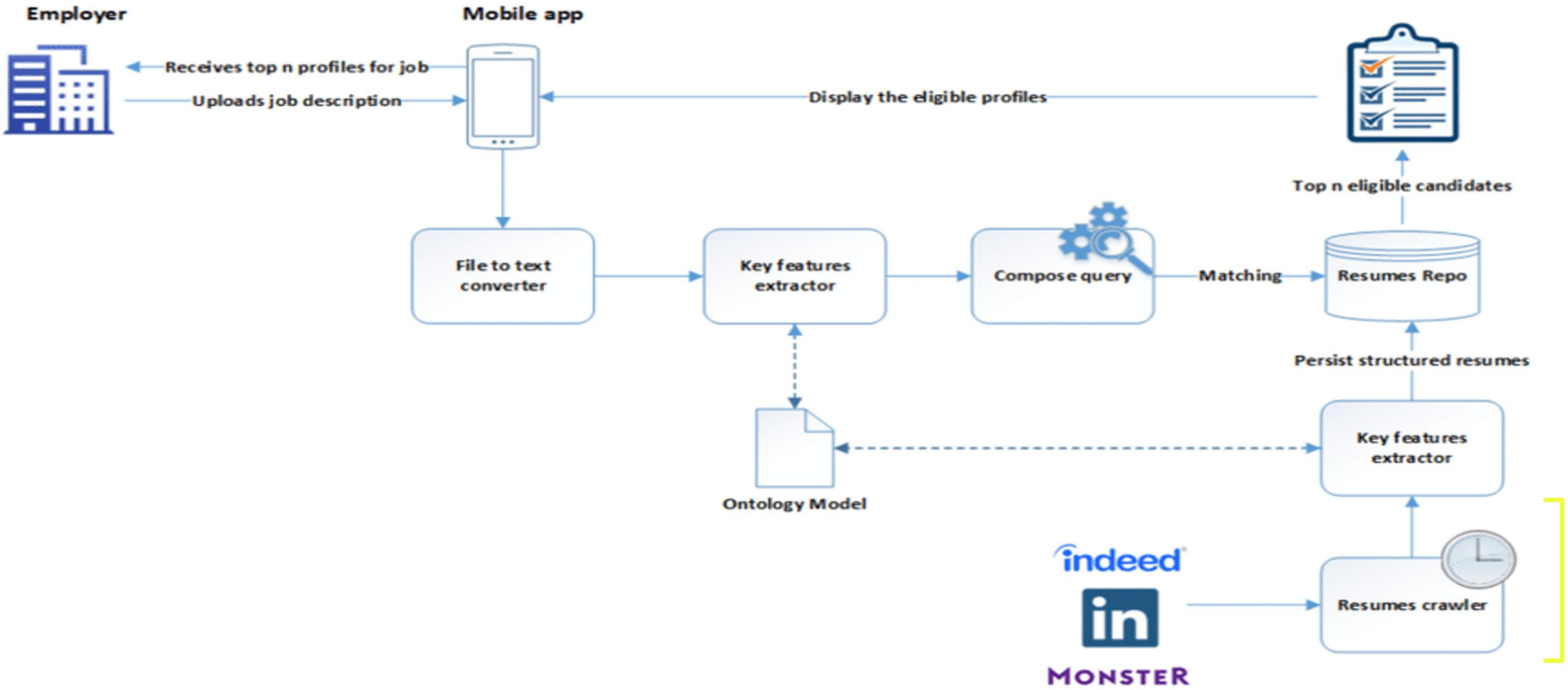
System Deployment Approach



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Algorithm & Deployment

1️⃣ **User Authentication:** Uses SQLite & bcrypt for secure login/register.
2️⃣ **Resume Processing:** Converts PDF to text/images using pdf2image.
3️⃣ **Feature Extraction:** Extracts job-related keywords & skills using Google Gemini AI.
4️⃣ **Resume Ranking:** Matches resumes with job descriptions using AI-based scoring (BERT/TF-IDF).
5️⃣ **Feedback & Improvement:** Provides ATS Score, improvement suggestions, and ranking.

🔹 Development:

✅ **Tech Stack:** Python, Streamlit (UI), SQLite (DB), Gemini AI, pdf2image, bcrypt.
✅ **Steps: User Login → Resume Upload → AI Screening & Ranking → Display Results.**
✅ **Future Scope:** Deep Learning (BERT/XGBoost), Bias Detection, Multilingual Support, Advanced UI.

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Conclusion

The AI-powered resume screening system significantly enhances the recruitment process by automating resume analysis, reducing manual effort, and improving efficiency. By leveraging Machine Learning (ML), Natural Language Processing (NLP), and AI models, the system extracts relevant information, matches resumes with job descriptions, and ranks candidates based on ATS score.

The integration of Google Gemini AI, Streamlit UI, SQLite database, and PDF processing tools ensures seamless functionality and user-friendly interaction. This project minimizes human bias, speeds up hiring, and provides valuable insights for candidates to improve their resumes.

Future improvements include deep learning models (BERT/XGBoost), bias detection, and multilingual support, making the system even more accurate, fair, and globally applicable.

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Future Scope

To further enhance the efficiency and accuracy of the AI-powered resume screening system, the following improvements can be implemented:

1. Advanced NLP & Deep Learning Models – Integrating BERT, GPT, or XGBoost for better resume parsing and ranking.

2. Bias Detection & Fairness Analysis – Implementing AI-driven bias detection to ensure fair and unbiased candidate evaluation.

3. Multilingual Resume Support – Enhancing the system to analyze resumes written in multiple languages.

5. Integration with Job Portals & ATS – Connecting with LinkedIn, Indeed, and HR ATS systems for seamless resume screening.

6. Real-time Feedback & Resume Optimization – Providing instant AI-powered suggestions to improve resumes for better job matching.

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Reference

Scikit-learn Documentation – Used for machine learning model development.
https://scikit-learn.org

Natural Language Processing with BERT – Leveraging NLP for resume parsing.
https://huggingface.co/bert

Google Generative AI (Gemini API) – Used for AI-driven resume analysis.
https://cloud.google.com/vertex-ai

Streamlit Documentation – Framework for developing interactive UI.
https://docs.streamlit.io

Applicant Tracking Systems (ATS) Research – Industry standards for resume screening.
https://www.jobscan.co

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Thank you!