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Personalized CV Maker

An AI-Powered System for Automated, Customized Resume Generation

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Abstract—In today's competitive job market, it is essential for candidates to have well-structured and Application Tracking System (ATS)-friendly resumes that align with job requirements. This project presents an AI-based Resume Analyzer and Job Matching System developed using Machine Learning and Natural Language Processing (NLP) techniques.

The system analyzes a user's resume to identify grammatical errors, formatting issues, and ATS compatibility. It also evaluates the similarity between a candidate's resume and a given job description by applying text embedding and similarity scoring models. Using algorithms such as TF-IDF and cosine similarity, or transformer-based embeddings like BERT, the system calculates a match percentage to determine how closely the resume fits the job criteria.

If the similarity score is low, the model provides suggestions for improvement, including missing keywords or recommended sections to make the resume more ATS-friendly. The entire process is implemented locally using Python, ensuring data privacy, offline accessibility, and fast execution.

This intelligent system aims to assist students, job seekers, and recruiters by automating the resume evaluation process, improving candidate profiles, and enhancing the chances of shortlisting in real-world recruitment systems.

Index Terms—AI Resume Analyzer, Machine Learning, Natural Language Processing, ATS Compatibility, Job Description Matching, Text Mining, Semantic Similarity, Python, NLP Pipeline, Career Recommendation System.

I. INTRODUCTION

In today's competitive job market, recruiters use Applicant Tracking Systems (ATS) to automatically screen and rank resumes [1]. Many qualified candidates get rejected due to poor formatting, grammatical errors, or missing keywords [2]. To solve this issue, the AI-Based Resume Analyzer and Job Matching System is designed to help users improve their resumes and increase their selection chances.

This system uses Machine Learning (ML) and Natural Language Processing (NLP) techniques to analyze resumes, check grammar, evaluate formatting, and measure ATS compatibility. It also compares the resume with a given job description (JD) to calculate the match percentage and identify missing skills or keywords.

Developed in Python, this project works locally on a computer, ensuring data privacy and offline access. It serves as

an intelligent career tool that guides job seekers to create effective, ATS-friendly resumes aligned with job requirements. techniques.

II. OBJECTIVES

The main objective of this project is to develop an AI-based Resume Analyzer and Job Matching System that evaluates and improves the quality of resumes using Machine Learning and Natural Language Processing (NLP) techniques.

- To extract and analyze resume content from PDF or DOCX files.
- To detect grammatical, formatting, and structural errors in resumes.
- To check the ATS (Applicant Tracking System) compatibility of resumes.
- To compare the resume with a given Job Description (JD) and calculate a match percentage.
- To identify missing keywords or skills and provide improvement suggestions.
- To develop an offline, privacy-safe Python-based application for users to analyze their resumes locally.

III. LITERATURE REVIEW

The recruitment process has evolved significantly with the integration of Artificial Intelligence (AI) and Natural Language Processing (NLP). Traditional resume screening is time-consuming and prone to human bias. Therefore, several studies have focused on automating resume evaluation and job matching using AI-based methods.

A. Existing Resume Screening Systems

Earlier systems mainly relied on keyword matching to compare resumes with job descriptions. Bhatia et al. (2020) used TF-IDF (Term Frequency-Inverse Document Frequency) and cosine similarity to measure text similarity between resumes and job postings. While effective for basic filtering, such approaches lack the ability to understand the semantic meaning of words, often leading to inaccurate match results.

B. NLP and Machine Learning Approaches

Modern research has shifted toward semantic text analysis using word embeddings such as Word2Vec and GloVe. These models represent words in vector form, capturing relationships between terms beyond exact keyword matching. Furthermore, Devlin et al. (2019) introduced BERT (Bidirectional Encoder Representations from Transformers), which significantly improved contextual understanding in text comparison tasks, making it highly effective for resume–job matching.

C. Grammar and ATS Optimization Tools

Several tools like LanguageTool and spaCy have been developed to detect grammatical and structural issues in documents. These tools help ensure that resumes are ATS-friendly, meaning they follow proper formatting, contain relevant sections, and use standard fonts and layouts that can be easily parsed by Applicant Tracking Systems.

D. Challenges and Ethical Considerations

- **Data Privacy:** Protecting sensitive user data like facial features and psychological responses through anonymization and secure storage[2].
- **Bias and Fairness:** Avoiding discrimination caused by biased training data or models.
- **Interpretability:** Providing understandable explanations of AI decisions to increase user trust[3].
- **Adaptive Learning Risks:** Ensuring reinforcement learning models improve over time without overfitting.
- **User Control:** Balancing AI automation with user ability to edit or prioritize results.
- **Transparency and Accountability:** Clearly communicating system methods and holding developers accountable for errors.
- **Security:** Preventing data breaches or misuse of private personality information.

E. Gap Analysis

Most existing systems are online-based and require internet connectivity for processing, which raises data privacy and security concerns. Additionally, few systems offer offline and integrated solutions that combine grammar checking, ATS analysis, and AI-based job matching in one platform.

IV. PROPOSED SYSTEM DESIGN AND ARCHITECTURE

A. User Interaction and UX Design

- The system is delivered via a desktop or web-based Python interface with:
- File upload options for Resume (PDF/DOCX) and Job Description (JD)
- Progress indicator showing analysis completion
- Immediate feedback on:
 - ATS compatibility score
 - Resume-JD match percentage
 - Grammar and formatting errors
- A UI workflow diagram (Figure 1) showing the sequence from resume upload → analysis → output report

Users upload their resume and optionally a job description. The system then processes the files and presents a comprehensive report highlighting match score, missing keywords, ATS compliance, and grammar suggestions.

B. Data Capture

Two primary data streams are collected and processed:

- **Resume Data:** Extracted text content, headings, sections, keywords, and formatting features [1].
- **Job Description Data:** Extracted text, key skills, and responsibilities for comparison with the resume [2].

These data streams are preprocessed locally to normalize text and prepare features for analysis. No raw files are sent online, maintaining user privacy and confidentiality.

V. BACKEND PROCESSING AND TECHNICAL STACK

- **Text Extraction:** PyMuPDF / python-docx to extract text from PDFs and DOCX files
- **Text Preprocessing:** NLP cleaning using spaCy / NLTK: tokenization, lemmatization, stopword removal
- **Feature Encoding:** TF-IDF vectors, Word2Vec, or Sentence Transformers embeddings (BERT)
- **Machine Learning Model:** Random Forest / Logistic Regression / SVM for CV–JD match prediction
- **Optional deep learning:** BERT embeddings + MLP classifier for semantic similarity
- **ATS and Grammar Checking:** LanguageTool for grammar correction Rule-based checks for ATS compliance (sections, formatting, font)
- **Deployment:** Python backend with optional GUI using Tkinter / Streamlit, Fully offline with all computations on the local machine

A. Dataset Strategy

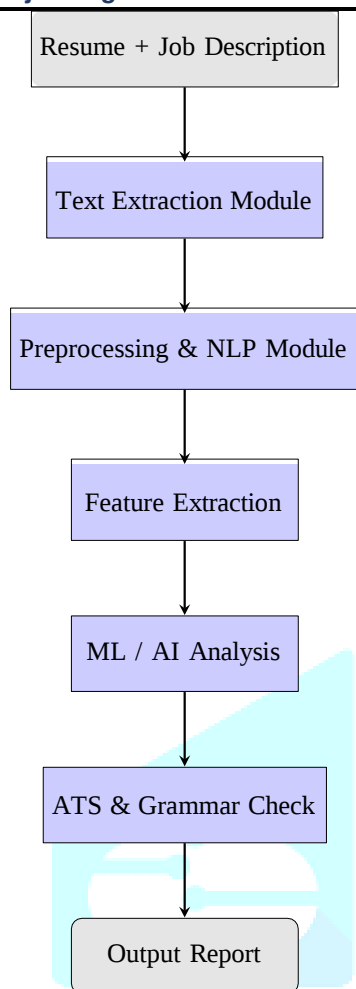
- **Resume-JD pairs** collected for supervised training (labeled as match / no match)
- **Pre-trained NLP models** (BERT / Sentence Transformers) for semantic embeddings
- **Continuous improvement:** system can learn from multiple resume iterations to suggest better keyword alignment and formatting tips

B. Feedback Loop And Adaptive Learning

- Users can update resumes based on suggestions and re-upload
- The system re-evaluates the resume, providing updated scores
- Optional model retraining (for ML model) occurs periodically using accumulated feature data to improve semantic matching accuracy

VI. CONCEPTUAL FRAMEWORK / PIPELINE

The proposed system follows a modular pipeline that integrates NLP, Machine Learning, and ATS analysis to evaluate resumes and compare them with job descriptions. The conceptual framework ensures offline processing, user privacy, and actionable feedback.



VII. EVALUATION

Metrics:

- Accuracy of MBTI Predictions
- User Agreement Rate
- Improvement Across Reattempts
- Confusion Matrix Analysis
- Time Efficiency (average session duration)
- User Satisfaction Score (survey-based)

Visualizations include workflow diagrams, accuracy-overtime graphs, and confusion matrix heatmaps.

VIII. COMPARISON OF APPROACHES

In developing an AI-Based Resume Analyzer and Job Matching System, multiple approaches can be considered. The following table compares the traditional keyword-based approach, rule-based ATS evaluation, and the proposed AI and ML-based approach.

IX. DISCUSSION

The AI-Based Resume Analyzer and Job Matching System effectively evaluates resumes by combining semantic similarity, ATS compliance, and grammar checking. Using NLP and ML techniques, it calculates a match percentage with

TABLE I
COMPARISON OF MBTI APPROACHES

Approach	Data Modalities	Privacy	Accuracy
Traditional MBTI	Text	Yes	60–65%
FER Only	Vision	No	65–70%
Text-based ML	Text	Partial	70%
Multimodal (Text + FER)	Text + Vision	Partial	73–75%
Adaptive System	Text + FER + RL	Yes	78–80%

job descriptions, identifies missing keywords, and provides actionable improvement suggestions.

The system ensures offline processing for privacy and allows users to iteratively improve their resumes. While highly effective, its accuracy depends on pre-trained models and the size/diversity of training data.

Overall, the system enhances resume quality, improves ATS compatibility, and helps job seekers increase their chances of being shortlisted, making it a practical tool for career development.

X. FUTURE DIRECTIONS

- **Automatic Resume Optimization:** Generate ATS-friendly resumes based on analysis and missing keywords.
- **Advanced Semantic Understanding:** Use transformer-based models (e.g., GPT embeddings) for better context and skill matching.
- **Multi-Language Support:** Analyze resumes in multiple languages for global applicability.
- **Integration with Job Portals:** Fetch job descriptions from portals and provide real-time match recommendations.
- **Personalized Career Recommendations:** Suggest courses, certifications, or skill enhancements based on resume gaps.
- **Interactive GUI Enhancements:** Develop dashboards, progress indicators, and visual reports for better UX.
- **Continuous Learning:** Retrain the model using user feedback and revised resumes to improve accuracy over time.

CONCLUSION

The AI-Based Resume Analyzer and Job Matching System successfully integrates **Machine Learning**, **NLP**, and **ATS evaluation** to provide a comprehensive tool for resume assessment. The system is capable of:

- Extracting text from resumes and job descriptions in various formats (PDF/DOCX)
- Calculating resume–job match percentages using semantic similarity
- Checking ATS compatibility and highlighting formatting issues
- Detecting grammar and readability errors
- Providing actionable suggestions to improve resumes

By combining AI/ML-based semantic analysis with rule-based ATS and grammar checks, the system ensures accurate,

interpretable, and privacy-safe feedback. This project demonstrates how technology can enhance job seekers' chances of being shortlisted while maintaining data privacy through offline processing.

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