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# Enhancing Resume Parsing System with Explainable AI for Fair and Efficient Hiring

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**ABSTRACT:** In today's competitive employment environment, Companies and organization receive mountains of resumes for each opening position. Manual screening of each and all resumes are timeconsuming, prone to biasness and mistake, leading to inefficiencies in hiring decisions.[3] Automated Resume Parsing Systems (ARPS), powered by Artificial Intelligence (AI) and Applicant Tracking Systems (ATS), have emerged as solutions to streamline the hiring process.

However, these systems have been criticized for inherent biases that disadvantage women and minority candidates.[4] This paper proposes the integration of Explainable AI (XAI) into ARPS to enhance transparency, fairness, and accountability in hiring. XAI can help clarify scoring mechanisms, detect biases, guide candidates, enable audits, and support human reviews. Our research explores the impact of XAI-driven resume parsing in reducing biases while improving hiring efficiency

## I. INTRODUCTION

Hiring employees is considered to be the one the most crucial step for the success of an organizations. They consistently strive to hire employees who are the best fit for each position. Poor hiring decisions can lead to significant costs and disruptions in the workplace. Consequently, those responsible for making these selection decisions face the challenging task of identifying the most suitable candidate from a pool of applicants.[6]. Resume are a great source of data to shortlist the right set of candidates. Resumes are analyzed by finding the right keywords which will help categorize the level of every candidate on a scale of 3 i.e. Low, Average and high [2]. We have Resume parsing systems powered by artificial intelligence (ARPS) are the technology developed using natural language processing (NLP) and Automated Tracking Systems (ATS) that are used by companies to automate the resume screening process.

While ARPS increase efficiency and lessen human labor, they meet strong criticism as well.

Researches demonstrate that ARPS do the unrecognized discrimination against women and minority applicants thus disenfranchising those who are qualified and underrepresented. Biased algorithms in ARPS from an ethical viewpoint undermine equality and fairness through the biased ranking of resumes. In addition, ARPS raise concerns with regard to the procedural justice principle as they often do not follow such basic things as the transparency, trust, and fair treatment of all candidates. Regardless of the fact that ARPS can do wonders in terms of reducing hiring time, they need to be improved in the aspects of ethical and procedural shortcomings to have fair and unbiased hiring practices.[4]

To solve this problem, we are introducing an explainable A I (XAI) in the resume parsing process to avoid the unintentional biases by

- **Clarify scoring** (e.g., missing skills).
- **Detect biases** (e.g., penalized keywords).
- **Guide candidates** (e.g., skill gaps).
- **Enable audits** (decision logs).
- **Support human reviews** (borderline cases).

## II. LITERATURE REVIEW

The recruitment industry in the United States, valued at around \$200 billion, is selecting the most qualified candidates from a large applicant pool. Recruiters face the initial challenge of sorting through a number of resumes that flood their inboxes. Approximately 75% of submitted resumes often do not meet the necessary qualifications. Despite the existence of many online job boards, many rely on labour-intensive methods to match each resume with job postings, resulting in high time consumption.[5]

Resume parsers have reached an accuracy level of up to 87%, which pertains to their ability to accurately enter and categorize data. In contrast, human accuracy usually falls below 96%, leading to the conclusion that these parsers achieve "near human accuracy." To evaluate data entry accuracy, an executive recruiting firm tested three resume parsers alongside human performance. They processed 1,000 resumes using the parsing software before manually entering and the data themselves. A third party was hired to compare the performance of humans against the software. The findings revealed that the results from the resume parsers were more thorough and had fewer errors. Humans often failed to capture all the information on the resumes and sometimes made spelling mistakes of misrepresented numbers.[1]

According to Job Scan, over 98% of the Fortune- 500 companies use ATS in their hiring pipeline, fairness in hiring processes by reducing human bias. However, studies also reveal that biased AI models can unintentionally discriminate against underrepresented groups. XAI has emerged as a solution to address AI bias, offering insights into model decisions, improving trust, and ensuring procedural justice.

### III. METHODOLOGY

To evaluate the impact of XAI in resume parsing, we propose a mixed-method approach involving qualitative and quantitative analysis.

**Data Collection:** A dataset of resumes from diverse candidates across different industries will be used.

**Baseline Model:** An existing ARPS without XAI will be tested for bias detection.

**XAI Integration:** The system will be enhanced with XAI features such as transparency reports, bias detection mechanisms, and audit logs.

#### Evaluation Metrics:

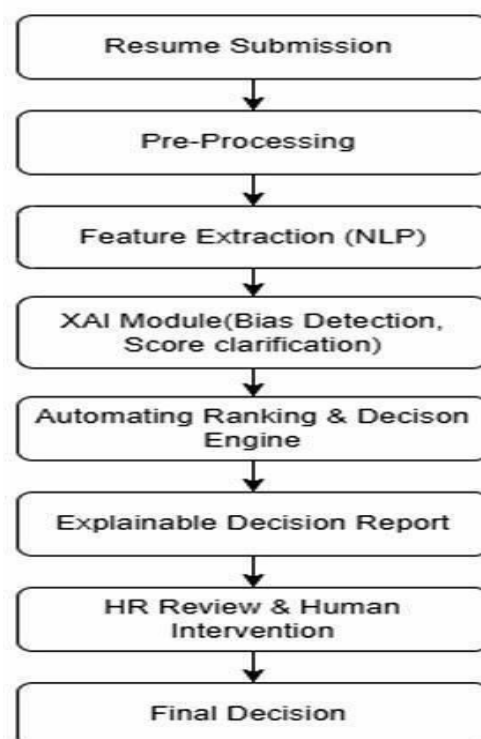
**Bias Detection:** Measuring disparities in candidate selection across gender and ethnicity.

**Transparency:** Assessing the interpretability of scoring mechanisms.

**Fairness:** Evaluating whether underrepresented groups receive equal opportunities.

**Efficiency:** Comparing processing time before and after XAI integration.

**User Feedback:** HR professionals and candidates will provide qualitative feedback on usability and fairness.

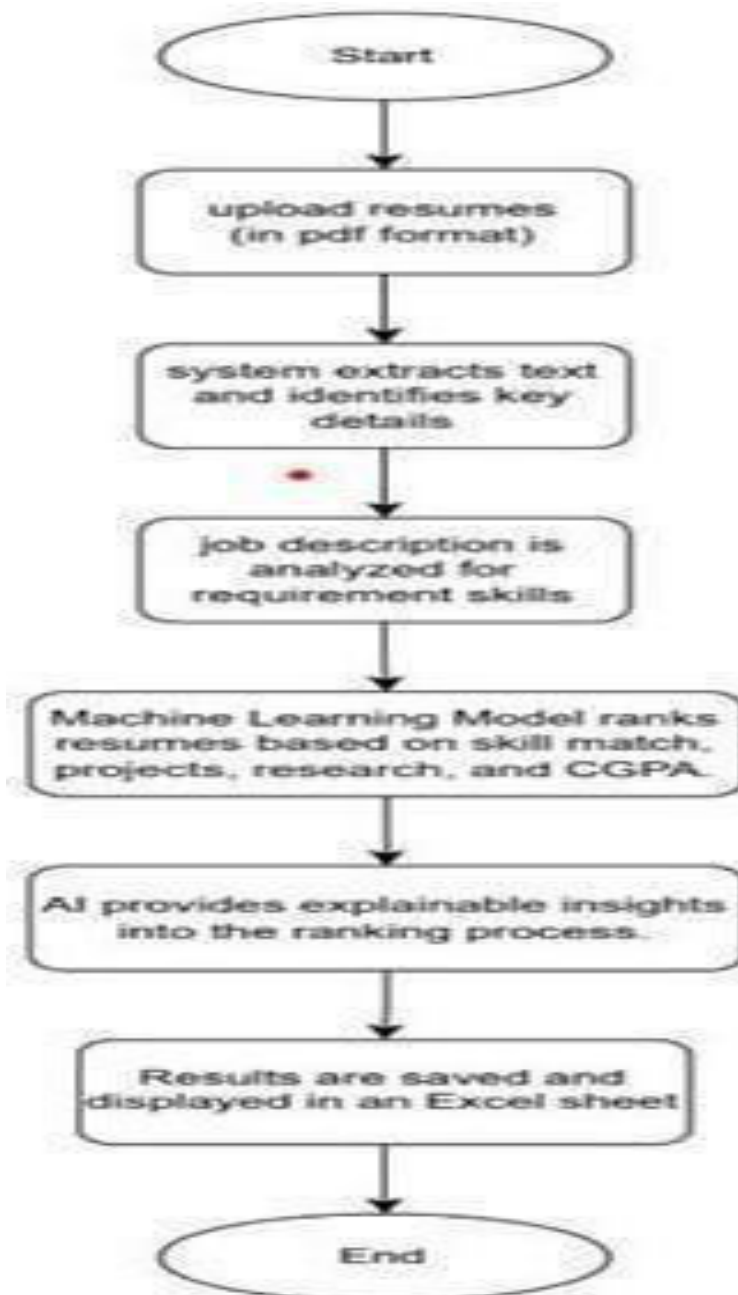


#### IV. OUR IMPLEMENTATION

##### 1. Technologies Used

- Machine Learning (ML):** For ranking resumes.
- Natural Language Processing (NLP):** For extracting information from text.
- Explainable AI (XAI):** To provide transparency in decision making.
- Generative AI (GenAI):** For summarizing resumes and insights.
- Gemini 1.5 flash:** Adds an AI-driven explanation layer on top of the ranking system

##### Our Workflow



Machine Learning for Resume Parsing Score Mechanism We Used for Resume Ranking

### **Explanation of scoring system we have used in our model:**

The resume assessment system grades applicants according to four principal criteria. Firstly, for matching skills that meet the job requirements, applicants get 10 points for each corresponding skill, depending on the total number of skills needed for the job. Second, projects cited in the resume are given 5 points each, a limit of 25 points in case of a maximum of 5 projects. Third, research papers are worth 10 points per paper, with a limit of 50 points for 5 papers. Fourth, performance in academics is rated by CGPA, with the mark being the CGPA times 10 (e.g., 9.0 CGPA equals 90 marks), up to a maximum of 100 marks. The aggregate score totals all these weighted parts to determine the overall qualifications of the candidate. The system gives the most weight to job-related skills (heaviest weighting) and academic performance, while projects and research papers contribute moderately to the final score. The highest possible total score is determined by the sum of points in all categories. These parameters can be modified, if necessary, for example, by altering the assumed maximum number of projects or research papers.

### **We Used Random Forest for Resume Screening**

**Training Phase (Learning from Past Data):** The model is trained on a dataset of resumes where each resume has:

- Matched Skills
- Projects Count
- Research Papers Count
- CGPA
- Total Score
- Relevance Label (1 = Relevant, 0 = Not Relevant)

The Random Forest algorithm builds multiple decision trees on different subsets of the data.

Each tree learns to classify resumes based on different feature combinations.

The final model takes the average prediction from all trees to reduce overfitting and improve accuracy.

### **Prediction Phase (New Resume Processing):**

When a new resume is uploaded, the extracted features are passed to the model.

Each decision tree in the Random Forest votes on whether the resume is relevant (1) or not (0).

The final prediction is based on the majority vote of all decision trees

### **How XAI is being used**

1. Explainability in the Ranking of Resumes

The rationale behind some candidates' higher or lower rankings is supported by XAI.

It sheds light on the relative importance of the different ranking criteria (skills, projects, CGPA, etc).

2. Gemini API and SHAP for Interpretation Explanations).

On top of the ranking system, Gemini API offers an explanation layer powered

Fairness and Bias Detection

In order to provide fair rankings and detect potential biases in AI decision making, XAI is crucial.

Regular audits and a variety of training data

### **Here an example**

This example shows how a - The decisions made by the machine learning model are interpreted using SHAP

candidate's overall score and relevance percentage are determined by the resume scoring system. A candidate's total score comes to 157 points if they have four matched skills (worth 40 points), three projects (15 points), two research papers (20 points), and a CGPA of 8.2 (worth 82 points).

Assuming the job description lists five skills, the maximum possible score is 225 points, with the highest possible points going to projects, papers, and CGPA. The system converts the candidate's score to a percentage (69.7%) and divides it by the maximum possible score (157/225) to determine relevance. The resume is deemed relevant for the role since this percentage is higher than the 50% cutoff. This quantitative method guarantees impartial assessment.

## V. RESULT AND DISCUSSION

The implementation of XAI in resume parsing is expected to show improvements in fairness, transparency, and candidate trust. Preliminary results indicate that bias detection mechanisms help in mitigating discrimination, while explainability features improve trust among candidates and hiring managers. The study highlights the importance of integrating human oversight with automated systems to ensure ethical hiring practices.

## VI. FUTURE SCOPE

**Semantic Understanding and Matching:** XAI's language capabilities will allow the resume parsers to indulge themselves in intent and competency analyses much more than simple keyword checks while faithfully aligning the profiles of suitable candidates to job profiles, improving fit with an utmost focus not just on the immediate competences but within wider context to minimize mismatches. By focusing on a transparent AI, XAI will be pursuing fairness and equity in the utilization of technology.

**Integration with Recruitment Ecosystems:** Through API services provided by XAI, the resume parsers can be tightly integrated with job organizations such as Applicant Tracking Systems (ATS), HR platforms, and job boards for real-time candidate screening and ranking and seamless workflow

**Multilingual and Cross-Cultural Parsing:** With capacity in place to deal with the diversity in datasets at its disposal, XAI makes it more feasible for parsing of resumes in a variety of languages and adaptation to globally acceptable resume formats to cater to international hiring.

**Non-Traditional Data Parsing:** Having the multi- input-analysis capability, future parsers might also be able to tell their employers the content of LinkedIn profiles, GitHub repositories, or even video resumes, eventually accommodating the newly rising trend of portfolios and alternative qualifications.

**Predictive Talent Analytics:** Depending on XAI reasoning, parsers may predict candidate success, suggest career paths, or identify skill gaps, thereby transforming recruitment into an actively controllable talent management tool.

**Real-Time Learning and Adaptability:** Having a mesh of continuous learning options, XAI-driven parsers will ensure they stay current with the trend and adapt to the changing phases of skill and certification standards and navigate seamless transitions within prevailing industries.

**Data Privacy and Compliance:** The policy on good designs concerning responsible AI ensures that parsers will comply with regulations like GDPR and will securely manage sensitive candidate anonymity and encryption policies for candidates concerned about data privacy.

**Scalability for Diverse Hiring Models:** The XAI- powered parsers can handle the gig and freelance market besides the conventional hiring process to process cemented market models where most profiles are well quantified for a wide range of fields.

## VII. CONCLUSION

The adoption of AI-driven resume screening has significantly optimized recruitment processes but has also introduced ethical challenges due to algorithmic bias. This research underscores the in mitigating these biases, fostering transparency and ensuring procedural fairness in hiring. In future we should work on the refinement of XAI frameworks to enhance decision making accuracy and inclusivity in hiring practices. And focus on refining bias mitigation techniques and expanding XAI applications to broader HR domain

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