ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb870

Explainable AI-Based Resume Screening System to Reduce Hiring Bias in Fresher Recruitment

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Publication Date: 2026/02/28

Abstract: The swift digital transformation of recruitment processes has resulted in the widespread implementation of Artificial Intelligence (AI)–driven resume screening systems, particularly in large-scale recruitment of fresh graduates.

Organizations that hire entry-level candidates often receive thousands of resumes, making manual screening inefficient, inconsistent, and susceptible to human bias. To overcome these challenges, AI systems are increasingly utilized to automate the evaluation of resumes and the shortlisting of candidates. While these systems enhance efficiency and scalability, they also raise significant ethical concerns due to their opaque decision-making processes.

Traditional AI-based recruitment systems function as black-box models, producing decisions without clear explanations.

This lack of transparency is particularly problematic in the context of fresh graduate recruitment, where candidates have limited work experience, and minor variations in resume features can disproportionately influence outcomes.

When AI systems reject candidates without providing reasons, it fosters mistrust, anxiety, and feelings of unfair treatment among fresh graduates.

Another pressing issue is hiring bias. AI systems are generally trained on historical recruitment data, which may harbor biases related to college reputation, geographic location, gender, or socioeconomic status. When such biased data is utilized for model training, AI systems may inadvertently perpetuate discriminatory hiring patterns.

This is especially detrimental in fresher recruitment, where equitable opportunities are crucial for social mobility and workforce diversity.

Explainable Artificial Intelligence (XAI) presents a solution by facilitating transparency and interpretability in AI decision-making. XAI techniques offer human-understandable explanations for why a resume is either shortlisted or rejected.

These insights enable recruiters to audit decisions, detect bias, and ensure ethical compliance. For fresh graduates, explainability provides clarity and constructive feedback, thereby enhancing trust in automated hiring systems.

This research paper investigates the use of Explainable AI-based resume screening systems specifically aimed at mitigating hiring bias in fresher recruitment.

The study examines current AI recruitment practices, identifies ethical and technical limitations, and highlights how explainability can improve fairness, accountability, and trust.

The findings illustrate that explainable AI is vital for responsible, unbiased, and transparent hiring of fresh graduates in contemporary organizations.

Keywords: *Explainable AI, Resume Screening, Hiring Bias, Recruitment Automation, Fair AI.*

How to Cite: P. R. Falke; K. J. Pawar; S. S. Sabat (2026) Explainable AI-Based Resume Screening System to Reduce Hiring Bias in Fresher Recruitment. *International Journal of Innovative Science and Research Technology*, 11(2), 2069-2073. https://doi.org/10.38124/ijisrt/26feb870

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I. INTRODUCTION

Recruiting fresh talent is essential for shaping the future workforce of organizations. Entry-level hiring establishes the foundational talent pool that companies rely on for sustained growth, innovation, and competitiveness.

With the rise of online job portals, campus placement platforms, and digital applications, businesses now face an influx of resumes from recent graduates for a single position. Manually screening this vast number of resumes is not only time-consuming but also inconsistent, often influenced by unconscious biases.

To tackle this challenge, many organizations are increasingly turning to AI-driven resume screening systems. These advanced systems utilize machine learning and natural language processing techniques to evaluate resumes based on relevant skills, academic achievements, certifications, and project experiences.

AI empowers recruiters to process applications efficiently, reduce hiring timelines, and standardize evaluation criteria among candidates. However, this growing dependency on AI in recruitment raises significant concerns regarding fairness, transparency, and accountability.

One of the most pressing issues is the opaque nature of AI systems. Recruiters often receive a ranked list of candidates but lack insight into how those rankings were determined.

In the context of fresher recruitment, where candidates may share similar academic backgrounds, even minor biases can greatly influence outcomes. The lack of explainability hinders recruiters from validating AI decisions and rectifying any unfair patterns.

Bias in fresher recruitment is especially troubling, as entry-level candidates may not have professional experiences to offset algorithmic disadvantages.

AI systems trained on historical data may inadvertently favor candidates from prestigious institutions or specific demographic backgrounds, sidelining equally qualified fresh graduates from diverse or underrepresented groups. Without transparency, this bias can go unnoticed.

Explainable Artificial Intelligence (XAI) seeks to address these challenges by shedding light on AI decision- making processes. XAI allows recruiters to comprehend how various features—such as skills, academic projects, internships, and certifications—impact screening outcomes.

This human-centered approach ensures that AI enhances ethical decision-making rather than replacing it blindly.

This research aims to develop an Explainable AI-based resume screening framework designed to minimize hiring bias in fresher recruitment.

By embedding transparency and fairness into automated screening systems, organizations can foster efficient yet ethical hiring practices.

- *Problem Statement*

Although AI-based resume screening systems have been widely adopted, they pose several significant challenges in the recruitment of fresh graduates.

The foremost issue is the lack of transparency in decision-making. Many systems generate outcomes without providing any justification, making it difficult to ascertain why a candidate was either shortlisted or rejected.

Another critical concern is algorithmic bias. AI models that are trained on historically biased hiring data may favor resumes from specific colleges, regions, or socioeconomic backgrounds. This leads to an unequal distribution of opportunities, particularly disadvantaging fresh graduates who depend on equitable entry- level hiring practices.

Recruiters also encounter challenges in validating AI-driven decisions. Relying blindly on automated systems can result in poor hiring outcomes and potential legal risks. Without sufficient explainability, organizations struggle to defend or audit their recruitment decisions effectively.

Fresh graduates often experience frustration due to the absence of feedback and transparency. This situation adversely impacts candidate trust, employer branding, and perceptions of fairness in campus recruitment.

Consequently, there is a pressing need for an Explainable AI-based resume screening system that minimizes bias, enhances transparency, and fosters ethical recruitment for fresh graduates.

II. LITERATURE REVIEW

Early studies on automated recruitment primarily concentrated on keyword-based and rule-based resume filtering. While these systems enhanced efficiency, they fell short in contextual understanding and adaptability, rendering them inadequate for complex evaluations.

With the evolution of machine learning, methods such as logistic regression, decision trees, and neural networks began to be utilized for resume screening. These models increased prediction accuracy but compromised interpretability, resulting in black-box systems.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb870

Recent research has shed light on the biases inherent in AI recruitment tools, indicating that systems trained on historical data may perpetuate discriminatory hiring practices. Scholars have underscored the ethical implications of using opaque AI in critical areas like recruitment.

In response to these challenges, Explainable AI has emerged. Researchers have suggested techniques that offer feature-level explanations and insights into decision-making processes. These approaches aim to make AI decisions comprehensible to users without technical expertise.

Professional organizations like IEEE have stressed the importance of transparency and accountability in AI systems, especially regarding employment decisions. Additionally, regulatory frameworks in alignment with GDPR have reinforced the right to explanation.

Nevertheless, current literature reveals a limited focus on fresher recruitment and the practical implementation of explainable systems. This research seeks to fill that void by emphasizing explainability as a fundamental design principle for unbiased hiring of fresh talent.

➢ *Research Objectives*

The goals of this research are to:

- Examine the limitations of conventional AI resume screening systems
- Identify potential sources of bias in the recruitment of fresh graduates
- Investigate Explainable AI techniques to promote transparent decision-making
- Mitigate discriminatory hiring outcomes
- Foster trust between recruiters and new graduates

➢ *Scope of Study*

This research delves into entry-level and campus recruitment, prioritizing the process of resume screening over the use of automated interviews. It encompasses aspects such as bias detection, enhancing transparency, and ensuring ethical compliance.

The aim is to provide support for human recruiters, not to replace them, by offering explainable insights. This framework is designed to be applicable in hiring fresh talent across corporate, campus, and government sectors.

III. METHODOLOGY

The methodology employs a conceptual and qualitative approach. Resume datasets are examined to uncover patterns that affect screening outcomes. Text preprocessing techniques are utilized to extract information on skills, education, projects, and certifications.

Machine learning models assess candidate suitability in relation to role requirements. Explainable AI techniques provide feature-level insights for each decision made.

Recruiters review these explanations prior to making the final selection, ensuring that human oversight is maintained. Ongoing monitoring helps to detect bias and facilitates corrective actions.

IV. BIAS IN FRESHER RECRUITMENT

Bias in the recruitment of freshers is a multifaceted issue that often arises from various institutional preferences, geographic biases, and socioeconomic influences. AI systems, which are increasingly used in the hiring process, can inadvertently favor candidates who hail from prestigious colleges or urban settings. This occurs because these systems are often trained on data reflecting historical hiring trends that may not account for diverse backgrounds.

As a result, freshers from diverse or rural backgrounds may find themselves at a disadvantage, even when their skills and qualifications are on par with those from more privileged backgrounds. This bias poses a significant threat to diversity and inclusion efforts within organizations, potentially leading to a homogeneous workforce that lacks varied perspectives and innovation.

Moreover, the lack of representation from different socioeconomic backgrounds can stifle creativity and hinder problem-solving capabilities, as diverse teams are known to produce more innovative solutions. Addressing this issue requires a conscious effort from organizations to not only recognize these biases but to actively work towards eliminating them.

One effective approach to combating bias is the utilization of explainability in AI systems. By making the decision-making processes of these systems more transparent, organizations can reveal concealed patterns of favoritism and take necessary corrective actions. This involves re-evaluating the criteria used in recruitment algorithms, implementing bias training for hiring managers, and fostering an inclusive culture that values diverse contributions.

In conclusion, addressing bias in fresher recruitment is crucial for building a truly inclusive workplace. By acknowledging and mitigating these biases, organizations can tap into a broader talent pool, fostering an environment where all individuals have the opportunity to succeed and contribute to the company's success.

➢ *Reducing Bias Through Explainable AI*

Explainable AI plays a crucial role in identifying and mitigating bias by uncovering the contributions of different features in AI models. This technology allows recruiters to assess whether attributes unrelated to the job—such as age,

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb870

gender, or ethnicity—are inappropriately influencing hiring decisions. By providing insights into how decisions are made, explainable AI helps in ensuring that the recruitment process is more objective and fairer.

Adjusting feature weights and training data are key strategies organizations can employ to minimize biased results. By fine-tuning these elements, companies can ensure that their AI systems make decisions based on relevant criteria, reducing the impact of any prejudiced data.

Transparency is essential in promoting fairness among candidate groups. When AI systems are transparent, they provide a clear understanding of how decisions are made, allowing for greater accountability and trust in the process.

By prioritizing explainability, AI evolves into a decision-support tool that aids human judgment rather than merely serving as an authoritative figure. This transformation enables organizations to use AI as a partner in decision-making, fostering more equitable outcomes and enhancing the overall integrity of AI-driven processes.

- *Ethical Considerations*

Ethical recruitment hinges on several foundational principles, including fairness, transparency, accountability, and data privacy. These elements are vital in fostering a recruitment process that respects both the candidates and the organizations involved. Fairness ensures that all candidates are given equal opportunities regardless of their background, while transparency allows candidates to understand the processes and criteria being used to evaluate them.

The use of explainable AI plays a crucial role in facilitating ethical audits and promoting informed decision-making. Explainable AI provides clear insights into how decisions are made, allowing for greater scrutiny and understanding.

This not only helps organizations maintain accountability but also builds trust with candidates by demonstrating a commitment to ethical practices.

Ensuring candidate consent and safeguarding privacy are essential components of ethical recruitment. It is imperative that candidates are fully informed and agree to how their data will be used.

Robust privacy measures must be in place to protect sensitive information from unauthorized access or misuse.

Transparent systems resonate with the principles of responsible AI, which advocate for the development and deployment of AI technologies that are beneficial, fair, and respectful of human rights.

By integrating these practices, organizations can ensure that their recruitment processes are aligned with the highest ethical standards, ultimately leading to a more equitable and trustworthy hiring environment.

- *Advantages*

Explainable AI plays a crucial role in fostering transparency, trust, and fairness within recruitment processes. By providing clear insights into decision-making, it boosts recruiter confidence and enhances candidate satisfaction, ensuring that all parties involved understand the reasoning behind decisions.

It is instrumental in ensuring legal compliance and ethical governance. By making AI systems more understandable, it helps organizations adhere to regulations and ethical standards, reducing the risk of biases and ensuring fair treatment of all candidates.

The continuous improvement of Explainable AI systems contributes significantly to their long-term reliability. As these systems evolve, they become more adept at learning from past data and adapting to new information, which helps maintain consistent performance and accuracy over time.

V. LIMITATIONS

Explainability can significantly increase computational complexity. This complexity arises because generating explanations often requires additional computational resources and processing power.

Furthermore, some explanations might not represent the precise underlying logic, serving instead as approximations to make the system's decisions more understandable.

Human interpretation is an essential component; without it, the potential for errors and misuse rises. The effectiveness of explainability depends heavily on the user's ability to correctly interpret the information provided.

Misunderstandings can lead to inappropriate application or decision-making, which could have serious implications depending on the context.

Balancing accuracy and interpretability is a persistent and intricate challenge. On the one hand, highly accurate models often operate as black boxes, providing little insight into their decision-making processes.

On the other hand, more interpretable models might sacrifice some degree of accuracy to offer clearer insights into how decisions are made. This trade-off requires careful consideration, particularly in fields where both accuracy and transparency are critical.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26feb870

VI. FUTURE SCOPE

Future research could incorporate real-time feedback mechanisms to provide immediate responses and adjustments during the resume creation process. Developing multilingual resumes can broaden accessibility and applicability across diverse global markets, enabling job seekers to present their skills effectively in different languages.

Furthermore, adaptive learning techniques can personalize the resume-building experience, tailoring it to individual user needs and proficiencies for optimal results.

The use of advanced natural language processing (NLP) may significantly improve the quality of explanations by providing more precise language suggestions and contextually relevant content that aligns with industry standards.

Additionally, integrating this technology with sophisticated interview evaluation systems presents further opportunities for enhancement, enabling seamless transitions from the resume stage to interview preparation and assessment, ultimately improving the overall recruitment process.

VII. CONCLUSION

This study concludes that resume screening systems powered by Explainable AI play a crucial role in minimizing hiring biases, particularly in the recruitment of fresh talent.

These systems provide a framework for transparency, fairness, and accountability, which are essential components of ethical hiring practices. By ensuring that automation complements rather than supplants human judgment, Explainable AI not only facilitates responsible workforce development but also supports diversity and inclusion initiatives.

Furthermore, these systems offer insights into decision-making processes, allowing organizations to refine their hiring strategies continuously, thereby promoting a more equitable and effective recruitment process.

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