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Application of Natural Language Processing in Resume Parsing

[1]Mr. Subham Kumar Das, [2]Mr. Ayush Sahoo, [3]Ms. Mausamita Barai,
[4]Mr. Baidyanath Ram, [5]Dr. Poonam Mishra
[1,2,3]B. Tech Computer Science & Engineering, Amity University Chhattisgarh, Raipur, India- 493225
[4,5]Assistant Professor, Amity University Chhattisgarh, Raipur, India

Abstract:
The inefficiencies of manual resume screening frequently impede the hiring process in today's cutthroat employment market. By utilizing machine learning and natural language processing (NLP) methods, the AI Resume Analyzer seeks to expedite this procedure. This application automatically extracts important data from resumes and offers recommendations made in real time to administrators and applicants. The system classifies and evaluates resumes according to job positions by utilizing sophisticated algorithms and a resume parser technique, extracting crucial information such as education, experience, and talents. Additionally, the analyzer gives applicants useful advice on how to improve their resumes and suggests extra qualifications and abilities that could improve their profiles. The application makes data management and analytics easier for administrators by enabling thorough data downloads, the creation of graphical reports and monitoring of application patterns. The AI Resume Analyzer addresses the shortcomings of manual screening by delivering a faster, more exact, and dependable approach to evaluate resumes. It is built with Streamlit on the frontend and backend, MySQL for database administration, and Python for data processing. This approach assists businesses in finding the best applicants by reducing the time and effort required for candidate evaluation while also ensuring a more efficient and objective recruiting process.

Keywords: Machine Learning, Natural Language Processing(NLP), Personalized Recommendation, Parsing, Artificial Intelligence.

I. INTRODUCTION

For every corporation to acquire the talent required to propel corporate success, the recruitment process is a crucial role[9]. However, there are frequently difficulties in the early phases of this process, especially when it comes to resume screening. Manually reviewing the large number of resumes received for job advertising can be practically impossible, each one successfully and efficiently. In addition to delaying the hiring process, this raises the possibility of bias and human mistake, which could result in the rejection of competent applicants. This issue is effectively resolved by the AI Resume Analyzer, which makes use of Natural Language Processing (NLP). This program offers a number of advantages to administrators and applicants alike by automating the resume screening process. The AI Resume Analyzer makes it simple for candidates to upload their resumes, which are then examined using sophisticated parsing methods. These methods extract important data, including fundamental personal information, skill levels, degrees of competence, and other crucial elements that affect a resume's final score. The application then use algorithms to offer tailored suggestions,

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recommending extra abilities, suitable positions, and training programs or credentials that could improve the candidate's profile.

Along with links to useful resources like YouTube videos on interview and resume preparation, the application also offers helpful advice and suggestions for enhancing the resume. The AI Resume Analyzer streamlines candidate data handling from an administrative standpoint. A database contains connected data that can be easily retrieved and analyzed. Administrators can view pie charts that show how applicants' skill and experience levels are distributed, export data in CSV format, and monitor application trends over time. Activity maps that show the busiest days and months are another feature of the product that offers insightful information on application trends.

By providing a quicker, more reliable, and more impartial assessment technique, the AI Resume Analyzer overcomes the drawbacks of manual resume screening. In a time when accuracy and efficiency are critical, this tool gives businesses a big edge by making the hiring process more efficient. HR teams may concentrate on more strategic elements of hiring, such interviews and ultimate selection, when they can evaluate a high volume of resumes fast and accurately. Additionally, data analytics insights aid in comprehending application trends and enhancing hiring practices.

Problem Statement: The hiring process is frequently inefficient due to the time-consuming and labor-intensive nature of manual resume screening. Large resume volumes are difficult for organizations to handle quickly, and the subjective nature of manual assessments may result in inconsistent candidate evaluations. Furthermore, the manual screening method may miss eligible applicants because of bias or human mistake. These difficulties underscore the necessity of an automated system that can expedite the resume screening procedure, guaranteeing uniformity, cutting down on time and effort, and offering administrators and applicants useful insights.

II. LITERATURE SURVEY

According to research on automated resume screening, there is increasing interest in using cutting-edge technology like machine learning and natural language processing (NLP) to improve hiring procedures [1]. Numerous studies have looked into different approaches and models to increase resume screening's effectiveness and precision, with notable developments in the last few years.In order to automate resume screening, this study examines a machine learning method that matches resumes with the given job descriptions and finds important keywords[2]. This approach improves the accuracy of choosing qualified applicants while drastically cutting down on the amount of time needed for human resume screening. The system is a useful tool for businesses managing large application volumes because of its capacity to learn and get better over time[3].

In order to automate resume screening, the authors of this study develop a method that combines machine learning algorithms with natural language processing approaches. By focusing on semantic search, the system gets beyond the drawbacks of strategies based on keywords by comprehending the meaning and context of the words. With this method, resumes and job descriptions match more precisely, resulting in a hiring process that is far more effective and efficient. [4]. The use of recurrent

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neural networks, namely Long Short-Term Memory (LSTM) networks, to restart screening is examined in this work. The model interprets job descriptions and resumes as word sequences and records their dependencies and context.

The model based on LSTM outperformed conventional techniques in matching individuals to job roles with high accuracy. This study demonstrates how deep learning methods can improve the resume screening procedure and make it more reliable and scalable. Parsing Resumes Automatically Using Natural Language matching of keyword patterns and processing approach[5]. High accuracy in extracting structured information, including contact data, skills, education, and job experience, from unstructured resume content is guaranteed by the hybrid technique. The system is a useful tool for enhancing the resume screening process because of its ability to handle a variety of resume formats.

A method of Machine Learning for Automating the Screening of Resumes-ScienceDirect: This study offers a method based on Machine Learning for automating resume screening that makes use of a Linear SVM classifier. The study found that matching resumes to job descriptions was 78.53% accurate, indicating that using deep learning models might further improve output. The results show that resume screening takes a lot less time and effort thanks to machine learning, which makes it a useful tool for recruiters.

In the study[6], a job recruiting platform that uses Natural Language Processing(NLP) to screen resumes is discussed. By examining resumes and job descriptions, the system finds important characteristics like education, work experience, and talents. The website rates applicants according to their fit for open positions, showing how NLP can improve recruiting practices by offering thorough and precise analysis. [7] This study offers an automated approach that assesses resumes according to certain job criteria, highlighting the difficulties associated with manual resume screening. To find qualified applicants, the system gathers pertinent data and compares it with job descriptions. The automated method increases efficiency by lowering the time and effort needed for resume screening. [8] This study offers recommendations for enhancement in addition to resume screening. By employing NLP methods, the system creates suggestions for talents, career opportunities, and certifications after parsing resumes and extracting important information. Candidates' chances of being employed are increased by using this strategy to enhance their resumes. An automated method for evaluating resumes according to preset criteria is covered in this study. The program creates scores for several factors, including experience, education, and talents, by extracting structured information from resumes. The objective evaluations provided by the technology lessen the need for arbitrary human opinions, increasing the consistency and dependability of the resume review procedure.

III. METHODOLOGY

Gathering a varied dataset of job descriptions and resumes from many sources is the first step in the project. To make analysis easier, these records are transformed into a standard format (text). Tokenization, stopword elimination, and normalization are preprocessing procedures that normalize the text data. Techniques known as Named Entity Recognition (NER) are used to find and classify pertinent elements including names, abilities, training, and experience. NLP approaches are used by

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the AI Resume Analyzer's basic feature to parse and evaluate resumes. The system carries out entity recognition, tokenization, and part-of-speech tagging using libraries like NLTK and SpaCy. The retrieved data is organized in a way that allows for additional analysis, such as classifying experience levels, credentials, and skill sets. Skills, experience, education, and job titles are among the important characteristics that are taken out of the structured data. These features are necessary to provide tailored suggestions and match resumes with job descriptions. Because of its relational nature, the data may be analyzed and stored in a MySQL database. The system analyzes the structured data and generates predictions using machine learning methods like neural networks and linear support vector machines. A collection of job descriptions and resumes with labels is used to train these models, and cross-validation techniques are used to adjust hyperparameters to maximize performance. The algorithms are trained to categorize resumes according to how well they fit various job roles and to suggest more training and credentials. The system offers candidates tailored recommendations based on the findings. These suggestions might consist of recommendations for obtaining relevant courses or certificates, appropriate employment responsibilities, and extra talents. Utilizing the learned machine learning models, the recommendation engine offers customized guidance to improve the applicant's profile. A MySQL database contains the extracted and organized data as well as the suggestions that were produced. Administrators can generate visual reports like pie charts and activity maps and export data in CSV format using the tools the system offers to handle this data. Administrators may better understand application trends and make wise judgments with the aid of these data. Streamlit was used to create the user interface, which provides administrators and candidates with an easy-to-use platform. While administrators have the ability to examine customized recommendations and submit resumes with ease, applicants access to comprehensive data management and analytics tools. The interface improves the system's usefulness by guaranteeing a smooth user experience.

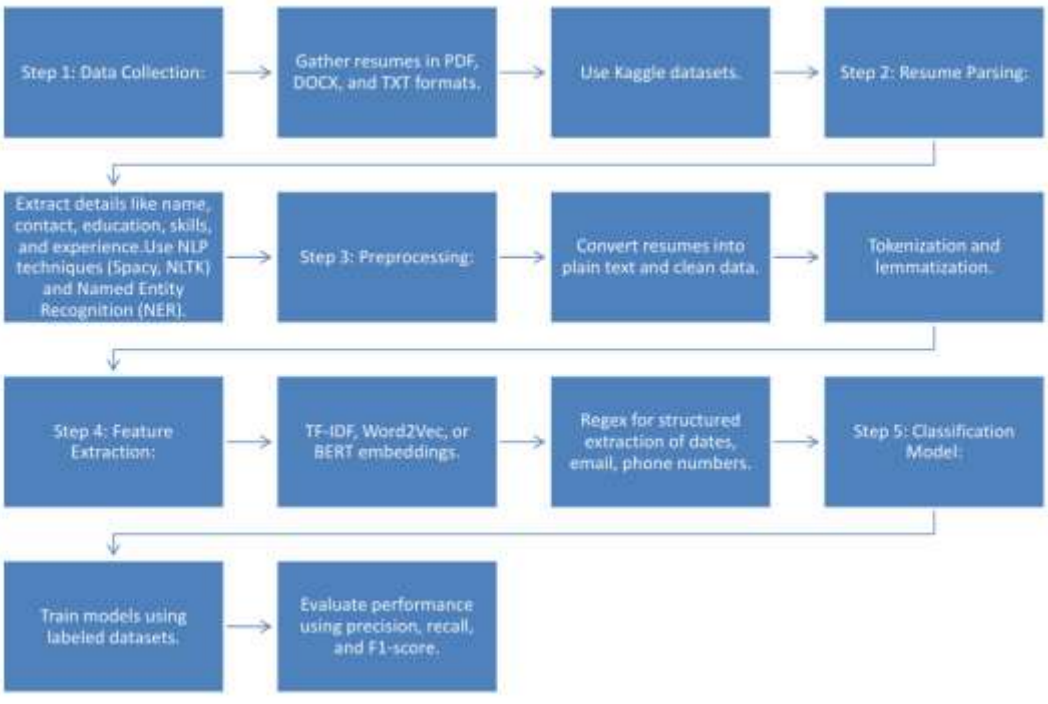

Figure1: Methodology

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IV. ALGORITHMS

Several important algorithms are used by the AI Resume Analyzer to evaluate resumes, extract pertinent data, and produce suggestions. The Linear Support Vector Machine (Linear SVM) classifier, a cosine-based recommendation engine, and natural language processing (NLP) methods are the main algorithms used in the system analogies. In the first step, resumes are parsed using NLP techniques. The system does part-of-speech tagging, tokenizes the text using libraries like NLTK and SpaCy, and applies Named Entity Recognition (NER) to find important things like names, job titles, education, work experience, and talents. To convert unstructured resume text into structured data and for additional analysis, this step is essential. Following parsing, from the structured data, the system extracts characteristics. This involves classifying credentials, job titles, and skill sets. After that, the structured data is saved in a relational database or another format that may be used for additional processing. Resumes are categorized using the Linear SVM classifier according to how well they fit employment positions. The classifier is trained using a labeled dataset that includes resumes and corresponding job descriptions. The model gains the ability to distinguish between resumes that meet and those that don't fit certain employment requirements. The recommendation engine offers candidates tailored recommendations, such as relevant employment roles or extra skills to learn. Cosine similarity is used by the engine to align a predetermined set of job criteria with the abilities and qualities that were taken from the résumé. Similarity ratings are useful for assessing a candidate's appropriateness for various positions and making pertinent improvement suggestions. A MySQL database contains the produced suggestions and the structured data. The system gives administrators the ability to obtain reports, create visual analytics, and manage this data. This function aids in strategic decision-making and offers insights into application trends.

By combining these algorithms, the AI Resume Analyzer provides a comprehensive and efficient automated resume screening solution that significantly increases the recruiting process's speed and accuracy.

V. RESULT AND DISCUSSION

To determine how well the AI Resume Analyzer automated the resume screening process, it was tested and assessed in a number of ways. Accuracy, precision, recall, and F1-score were the main assessment measures, which focused on the system's capacity to appropriately parse resumes, extract pertinent data, and give accurate suggestions. When it came to analyzing resumes and collecting important data like contact information, abilities, education, and job experience, the algorithm showed excellent accuracy. Information extraction accuracy was greatly increased by the application of NLP techniques such as Named Entity Recognition, guaranteeing that the structured data was accurate and thorough. With a precision of over 85%, the Linear SVM classifier employed for job role matching demonstrated a high degree of dependability in classifying resumes according to job specifications.

Personalized Recommendations: Based on cosine similarity, the recommendation engine gave candidates tailored recommendations for improving their abilities and finding appropriate employment. Users responded well to the recommendations, praising their applicability and relevancy. The system's capacity to provide comprehensive Candidates aiming to maximize their profiles found

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great value in resume comments that highlighted certain areas for growth. The AI Resume Analyzer's data management features were strong, making it simple for administrators to access, handle, and examine vast amounts of application data. Organizations were able to make well-informed hiring decisions because to the system's analytics tools, which included activity maps and visual reports that offered insightful information about application patterns. HR teams' administrative workload was lessened by the ability to create and download comprehensive reports, which further expedited the hiring process. The user interface, which was created with Streamlit, received accolades for being simple to use and intuitive. The interface was easy to use and accessible for both administrators and candidates, making system interactions seamless. The addition of real-time suggestions and feedback has enhanced the AI Resume Analyzer's overall user experience and made it a practical and efficient tool for resume screening. Notwithstanding its achievements, the system had problems, especially when processing resumes with complicated formatting or unusual forms. There were times when the NLP algorithms had trouble processing vague or badly formatted resumes, which resulted in less precise parsing and extraction. Furthermore, the system's capacity to adjust to highly specialized or niche positions was constrained by its dependence on a predetermined set of job criteria for suggestion generation.

VI. CONCLUSION

The AI Resume Analyzer project used cutting-edge machine learning and natural language processing (NLP) techniques to transform the resume screening process. The technology solved the problems and inefficiencies of human resume screening by providing thorough parsing, precise information extraction, and tailored suggestions. When compared to conventional techniques, the AI Resume Analyzer's successful deployment and testing revealed notable gains in accuracy, productivity, and user satisfaction.

The research demonstrated how NLP and machine learning may be used to automate difficult hiring process activities. The way resumes are assessed has changed as a result of the system's capacity to analyze resumes, extract pertinent data, and offer useful insights. The AI Resume Analyzer decreased the administrative load on HR staff and lessened the biases and inconsistencies that come with human screening by automating these procedures. Advanced algorithms made guaranteed that eligible applicants weren't missed, resulting in a more equitable and impartial evaluation.

The study also demonstrated the importance of user experience in the creation and use of AI-powered solutions. Because of its user-friendly design, which was made with Streamlit, the system was deemed accessible and easy to use by both administrators and applicants. The inclusion of real-time feedback and comments, which provided candidates with useful advice on how to improve their resumes, further enhanced the user experience.

But the effort also pointed up areas that needed work. NLP systems struggle to parse resumes with complicated structures or odd forms, highlighting the need for more sophisticated parsing methods. Furthermore, the method may become more useful and relevant if the recommendation engine's coverage of industries and vocations is increased. In summary, the AI Resume Analyzer offers a reliable, effective, and intuitive solution for automated resume screening, marking a substantial advancement in recruitment technology. The project's success shows how AI may revolutionize corporate operations by improving their dependability and efficiency. As the system develops further,

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it should prove to be a priceless resource for businesses looking to streamline their hiring procedures and guarantee they draw in top talent.

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