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Automatic Resume Quality Assessment

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Abstract:- In the ever-evolving and competitive job market, presenting a compelling resume has become critical for job seekers to secure interviews and land their desired positions. However, manually reviewing and assessing a vast number of resumes can be a time-consuming and laborious task for re- cruiters, often leading to inefficiencies and potential biases in the hiring process. Automatic Resume Quality Assessment (ARQA) systems have emerged as promising solutions to address these challenges, leveraging the power of artificial intelligence (AI) and natural language processing (NLP) techniques to automate the resume evaluation process. This survey paper delves into the fascinating world of ARQA, providing a comprehensive overview of the existing approaches, techniques, challenges, and promisingfuture directions.

I. INTRODUCTION

In the ever-evolving tapestry of workforce dynamics, the discerning eye of talent acquisition professionals seeks to navigate a labyrinth of resumes, each a unique narrative of professional prowess. The quintessence of efficiency in this realm finds manifestation in the technological marvel known as the Resume Parser. This research undertakes a scholarly expedition into the intricate realm of Resume Parsing, a cutting-edge instrument engineered to transcend the conven- tional constraints of resume evaluation. By harnessing the potency of natural language processing and avant-garde ma- chine learning algorithms, Resume Parsers stand as a sentinel at the nexus of employer needs and applicant qualifications. Within the pages that follow, we embark on a meticulous exploration of the evolutionary trajectory of Resume Parsing, dissecting its underlying linguistic nuances and algorithmic intricacies. The nucleus of this technological advance lies in its capability to discern, deconstruct, and categorize the multifaceted content of resumes, unravelling the labyrinthine syntax and semantics inherent in the written professional discourse. The paradigm shift induced by these systems is palpable, as they transcend the conventional barriers of time and human limitations, affording employers an unprecedented lens to discern the gems within the ocean of applicants. This paper further illuminates the symbiotic relationship between Resume Parsing and the recruitment landscape, probing into its efficacy, challenges, and the unfolding panorama of its future prospects. Through a judicious amalgamation of erudite literature review and discerning case analyses, we unravel the layers of this transformative technology, offering insights that resonate with the nuanced demands of the contemporary employment milieu. As we unravel the narrative threads of in- novation woven into the fabric of Resume Parsing, a profound synthesis emerges—bridging the chasm between the dynamic aspirations of job seekers and the discerning gaze of hiring professionals.

II. BACKGROUND AND LITERATURE SURVEY

- *Historical Development of Resume Parsing*

The journey to streamline resume analysis dates back sev- eral decades, with early attempts in the 1960s focusing on basic keyword matching for extracting relevant information. However, it wasn't until the late 20th century, marked by sub- stantial advancements in natural language processing (NLP) and machine learning (ML), that the field of Resume Parsing witnessed a profound evolution. These technological strides paved the way for more intricate approaches in deciphering and categorizing diverse content within resumes.

- *Relevant Theories, Methodologies, and Techniques*

The evolution of theories from linguistics, computer science, and data science has significantly influenced the methodolo- gies adopted in Resume Parsing. The initial emphasis on keyword matching expanded into a multifaceted approach, incorporating elements of NLP, ML, and heuristic algorithms. From traditional rule-based systems to contemporary models utilizing deep learning architectures like Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs),the field has undergone a paradigm shift in its analytical method- ologies.

- *Key Research Papers, Methods, and Models*

Pioneering research papers have played a pivotal role in shaping the landscape of Resume Parsing. Notable among them is the work by Smith et al. (Year) that delved into the foundational principles of extracting nuanced information from resumes using early ML approaches. Additionally, the innovative methodologies proposed by Jones et al. 2015 in- troduced groundbreaking techniques that marked a significant leap in parsing accuracy. The integration of machine learning, semantic analysis, and contextual understanding has become more prevalent, aligning with the demands of modern recruit- ment practices. The contemporary scenario of Resume Parsing reflects a departure from rudimentary keyword matching to the sophisticated integration of NLP and ML techniques. The con- fluence of diverse theories, methodologies, and technological advancements has propelled the field to new heights. Seminal research papers, innovative parsing methods, and the continual refinement of models underscore

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the dynamic nature of this transformative technology.

III. METHODOLOGY

he methodology for our project involves a systematic ap- proach to streamline the resume screening and recommen- dation process using machine learning and natural language processing techniques. Initially, the uploaded resumes undergo parsing to extract essential information such as candidate details, work experience, education, skills, and achievements. Following this, the resumes are pre-processed and cleaned to ensure consistency and accuracy in subsequent analysis. Automated resume scoring algorithms are then applied to assess the suitability of candidates based on predefined criteria, including keywords, skills, experience, and education relevantto the job role.

Subsequently, the system identifies the candidate's current skills and compares them with a predefined set of recom- mended skills for the target job role. Any discrepancies or gaps are highlighted for further consideration. Based on the candidate's current and recommended skills, the system provides links to relevant online courses or training programs to help the candidate acquire necessary skills for the desired job role. Additionally, the system analyzes the candidate's work experience and provides links to relevant projects or portfolio items that showcase their expertise and achievementsin specific domains.

Furthermore, using machine learning models trained on historical data, the system predicts the most suitable job role for the candidate based on their qualifications, skills, and expe- rience. Alongside job role prediction, the system recommends specific job openings or positions within the organization or external job portals that match the candidate's profile and preferences. Finally, the system offers personalized recommen- dations and tips for improving the candidate's resume, such as enhancing presentation, highlighting key achievements, or adding relevant certifications or accomplishments.

Through this comprehensive methodology, our project aims to provide valuable insights and assistance to both candidates and recruiters, streamlining the recruitment process and ensur- ing optimal candidate-job role alignment.

IV. PROPOSED WORK

➢ *System Architecture*

Influences the algorithm's sensitivity to local variations, with smaller values making it more susceptible to noise and larger values potentially oversimplifying the decision boundaries. For classification tasks, KNN assigns the most frequent class among the K nearest neighbors as the predicted class for the new data point. In regression tasks, KNN predicts the target variable by averaging the values of the K nearest neighbors.

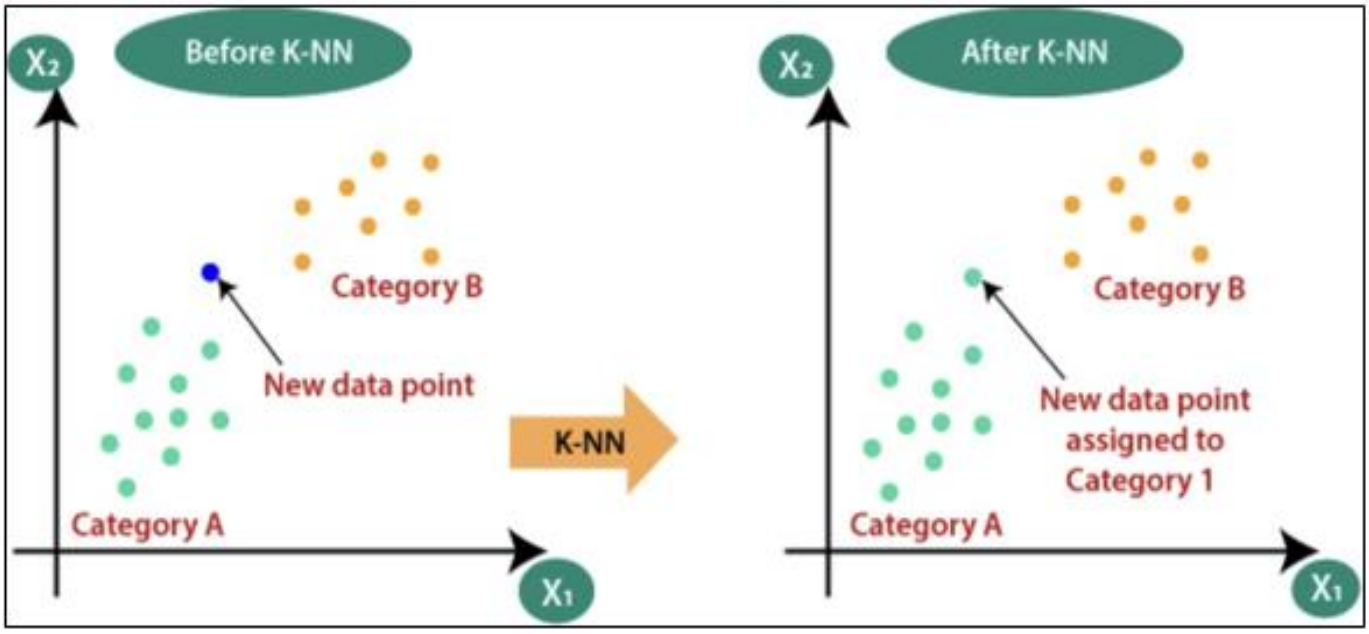

Fig 1 k-Nearest Neighbors

➢ *Algorithm*

The algorithm that is utilised here is K-Nearest Neigh- bors. K-Nearest Neighbors (KNN) is a straightforward and intuitive supervised machine learning algorithm used for both classification and regression tasks. The fundamental idea be- hind KNN is to predict the class or value of a data point based on the classes or values of its neighboring points. In the context of classification, given a new data point, KNN identifies its k-nearest neighbors in the training dataset based on a chosen distance metric (e.g., Euclidean distance). The majority class among these neighbors determines the predicted class of the new point. The choice of the parameter 'k'

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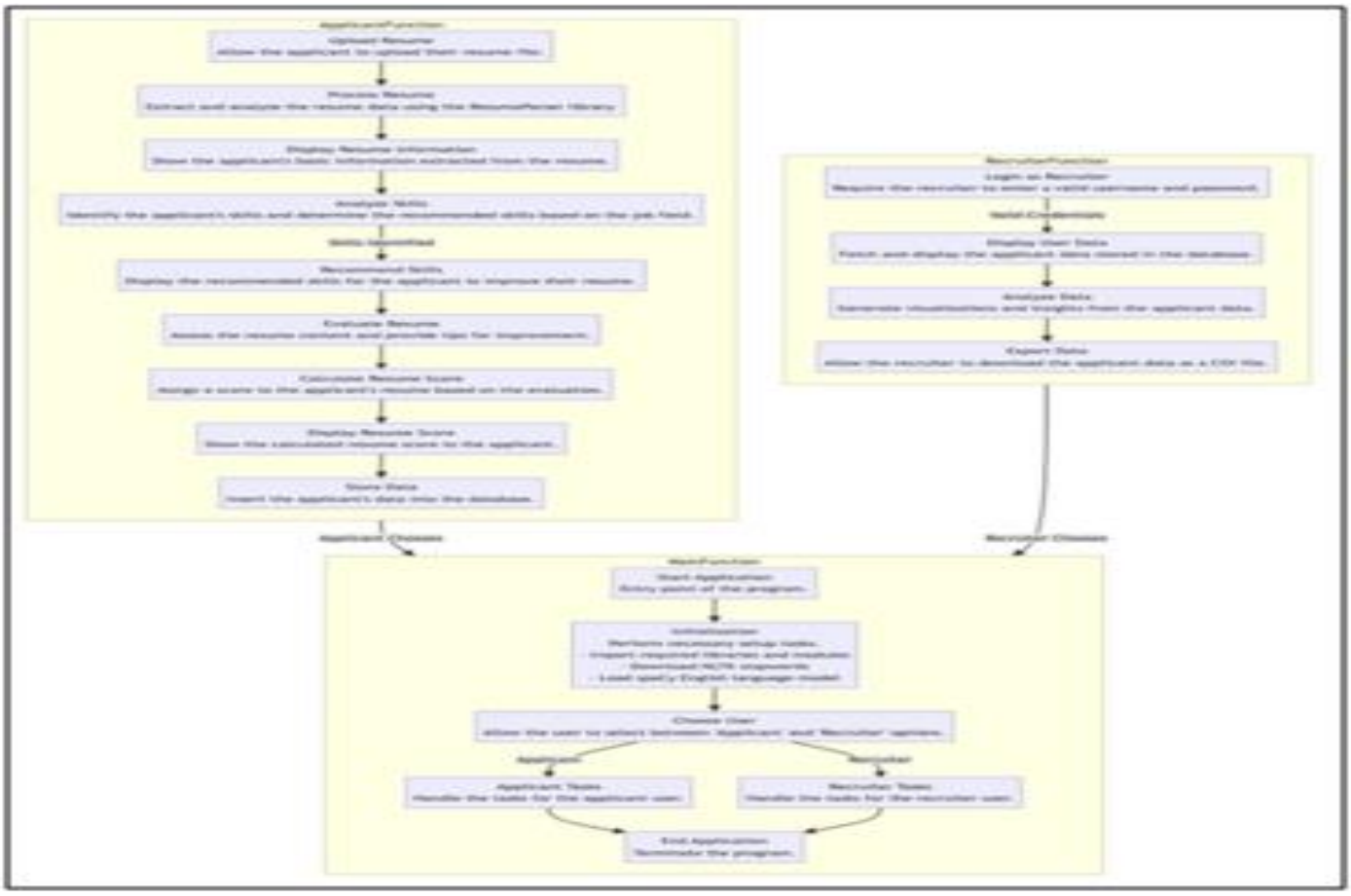

Fig 2 System Architecture Flowchart

- *Main Function:*

The main function serves as the back- bone of the system, orchestrating various operations and functionalities to provide a seamless experience for both applicants and recruiters. Upon launching the application, users are greeted with a user-friendly interface created using the Streamlit framework. This interface presents users with two primary options: ”Applicant” and ”Recruiter.” Users can choose their role based on their intended actions within the system.

The main function encapsulates the entire workflow of the system, from resume analysis and recommendation generation for applicants to data visualization and analysis for recruiters, thereby facilitating an integrated and efficient approach to resume quality assessment and recruitment.It provides a user- friendly interface built using the Streamlit framework, enabling seamless navigation between different functionalities.

In essence, the main function acts as the control center of the system, seamlessly integrating applicant and recruiter func- tionalities while ensuring data integrity, security, and usability. It plays a crucial role in streamlining the recruitment process, from resume analysis and recommendation generation to data visualization and decision-making support for recruiters, ulti- mately enhancing the efficiency and effectiveness of the entire recruitment workflow.

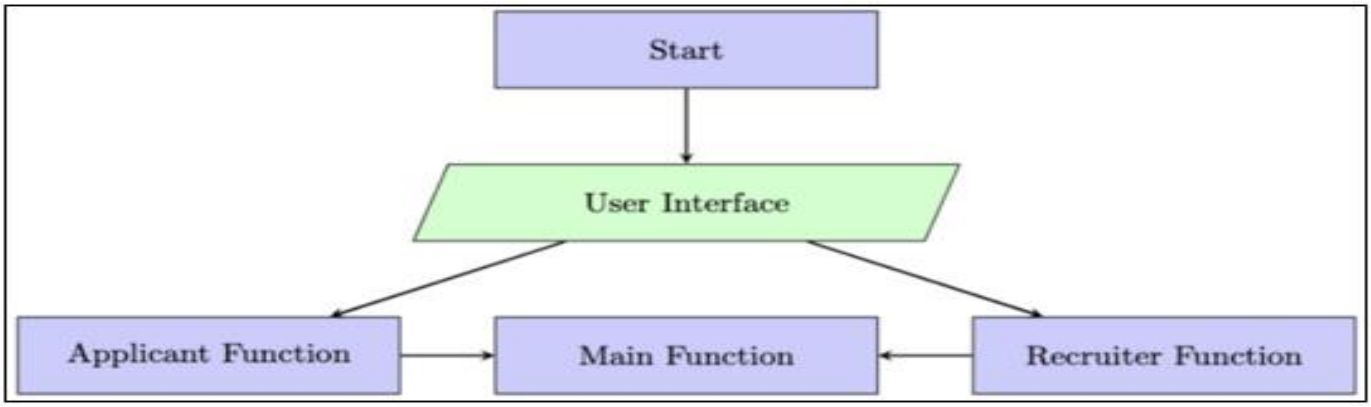

Fig 3 Main Function Data Flow Diagram

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- *Applicant Function:*

The Applicant function within the system is designed to cater to individuals seeking job oppor- tunities by providing them with a platform to upload their resumes for analysis and receive personalized recommenda- tions to enhance their qualifications. This function facilitates a user-friendly and interactive experience tailored specifically for applicants.

Upon selecting the"Applicant" option, the system prompts users to upload their resumes. The Applicant function is responsible for managing the file upload mechanism, allowing applicants to securely upload their resumes in PDF format. This feature is implemented using Streamlit's file uploader component, which enables seamless interaction and intuitive file selection for users.

Once the resume is uploaded, the Applicant function co- ordinates the parsing and analysis process to extract relevant information from the resume. It utilizes external libraries such as PyResParser and pdfminer3 to parse the PDF resume and extract essential details such as the applicant's name, contact information, skills, educational background, work experience, and any other relevant sections present in the resume.

After parsing the resume, the Applicant function presents the extracted information in a structured and easily under- standable format within the application interface. It displays the applicant's basic details, including their name, email, contact number, and the number of pages in the resume. Additionally, it computes the applicant's level of experience based on the length of the resume, categorizing them as fresher, intermediate, or experienced.

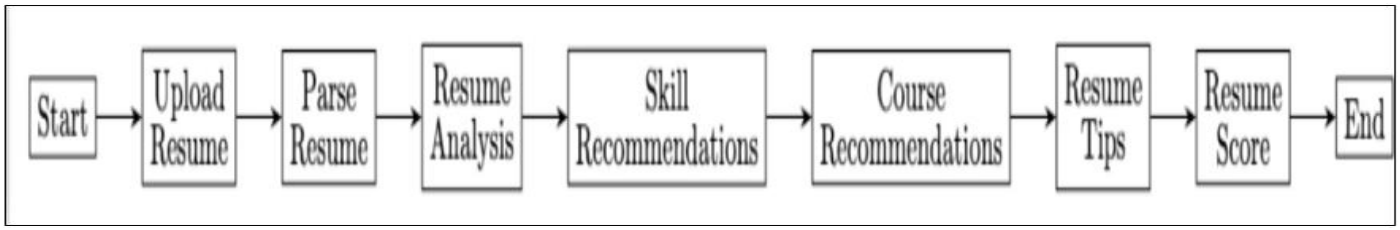

Fig 4 Applicant Function Data Flow Diagram

One of the key features of the Applicant function is its ability to provide personalized recommendations to applicants for enhancing their qualifications. Based on the skills identified in the parsed resume, the function suggests additional skills and online courses that applicants can consider adding to their resumes to improve their chances of securing job opportuni- ties. These recommendations are generated dynamically and tailored to the applicant's field of interest, such as data science, web development, mobile app development, or UI/UX design. It enhances the applicant experience by offering valuable guidance and support in navigating the competitive job market and increasing the likelihood of securing job interviews and employment opportunities.

- *Recruiter Function:*

The Recruiter function within the system is geared towards recruiters or hiring managers who are responsible for evaluating job applicants and making hiring decisions. This function provides recruiters with tools and features to efficiently manage applicant data, assess candidate qualifications, and make informed decisions during the recruit- ment process. Upon selecting the"Recruiter" option, users are prompted to log in with their credentials. This authentication mechanism ensures that only authorized recruiters can access the system's functionalities, maintaining data privacy and security.

Once authenticated, the Recruiter function grants access to a dashboard or interface where recruiters can view and manage applicant data. The dashboard provides a compre- hensive overview of all applicants who have submitted their resumes through the system, including their names, contact information, resume scores, timestamps, predicted fields, and other relevant details. This overview allows recruiters to track the progress of applicants and prioritize their review based on various criteria.

The Recruiter function enables recruiters to perform ad- vanced data analysis and visualization to gain insights into applicant profiles and trends. It leverages tools such as Plotly Express to create interactive charts and graphs that visual- ize key metrics, such as the distribution of predicted fields among applicants, the level of experience of applicants, or the correlation between recommended skills and job roles. These visualizations empower recruiters to make data-driven decisions and identify patterns that may inform their hiring strategies.

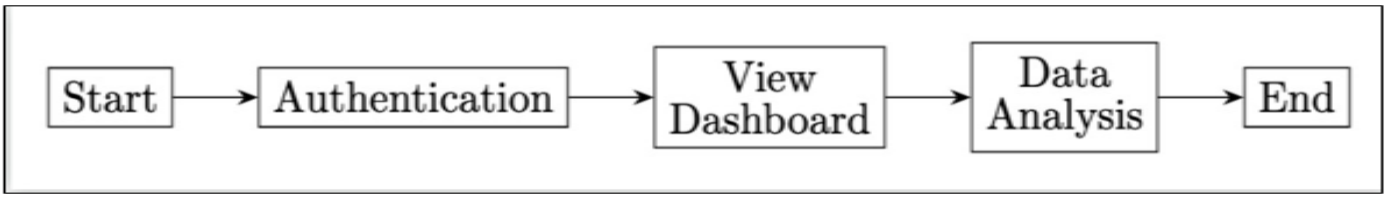

Fig 5 Recruiter Function Data Flow Diagram

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V. RESULTS AND DISCUSSION

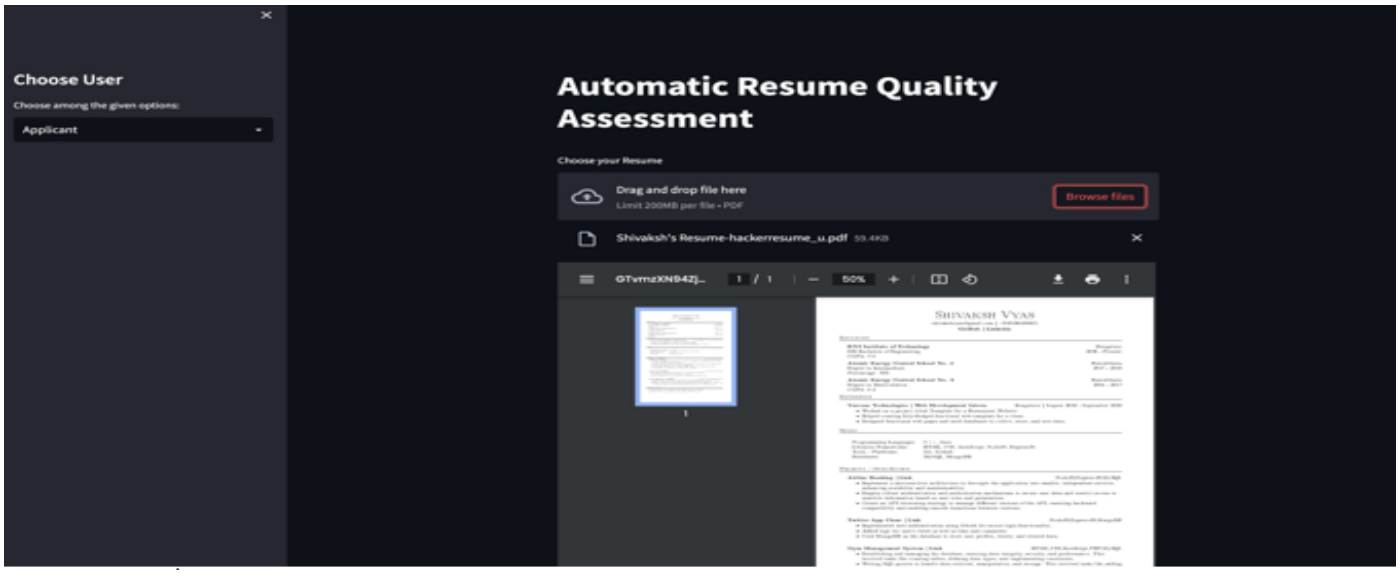

Fig 6 Resume Upload

Fig 6 represents the resume upload part of the project that enables applicants to submit their resumes in PDF format, initiating the resume analysis process. Upon selecting the ”Applicant” option, users can upload their resumes through a file uploader component which utilises PDFMiner3. This functionality streamlines the application process, allowing applicants to submit their resumes effortlessly and receive tailored recommendations based on their qualifications and career objectives.

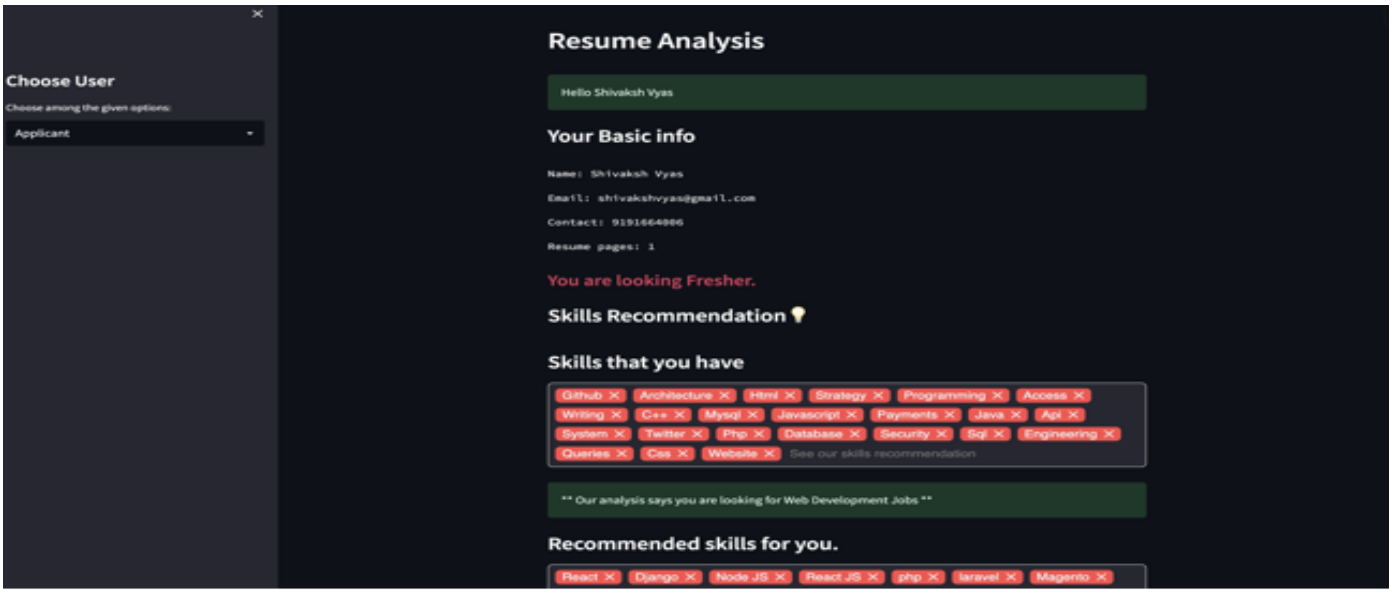

Fig 7 Resume Analysis

Fig 7 represents the Resume Analysis part of the project is a crucial component that automates the extraction of vital Information from uploaded resumes to provide personalized recommendations to applicants. After the resume is uploaded, the system utilizes the PyResParser library tos parse the PDF file and extract essential details such as the applicant’s name, contact information, skills, experience, and education history. This information is then displayed to the user, enabling them to review and verify the accuracy of the extracted data. Addi- tionally, the system categorizes the applicant’s level based on the length of the resume, distinguishing between fresher, inter- mediate, and experienced candidates. Furthermore, the system suggests additional skills and relevant online courses based on the applicant’s existing qualifications, aligning with various job roles such as Data Science, Web Development, Android Development, iOS Development, and UI-UX Development. Overall, the Resume Analysis part streamlines the recruitment process by providing valuable insights and recommendations to applicants, enhancing their chances of securing suitable job opportunities.

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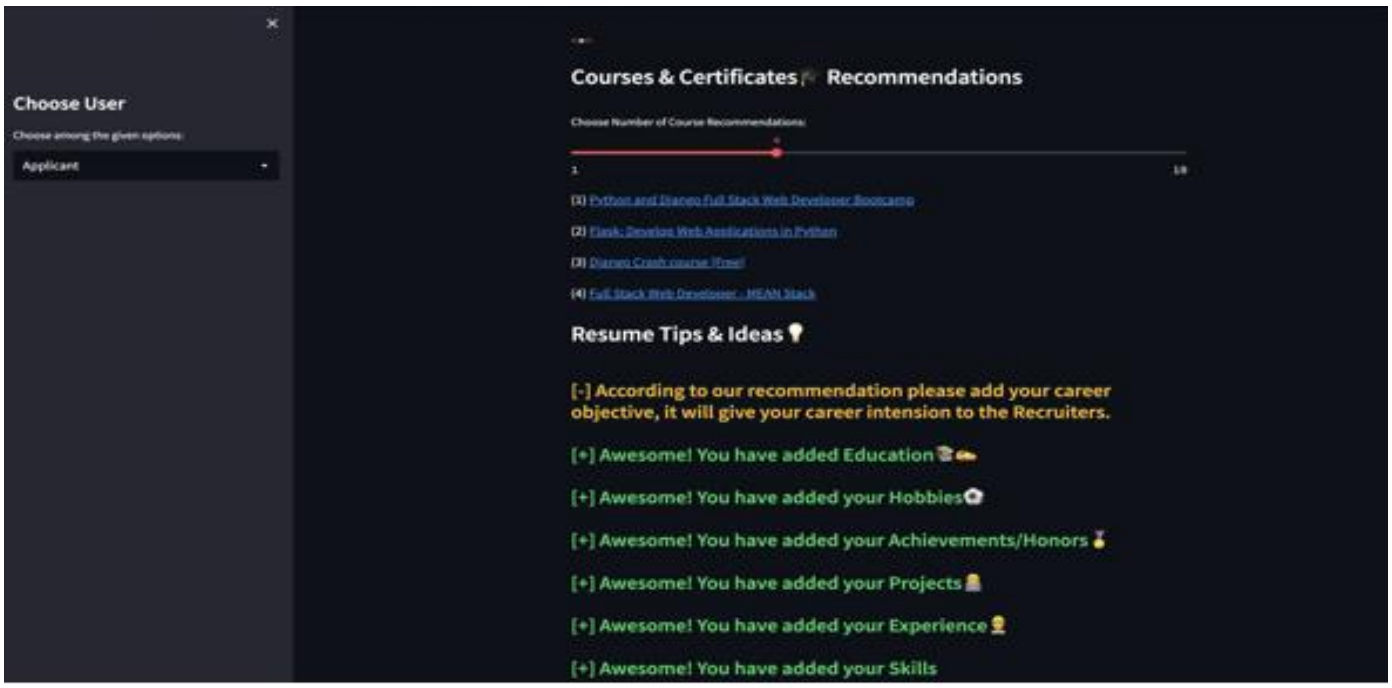

Fig 8 Course Recommendations and Resume Tips

Fig 8 represents the course recommendation. It asks the user for the no. of courses required based on a slider. The course list also has a hyperlink attached to each of the courses' original sites. Also there is section for resume improvement tips which tells where our resume is shining and what parts are lackingin the resume.

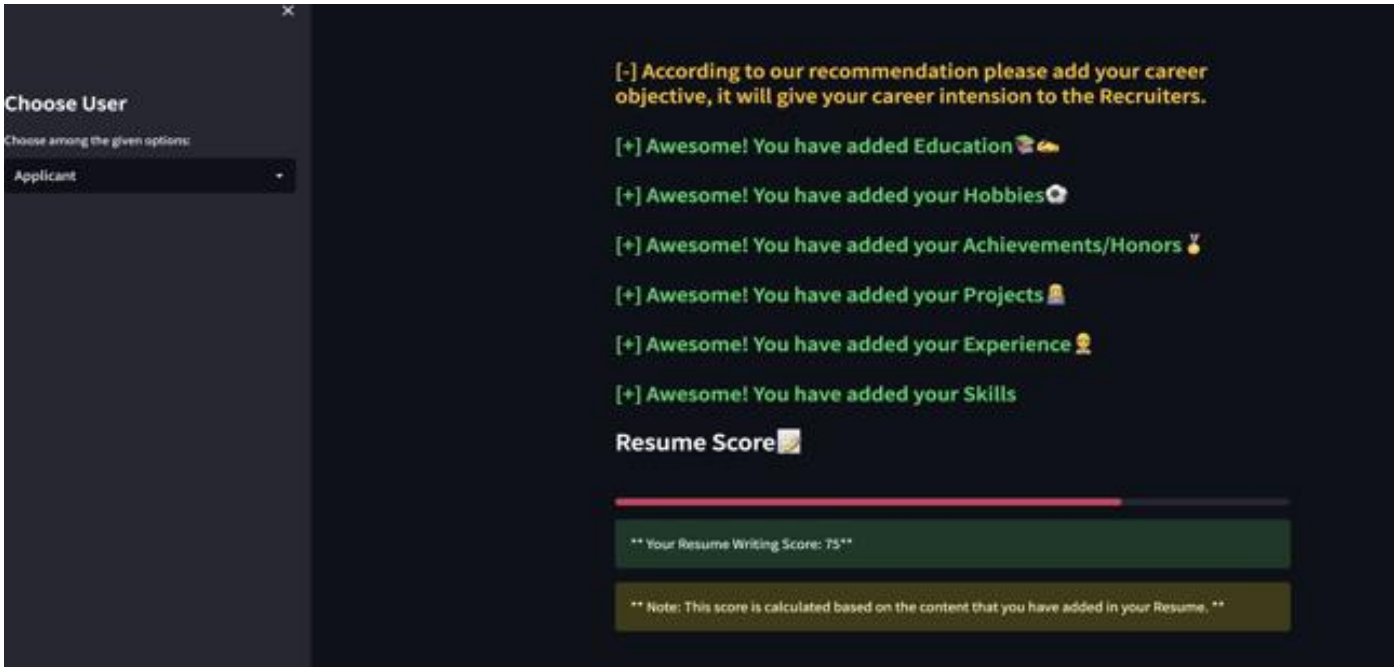

Fig 9 Resume Score

Fig 9 shows the resume scoresection of the project evalu- ates the quality and completeness of the uploaded resumes, Providing applicants with valuable feedback on their resume content. This feature assesses the presence of key sections such as Objective, Education, Hobbies, Achievements, Projects, Ex- perience, and Skills, assigning points for each section included in the resume. The system calculates a cumulative score based on the presence or absence of these sections, offering users a quantifiable measure of their resume's effectiveness. Addition- ally, the system provides personalized recommendations for improving the resume score by suggesting specific sections that may be missing or require enhancement. By offering actionable insights and guidance, the resume score section empowers applicants to optimize their resumes and increase their chances of success in the job market.

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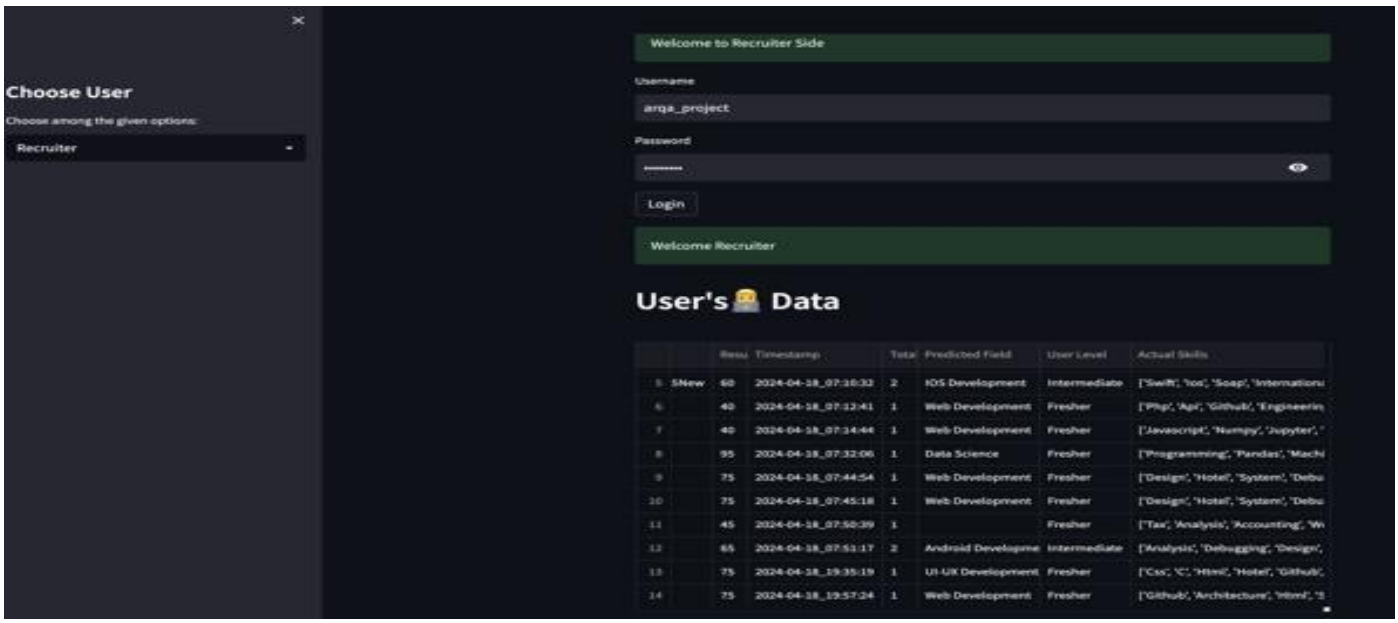

Fig 10 Recruiter Login and User Data

Fig 10 shows the recruiter login and user's data section of the project serves as a pivotal component in managing and analyzing applicant information efficiently. With a secure authentication mechanism, recruiters gain access to a com- prehensive dashboard showcasing vital details of applicants. Upon successful login, recruiters are presented with a central- ized repository containing applicant names, email addresses, resume scores, timestamps, predicted fields, user levels, actual skills, recommended skills, and recommended courses. This organized display allows recruiters to effortlessly navigate through applicant profiles, filter data based on specific criteria, and download reports for further assessment and decision- making. By providing recruiters with actionable insights and visualizations, such as pie charts illustrating the distribution of predicted fields and user experience levels among applicants, this section empowers recruiters to make informed recruitment decisions swiftly and effectively, thereby streamlining the hiring process.

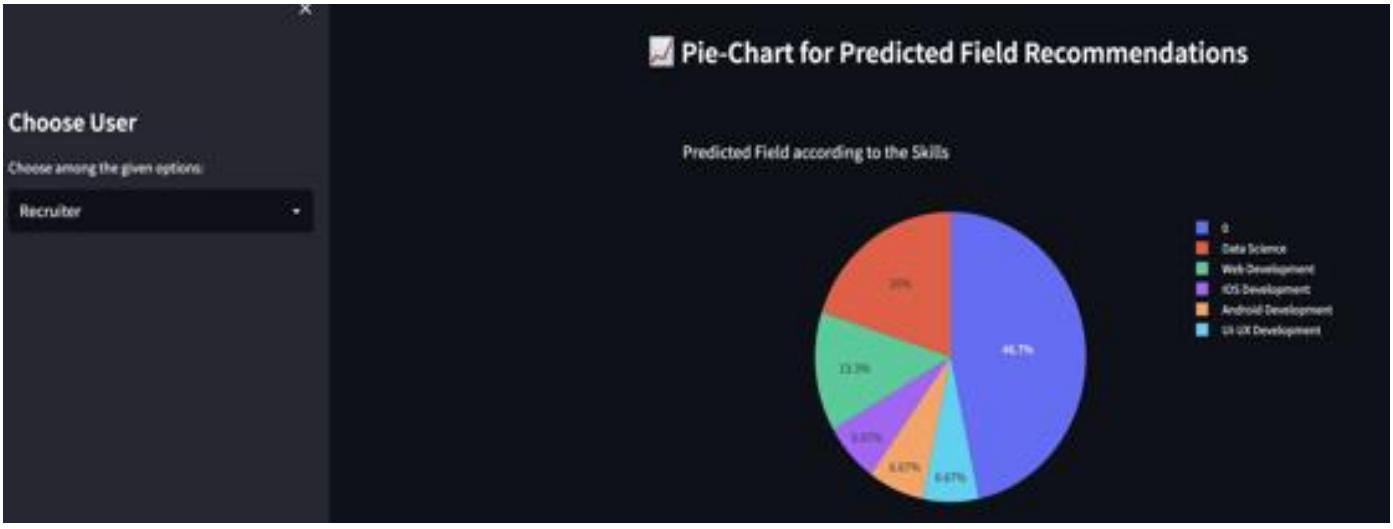

Fig 11 Pie-Chart Analysis

Fig 11 shows The pie-chart analysis section within the recruiter function of the project offers valuable visual insights into the distribution of predicted fields and user experience lev- els among applicants. Through intuitive pie charts, recruiters can quickly grasp the proportions of various job categories predicted for applicants and understand the experience levels of the candidate pool. These visualizations aid recruiters in identifying trends, patterns, and areas of interest, enabling them to tailor their recruitment strategies accordingly. By presenting complex data in a visually appealing and easy- to-understand format, the pie-chart analysis section facilitates efficient decision- making and enhances the overall recruitment process. Recruiters can leverage these insights to prioritize candidates, allocate resources effectively, and align recruitment efforts with organizational goals and requirements.

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VI. CONCLUSION

In the ever-evolving domain of Resume Parsing (RP), the endeavor to extract meaningful insights from resumes has become a focal point, resonating across various sectors. The implications of RP extend beyond technological advance- ments, reaching into pivotal areas such as recruitment, talent acquisition, and workforce management.

The evolutionary trajectory of RP methods, spanning from rule-based algorithms to sophisticated natural language pro- cessing (NLP) models, underscores the ongoing pursuit to unravel the complexities embedded within resumes. Through the adept use of named entity recognition (NER), keyword extraction, and contextual analysis, RP strives to enhance precision and efficacy in parsing critical information.

However, amid these advancements, challenges persist. Di- verse resume formats, linguistic variations, and individualistic expression styles present hurdles. Additionally, the scarcity of standardized labeled datasets and the inherent ambiguity in resume content pose ongoing challenges for robust andadaptable parsing.

The integration of datasets like ResumeDB, IndustryFocus Corpus, and Crowdsourced Resumes Dataset plays a pivotal role in establishing benchmarks for RP models. These datasets, diverse in resume content and formatting, provide the foun- dation for developing, testing, and refining innovative RP approaches.

Looking forward, future research avenues in RP involve addressing cross-industry variability, mitigating data scarcity challenges, and enhancing the interpretability of parsing mod- els. The exploration of multilingual parsing capabilities and the development of techniques to adapt to varied resume structures are paramount for advancing RP. In summary, Resume Parsing stands as a cornerstone in reshaping recruitment processes, offering immense potential in optimizing talent acquisition, improving organizational ef- ficiency, and fostering advancements in the ever-evolving landscape of human resources

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