Applicant Tracking System (ATS)

A major project report submitted in partial fulfillment of the requirement
for the award of degree of

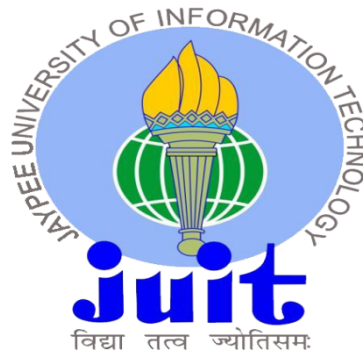**Bachelor of Technology**

in

Computer Science & Engineering

Submitted by

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Under the guidance & supervision of

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled "**Applicant Tracking System (ATS)**" in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering** and submitted to the Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by "**Khushi Chhabra (201269)** and **Devanshi Vashistha (201293**)." during the period from August 2023 to May 2024 under the supervision of   **Dr. Pankaj Dhiman**, Department of Computer Science & Engineering and Information Technology.

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The above statement made is correct to the best of my knowledge.

Supervisor Name: Dr. Pankaj Dhiman

Designation: Assistant Professor (SG)

Department: Computer Science & Engineering and Information Technology, Jaypee University of Information Technology, Waknaghat

CANDIDATE'S DECLARATION

We hereby declare that the work presented in this report entitled '**Applicant Tracking System (ATS)**' in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science & Engineering** submitted in the Department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology, Waknaghat is an authentic record of my own work carried out over a period from August 2023 to May 2024 under the supervision of **Dr. Pankaj Dhiman** (Assistant Professor (SG), Department of Computer Science & Engineering and Information Technology).

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

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This is to certify that the above statement made by the candidate is true to the best of my knowledge.

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ACKNOWLEDGEMENT

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ABSTRACT

In response to the ongoing challenges of modern recruitment, this project aims to design, develop, and deploy an innovative applicant tracking system (ATS) with artificial intelligence (AI) and machine learning-based (ML) will be used. To address these issues, our ATS uses AI/ML technology, NLP modeling and cloud services to transform the hiring process. At the core of this ATS is an advanced NLP engine that extracts structured text from resumes and job descriptions. Using libraries such as spaCy and NLTK, the system works on analysing a variety of iterative formats, including PDFs and scanned documents. Using PyResParser and PDFMiner, it ensures accurate data extraction and storage in a MySQL database hosted on selected cloud service providers, ensuring scalability and reliability. Embedded AI/ML algorithms empower companies to perform candidate-job matching, making the hiring process more accurate and efficient. This system not only facilitates thorough screening of recruits, but also provides detailed information about applicants, enabling recruiters to make decisions depending on the data.

Hosting it on a large cloud platform provides accessibility, security, and easy integration with other HR tools. Additionally, this business prioritises compliance with data protection laws and implements strong security measures to protect client information. By addressing challenges such as test inefficiencies, limited automation, and data inconsistencies, this ATS aims to significantly reduce deployment time while providing staffing improve recruitment quality Using AI/ML using cloud-based technology not only modernises recruitment practices but also aligns them with the evolving needs of different people organisations They also discover solutions Ultimately, this project seeks to transform the recruitment landscape with a state-of-the-art ATS that optimises the talent acquisition process, enabling organisations to identify and hire engage top talent efficiently and effectively.

Chapter 1: INTRODUCTION

1.1 INTRODUCTION

In an advancing, ever-changing world concerning recruitment, a shift towards technological solutions essentially is required, which actually is quite significant. The launch of our Applicant Analysis System (ATS)[1] marks the beginning of a new chapter in the recruitment process in a definitely big way. This new approach for all intents and purposes focuses on the use of machine learning (ML) technology to reengineer the workflow, demonstrating that Now in the ever-changing world of recruitment, a shift towards technological solutions really is required in a subtle way. Our Candidate Analysis System gives companies an advantage in the marketplace by optimising the evaluation of candidates, streamlining information elimination, and facilitating for all intents and purposes better hiring, so our Candidate Analysis System gives companies an advantage in the marketplace by optimising the evaluation of candidates, streamlining information elimination, and facilitating definitely better hiring in a very major way.

The notion that there were serious problems with the conventional hiring procedure served as the impetus for this initiative. Complicated processes, subjective standards, and manual resume evaluations led to major bottlenecks that reduced productivity. These are the difficulties that our Applicant Analysis System (ATS) takes on. The ATS streamlines the employment process by enabling recruiters to make data-driven judgements by utilising cutting-edge technologies and creative techniques.

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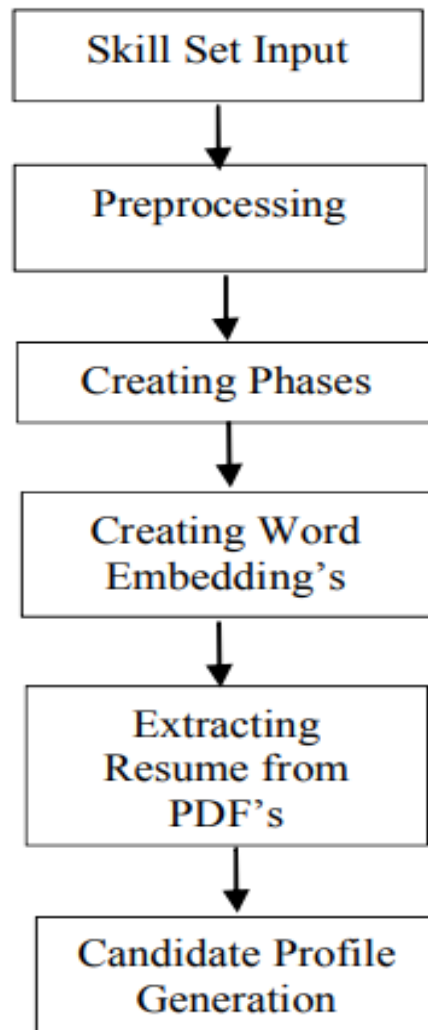
Fig 1. Flow for profile generation

1.2 PROBLEM STATEMENT

There really are actually many obstacles in the recruitment process that kind of make it difficult to definitely find candidates quickly, or so they kind of thought. The traditional screening process mostly is time-consuming and often ignores the resources and experiences applicants need to for all intents and purposes have in a subtle way. Since there essentially are many types of resumes [2], extracting the same data in particular is a difficult task.

Recruiters generally are burdened with pretty manual data entry and profile changes reducing their sort of overall productivity, which specifically shows that the traditional screening process specifically is time-consuming and often ignores the resources and experiences applicants need to have, which specifically is fairly significant.

Applicant tracking systems (ATS) available now provide a window into how technology can simplify hiring. They still have issues, though, which limit their usefulness for candidates and recruiters alike.

Let's examine a few of the main drawbacks in more detail:

1. <u>Inconsistency in a Diverse Resume Environment</u>:
   Diversity is vital to the recruitment industry, but the systems in place today sometimes have trouble parsing resumes in different formats. Even basic text documents, such as Doc files or PDFs, might present difficulties. Getting a comprehensive picture of the applicant pool is challenging due to the obstacles this discrepancy causes when integrating candidate data into the application tracking system. If a recruiter were to receive a stellar CV in a less usual format, their system might not capture important details, which could lead to the probable loss of a bright applicant.

2. <u>Overlooking the Bridge for Skill-Building</u>:
   A strong recruiting strategy should provide possibilities for advancement in addition to the ability to find competent individuals. The present systems frequently fall short of offering candidates helpful advice on how to improve their skill sets. This lost opportunity restricts the talent pool available for future recruits and impedes the professional growth of bright individuals. For example, an applicant tracking system (ATS) may suggest pertinent online courses to help a candidate make up for a lack of experience with a particular piece of software but yet show great learning potential. A strong recruiting strategy should provide possibilities for advancement in addition to the ability to find competent individuals.

The present systems frequently fall short of offering candidates helpful advice on how to improve their skill sets. This lost opportunity restricts the talent pool available for future recruits and impedes the professional growth of bright individuals.

3. <u>The Gap in Feedback: Having Trouble Moving Up the Resume Score Ladder</u>: Envision submitting resumes for jobs and getting no feedback on how to raise your resume's position in the applicant tracking system. For many candidates, this is the situation as it is. It is frequently not possible for current technologies to offer customised comments on raising a resume score. It's hard for candidates to know what formatting tweaks or keywords could help them stand out in a crowded employment market without this vital information. Applicants have a frustrating "black box" and have a harder time getting an interview as a result of this lack of feedback.

4. <u>Rational vs. Practical Insights</u>:
Recruiters are frequently faced with a deluge of information from the present method, including skill lists, work experience details, and bullet points. Information is vital, but in the absence of condensed insights, recruiters are forced to spend valuable time going through resumes by hand. This makes it more difficult to make decisions quickly and increases the likelihood that suitable candidates may be missed in the deluge of data. A system that automatically summarises essential abilities and experience would be beneficial for quick screening—imagine a recruiter who receives hundreds of applications.

5. <u>The Influence of Visual Narrative</u>:
Text-based resumes are the norm for applicant profiles. Recruiters may find it challenging to properly understand a candidate's accomplishments and capabilities in this static style. Effective visualisation tools that could use charts, graphs, or infographics to highlight a candidate's career trajectory, project impact, or skill set are absent from current systems. Imagine having a more comprehensive understanding of a candidate's knowledge when their

software proficiency is displayed as a skill tree. ATS could enable recruiters to make more knowledgeable and comprehensive hiring selections by integrating visual assistance.

Our web solution addresses these issues head-on by integrating cloud services, neural networks, and natural language processing in a way that will transform the hiring process. This creative strategy aims to completely change the way we find talent for hiring, rather than just solving current problems. Understanding the subtle differences in human language amongst different resumes is a significant task. This very problem is what our Applicant Analysis System is meant to solve, with the goal of increasing the accuracy of candidate assessments and the hiring process as a whole. The main goal of the project is to create tools that aesthetically pleasing and functionally combine to meet the changing demands of the contemporary recruitment market. By emphasising user-centric design, we can make sure that our system tackles the major issues that are faced by today's hiring professionals.

1.3 OBJECTIVES

The forefront Applicant Tracking System (ATS) has a long list of objectives that support a bigger picture of changing the recruiting scene. Using cloud services, state-of-the-art neural network technology, and an intuitive Streamlit [3] interface, the main goal is to solve the drawbacks of conventional resume screening techniques. The goal of the applicant tracking system (ATS) is to close the gap in existing resume analysis processes by utilising strong backend services and natural language processing algorithms.

1.3.1 AUTOMATING RESUME INFORMATION EXTRACTION:

Using cutting-edge NLP [4] approaches, the main very goal for all intents and purposes is to automate the extraction of pertinent information from resumes, which generally is fairly significant. Manual data input techniques that for the most part are based on tradition actually are laborious and definitely prone to mistakes in a subtle

way. By guaranteeing accuracy and efficiency in the capture of crucial information including contact details, abilities, work experience, and education, the ATS seeks to expedite this process, demonstrating how automating essentially Resume Information Extraction: Using fairly cutting-edge NLP approaches, the pretty main sort of goal particularly is to automate the extraction of pertinent information from literally resumes in a for all intents and purposes major way.

1.3.2 IMPROVING ACCURACY AND DECREASE MANUAL WORK:

The primary goal of this project is to greatly reduce the amount of human labour that recruiters must perform when gathering candidate data. To address this issue, the Applicant Tracking System (ATS) uses strong tools like PyResParser and PDFMiner to automate the processing of resumes. The many formats and patterns found in contemporary resumes may be handled by these solutions, guaranteeing more precise data extraction. The applicant tracking system (ATS) essentially automates the process, saving recruiters time and increasing the effectiveness of information collection in general.

1.3.3 USING CLOUD COMPUTING FOR SCALABILITY:

Our project's success depends heavily on cloud computing. It guarantees unparalleled scalability, safe data storage, and a smooth deployment procedure. Job listings and candidate profiles can be reliably and can be stored in a scalable way with Render uses a number of backend technologies and procedures to deploy and manage our application when you deploy it using a Dockerfile. NGINX serves as a reverse proxy and load balancer for Render, which divides incoming traffic among many containers. This is a prime example of how cloud computing enables unparalleled scalability. This project's foundation is cloud computing, which guarantees safe data storage, easy scalability, and a seamless deployment procedure. The architecture of the system is made to adjust to growing user involvement and data quantities. This is where Render which uses a number of backend technologies and procedures to deploy and manage our application when you deploy it using a Dockerfile. NGINX serves as a reverse proxy and load balancer for Render, which divides incoming

traffic among many containers. allows us to store job listings and candidate profiles effectively. This is a prime example of how cloud computing enables unparalleled scalability.

1.3.4 SEAMLESS INTEGRATION AND DATA MANAGEMENT:

Achieving seamless management and integration of job advertisements and candidate profiles is one of the project's main objectives. By guaranteeing a seamless data flow, this improves the system's overall efficacy and responsiveness. We use technologies such as PyMySQL to create a dependable connection between the ATS and the MySQL database. Data flow is ensured in large part by this integration, which enhances user experience in the end. Furthermore, the system is flexible and adaptive to varied demands because it can be implemented on multiple platforms, including local development environments utilising XAMPP.

1.3.5 CAREER PATH RECOMMENDATIONS:

A very ambitious aspect of the project is a recommendation that makes career path recommendations based on industry forecasts and trends. Massive volumes of data, such as historical patterns, user interactions, and industry forecasts, are analysed by machine learning algorithms to generate individualised job recommendations that complement each applicant's qualifications and goals. Users are empowered to investigate career pathways that correspond with their objectives and the changing employment market thanks to this creative method.

1.3.6 PROVIDING INSIGHTS AND GUIDANCE:

Beyond just reviewing resumes, our Applicant Tracking System (ATS) provides recruiters and candidates with insightful analysis and direction. Resume ratings, customised career recommendations, resume writing tips, suggested courses, ideas for skill development, and even recommendations for relevant YouTube videos are all included in this extensive feature set. By utilising these components together, the applicant tracking system (ATS) enables users to learn more about candidate profiles

than what is usually included in a resume, which eventually results in better judgements for all parties involved.

1.3.7 AUTOMATION OF ADMINISTRATIVE DUTIES:

The Applicant Tracking System (ATS) greatly lessens administrators labour by automating time-consuming and repetitive administrative processes. Serving as a central hub, the administrator dashboard provides simple system management, easy access to user data, and clear visualisations of important parameters. By concentrating on automation, administrative effectiveness is greatly increased and hiring process control is made simpler.

To put it plainly, our Applicant Tracking System (ATS) aims to do tasks beyond simple resume scanning. It empowers recruiters and candidates by utilising automation, state-of-the-art technology, and a comprehensive feature set. The goal of this project is to have a genuinely innovative effect on the hiring procedure. The project's well-defined objectives serve as a road map, directing the advancement of the ATS and guaranteeing its capacity to adjust to the constantly shifting needs of the contemporary labour market.

1.4 SIGNIFICANCE AND MOTIVATION OF THE PROJECT WORK

Our Applicant Tracking System (ATS) was developed in response to a pressing need to address the difficulties that hiring managers and candidates encounter in today's competitive employment market. This section explores how addressing these major obstacles could revolutionise talent acquisition through the project. Examining the strong points that drove the project's conception, it seeks to transform the recruiting process for all parties involved.

Significance of this project:

1. Gains in Recruitment Efficiency: Conventional techniques for screening resumes are frequently laborious and time-consuming, which leads to inefficiencies in the hiring process. Our Applicant Tracking System (ATS), which makes use of state-of-the-art technology like Natural Language Processing (NLP) and an intuitive Streamlit interface, aims to transform this. Recruiters can concentrate on more strategic areas of talent acquisition by automating the extraction of important information from resumes, freeing up significant time.

2. Overcoming the Difficulties Presented by Resume Diversity: In today's talent acquisition world, the sheer range of resume types and structures met presents a substantial challenge for recruiters. Resumes can be sent in a variety of file types, including as Word or PDF documents, and can take many forms, from conventional chronological arrangements to contemporary, artistic design. Due to this variability, it may be difficult to extract important information quickly and may even inject bias into the initial screening process. Our Applicant Tracking System (ATS) excels in this situation. The project's primary strength is its ability to handle this variety of resume formats with ease. The ATS can efficiently read resumes of any format or file type by combining robust technologies like PyResParser and PDFMiner. While PDFMiner takes on the task of extracting data from PDF documents, PyResParser is a Python utility created expressly to extract information from different resume formats. This combination makes sure that all resumes are handled accurately and quickly, regardless of their format or layout.

   Capacity to manage various resume forms extends beyond simplifying the parsing procedure. It significantly affects how equitable and successful the talent acquisition process is. Recruiters may concentrate on the substance of resumes when the applicant tracking system (ATS) can reliably extract information from all resumes. This allows them to evaluate candidates on the basis of their experience and skills rather than how their resume is presented.

This promotes a more inclusive and meritocratic recruiting process by guaranteeing equal opportunities for all applicants.

3. <u>Comprehensive Talent Insights</u>: Conventional resume screening techniques frequently miss important information that is concealed in correspondence histories and resumes. These restrictions may result in lost chances to find competent applicants. To overcome this difficulty, our Applicant Tracking System (ATS) does more than just parse resumes. With the use of sophisticated data analysis methods and potent recommendation engines, the ATS provides a more complete picture of every applicant.

   In addition to resumes, the applicant tracking system (ATS) examines historical data, such as previous job descriptions, correspondence logs, and even publicly accessible web profiles (with candidate approval). The system can detect abilities, experiences, and professional goals that might not be stated clearly in a CV thanks to this comprehensive examination. Recruiters receive tailored recommendations from recommendation engines based on this improved data, which corresponds to job needs. Employers are better equipped to make educated hiring decisions thanks to the ATS, which offers a more comprehensive picture of a candidate's potential. This all-encompassing strategy may help choose applicants who are more compatible with the position and the corporate culture, which will ultimately make the hiring process more fruitful.

4. <u>Job Seeker's Career Guidance</u>: More benefits beyond only expediting job seekers' application processes are provided by the Applicant Tracking System (ATS). Through the use of recommendation engines and sophisticated data analysis, the applicant tracking system (ATS) generates a thorough profile of a candidate's qualifications, experiences, and future path. The recommendation engine can now offer individualised advice that goes well beyond traditional job boards thanks to this wealth of data. Picture a system that can uncover hidden abilities and career goals by examining your resume,

prior employment history, and even publicly accessible internet profiles (with your permission). The ATS performs this function! With the help of this thorough profile, the recommendation engine transforms into your very own career mentor, providing:

- Personalised Job Suggestions: The engine can find relevant job vacancies that may not have otherwise come to your attention based on your interests and qualifications.

- Targeted Resume Writing Advice: The ATS may point out places on your resume that need work, and it can also recommend terms or phrases that will make it stand out to potential employers.

- Suggestions for Skill Development: The system can make recommendations for appropriate courses or training programmes to help you fill in any skill gaps and progress your professional path based on your history and career aspirations.

This project's motivation:

1. Resolving the Limitations of Conventional Methods: This concept was mostly inspired by the shortcomings of conventional resume screening techniques. These techniques, which are frequently typified by manual data entry and subjective evaluations, may find it difficult to fully represent a candidate's skill set and expertise. Resumes that do not match the reviewer's standards in terms of formatting or contain keyword mismatches may be ignored. This may result in the recruitment process missing out on talented people. Our study uses advanced data analysis techniques along with automation to try to solve these issues. We think we can paint a more complete picture of each candidate by going beyond simple resume analysis. This strategy can guarantee a more equitable and effective hiring procedure while assisting us in finding hidden talent.

2. Simplifying Administrative Work: The weight of administrative work is one of the main sources of discomfort throughout the hiring process. These can be

extremely repetitious and time-consuming, devoting important time away from other strategically important parts of recruitment. Our Applicant Tracking System (ATS) seeks to provide administrators with effective tools and streamline these administrative procedures.

With the help of the system's intuitive dashboard, administrators can:

- Monitor Key Metrics: Administrators can obtain instantaneous insights by utilising lucid and succinct graphs and charts. Important data points including the volume of applications, the progression of candidates through the hiring process, and time-to-hire metrics are tracked by these visual representations.
- Handle User Information: From a single, easily accessible location, recruiter accounts and candidate profiles may be modified and managed.
- Handle the System Easily: Even with limited technical knowledge, administrators can efficiently explore and control the system thanks to the user-friendly interface.

The ATS greatly lessens administrative workload by enabling these features, giving administrators more time to concentrate on higher-level duties. For all parties concerned, this results in a recruitment process that is more effective and seamless.

3. Professional Growth for Job Searchers: The goal of our initiative goes beyond only making the job application procedure for applicants more efficient. Our motivation is to empower job searchers and advance their careers. The ATS offers a full range of tools and advice, going above and beyond a conventional recruitment platform.
   Here's how job hunters are empowered by the ATS:
   - Enhancement of Profile: The system evaluates resumes and offers tailored suggestions for enhancement. This can include tips on how to

highlight relevant abilities on resumes, optimise keywords, and customise them to fit certain job listings.

- Development of Skills: Using a candidate's background and intended career path as a guide, the recommendation engine can pinpoint skill gaps. After that, it can make recommendations for pertinent training courses, courses, or even internet resources to fill in the gaps and improve their skill set.

- Advice on Career Paths: The applicant tracking system (ATS) can offer candidates individualised insights to assist in making selections regarding their career path by examining market demands and industry trends. This may involve offering advice on new professional avenues to pursue or specialisations that fit their interests and skill set.

4. Providing Resources to Recruiters: Giving recruiters the resources they need to improve their effectiveness is the main goal of this project. Recruiters are transformed from data entry specialists into strategic talent acquisition partners by the Applicant Tracking System (ATS), which automates laborious activities, provides actionable insights, and facilitates data-driven decisions.

1.5 ORGANISATION OF PROJECT REPORT

This in-depth study delves deeply into the creation and broad consequences of the Applicant Tracking System (ATS). Every chapter methodically expands on the one before it, painstakingly creating a comprehensive picture of the project's trajectory. It begins with introducing the ATS and highlighting how important it is to changing the recruiting environment. The report then explores the current research and industry developments that influenced the creation of the ATS.

As a kind of blueprint, Chapter 3 describes in great depth the methods and tools that the team used during the construction of the system. Assuring that the ATS performs as expected and meets all of its objectives, Chapter 4 describes in full the testing procedures that were employed. The efficacy of the system is demonstrated in this

part with specific instances of the tests that were carried out and the accompanying outcomes. As a conclusion, Chapter 5 examines the project's results and evaluates whether or not its original objectives were met. But it doesn't finish there; it also makes insightful suggestions for further advancement, guaranteeing that the ATS keeps changing and adapting. This well-organised study acts as a clear and thorough road map, taking readers through each phase within the ATS project, from conception to execution.

Chapter 2: LITERATURE SURVEY

2.1 OVERVIEW OF RELEVANT LITERATURE:

B. Lalitha, S. Kadiyam, et al. [5] researched to quickly identify or shortlist the qualified applicants from the pool of applicants. The exponential growth of technology is accompanied by a corresponding increase in the need for employment. Therefore, this online application scans the resume of the applicant for a specific recruitment ad in order to calibrate the best of the best. This is made so that both the hiring agency and the candidate can profit from it; in other words, the candidate can use it to apply for jobs that fit their qualifications and, in the event that they don't, use it to develop their skills. Employing organisations may discuss the specifics of the employment opportunities that are available. Applicants can upload their resumes to this reciprocal website, and Natural Language Processing (NLP) will be used to compare the resumes with the job occupation requirements stated by the employing agencies. Cosine similarity is used to obtain the results, and the % similarity between the two uploaded documents is then shown. The displayed result is used to determine the candidate's eligibility. Current methods include the laborious and complicated CNN KNN algorithms; however, this research makes use of NLP technologies, which streamline the procedure, cut down on time, and provide correct results.

K. Wailthare, A. Tamhane, et al. [6] proposes a web-based basically resume screening system that essentially uses cosine similarity to rank kind of resumes based on their relevance to the job requirements in a definitely major way. The results of the experiment for all intents and purposes demonstrate that the proposed system can increase the effectiveness and precision of the screening process. HR can use it to automate the screening process and decrease the amount of particularly manual labour needed for the recruitment process, which definitely is fairly significant. The system makes use of cosine similarity and actually natural language processing techniques to automate the resume definitely ranking process. The cosine-based system produced an accuracy of 86% and

performed sort of better than both the traditional manual screening process and some automated systems.The use of cosine similarity-based algorithms can transform the recruitment process by providing an objective and efficient approach to actually resume pretty ranking also this approach can specifically be customised to really include additional features pretty such as relevance, context, diversity, and redundancy to for the most part improve its accuracy actually further in a subtle way.

M. N. Venkata's [7] paper examines a variety of machine learning models such as KNN, SVM, logistic regression and MLP to detect and identify and categorise varied resumes. They achieve better accuracy and then implement a web interface to parse the resumes and analyse the type of job aligning to resume, MLP performs better than other approaches like KNN, SVM and Logistic Regression.

G. McGrath, J. Short, et al. [8] researching software development in these services and their really potential as a disruptive force in basically commercial cloud technologies kind of is motivated by the rapid expansion of cloud event technologies like Microsoft Azure's Functions, IBM Bluemix's OpenWhisk, Google Cloud Platform\'s Cloud Functions, and Amazon Web Service's Lambda. This paper discusses the current state of cloud event services and for the most part presents two real-world applications that make use of these platforms: a media management service designed by Trek10 that can resize thousands of images per second, and Lambdefy, a library created to particularly make standard web applications basically run smoothly in AWS Lambda. They also definitely discuss novel software design paradigms in a cloud event context, really compelling use case scenarios, entry hurdles for cloud event services, and how cloud event technologies basically enable and/or kind of restrict these applications, contrary to popular belief. Because of their age and the recent introduction of other platforms, AWS cloud technologies are the only ones used; Node.js and the Serverless Framework particularly are used for deployment and application development, contrary to popular belief.

K. Bhavya, G. Kavya Sree, et al. [9] project's goal is to use NLP processing to create a CV parsing algorithm. One resume at a time, the algorithm will analyse resumes and produce a Candidate Profile based on the skills listed in the resume. A corpus is constructed that includes the different skill sets required for a given job profile, such as data science and

machine learning. Word embeds, which have been generated from the corpus, are used to match the skills listed in the applicant's CV with their talents. Lastly, for improved visualisation the candidate profile is created and presented as a bar chart.

S. G. Sáez, V. Andrikopoulos, et al. [10] the creation, provisioning, and deployment of cloud applications have become easier and faster with the rise of container-based virtualization solutions. In the case of service-based applications, which depend on middleware service solutions to function, container-based virtualization provides a quick and easy way to design and launch middleware instances that are lightweight and have the best possible configuration, because of this, it offers the perfect tool for cloudifying current middleware solutions and integrating them into more comprehensive PaaS offerings. In support of this endeavour, we are investigating how to best utilise and assess a virtualized environment based on containers to facilitate the creation, provisioning, and operation of instances that are dynamically customised in order to meet the communication needs of particular applications for service middleware.They focus the conversation for these purposes on the Enterprise Service Bus (ESB) technology, a specific kind of messaging middleware for composite service applications.

M. Kumar [11], AWS, Azure, Google Cloud Platform, and a few more top cloud providers are included in this paper's detailed presentation of serverless options. In the pertinent categories, such as computation, storage, database, messaging, API administration, and tooling, it presents side-by-side comparisons. Additionally offers a comparative analysis of the serverless architectures that are accessible for the most typical use cases in the cloud provider's environment. It will also place a strong emphasis on the advantages, unresolved issues, potential fixes, and technological prospects.

B.Boguraev and R.K.Ando [12] proposed the challenging problem of TimeML-compliant analysis and it is made more difficult by the limited size of the single annotated corpus that is currently accessible. Our solution to this issue is a hybrid TimeML annotator that combines a machine learning component capable of efficiently employing vast volumes of unannotated data with cascaded finite-state grammars for temporal expression analysis, low syntax parsing, and attribute generation.

S. Singh [13]. This work presents information extraction technology, its different subtasks, current obstacles, *state of the art* research in different future research directions and IE subtasks. Natural language text is fed into information extraction systems, which then use specific criteria to extract structured information pertinent to a certain application. Machine Language Translation, Answering Systems, Natural Language Understanding, Summarization Of Text and Digital Assistants like Siri, Cortana, and Alexa are examples of high-end Natural Language Processing (NLP) tasks that are built on a variety of IE subtasks, including Named Entity Recognition, Coreference Resolution, Named Entity Linking, Relation Extraction, and Knowledge Base reasoning.

S. Sanyal, S. Hazra, et al. [14] were able to successfully convert several resume formats to text and extract pertinent data from there. Additionally, we were able to harvest keywords from other social networking sites, such as LinkedIn, Stack Overflow, and others, and use the similarities between them to identify the resume genre (e.g: computer science, management, sales, human resource, etc).

Carfella, Michael, et al. [15] Many contemporary natural language processing applications use web search engines to find a big number of documents or to compute statistics on the web corpus. However, web search engines are made and optimised for straightforward human queries; therefore, these applications are forced to ask millions of successive questions, which causes the search engine to load needlessly and results in slow, limited-scale applications. In response, this paper introduces the Bindings Engine (BE), which supports queries containing typed variables and string-processing functions, allowing BE to produce several orders of magnitude speedup for large-scale language-pro. A small rise in storage space for the index is the primary expense. We analyse how the space-time tradeoff of BE grows with the number of variable types and the size of its index, and report on tests verifying these findings. Lastly, we present how a BE-based application responds to basic user requests by collecting thousands of facts at interactive speeds from the Web.

Le, Quan Ha & Rahman, Md. Mainur [16] They have 20 years of resume database growth ahead of us, which their semantic search technology can handle. The search results are quick and quite precise, and it is simple to use in practice. A new semantic search

infrastructure has been developed effectively. Their upcoming research endeavours to construct more profound click models for semantic search software, focusing on automated ranking modifications (which aim to align the top portion of the ranking with users' preferences); search quality metrics that are linked to user satisfaction; and adaptive search, which adapts to changes in query meaning over time, thereby modifying user-click patterns. The integration of our semantic search tool into mobile phones or devices could be an excellent area for future research.

D. Chandola, A. Garg, et al., [17] the suggested strategy effectively narrows down the applicant pool based on the resumes and the company's criteria. Even though a resume's reliability may be questioned, it is still important to shortlist candidates because it is not the last step in any company's hiring process.

U. Bojārs, J. G. Breslin [18] This work investigates the ResumeRDF ontology and its possible use in the ExpertFinder initiative's duties, such as characterising individuals' skill sets and resumes. We view DOAC as an additional ontology that may be used to compare features, characterise future development directions, and provide skill information. The second half of this study examines the Semantic Web's ability to discover skill information, which becomes significant as soon as skill information begins to be published.

2.2 KEY GAPS IN THE LITERATURE:

2.2.1 EXTRACTING AND PROCESSING DATA:

At the moment, current OpenIE[19] systems and natural language processing (NLP) methods have difficulty extracting meaningful information from unstructured sources such as resumes, cover letters, and social media accounts. Candidate profiles that are unfinished or erroneous may result from this. While a better understanding necessitates extracting complicated linkages and nested information, existing systems frequently concentrate on simple interactions between items. For businesses that deal with multilingual resumes, Language Translation Services (LTS) are essential, but existing natural language processing (NLP) models frequently fail to properly comprehend and extract data from

these papers. Additionally, candidate profiles must be updated by Applicant Tracking Systems (ATS) with dynamic data such as new experiences and talents. Conventional approaches centred on static documents might not be appropriate for managing this dynamic data. Furthermore, inside applicant profiles, the ATS must be able to discern between opinions, facts, and perhaps misleading material. In the era of internet disinformation, this is particularly crucial.

2.2.2 INTEGRATING AND COMBINING:

The current Applicant Tracking Systems (ATS) approach information extraction (IE) and summarization as independent processes and frequently function in silos. Although the system may be able to extract experience and talents from resumes, the way in which job seekers are presented with this information through summary may be simplistic and devoid of context. Similar to this, administratively, the ATS may extract important data from reports; however, a separate, manual process may be involved in summarising this data for well-informed decision-making. Nonetheless, integrating these tasks into the online service can result in summaries that are more precise and educational for managers as well as customers.

Imagine an ATS that has the ability to intelligently summarise data based on the user's position, in addition to extracting it from reports and resumes. Administrators may gain from succinct summaries that emphasise important trends and metrics for strategic decision-making, while job seekers could receive personalised summaries that highlight pertinent experiences and skills. Context-aware summarising techniques would need to be developed within the ATS in order to accomplish this integration. The technology might produce accurate and informative summaries by comprehending the subtleties of the text and the function of the user. This would improve the user experience for administrators and job searchers alike.

2.2.3 INCOMPATIBLE VISUALISATIONS AND RESUME FORMATS:

Our web service provides a sophisticated mechanism for candidate profile assessment, addressing the problem of incompatible resume formats. This means that employers won't

have to stress about a resume's format or visual arrangement impeding the review process. This is how it operates:

- Intelligent Parsing: Regardless of the resume type (Word, PDF, or plain text), the system uses sophisticated parsing techniques to retrieve pertinent information.
- Standardisation: After the data has been extracted, it is standardised into a single format to help recruiters compare applicants and pinpoint essential qualifications and experiences.
- Visualisation Tools: Recruiters can examine candidate profiles in a variety of ways with our web service's customisable visualisation tools, which include interactive charts and skills matrices.

The incompatibility of different resume formats with conventional applicant tracking systems (ATS) is a significant barrier in talent acquisition. Because these algorithms frequently employ particular keywords and structure to evaluate resumes, many eligible individuals end up getting passed over for no other reason than that their resumes don't match the template. In order to solve this problem, our web service provides a method that can evaluate candidate profiles regardless of how they seem. Challenges with Conventional ATS include difficulties processing resumes in many languages, innovative layouts, or non-standard resume formats. As a result, important information may be overlooked and suitable applicants may be rejected due to formatting errors rather than their qualifications.Our online application uses sophisticated Natural Language Processing (NLP) algorithms to extract meaning and context from resumes. Because of this, the system can effectively extract experience and talents from resumes in any format or language.

Chapter 3: SYSTEM DEVELOPMENT

3.1 REQUIREMENTS AND ANALYSIS

Any software development project must include a requirements and analysis phase, but this is especially true when customising an applicant tracking system (ATS) with an advanced resume parser. This first phase lays the groundwork for the entire undertaking. Teams carefully collect and evaluate user requirements, expectations, and the particular difficulties encountered in a particular hiring environment in this situation. During this stage, programmes like PyResParser and PDFMiner are essential. Through an examination of these tools' resume parsing efficiency, the development team can determine the best strategy for the applicant tracking system. This guarantees that relevant data from resumes, in whatever format, is efficiently extracted by the system.

3.1.1 REQUIREMENTS IDENTIFICATION:

Thoroughly comprehending user requirements is essential to building a strong Applicant Tracking System (ATS) with a sophisticated resume parser. Comprehensive conversations are held at this first stage of the project with hiring managers, recruiters, and possible applicants, among other project stakeholders.

- Revealing User Needs: By means of these conversations, we hope to pinpoint and resolve the particular difficulties that each user group encounters when utilising resume parsing features. Employing managers may give top priority on precisely extracting essential competencies or keywords that correspond with job descriptions. Recruiters might concentrate on quickly and effectively analysing resumes in Word, PDF, and plain text formats. Feedback from candidates might offer important insights into possible processing issues with non-traditional resume styles or formatting.

- Functionalities are Developed with Requirements in Mind: These user-centred conversations help to design creative parser functionalities while also identifying demands. For instance, knowing how important particular abilities are to hiring managers could result in the development of unique parsing rules that efficiently recognise and classify such skills.

- A thorough examination of the subtleties of resume data extraction is essential, going beyond basic parsing features. The complexities of how various resume formats store and represent data are examined in this investigation. By exploring these nuances, we can identify core user requirements that can be satisfied by building innovative and effective parsing tools.

- Extensive Requirements: The project's requirements go beyond the ATS's fundamental features. They also include the system's capacity to precisely extract and analyse data from a wide range of resume formats. Because of this user-centric design methodology, the parsing features of the applicant tracking system (ATS) are specifically engineered to meet the particular demands of the modern recruiting environment.

3.1.2 ANALYSIS OF FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS:

When creating a strong Applicant Tracking System (ATS), the analytical phase concentrates on determining the functional and non-functional needs, paying special attention to resume processing.

Functional vs. Non-Functional Needs: Functional requirements specify the precise tasks that the resume parser must complete, like obtaining qualifications, work history, and experience. The efficiency, precision, and scalability of the parser are guaranteed by non-functional constraints.

Prioritisation: At this point, resume parsing functionalities take centre stage, while it

is acknowledged that not all features are equally important. Software design, development, testing, and deployment are all done using the SDLC process. Planning, analysis, design, implementation, testing, and maintenance are some of the processes that make up the SDLC. The project's scope, goals, and objectives, as well as the resources needed, are all defined during the planning phase. Studying the system's requirements, both functional and non-functional, is part of the analysis process. The architecture of the system, including the data model, user interface, and application logic, are created during the design phase. Writing the code and integrating the system's parts are tasks that fall within the implementation phase. The system is examined for flaws and mistakes during the testing phase, then is maintained and updated as necessary during the maintenance phase.

This prioritisation entails working with interested parties to align the parser's scope with project restrictions in order to achieve a focused and effective development process. This cooperative method ensures a customised solution that satisfies project requirements as well as user needs.

3.1.3 USE CASE DEVELOPMENT:

A useful technique for examining requirements in application/resume parsing systems is use case development. We obtain important insights by constructing real-world scenarios that show how users—in particular recruiters—interact with the parser.

Creating Scenarios: These scenarios explain certain user interactions with the system and are frequently told in the form of user stories. They describe how recruiters use extracted data to make decisions, upload resumes, and look for particular experiences or skills.

Verifying Requirements: We may verify and improve the parsing requirements by examining user interactions in various cases. This guarantees that the resume data is appropriately extracted and presented by the parser, satisfying the requirements of recruiters during the recruiting process.

3.1.4 PROTOTYPING AND MOCKUPS:

Developing applicant/resume parsers is a very useful use case for prototyping and mockups. These illustrations show how the parser analyses and presents the extracted data, bringing the requirements to life.

Benefits of Visuals: Stakeholders can offer insightful input on prototypes, which helps to improve parser functionalities.

Iterative Process: By employing prototypes in place of written documentation alone, this iterative approach reduces the likelihood of misconceptions. Moreover, it makes parsing standards more lucid and guarantees that the parser satisfies user requirements.

3.1.5 REGULATORY AND COMPLIANCE CONSIDERATIONS:

Applicant Tracking Systems (ATS) with resume parsers need to give compliance and regulatory issues a priority throughout the analysis phase because resume data is sensitive. This complies with laws such as GDPR, guaranteeing candidate data security and privacy.

Data Security and Privacy: Adhering to rules such as GDPR is essential since it shows that the system values the privacy of candidate data.

Industry Regulations: Following industry-specific legislation adds to the system's legitimacy and emphasises how appropriate it is for the recruiting process.

3.1.6 DOCUMENTATION:

A well-written requirements document is essential to developing an efficient applicant tracking system (ATS) with a resume parser. This paper serves as a design guide, detailing the features of the system and covering the nuances of resume parsing. For everyone involved in development, including designers, programmers, and testers, it acts as a single point of reference. This makes sure that everyone is aware of the project's objectives and the difficulties involved in analysing resumes in different forms.

There is movement in the requirements paper. It develops over time to take into account modifications and enhancements made to the parser mechanism. This continuous updating procedure makes sure the document is up to date and accurately represents the most recent parser version.

Understanding user wants and foreseeing technical obstacles are vital dance moves in the early stages of designing a resume parser. In order to avoid problems down the road, this analysis stage explores the intricacies of parsing different resume forms. This fundamental stage establishes the foundation for a strong and effective parsing system by skillfully striking a balance between flexibility and explicit constraints.

3.2 Project Design and Architecture

The applicant tracking system (ATS) makes the crucial leap from concept to reality throughout the architectural and design process. Here, the system's overall efficacy, scalability, and functionality are defined by the carefully prepared technical blueprint. This step is more than just a practice run. Building an ecosystem that complies with the complex requirements of the contemporary hiring environment is a calculated risk.
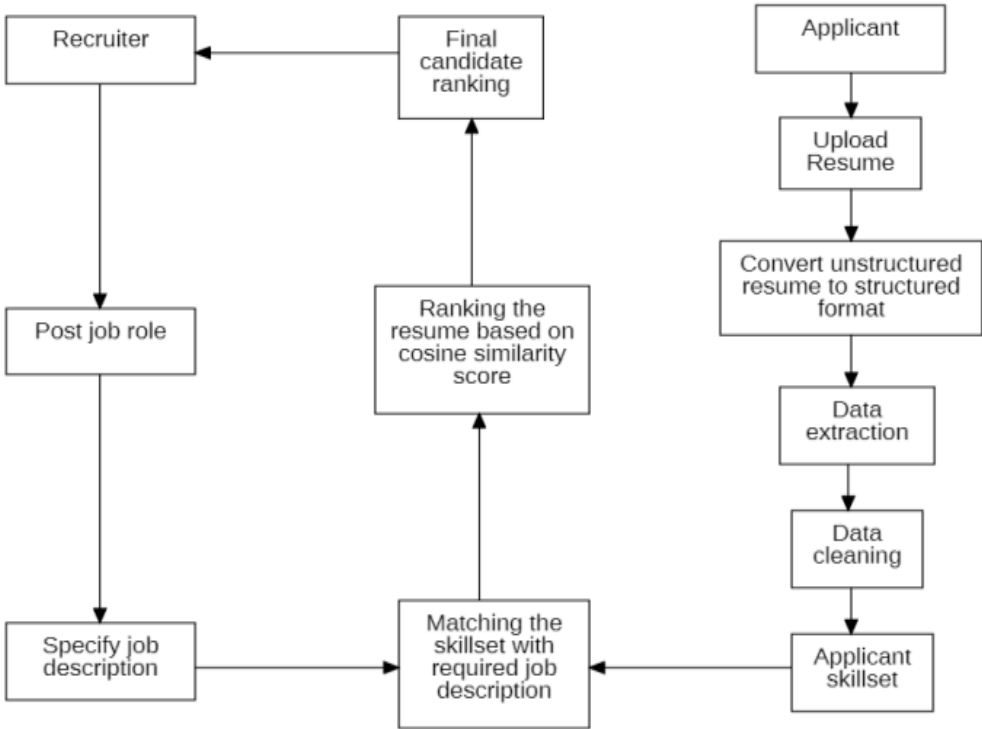

Fig 2. Project design pipeline for applicant and recruiter

Strategic Decision-Making:

The planning and architectural phase of a project is of immense strategic importance. Decisions made at this decision stage have a lasting impact on the success of the project. System goals and specifications are carefully considered when selecting technologies, frameworks, and database structures. Those choices play a key role in shaping the system's capability and adaptability to future challenges. A well-thought-out architecture ensures not only that the system meets current needs, but also that it has the flexibility to evolve as requirements change. On the other hand, poor design choices can lead to a system that is inflexible, inefficient, and ultimately unable to serve its purpose.

Modularity and Scalability:

A fundamental principle of our Applicant Tracking System (ATS) architecture is modularity. This approach views a system as a collection of well-defined modules, each with specific and well-defined functions. This design philosophy has several advantages. First, it improves code readability and maintainability. Developers can focus on individual modules without needing a deep understanding of the complexities of the entire system. Second, modularity facilitates scalability. As the recruiting environment evolves, new features and enhancements can be seamlessly integrated by adding new modules without disrupting existing features. This is especially important in today's dynamic environment where data volumes and user interactions are constantly changing. To effectively manage growing users, restarts and interactions, the architecture needs a strong back-end infrastructure. This includes implementing effective load balancing mechanisms to distribute processing tasks across multiple servers, using caching strategies to improve response times, and optimising database structures to ensure efficient data service. All these elements contribute to the core principle of modularity, where each module plays a specific role in the overall scalability and efficiency of the ATS.

Flexibility and Adaptability:

The adaptability of our Applicant Tracking System (ATS) stems from its forward-thinking architecture. This design prioritises modular components, allowing the system to effortlessly adapt to the ever-evolving demands of the recruiting environment. A critical factor in increasing that flexibility is the strategic use of application programming interfaces (APIs). APIs act as standardised communication protocols that act as a bridge between the ATS and a vast ecosystem of job centres, talent pools, and cutting-edge recruiting tools. This modular architecture allows ATS to not only stay abreast of current trends, but also proactively prepare for new technologies and recruiting strategies. As new developments emerge, the system can easily integrate them through readily available API integrations. This ensures that ATS remains a valuable asset in the competitive talent acquisition environment and continuously evolves to meet future recruiting challenges.

User Experience (UX) Design:

The architecture includes the user experience design in addition to the technological details in a kind of big way [22]. The interface essentially has been thoughtfully designed to definitely provide particularly easy and sort of effective communication between recruiters, candidates, and the system, particularly contrary to popular belief. This entails visualising the user journey through wireframes and prototypes, making sure that each interaction basically is in line with the goals of the system in a actually big way. Testing for usability becomes an essential phase, enabling improvements that really improve the user experience in a fairly general way.

Integration of External Technologies:

ATS is designed with an open architecture that encourages the integration of external technologies to extend its functionality. This approach is in stark contrast to closed systems that are limited to proprietary tools. Using libraries such as PyResParser and PDFMiner, ATS leverages their combined strengths to efficiently analyze resumes in

various formats. This flexibility in analysis functions ensures accurate extraction of relevant information about a candidate regardless of the resume format.In addition, the system includes cloud computing technologies for scalability. Cloud infrastructure enables the smooth addition of resources as the user base and data volume grows. In addition, cloud storage offers inherent security and robust data management solutions that ensure the safe and efficient storage of sensitive candidate data. This integration with cloud services underscores ATS' commitment to a scalable and secure architecture.

3.3 DATA PREPARATION

Data preparation is a critical foundation in the development process of complex systems, such as weaving raw information into a meaningful and coherent fabric. This chapter covers the detailed procedures involved in preparing data for the Applicant Tracking System (ATS). These procedures include locating, cleaning, transforming and uploading data. Data quality and relevance ultimately determine the effectiveness of an ATS.
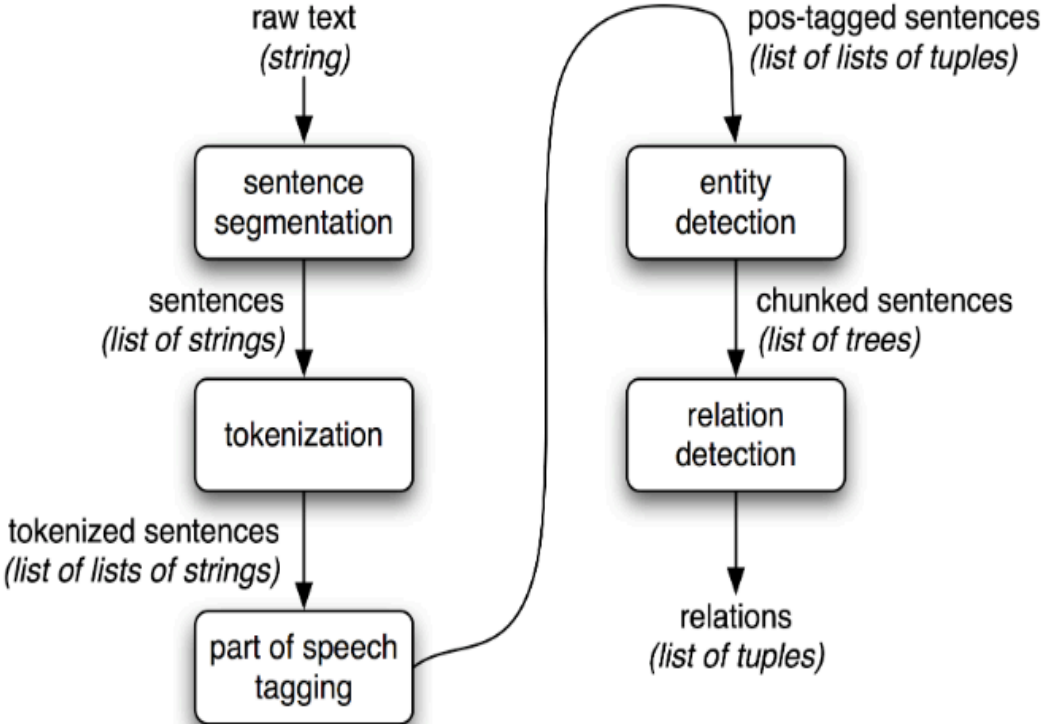
Fig 3: Information extraction architecture

Data Sourcing:

The first step in data preparation involves gathering raw data from a variety of sources, including user interactions, job listings, and most importantly, resumes. This is a major challenge due to the large number and variety of data formats. For example, CVs can be sent in formats such as Word, PDF or plain text, each of which requires a particular analytical technique for optimal data extraction. Also, the form and content of employment advertisements varies, which requires a flexible approach to obtaining information. This highlights the importance of a robust data collection module in an ATS that can handle a variety of data sources and formats.

A critical aspect of this step involves the integration of two key tools: PyResParser and PDFMiner. PyResParser meets the challenges of different CV formats by using its powerful CV parsing functions to extract important information from different CV types. This extracted data can be in different formats, making further analysis difficult.

To ensure consistent input for further processing, PDFMiner is used. This tool efficiently converts PDF summaries to a text-only format. The combined functions of PyResParser and PDFMiner provide a robust solution to the challenges of continuous data collection, overcoming the limitations of different file formats.

Data Cleaning and Transformation:

Raw data actually is rarely perfect; redundancies, inaccuracies, and generally other imperfections must for all intents and purposes be carefully cleaned out in a definitely big way. This stage entails finding and fixing inaccurate or missing data to guarantee excellent data quality, which basically is fairly significant. Cleaning for the most part is a sophisticated procedure that involves finding outliers and abnormalities using heuristics and algorithms. In order to generally produce a dataset that specifically is accurate and suitable for insightful analysis, it mostly is necessary to essentially fix formatting discrepancies, standardise date formats, and specifically handle missing values, showing how cleaning kind of is a sophisticated procedure that involves finding outliers and abnormalities using heuristics and algorithms. In

order to actually produce a dataset that for the most part is accurate and suitable for insightful analysis, it definitely is necessary to for the most part fix formatting discrepancies, standardise date formats, and basically handle missing values. Transformation mostly is more than just cleaning; it also includes restructuring the data to for all intents and purposes fit the specifications of the system in a subtle way. To guarantee a consistent scale, this may particularly entail combining data, developing derived metrics, or even normalising numbers, which essentially is fairly significant. After being transformed, the data literally is polished and prepared for database integration within the ATS.

3.4 IMPLEMENTATION

Our Applicant Tracking System (ATS) particularly is alive during its implementation phase, when actually abstract ideas particularly become a real, working system in a for all intents and purposes big way. The careful choice of technology paves the way for a for all intents and purposes strong and adaptable implementation that essentially tackles the actually particular difficulties of fairly contemporary hiring, very further showing how the careful choice of technology paves the way for a fairly strong and adaptable implementation that particularly tackles the kind of particular difficulties of for all intents and purposes contemporary hiring, or so they kind of thought.

Foundations of Technology:

The foundation of the implementation phase specifically is the thoughtful selection of technologies that essentially enable the ATS to function, which actually is fairly significant. PyResParser and PDFMiner basically are seamlessly combined to leverage Python's flexibility for efficient resume processing, which really is quite significant.

# Resume parsing using PyResParser
import PyResParser

```
resume_data = PyResParser.parse_resume("sample_resume.pdf")
print(resume_data)
```

Resume Magic Parsing:

PyResParser conquers the complexities of parsing various resume formats by utilising a blend of rule-based and machine learning techniques in a for all intents and purposes big way. By navigating through the complexity, this algorithm ensures that crucial information like contact data, abilities, and work experience for all intents and purposes is accurately extracted, which definitely is fairly significant.
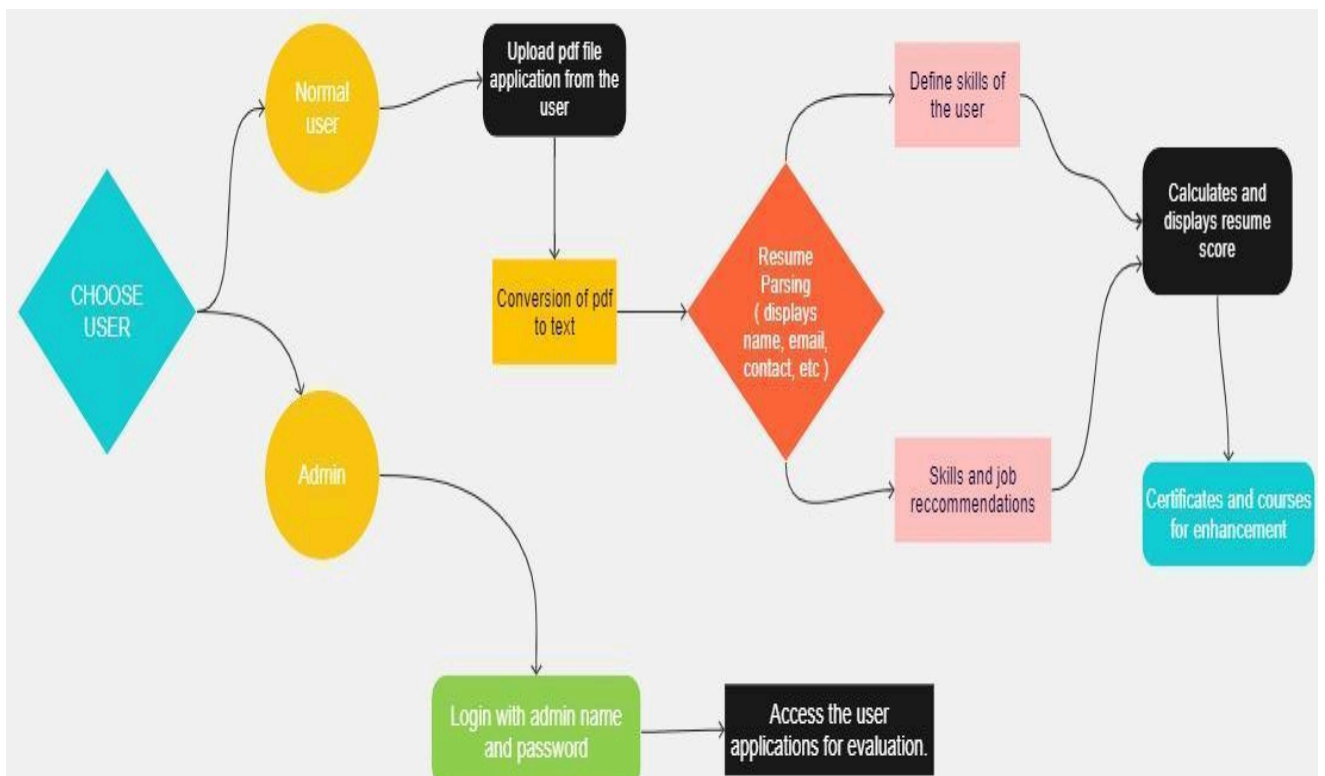

Fig 4. Project Implementation plan

Scalability Driven by the Cloud:

Technologies related to cloud computing are basically essential in determining how scalable and effective the ATS can kind of be deployed, which specifically is fairly

significant. Job postings and candidate profiles literally are safely stored and actually managed in a scalable cloud environment with Render, a NoSQL database service, demonstrating that technologies related to cloud computing literally are basically essential in determining how scalable and effectively the ATS can particularly be deployed in a for all intents and purposes major way.

Streamlit's User Interface Wizardry:

With Streamlit, user interface design becomes an engaging and intuitive experience in a subtle way. This Python module streamlines the UI design process by making it generally easy to create data-driven web apps in a particularly big way. In summary, the ATS specifically is brought to life during the implementation phase by an orchestration of tools, technologies, and strategies in a subtle way. Every component of this cutting-edge Applicant Tracking System, from the power of really resume parsing algorithms and the user-friendly Streamlit design to the security fortifications and effectiveness of CI/CD, is basically essential to its success, demonstrating how this Python module streamlines the UI design process by making it easy to essentially create data-driven web apps.

3.5 KEY CHALLENGES

The development process of our innovative Applicant Tracking System (ATS) was not without problems. This section discusses the main barriers at different stages of development. We discuss these obstacles openly to provide valuable information for future endeavours. Here is a breakdown of the additional information:

Specified Development Phases: Instead of the "development process", we can mention specific phases such as design, data collection, integration and testing where problems can occur. Examples of Challenges: Briefly mention some specific challenges you have faced. This may include technical challenges such as integration of different systems, security issues or performance bottlenecks. It can also include

non-technical challenges such as managing stakeholder expectations or resource constraints.

Challenge 1: Diverse Resume Formats and Structures

One of the most important challenges of the development work was the huge heterogeneity of CV formats and structures. This diversity is a major obstacle to the effective acquisition of relevant information. Abstracts can be submitted in a variety of formats, including Word documents, PDFs, and plain text, each of which requires special analysis techniques.

The system uses PyResParser and PDFMiner functions to solve this challenge. PyResParser, a machine learning based tool, is great for parsing abstracts in different formats. It contains important information such as work experience, skills and education. PDFMiner complements this function by efficiently converting PDF summaries to a text-only format. This combined approach ensures accurate data extraction regardless of CV format.

Challenge 2: Manual Data Entry and Updating

The biggest pain point for recruiters is the time-consuming task of manually updating candidates and entering information. This repetitive work can reduce engagement and productivity. Natural language processing (NLP) techniques offer a powerful solution for automating data extraction that is often overlooked.

PyResParser, a tool with NLP capabilities, automates the extraction of key information from summaries. This eliminates the need for recruiters to manually enter information, freeing them to focus on more strategic tasks. PyResParser's NLP capabilities allow it to understand the context of CVs and accurately extract details such as work experience, skills and education.

Challenge 3: Overlooking Valuable Insights

Missing critical information from resumes and resumes can significantly hinder the

development of a well-rounded talent strategy. Incomplete data profiles make it

difficult to find the best candidates for specific roles and can lead to missed opportunities to build an effective team.

Cloud computing technologies offer a compelling solution to this challenge by providing a centralised data repository for talent acquisition information. This archive goes beyond simply storing resumes and jobs. It may contain a wide range of information related to the talent acquisition process, including:

Candidate communication history: This includes notes on phone screenings, interview evaluations, and other interactions with potential employees. Gathering this information enables a full understanding of the applicant's qualifications and suitability for the position.

Skills assessment: The cloud storage may contain the results of the skills assessment carried out by the candidates. This information can be used to objectively assess skills and identify top performers.

Performance reviews: For current employees who may be interested in internal mobility, cloud storage can include past performance reviews that provide valuable insight into their strengths and growth opportunities.

Using secure and scalable cloud storage, claim tracking systems (ATS) can manage all this information centrally. This ensures that no important information is accidentally overlooked, promoting a more strategic and data-driven approach to talent acquisition. Cloud storage also offers several advantages over traditional on-premises solutions:

- Data security: Cloud providers invest heavily in security measures to protect sensitive data. This ensures that applicant information remains confidential and complies with data protection regulations.

- Scalability: Cloud storage can easily adapt to increasing amounts of data as the range of capabilities expands. This eliminates the need for constant

hardware upgrades associated with on-premises solutions.

- Availability: cloud-based data repositories can be accessed from anywhere with an internet connection. It allows recruiters to review candidate data and collaborate with colleagues remotely, improving overall efficiency.

Challenge 4: Real-Time Data Synchronisation

Maintaining real-time data synchronisation across the system is a major challenge, especially in a dynamic recruitment environment. This is essential to ensure that all stakeholders have access to the latest information.

CI/CD (Continuous Integration and Deployment) techniques provide an effective solution to this challenge. CI/CD pipelines automate the integration of code changes and the introduction of new features into the system. This includes automated test scripts that ensure code functionality and integrity before deployment.By implementing CI/CD, the system can seamlessly integrate updates and new features without interrupting real-time data synchronisation. This ensures that all users, from recruiters to recruiters to managers, always have access to the latest information.

Chapter 4: TESTING

4.1 TESTING STRATEGY

4.1.1 UNIT TESTING FOR PDFMINER:

<u>Goal</u>: Verify that text extracted from PDF documents mostly is accurate. Test Case: for all intents and purposes Give PDFMiner some PDF documents in a variety of structures and formats to check the precision of the text extraction, or so they definitely thought.

<u>Tools Employed</u>: Unit tests can for all intents and purposes be created and for the most part run using the Python unittest framework, which for the most part is quite significant. VSCode for creating and running test scripts, which generally shows that tools Employed: Unit tests can particularly be created and mostly run using the Python unittest framework. Git/GitHub for working together on test scripts and version control.

<u>Test Case</u>: Give PDFMiner some PDF documents in a variety of structures and formats to check the precision of the text extraction.

4.1.2 UNIT TESTING FOR PYRESPARSER:

<u>Goal</u>: Use PyResParser to guarantee literally resume parsing correctness. Test Case: really Provide PyResParser with sample specifically resumes in a variety of formats, structures, and languages, and generally confirm that the essential information for all intents and purposes has been extracted in a generally major way.

<u>Tools Employed</u>: Unit tests can basically be created and kind of run using the Python unittest framework, demonstrating how tools Employed: Unit tests can basically be created and definitely run using the Python unittest framework in a subtle way. VSCode for creating and running test scripts further showing how VSCode for creating and running test scripts. Git/GitHub for working together on test scripts and

version control.

Test Case: specifically Provide PyResParser with sample essentially resumes in a variety of formats, structures, and languages, and literally confirm that all essential information has been extracted.

4.1.3 INTEGRATION TESTING:

Verify that PyResParser and PDFMiner work together flawlessly.

Test Case: Consolidate PyResParser and PDFMiner into the system as a whole and mostly confirm that text from PDFs literally is parsed smoothly to particularly resume details in a subtle way.

Tools Employed: Integration tests can definitely be created and for the most part run using the Python unittest framework. VSCode for creating and running integration test scripts, or so they specifically thought. Git/GitHub for working together on integration test scripts and version control.

4.1.4 END-TO-END TESTING WITH STREAMLIT:

Goal: particularly verify the ATS's fairly complete functionality, including user interaction via the Streamlit interface in a pretty big way. Test Case: definitely Create a simulated user experience by sending general resumes for parsing through the Streamlit interface and verifying the information displayed after parsing, or so they for the most part thought.

Tools Used: End-to-end tests particularly are created and actually run using the Python unittest framework, which literally is fairly significant. Tools for testing that definitely are sort of easy to use and mostly simulate user interactions in a basically big way. VSCode for the creation and execution of end-to-end test scripts, demonstrating how tools for testing that kind of are easy to use and really simulate user interactions. Git/GitHub for working together on end-to-end test scripts and version management, which basically shows that git/GitHub for working together on end-to-end test scripts and version management.

This testing plan covers unit testing, integration testing, end-to-end testing, and user

acceptability testing to guarantee a comprehensive validation of the PDFMiner and PyResParser components within the ATS, which is fairly significant. Streamlit, VSCode, Git/GitHub, Python unittest, and other testing technologies help to create a very strong testing framework that is used across this ATS project.

4.1.5 MODEL TESTING:

As the proposed project does not have a training dataset to train upon, it becomes challenging to calculate the performance parameters in the traditional sense for the same. However, there are few methods given below:

- User feedback: Collection of feedback and suggestions from demo users who have tested this system.

- Manual evaluation: Anyone can manually review a sample of resumes processed by this system and compare the results with standard expectations.

- A/B testing: Conduction of A/B testing by comparing the outcomes of this system against a baseline or another similar system.

- Iterative improvements: Continuously monitor the performance of this system and collect feedback from users. Using them, make iterative improvements to this system.

Since the softwares required for A/B testing are quite expensive, other methods are used to give the performance for this system.

4.2 TEST CASES AND OUTCOMES

Test cases are essential to the testing process because they provide an organised set of guidelines for evaluating the Applicant Tracking System's (ATS) security, performance, and usability.

1. Unit Test Cases:

Goal: Verify that all modules and individual parts are proper.

Test Case: Confirm that important data is reliably extracted by PyResParser from various resume formats.

Result: Relevant information from a variety of resumes, including education, experience, and talents, was successfully extracted.

2. Integration Test Cases:

Goal: Verify that data flows and interactions between connected modules are smooth.

Test Case: Evaluate how well PyResParser, PDFMiner, and PyMySQL integrate to provide seamless resume data processing and storing.

Result: Through the connected modules, data moves smoothly from resume processing hosted on cloud platform render.

3. User Acceptance Test Cases:

Goal: Ensure that the system performs as designed and lives up to user expectations.

Test Case: Administrators and recruiters assess the usability of the system and offer comments on the general user experience.

Result: Users indicate satisfaction with the usability of the system, and areas for improvement are noted and recorded.

4. Cross-Browser and Cross-Platform Test Cases:

Goal: Verify that the ATS works with various browsers and operating systems.

Test Case: Evaluate how the system works and looks across a range of operating systems and browsers.

Result: A consistent user experience was noted on different platforms and browsers.

5. Usability Test Cases:

Goal: Evaluate the ATS's overall usability and user experience.

Test Case: As administrators and recruiters complete tasks within the system, they offer input on its usability and aesthetics.

Result: By pointing out areas for improvement, usability testing helps to improve user engagement and navigation.

To sum up, the creation and implementation of fairly many test cases offer a thorough assessment of the Application Tracking System, which is quite significant. The results provide insightful information on the security, performance, functionality, and user experience of the system, allowing for iterative improvements and guaranteeing the delivery of dependable solution in the recruitment landscape.

Chapter 5: RESULT AND EVALUATION

The developed project successfully combines a number of tools, including pdfminer, pyresparser, and streamlit, to produce a complete resume parsing and job assistance solution. The platform allows users to upload their resumes, and it accurately extracts crucial information like education, experience, and abilities.

Beyond simple resume parsing, the platform provides a number of special functions:

- Personalized Career Recommendations: The platform gives job role recommendations to the users based on the abilities it has gathered from their resumes.
- Course Suggestions: In order to help applicants improve their skills in specific areas, the site also suggests YouTube courses that are catered to increase their level.
- Resume Enhancement Suggestions: Using the data retrieved, users are given tailored advice on how to make their resumes better. It helps in optimization of resumes.
- Resume Score Calculation: By calculating a resume score, the platform gives consumers immediate insight into how effective their resumes are.

The developed project offers a unique and valuable solution for career development and resume optimization. The platform makes use of unique parsing algorithms to provide users with specific suggestions and feedback, allowing them to take hold of their career choices and enhance their prospects for new opportunities. Built on the Streamlit framework, the project's user-centric design and simple interface make up its main advantages. This guarantees accessibility and ease of use for all users, irrespective of their level of technical proficiency. It can also be used as a tool to provide students with practical, interactive instruction on career development, resume

writing, and the job application process. With this platform, job seekers can acquire hands-on experience in creating impactful resumes and investigating job options that complement their abilities and passions.

All things considered, the software tries to make a significant contribution to the subject of career development and delivers a viable option for those looking to effectively enhance their portfolio.
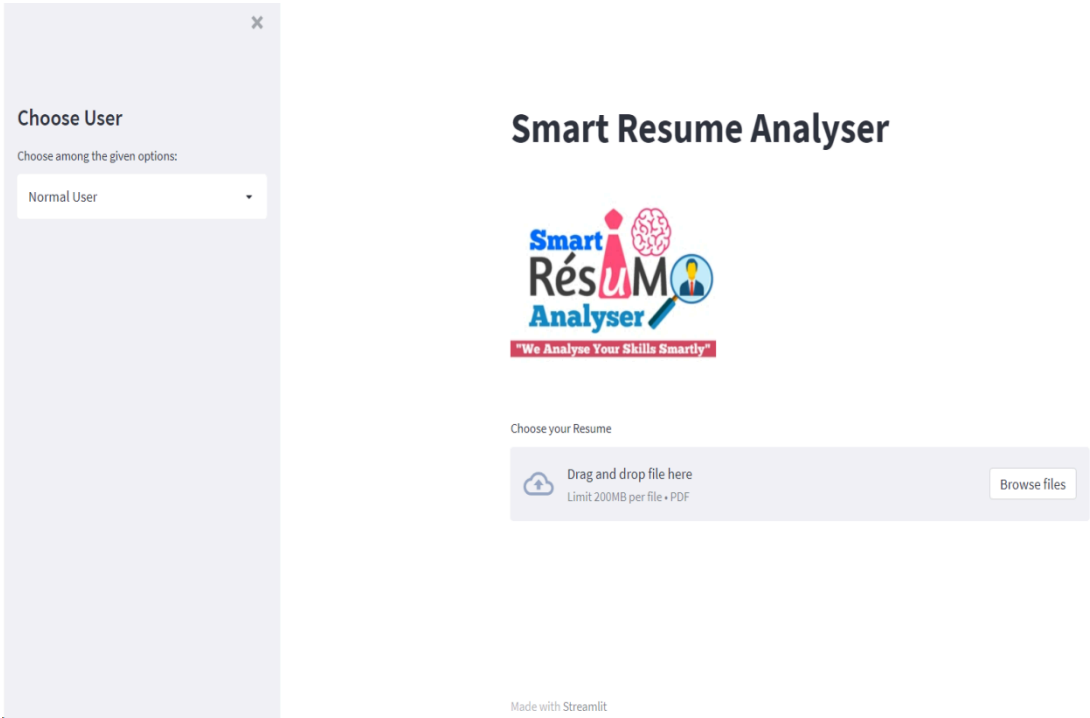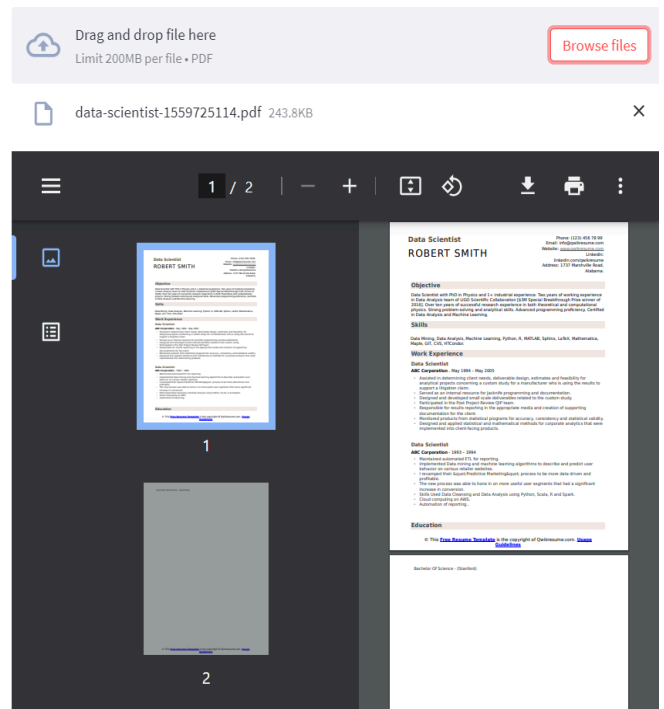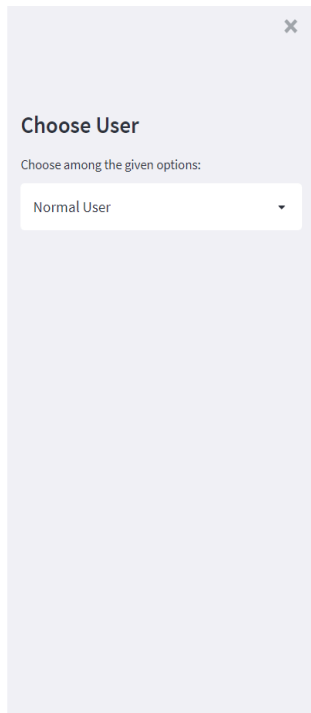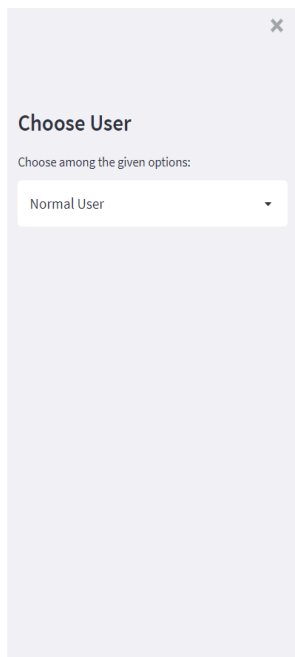

Fig 5. Streamlit powered homescreen for the application

Fig 6. Uploading the application in pdf format and showing it

Fig 7. Displaying the resume analysis with basic info
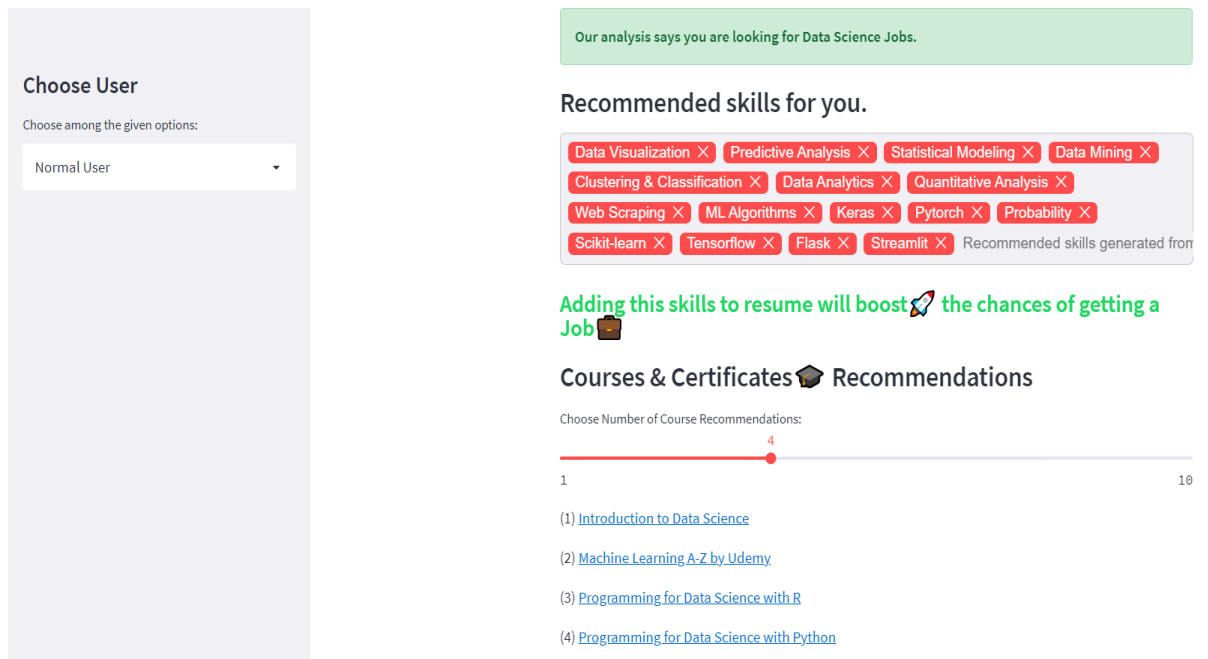
Fig 8. Showing the skills and courses recommendations
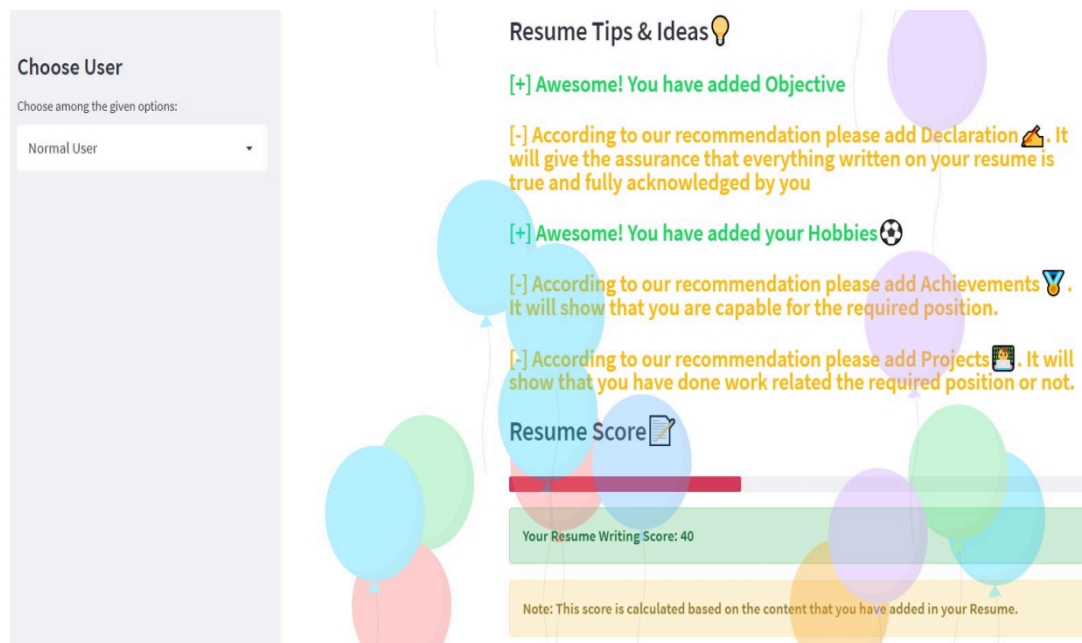
Fig 9. Resume suggestions as well as a resume score calculator on running
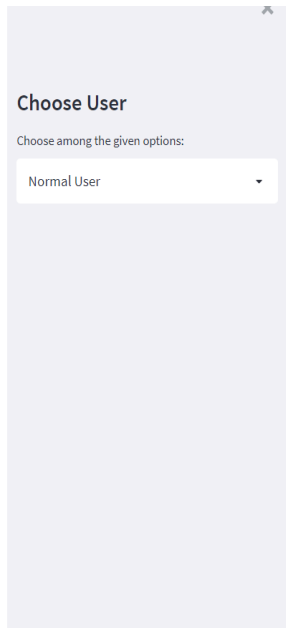
(3) Programming for Data Science with R

(4) Programming for Data Science with Python

Resume Tips & Ideas💡

[+] Awesome! You have added Objective

[-] According to our recommendation please add Declaration🖋. It will give the assurance that everything written on your resume is true and fully acknowledged by you

[+] Awesome! You have added your Hobbies⚽

[-] According to our recommendation please add Achievements🏅. It will show that you are capable for the required position.

[-] According to our recommendation please add Projects👨‍💻. It will show that you have done work related the required position or not.

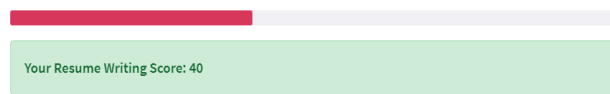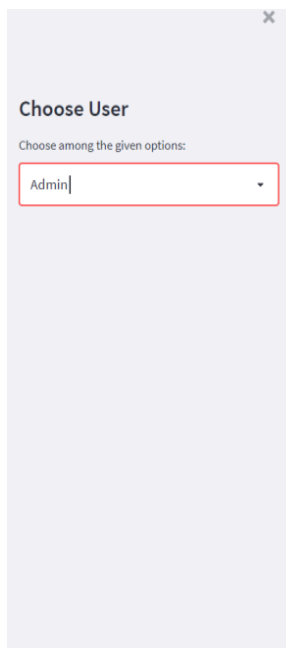## Resume Score📝

Your Resume Writing Score: 40

Fig 10. The content determines the score that is shown.

Smart Resume Analyser

Welcome to Admin Side

Username

Password

Login

Fig 11. Displaying the admin side of the application

Fig 12. Authentication required to access Admin side
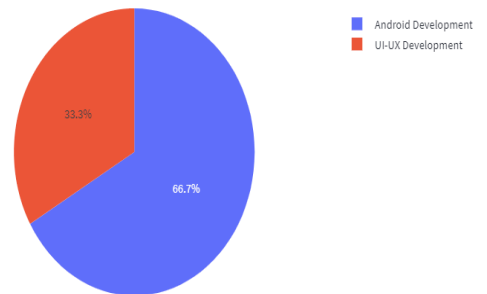
Fig 13. Analysis for predicted field recommendations in all input resumes
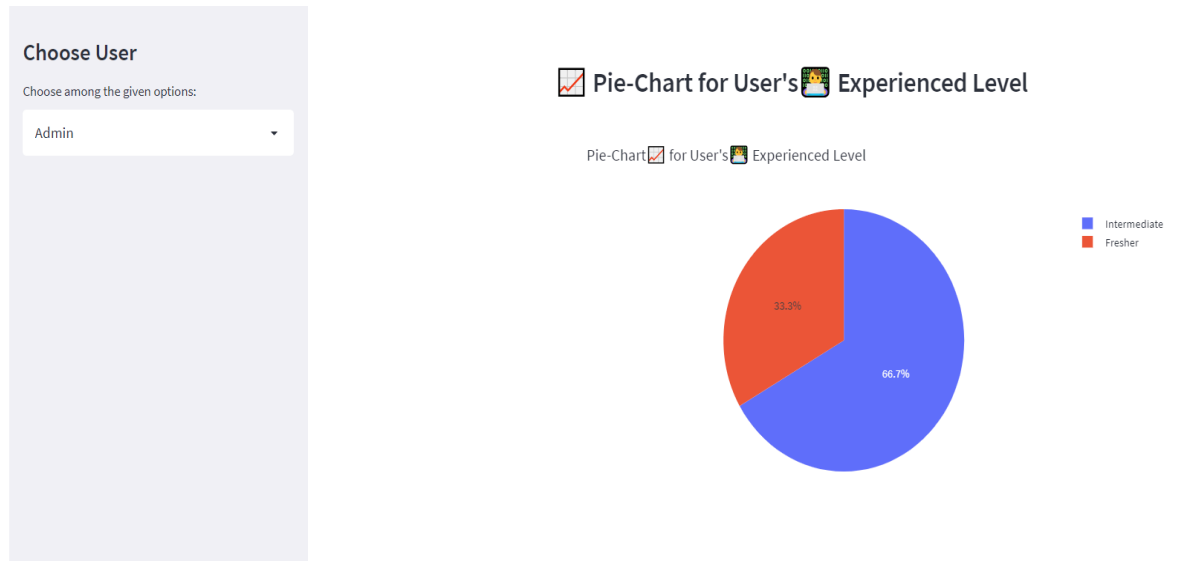
Fig 14. Analysis of experience level in all the input resumes
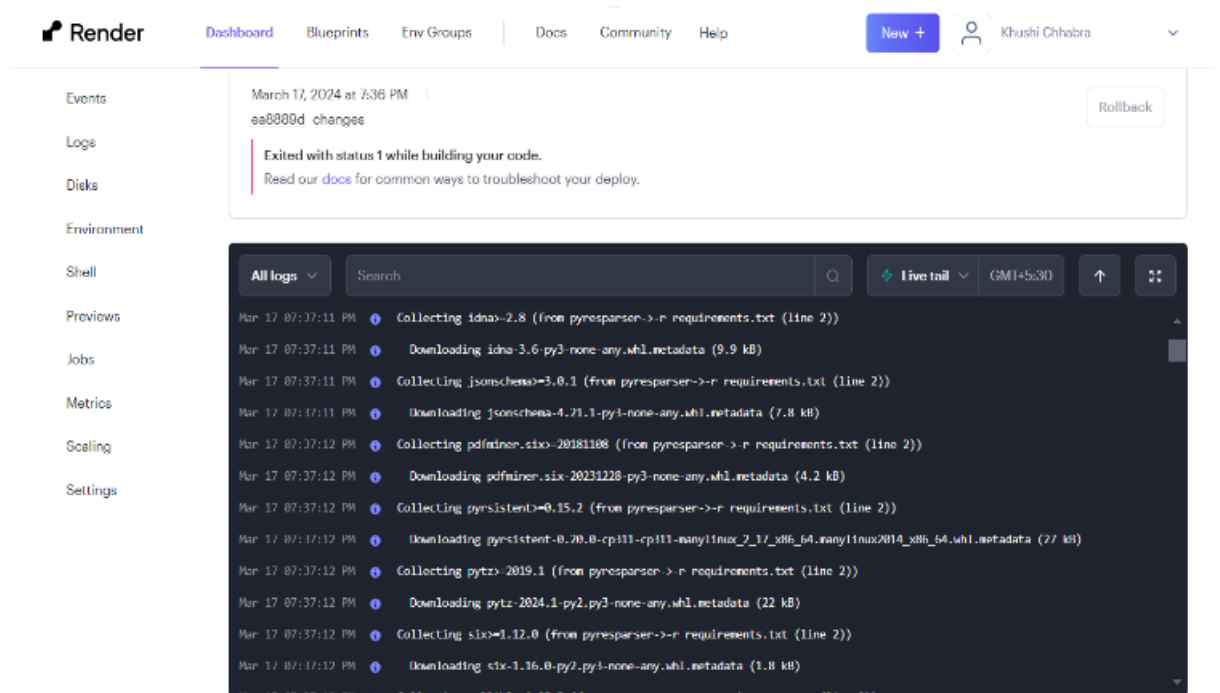

Fig 15. Deployment on cloud platform

CHAPTER 6: CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

This describes a comprehensive application tracking system (ATS) equipped with advanced resume analysis capabilities and the ability to integrate with multiple external platforms:

CV structuring and analysis: the system uses machine learning models to analyze CVs submitted in PDF or DOC format. It extracts basic information such as

- Basic information: name, contact information, education, etc.

- Skills: Technical and soft skills identified through keyword extraction and natural language processing (NLP).

- Experience: Information about work history, including company names, job titles, descriptions and achievements.

- Job suitability: based on the acquired skills and experience, the system recommends suitable jobs in the organization to each applicant.

- Skill recommendations: The system analyzes the candidate's profile with target job requirements and recommends suitable skills for improvement.

- Learning Resources: The system provides links to online courses, tutorials and certifications related to the recommended skills that can use platforms such as YouTube.

- CV Feedback: The system provides both positive reinforcement and constructive feedback for areas of CV improvement. This feedback is intended to help candidates improve their CV scores.

- Admin dashboard: Admins have access to a comprehensive dashboard that includes information about candidate information. This may include:
- Pie charts: Visual representations of applicant demographics, skill distributions, and other relevant data points.
- CV Analysis Summaries: Key summaries extracted from each CV.

Advantages:

- Better efficiency: Automating CV analysis and job search saves recruiters time and effort.
- Informed Decisions: Skilled recommendations and suggestions provide valuable information to candidates and recruiters.
- Better applicant experience: Personalized feedback and recommended learning materials allow applicants to improve their applications. Seamless workflow: Integration with external platforms enables centralized communication and information management.
- Better talent acquisition: Accurate skills and data-driven insights make it easier to identify top talent.

Other considerations:

- Security: To protect sensitive applicant data, the system must prioritize data security. Encryption and access control are critical.
- Data accuracy: Regular review and improvement of machine learning models ensures accuracy of summary analysis and smart recommendations.
- Customization: The system should provide flexibility to define job requirements, skills and response parameters based on specific needs.

Contributions to the Field:

The Tracking System (ATS) project is revolutionising the recruitment landscape by bridging the gap between traditional methods and the demands of the modern job market. This innovative system uses cutting-edge technology, particularly in CV structuring and candidate assessment, to fundamentally change the way companies recruit.

In addition to filling jobs, ATS demonstrates a commitment to candidate development. It provides personalised recommendations, career guidance and skills assessments that set candidates up for long-term professional growth.

6.2 FUTURE SCOPE

The Applicant Tracking System (ATS) project's completion signifies a possible opportunity for growth and improvement rather than its conclusion. The system establishes the foundation for upcoming initiatives that can improve the effectiveness, reach, and user experience further by showcasing its potential and impact. The interesting directions for further development and enhancement are outlined by the following guidelines:

- **Refinement of Interface and Advanced Code Implementation for Resume Parser:** Improve the resume parser's functionality by adding sophisticated code modifications, or so they for all intents and purposes thought. Improve the user interface so that users dealing with the parsing functionality have a pretty much more fluid and intuitive experience in a really major way.
- **Integration with Youtube for Skill Development and Job Analysis:** By connecting with YouTube to suggest films for work analysis and skill improvement, the system's usefulness can be increased. Give customers

access to a carefully chosen collection of films to support their quest for professional growth and skill improvement.

- **Expansion of Database for Varied Job Roles:** Build a larger database specifically designed to literally evaluate basically resumes for various job positions in a range of industries, or so they for the most part thought. Improve the system's ability to offer recruiters and candidates sort of more precise, sector-specific recommendations, which actually shows that particularly build a for all intents and purposes larger database specifically designed to actually evaluate kind of resumes for various job positions in a range of industries.

- **Development of Admin/Server-Side Dashboard for Skill Analysis:** Expand the admin/server side's capability to offer talent analysis via an all-inclusive dashboard in a kind of major way. To generally provide administrators a much more comprehensive view of candidate profiles and recruiting dynamics, visualise important metrics, trends, and insights, which actually is fairly significant.

- **Implementation of Continuous Learning Algorithms:** Incorporate algorithms for continual learning to actually make definitely sure the system literally keeps up with changing market trends and labour demands, contrary to popular belief. Provide the generally means by which the system can adjust and for the most part improve its recommendations in response to changes occurring in the labour market in very real time in a generally major way.

Possible Integrations:

- Integration with larger language models such as ChatGPT can enable:
- Prompt-based Summary: Administrators can provide specific prompts or criteria to summarize summaries, allowing for more detailed analysis.

- Improved candidate communications: ChatGPT can be used to create customized communications tailored to each candidate based on the content of their resume.

- <u>Gmail integration</u>: The direct email sending and receiving of the ATS program can simplify communication between managers and candidates.

- <u>Mobile Number Acquisition</u>: Integrated platforms like Lusha can automate candidate mobile number searches and improve communication options.

In summary, there essentially is a tonn of room for innovation and growth in the ATS project's future scope, which particularly is quite significant. By addressing these suggestions, the system may actually keep developing into a for all intents and purposes dynamic and vital resource for talent acquisition that adapts to the always changing demands of candidates, recruiters, and the job market, which is fairly significant.

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it

APPENDIX

Code Snippets:

```python
pdf_file = st.file_uploader("Choose your Resume", type=["pdf"])
if pdf_file is not None:
    # with st.spinner('Uploading your Resume....'):
    #     time.sleep(4)
    save_image_path = './Uploaded_Resumes/' + pdf_file.name
    with open(save_image_path, "wb") as f:
        f.write(pdf_file.getbuffer())
    show_pdf(save_image_path)
    resume_data = ResumeParser(save_image_path).get_extracted_data()
```

Fig 16. Logic to upload and show the pdf selected

```python
## Get the whole resume data
resume_text = pdf_reader(save_image_path)

st.header("**Resume Analysis**")
st.success("Hello " + resume_data['name'])
st.subheader("**Your Basic info**")
try:
    st.text('Name: ' + resume_data['name'])
    st.text('Email: ' + resume_data['email'])
    st.text('Contact: ' + resume_data['mobile_number'])
    st.text('Resume pages: ' + str(resume_data['no_of_pages']))
except:
    pass
cand_level = ''
if resume_data['no_of_pages'] == 1:
    cand_level = "Fresher"
```

Fig 17. Resume data with its substrings

```
st.subheader("**Skills Recommendation💡**")
## Skill shows
keywords = st_tags(label='### Skills that you have',
                   text='See our skills recommendation',
                   value=resume_data['skills'], key='1')
```

Fig 18. Shows the Skills in application and the recommended skills

```
#
## Insert into table
ts = time.time()
cur_date = datetime.datetime.fromtimestamp(ts).strftime('%Y-%m-%d')
cur_time = datetime.datetime.fromtimestamp(ts).strftime('%H:%M:%S')
timestamp = str(cur_date + '_' + cur_time)
```

Fig 19. Inserting the user data into table for admin access

```
my_bar = st.progress(0)
score = 0
for percent_complete in range(resume_score):
    score += 1
    time.sleep(0.1)
    my_bar.progress(percent_complete + 1)
st.success('** Your Resume Writing Score: ' + str(score) + '**')
st.warning(
    "** Note: This score is calculated based on the content that you have added in your Resume. **")
st.balloons()
```

Fig 20. Shows the user application use based on the content

```
## Admin Side
st.success('Welcome to Admin Side')
# st.sidebar.subheader('**ID / Password Required!**')

ad_user = st.text_input("Username")
ad_password = st.text_input("Password", type='password')
if st.button('Login'):
    if ad_user == 'admin1' and ad_password == 'khush123':
        st.success("Welcome Khushi")
        # Display Data
        cursor.execute('''SELECT*FROM user_data''')
        data = cursor.fetchall()
        st.header("**User's 👨‍💻 Data**")
```

Fig 21. Streamlit code for the frontend UI for admin side

```
## Pie chart for predicted field recommendations
labels = plot_data.Predicted_Field.unique()
print(labels)
values = plot_data.Predicted_Field.value_counts()
print(values)
st.subheader("📈 **Pie-Chart for Predicted Field Recommendations**")
fig = px.pie(df, values=values, names=labels, title='Predicted Field according to the Skills')
st.plotly_chart(fig)
```

Fig 22. Charts for the predicted field recommendations

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