

AI Powered Career Assistant

Ayush Kank¹, Jayesh Kande², Laxman Dewasi³, Mr. Amit Kukreja⁴

^{1,2,3}UG Scholar, Department of Electronics and Telecommunication, K. J. Somaiya Institute of Technology, Sion

⁴Professor, Department of Electronics and Telecommunication, K. J. Somaiya Institute of Technology, Sion

Abstract—Contemporary job market is becoming more competitive, which is causing a divide between the career preparation of candidates and the expectations of industry. Despite the widespread implementation of AI in assisting recruitment, in the forms of job recommendation and resume parsing, existing systems are limited in their functionalities, and do not offer holistic career guidance. This thesis proposes an AI-Powered Career Assistant, an online service that offers end-to-end, customized career support to job seekers through the use of modern NLP algorithms. This system combines NLP, ML, and Large language models (LLMs) to perform automatic resume analysis, job recommender, and interview preparation. The proposed solution will be deployed through a scalable client-server architecture, with secure backend processing and an attractive, intuitive user interface. Early tests have shown greater candidate readiness, improved interview performance and greater confidence. By uniting many AI functions into one comprehensive offering, this system offers a holistic approach to career development and highlights the potential of AI in improving recruitment efficiency and employability.

Index Terms—Artificial Intelligence, Large Language Model, Machine Learning, NLP.

I. INTRODUCTION

AI has been developing rapidly, and we are witnessing an integration of AI in the activities of the enterprise and most other aspects of life. It has greatly changed the processes around career advancement, from screening resumes and job applications, through to individual career growth. With the current competitive environment, a job seeker has difficulties in an individual assessment and path preparation, lack of specialist mentorship, lack of the personalized path, etc. There are a lot of information in the internet

but most of them are not personalized, and do not meet a candidate's special needs, so called "preparation gap", which adversely affects a candidate's demonstration of his skills and capability, thus lower the chance of success. To overcome these difficulties, this project is planning to create an AI-powered career assistant, a Smart Web-based platform designed to deliver personalized and 360-degree approaches by exploring the potential of a LLM based NLP assisted system. This new approach based on AI will help the users with a very natural and customized access to every possible aspect of career planning. Main features of the system cover automated resume parsing, automated generation of personalized mock interviews, real-time feedback and intelligent job matching.

Our automation of resume parsing employs information extraction methods to create structured representation of resume data, including skills and education employment. With the help structured information, automated mock interviews are generated, tailored to candidate's domain and skills, and the details of the interviewer's questions are adapted to the user's inputs. In addition, feedback is performed on users' response in terms of confidence, communication skills and technical details.

On a technical level, the system is also built on a relatively modern full-stack platform. The frontend uses responsive web design for an easy-to-use user interface, while the backend is composed of a scalable server-side framework for application logic and API integrations. Generative AI models such as Google's Gemini are used as the intelligent layer, providing context-sensitive responses and composing structured outputs, while data is stored in the cloud. The overall goal of this project is to allow all of us equal access to the most effective career advice in a scalable, affordable and intelligent fashion.

II. LITERATURE SURVEY

Advancements in Artificial Intelligence (AI) in the recent years have revolutionized the way the recruitment systems work especially in job recommendation and resume analysis. Kushwaha et al. [1] used AI in developing a job recommendation system. This job recommender uses contents based filtering and collaborative filtering techniques to recommend suitable jobs for the user by analyzing the job description as well as the user profile. By combining content based filtering and collaborative filtering, the job description in addition to the profile is used to analyze the job recommendation.

The system uses cosine similarity, inputted data in addition to Word2Vec embedding techniques to measure the similarity and the words and their context are used to represent the skills in the job description in order to generate an accurate personalized result.

The system is analyzed and measured using metrics such as precision, recall and F1-score with an accuracy of precision, recall and F1-score is improved. In addition, their work also indicates the development of job recommendation systems, from the relatively primitive keyword-based, rule-driven match to the AutoML empowered AI based match. They usually use machine learning and deep learning methods to improve job matching accuracy for modern job boards, such as LinkedIn, Indeed and Google for jobs, where State of Artly transformer based models used to capture contextual information for more relevant recommendations.

Compared to job matching, career preparatory related services is not available from these systems. This paper proposes a system based on machine learning, where the recommendation of career is done by analyzing user skills and interests based on classification algorithms such as decision trees and support vector machine (SVM). This project is about resume parsing using NLP methods, pulling important elements out of the resume and using them to match the job description in order to give the most accurate job suggestion [1]. This work employs deep neural networks for modeling user preferences and user behavior, and hence the personalized and adaptive delivery of career guidance suggestions over time [2]. This paper introduces into a hybrid recommender system involving collaborative and content-based recommendations for more accurate recommendations and leads to the proper career paths

using the user data [3] This work applies clustering and classification techniques to evaluate skill gaps between existing abilities and aspired careers, providing users insights into their improvement areas [4]. This research builds a conversational AI (chatbot) using NLP and transformer models to offer real time, time-efficient career guidance conversation and response to the users questions [5] This is the general idea of this paper use big data analytics and time series forecasting to analyze job market tendency in order to help user in selecting career with higher chance of request in the coming future [6].

The related works are summarized in Table I:

TABLE I: COMPARISON OF EXISTING CAREER SYSTEM

Sr. No.	Research Paper	Method Used	Key Feature
1	An Intelligent Career Recommendation System Using ML [1]	Supervised Learning (Decision Trees, SVM)	Matches user skills with suitable career paths
2	AI-Based Resume Analysis and Job Recommendation System [2]	Natural Language Processing (NLP), TFIDF	Extracts resume data and suggests relevant jobs
3	Deep Learning Approach for Personalized Career Guidance [3]	Deep Neural Networks (DNN)	Learns user preferences for tailored career advice
4	Hybrid Recommender System for Career Path Prediction [4]	Collaborative + Content Based Filtering	Combines user behavior and job data for accuracy
5	Skill Gap Analysis Using AI Techniques [5]	Clustering (K Means), Classification	Identifies missing skills for target careers
6	Conversational AI ChatBot for	NLP, Transformer Models	Interactive career guidance

	Career Counselling [6]		via chatbot interface
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III. DATASET AND PREPROCESSING

Datasets will be used in the AI system for career guidance. In order to build an efficient and personalized AI recommendation system, existing real-world datasets used in career guidance will be helpful. For instance, there is Kaggle Job Postings Dataset which contains 20,000+ jobs posting, the LinkedIn Workforce Data which contains over 1 million profiles, or the open source database O*NET) which describes over 1,000 occupations with details of the skills required. Datasets may contain the structured data as well as unstructured data. For example: in dataset the title salary experience year etc. are structured data in human resource filed but file resumes, job description are unstructured data in the unstructured data store. Several datasets combined can increase coverage and this allow us to capturing the actual job demands. The importance of data preprocessing is to make the data as clean and consistent as possible for the machine learning models. Here the general data cleaning process is to eliminate the missing data, duplicate data and unimportant/noisy data.

In addition, for the machine learning models, various preprocessing techniques have been utilized for the given data. For example in our scenario from the resumes and job descriptions, text preprocessing techniques like tokenization, Removal of stop words, stemming and lemmatization can be applied, and then the rest of the text can be converted into numerical vectors using TFIDF or word embedding techniques. Using our variable salary, experience can also be normalized while for the categorical variables such as particular job roles, one-hot encoding can be used. Between a very large amounts of data such as 50,000 record preprocessing plays a vital role in improving the performance of the models and making it less biased, thus suitable for career prediction and recommendations.

A. System Architecture:

The system proposed is based on the Resspar system, which is built on the predefined modular client-server architecture and it has following components:

- 1) User Interface Layer: A web-based interface that allows users to upload resumes, interact

with the system, and receive outputs such as feedback and recommendations.

- 2) Processing Layer: Handles resume parsing, text processing, and interaction with AI models. This layer integrates NLP techniques and Generative AI for intelligent data extraction.
- 3) Database Layer: Stores structured resume data, user profiles, and extracted features such as skills, qualifications, and experience.
- 4) AI and Recommendation Engine: Combines LLM- based processing [2] and ML-based recommendation techniques [1] to generate insights, match jobs, and provide feedback.

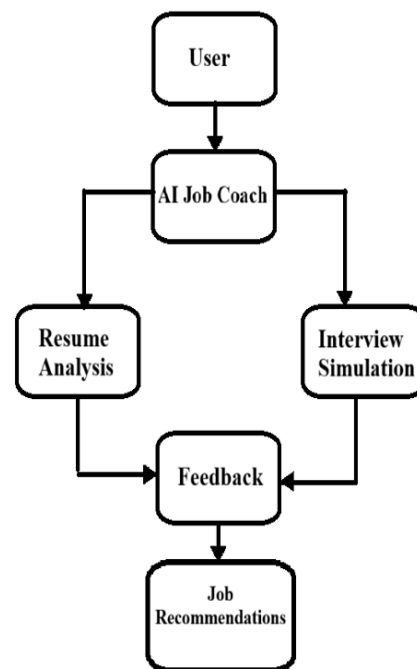


Fig. 1. Block Diagram for AI Career Assistant

B. Resume Parsing and Information Extraction:

The system implements NLP and Generative AI techniques to perform automated resume parsing, following the approach taken in Resspar [2]. Resumes are uploaded in formats like PDF or DOC:

- 1) Use of document processing tools for text extraction
- 2) Tokenization and Named Entity Recognition (NER) are NLP techniques that are applied
- 3) Uses Large Language Models (LLMs) to convert unstructured resume data into structured information. The information obtained includes:
 - a) Personal data(name, email, phone number).
 - b) Skills and technical skills.

- c) Educational qualifications.
 - d) Travel experience: This structure enables further processing and better usability of data.
- C. Feature Extraction and Text Representation:
Based on the job recommendation system in [1], the extracted resume data is transformed into feature vectors:
- 1) Text preprocessing: cleaning, stop-word removal, normalization.
 - 2) Vectorization techniques: TF-IDF and Word2Vec embedding's.
 - 3) Semantic representation: capture contextual meaning of skills and job descriptions.
The system generates personalized job recommendations by ranking jobs based on similarity scores.
- D. Job Recommendation Mechanism:
The system incorporates a hybrid recommendation approach inspired by [1]:
- 1) Content-Based Filtering: Matches user skills with job descriptions using cosine similarity.
 - 2) Collaborative Filtering: Uses user behavior and preferences to improve recommendations.
 - Semantic Matching: Enhances accuracy by understanding contextual relationships between skills and roles.
- E. Candidate Filtering and Matching:
Similar to the filtering mechanism in Resspar [2], the system enables:
- 1) Skill-based filtering of candidates.
 - 2) Matching resumes with job requirements.
 - 3) Ranking candidates based on relevance.
- This reduces manual effort and improves recruitment efficiency.
- F. AI-Based Interaction and Feedback (Extension):
Unlike existing systems, the proposed methodology extends [1] and [2] by integrating interactive AI capabilities:
- 1) Generates mock interview questions based on resume data.
 - 2) Evaluates candidate responses using LLM.
 - 3) Provides real-time feedback and improvement suggestions.
- This module enhances candidate-side preparation, which is not addressed in the base systems.
- G. Data Flow Process:
The system follows a structured pipeline:
- 1) User uploads resume.
 - 2) Resume is parsed using NLP and LLM [2].
 - 3) Data is converted into a structured format.
 - 4) Features are extracted using the TF-IDF and Word2Vec [1].
 - 5) Job matching is performed using similarity measures.
 - 6) AI generates recommendations and feedback.
 - 7) Results are stored and displayed to the user.
- H. Key Improvements over Existing Systems:
- 1) Combines resume parsing [2] + job recommendation [1].
 - 2) Introduces interactive AI-based interview preparation.
 - 3) Provides end-to-end career assistance instead of isolated features.
 - 4) Enhances personalization using AI-driven insights.
- I. Summary of Methodology:
The proposed system integrates NLP, Machine Learning, and Generative AI to create a unified career guidance platform. By leveraging structured resume parsing and intelligent recommendation techniques from existing research, along with additional interactive AI features, the system provides a comprehensive solution that improves both recruitment efficiency and candidate preparedness.

IV. SYSTEM ARCHITECTURE AND IMPLEMENTATION SYSTEM

The suggestion AI-Powered Career Assistant is a resilient, scalable platform that uses integrated resume parsing, job recommendations and AI interview assistance in an integrated application. The design is based on a three-layer architecture with a presentation, application and data layer with a layered architecture. This allows the system to be separated into concerns for easier maintenance and scalability. The overall design is based on existing resume parsing and job recommendation designs but in addition offers interview assistance so people can have a complete career assistant.

The presentation layer (Frontend) React.js and Tailwind CSS was used to create the presentation layer so that the interface is easy to use and responsive. Users can register and log into their accounts, upload resumes, get responses from the interview-mock modules, and view generated feedback and job recommendations from the interface. The interface is designed to be as easy to navigate as possible with real-time updates while user inputs are being captured and sent to the backend

using REST API calls so we can communicate seamlessly between the Client and Server.

The application layer (backend).Implemented on Node.js and Express.js to perform all the necessary features and business logic layer. Handles the request from the user APIs resume uploading and manage with AI API. It is a middleware between the user interface and database to prove secure communication between them. Usage of LLM API used with prompt engineering to generate well-formed and context encapsulated results. Sensitive information like API keys is stored as environment variables, authentication also provided.

The data layer (a.k.a. database) is created by using MongoDB Atlas or SQLite, which a database management system that stores data exactly as it is needed (not as detailed information but consists of structured and semi structured data). It can handle with large amount of data swiftly. It identifies the data and updates accordingly. It can keep the data as persistent for the purpose of keeping user sessions and delivering recommendation based on the history. Besides the job recommendation, a mock interview module is also integrated in the system that provides the recommendation of interview question. Based on user's resume and the/job description selected, the system automatically propose interview questions to the candidate, and then utilize the AI models to analyze the candidate's answer to make evaluation of relevance, clarity and completeness, in order to give users feedback, score and advice for improvement. This interactive feature set the proposed system apart from existing recruitment tools by candidate-focused approach for job matching.

The data flow architecture makes it possible to smoothly pass information through all layers of the application. User input received at the frontend layer will be transferred to the backend layer for preprocess, then forward to the AI layer. The AI models will generate outputs which are stored in database and transferred to the frontend layer to realize real-time interaction. The modular architecture allows feature extension, for example, voice mode interview, analysis dashboard, and multi-request support.

In conclusion, the system implementation surrounds the areas of scalability, security and intelligence automation. By integrating a number of web

advancements and the 'intelligent' processing through the AI, the proposed architecture offers a holistic approach to constitute a robust career guidance solution in not only contributing to recruitment efficiency, but also making the candidate more job-ready

V. COMPARATIVE ANALYSIS

A comparative study is proposed between the AI-Powered Career Assistant and existing systems such as AI-Based Job Recommendation System [1], along with the Resspar Resume Parsing System [2] to analyze its novelty and utilities. The comparison would be based on various parameters such as: Although current job recommendation systems [1] mainly recommend jobs by matching candidate profile with job description by applying a number of Machine Learning approaches including content-based approach and collaborative filtering, they are insufficient to help users get their resumes improved, prepare interviews and give instant feedback.

They use approaches including TF-IDF, Word2Vec and cosine similarity to enhance matching performance but are limited to candidate search functions.

The other aspect is Resspar system [2], which is based on automated resume parsing through NLP and Generative AI. The system process name, contact details, skill set, education and experience from unstructured resume and filter the relevant candidates with unstructured requirement. This decrease the amount of manual work by the recruiters and also improve effectiveness of process.

TABLE II: COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEM

Parameter	Existing Systems (Job Recommendation + Resspar System)	Proposed System
Primary Focus	Job recommendation or resume parsing (separate systems)	End-to-end career guidance

Resume Parsing	Available only in Resseract System	Yes (advanced)
Job Recommendation	Available only in Job Recommendation System	Yes (hybrid approach)
Techniques Used	TF-IDF, Word2Vec, Cosine Similarity, NLP, NER, LLM	NLP, ML, LLM, Hybrid Filtering
AI/LLM Integration	Partial to moderate	Advanced
Semantic Understanding	Limited to moderate	High
Interview Preparation	Not supported	Yes
Real-Time Feedback	Not available	Yes
Personalization	Limited	High
User Interaction	Low	High
Automation Level	Medium to high	Very high
Target Users	Job seekers or recruiters (separate)	Job seekers & recruiters
System Scope	Single functionality systems	Multifunctional integrated system
End-to-End Support	Not provided	Yes
Scalability	Moderate to high	High

However the system is guide only to the one side of interaction where candidate is not supported or assisted. However, proposed system combines the features of the above two systems and enhances them with more complex AI techniques. It not only pulls out resume data and transforms it but also performs semantic matching between candidate skill set and job description as well as providing a mock interview feature that uses LLMs to create a set of questions for each interview and also provide real time feedback as well as track progress through it. Moreover, it focuses on personalization. Using information from user system interaction, our system would be able to provide customized suggestions and improvements. Below is the output interface of AI-powered career assistant system named, an interactive, intelligent

career coach system to give career advice. The system is running on localhost:5000, show as a chatbot based user interface. Introduction When a user opens the system, it will greet the user and ask their current career goal. For example, the user may enter "I'm looking to be a Java Developer ". The system takes the input and with the use of NLP (Natural Language Processing), creates an appropriate context on how to react.

The following response is then issued to the user: "You're looking to be a Java Developer. The next thing I would suggest is that you take an informal practice interview to help you hone your skills." An important capability illustrated in the output is the behavioural insight component, this looks at user whim and makes suggestions or returns specific output such as in the case of the blank character provided meaning for career selection. This is evidence for the use of AI based techniques used for a user profiling and suggestions. The interface has a "Reset session" button which can reset the chat interaction back to the starting state as well as a chat text box to continue the conversation. In general, this system demonstrates real-time interaction personalization recommendation, and intelligent response, making it a comprehensive end-end AI career consultant for the tasks mentioned above, such as guiding decision, improving skill, and preparing for interview.

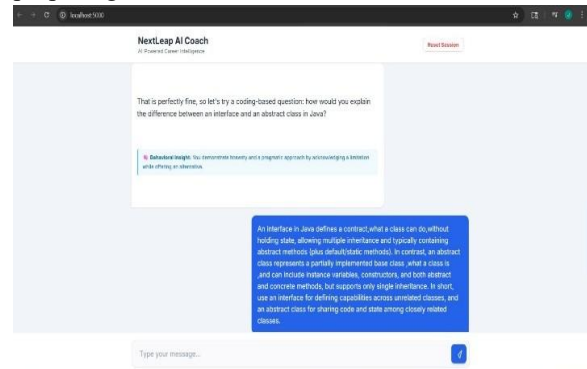


Fig. 2. Response provided by user

The figure shows 2nd output page of The NextLeap AI Coach, which shows how the AI Coach prepare and evaluate the interview. As the career goal of the candidate is Java Developer, the system continues to create an interview environment by asking coding related question. In the example shown in the figure, the system asks, explains the differences between an interface and an abstract class in Java. Another providing a behavioral insight, based on the

previous answer history. For example, the system identify the behavior as pragmatic and honest. It shows that the system also measure soft skill and communication behavior, not only raw technical input.

To conclude, this output demonstrates the ability to for the system to provide an interview scorecard, functionality of conduct mock interviews and give real-time feedback on skills and behavior. It also reasserts the system's positioning as a full-fledged AI solution to career coaching for skills.

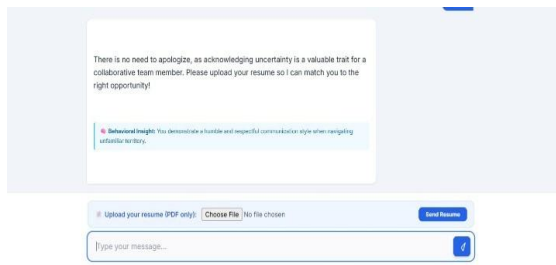


Fig. 3. Response provided by AI Coach

The Fig.3 provides further output screen of NextLeap AI-Coach, specifically designed to illustrate its capability to receive resumes and job-match the user. In this case, system acts positively, appropriately in business by suggesting it is good to be unsure, and is friendly by requesting the user to have their resume ready so that it can extract information from it and categorize the user against relevant jobs. And finally the system hand to the user a behavioural insight, this insight rate user's way of communicating. It shows Strengths such as simple humble and courteous communicating, which means AI is handling soft skills rather than technical input. Another functional element on website that is visible is section for uploading your resume. It allows users to upload PDF files which indicates that the system is able to process the resume further. This could allow website to automatically analyze the skills, experience and qualifications from resume. In general, this makes output multi-function, so user will have conversation AI, behavior analysis and resume parse at the same time. It can improve user experience because it gain user guidance and refer users to career explore, recommend job and foster business & professional development.

These three outputs collectively show the trio of inputs (interview guidance /Interview simulation /Resume-based career matching) from the NextLeap AI-Coach as end-to end AI-powered

career assistant that interacts with the user through conversation, evaluation and resume parsing.

In first interaction, NextLeap aske user about their career goal and after understanding user's intent, provided interview guidance on how to prepare for interview (via conversation) and what personality traits they exhibit (via candidate analysis) like clarity of purpose. In second interaction, it simulate the technical interview (by asking questions) based on user inputs and integrated two different types of evaluation (candidate analysis based on personality and candidate interview based on technical skills) along with real-time feedback to the user. In the third interaction, NextLeap focused on resume-based career matching, by making the user upload their resume in pdf format, extracting the details from the resume and suggesting candidates suitable for a given job (by resume parsing). It further continued with candidate analysis with personality traits like humility and Communication style.

VI. CONCLUSION AND FUTURE WORK

The proposed AI-Powered Career Assistant presents a comprehensive and intelligent solution to address the limitations of existing recruitment and career guidance systems. Unlike traditional platforms that focus on isolated functionalities such as job recommendation or resume parsing, the proposed system integrates multiple components—including resume analysis, job matching, and interview preparation—into a unified framework. By leveraging advanced technologies such as Natural Language Processing (NLP), Machine Learning (ML), and Large Language Models (LLMs), the system effectively transforms unstructured resume data into meaningful insights and enables semantic understanding of user profiles. The hybrid recommendation mechanism improves the accuracy of job matching, while the AI-driven mock interview module provides real-time feedback, helping users enhance their performance and confidence. The modular and scalable architecture ensures secure data handling, efficient processing, and seamless interaction between system components. Overall, the system successfully bridges the gap between candidate preparation and industry expectations, demonstrating the potential of AI in improving employability and recruitment efficiency.

Despite its effectiveness, there are several opportunities for future enhancement. The system can be extended by incorporating multimodal capabilities, such as voice and video-based interview simulations, to evaluate non-verbal communication skills including tone, facial expressions, and body language. Additionally, integrating advanced analytics and skill-gap assessment can enable the system to track user performance over time and provide personalized learning recommendations. Future improvements may also include support for multilingual interactions to increase accessibility, as well as the development of domain-specific models tailored to different industries for more accurate guidance. Furthermore, integration with external job portals and learning platforms can create a complete ecosystem for career development. These enhancements will further strengthen the system's capability, making it a more robust, adaptive, and impactful solution in the field of AI-driven career guidance.

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