International Journal of Scientific Research in Engineering & Technology
Volume5, Issue1 (January-February 2025), PP: 31-34.
https://www.doi.org/10.59256/ijsreat.20250501003
www.ijsreat.com ISSN No: 2583-1240

AI-Powered Career Advisor (A Personalized Career Guidance System)

P. Anu Uthayam[1], Dinesh.S[2], Sanjay.E[3], Manothkumar.R[4], Rishikaran.R[5]
[1]AP, IT Department, Er. Perumal Manimekalai College of Engineering, Hosur, Tamilnadu, India.
[2,3,4,5] Er. Perumal Manimekalai College of Engineering, Hosur, Tamilnadu, India.

To Cite this Article: *P. Anu Uthayam[1], Dinesh.S[2], Sanjay.E[3], Manothkumar.R[4], Rishikaran.R[5], "AI-Powered Career Advisor (A Personalized Career Guidance System), International Journal of Scientific Research in Engineering & Technology, Volume 05, Issue 01, January-February32025, PP: 31-34.*

Abstract: *The AI-Powered Career Advisor is a web platform that helps students and early-career professionals make informed career decisions using AI. It analyzes user profiles, preferences, and market trends to provide personalized career guidance. Leveraging models like GPT-4 and Word2Vec, it offers job recommendations, skill gap analysis, and career path visualizations.The system integrates real-time data from APIs like Adzuna (job listings), Coursera (courses), and GitHub (projects) to keep users updated on job opportunities and industry trends. It also includes resume analysis, automated CV generation, and an AI chatbot for instant career advice.Unlike static career advisory tools, this platform adapts to user inputs and market changes, ensuring relevant and dynamic recommendations. Future enhancements include deep learning-based personalization, mobile accessibility, and advanced AI-driven insights.*

Key Word: *AI Career Guidance, Job Recommendations, Skill Analysis, Resume Processing.*

1. INTRODUCTION

Background and Motivation

Choosing the right career in the fast-changing tech industry can be overwhelming for students and early professionals. Traditional career guidance often lacks personalization and data-driven insights. To bridge this gap, we developed the AI- Powered Career Advisor, leveraging AI to provide tailored career recommendations based on skills and interests.

Problem Statement

Individuals struggle to choose the right career due to a lack of personalized guidance and the overwhelming number of options in tech. Existing tools often fail to consider individual skills, interests, and industry trends, leading to poor career decisions and dissatisfaction.

Importance of an AI-Powered Career Advisor

An AI-powered advisor offers personalized, data-driven career guidance by analyzing user profiles and industry trends. This empowers users with timely, relevant insights, helping them make informed career choices, improve job readiness, and achieve professional success.

II.LITERATURE SURVEY

Advancements in AI Career Advisory

AI-powered career advisors use AI, ML, and NLP to provide personalized career recommendations, surpassing traditional rule-based systems. Models like GPT-4, Word2Vec, and BERT analyze user profiles and real-time job market trends, while collaborative filtering and supervised learning predict career paths and suggest skill development.

Real-time job market data from platforms like Adzuna, LinkedIn, and Indeed inform job recommendations, while Coursera and Udemy suggest courses to bridge skill gaps. AI-powered resume analysis enhances career guidance by identifying missing competencies and suggesting improvements. AI chatbots offer instant career counseling and roadmap generation.

Challenges include bias in AI models, lack of interpretability, and difficulty assessing soft skills. Future improvements will enhance explainability, deep learning models, and mobile AI solutions, making career guidance more accurate, accessible, and adaptive.

III.METHODOLOGY

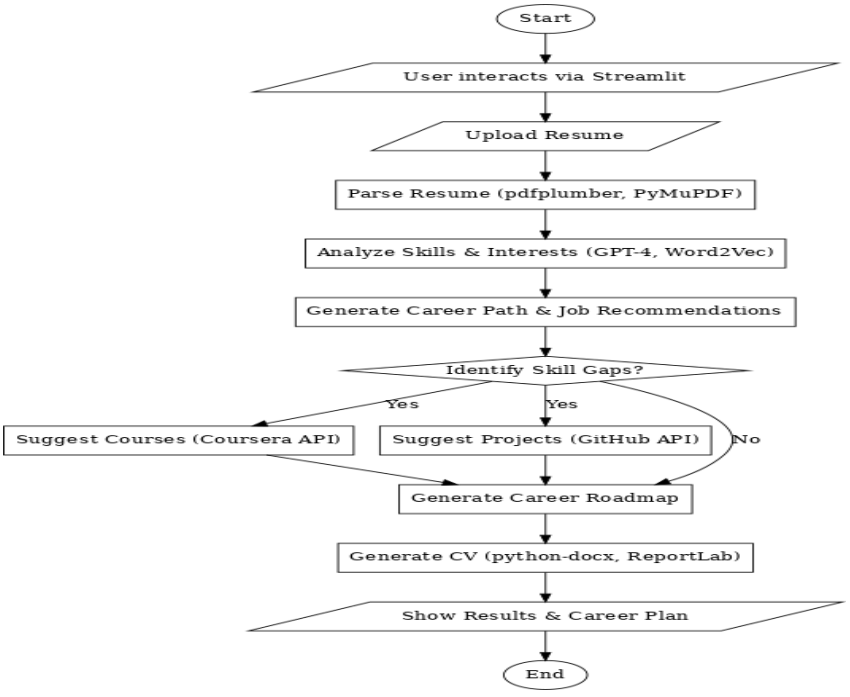
1. Research & Planning – Identified the need for AI- driven guidance, reviewed tools, and gathered datasets from GitHub, Kaggle, UCI, and O*NET.
2. Model Development – Due to computational constraints, opted for GPT-4 for NLP instead of a custom LLM.

3. Feature Enhancements – Added CV upload & analysis to generate job recommendations.
4. Job Listings API – Chose Adzuna over LinkedIn and Indeed due to cost and access limitations.
5. Cost Optimization – Evaluated Llama-2 & BERT, but GPT-4 was the most feasible choice.
6. Educational Integration – Used Coursera & GitHub APIs for personalized learning recommendations.
7. CV Builder – Designed a customizable CV generator, downloadable in multiple formats.
8. User Interface – Developed a Streamlit-based UI for an intuitive experience.
9. Career Roadmap & Skill Gap Analysis – Built a four-step roadmap linking job recommendations with skill-building resources.
10. Chatbot & Feedback – Integrated a GPT-4 chatbot for real-time guidance and feedback collection.
11. RAG Experimentation – Tested Retrieval- Augmented Generation but found limited success.

IV.TECHNOLOGIES

1. **Frontend (User Interface)**
   - Streamlit → Provides a simple and interactive UI for users to input resumes, explore career paths, and chat with the AI.
2. **Backend (AI & Data Processing)**
   - OpenAI (GPT-4) → Processes resumes, generates career recommendations, and powers the chatbot.
   - pdfplumber & PyMuPDF → Extracts text from PDF resumes for analysis.
   - python-docx & ReportLab → Creates professional CVs in DOCX and PDF formats.
   - NetworkX & PyVis → Generates career path visualizations.
3. **Data Storage**
   - PostgreSQL → Stores user profiles, resumes, and interaction history.
4. **External APIs (Enhancing Recommendations)**
   - Adzuna API → Fetches real-time job listings.
   - Coursera API → Suggests relevant courses.
   - GitHub API → Provides project opportunities.
5. **Deployment**
   - Docker → Ensures easy deployment and scalability.
   - Cloud Hosting (Azure/Heroku) → Hosts the application.
   - Security Measures → Protects user data and privacy.

V. FLOW CHART



VI.ALGORITHM USED

1. Resume Parsing & Analysis

Algorithm: Named Entity Recognition (NER) + Text Extraction

- **Purpose:** Extract structured information from resumes, such as skills, experience, and education.
- **Libraries:** spaCy, pdfplumber, PyMuPDF, NLTK
- **Approach:**

- Extract raw text from PDF resumes.
- Use NER to identify key entities (e.g., job titles, education, skills).
- Store structured data for further analysis.

2. Career Path Recommendation

Algorithm: Word2Vec or BERT-based Embedding + Similarity Matching

- **Purpose:** Suggest career paths based on the user's skills and interests.
- **Libraries:** Gensim, transformers, FAISS (for fast similarity search)
- **Approach:**
  - Train or use a pre-trained Word2Vec/BERT model on career-related data.
  - Represent careers and skills as vectors.
  - Compute cosine similarity between user profile and career paths.
  - Recommend the most relevant career options.

3. Skill Gap Analysis

Algorithm: Graph-Based Analysis + TF-IDF

- **Purpose:** Identify missing skills required for a chosen career path.
- **Libraries:** Network X, TF-IDF from sklearn. feature_ extraction. text
- **Approach:**
  - Model career paths and required skills as a graph.
  - Use TF-IDF to rank essential skills based on job descriptions.
  - Compare user skills with the required skills.
  - Recommend missing skills and courses.

4. Job Recommendation System

Algorithm: Collaborative Filtering + Content-Based Filtering (Hybrid)

- Purpose: Recommend jobs based on the user's profile.
- Libraries: Scikit-learn, Surprise
- Approach:
  - Content-Based Filtering: Match users to jobs based on extracted resume features.
  - Collaborative Filtering: Find similar users and suggest jobs based on their interests.
  - Combine both approaches for better accuracy.

5. Career Roadmap Generation

Algorithm: Decision Tree / Rule-Based System

- **Purpose:** Provide step-by-step guidance for users to achieve their chosen career.
- **Libraries:** Scikit-learn (for decision trees)
- **Approach:**
  - Define a decision tree for career progressions.
  - Given a user's profile, trace the optimal path to their career goal.
  - Suggest courses, certifications, and experience needed for the next step.

6. AI Chatbot for Career Advice

Algorithm: GPT-4 (OpenAI API) / Fine-Tuned LLM

- **Purpose:** Answer career-related queries and provide interactive guidance.
- **Libraries:** OpenAI API, LangChain (for fine- tuning/custom workflows)
- **Approach:**
  - Process user queries.
  - Use GPT-4 to generate career insights, skill improvement tips, and general advice.
  - Integrate with other models (e.g., job recommendations, roadmap generator).

7. Resume Improvement Suggestions

Algorithm: BERT-based Text Classification + Rule-Based System

- **Purpose:** Analyze resumes and suggest improvements in formatting, keywords, and content.
- **Libraries:** transformers, NLTK, spaCy
- **Approach:**
  - Use BERT or GPT-4 to classify resume sections.
  - Identify missing or weak areas (e.g., lacking key skills, poor formatting).
  - Suggest improvements based on industry trends.

Summary of Key Algorithms

Feature	Algorithm	Libraries
Resume Parsing	NER + Text Extraction	spaCy, pdfplumber, PyMuPDF
Career Path Recommendation	Word2Vec/BERT + Similarity Matching	Gensim, FAISS, transformers
Skill Gap Analysis	Graph-Based Analysis + TF-IDF	Network X, sklearn
Job Recommendation	Hybrid Filtering (Content-Based + Collaborative)	Scikit-learn, Surprise
Career Roadmap	Decision Tree / Rule- Based	Scikit-learn
AI Chatbot	GPT-4 (OpenAI API)	OpenAI, LangChain
Resume Improvement	BERT + Rule-Based	transformers, NLTK, spaCy

VII. OUTCOMES

1. Personalized Career Recommendations – Provides tailored career paths based on skills, interests, and job market trends using AI-driven analysis.
2. Resume Analysis & Improvement – Identifies skill gaps, missing competencies, and formatting issues, offering suggestions to optimize resumes.
3. Automated CV Generation – Enables users to create professional CVs with customizable templates, downloadable in multiple formats.
4. Real-Time Job Matching – Integrates Adzuna API to recommend live job opportunities aligned with user profiles.
5. Skill Gap Identification & Learning Suggestions – Assesses required skills for career growth and recommends relevant courses from Coursera and GitHub projects.
6. Interactive Career Roadmap – Generates a step- by-step guide for career progression, linking job recommendations, skill-building, and certifications.
7. AI-Powered Chatbot for Career Guidance – Provides instant career advice, interview tips, and industry insights via a GPT-4 chatbot.
8. Scalable & Cost-Optimized Solution – Balances performance and feasibility by leveraging GPT-4, avoiding expensive model training while maintaining high accuracy.
9. User-Friendly Interface – A Streamlit-based UI ensures smooth navigation and an engaging experience.
10. Continuous Learning & Adaptation – Uses feedback mechanisms to refine recommendations and improve system performance over time.

VIII.CONCLUSION

The AI-Powered Career Advisor delivers personalized, data-driven career guidance, helping students and professionals make informed decisions. Developed over eight weeks, it integrates AI models, career data, and user- friendly features like CV analysis, skill gap assessment, and an interactive chatbot.

Despite challenges like resource constraints and RAG system limitations, the team optimized performance using pre-trained models and fine-tuned GPT-4 with O*NET data. User feedback and rigorous testing ensured reliability and effectiveness.

REFERENCES

1. *Mikolov, T., et al. (2013). "Efficient Estimation of Word Representations in Vector Space." arXiv preprint arXiv:1301.3781. (For Word2Vec)*
2. *Devlin, J., et al. (2019). "BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding." Proceedings of NAACL-HLT 2019. (For BERT-based NLP tasks)*
3. *Resnik, P. (1999). "Semantic Similarity in a Taxonomy: An Information-Based Measure and its Application to Problems of Ambiguity in Natural Language." Journal of Artificial Intelligence Research. (For semantic similarity in career recommendations)*
4. *Russell, S., & Norvig, P. (2020). Artificial Intelligence: A Modern Approach (4th Edition). Pearson. (General AI principles)*
5. *Raschka, S., & Mirjalili, V. (2019). Python Machine Learning (3rd Edition). Packt Publishing. (For machine learning implementations)*