FitForward Site

Individual Final Report

1. Introduction

This report examines two key projects undertaken to address challenges in aligning resumes with job descriptions: the Resume Feedback and Recommendation System and FitForward: Resume-Based Job Finder with Feedback.

The first project, the Resume Feedback System, was developed to evaluate resumes, identify gaps in required skills, and offer actionable recommendations for improvement. By systematically extracting and categorizing skills into technical, domain-specific, and soft skill categories, the system empowered job seekers to refine their resumes for enhanced relevance to targeted roles. Despite demonstrating substantial potential, the project encountered significant limitations due to the scarcity of domain-specific data, which ultimately necessitated a strategic pivot to the second initiative.

The second project, FitForward: Resume-Based Job Finder with Feedback, was conceptualized to address these data constraints and shift the focus to real-time job discovery. This solution enables users to upload resumes, assess alignment with job descriptions, and identify the best-matching opportunities. Key features include a robust similarity scoring mechanism for resume-to-job matching, keyword-driven feedback, and an intuitive interface designed to enhance user engagement. This project presents a scalable and practical tool to improve job seekers' employability in an increasingly competitive market.

This report explores the methodologies, technical contributions, challenges, and outcomes associated with both projects. It underscores the innovative application of NLP techniques and highlights the iterative development approach adopted by the team to deliver impactful solutions.

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2. Description of Individual Work

2.1 Background

Resume Feedback System:
This project addressed a critical challenge for job seekers: assessing how well their resumes align with specific job descriptions. Utilizing advanced Natural Language Processing (NLP)

techniques, the system analyzed resumes, compared them against job descriptions, and delivered structured, actionable feedback. The feedback was categorized into three key areas: technical skills, domain knowledge, and soft skills, providing users with clear, targeted recommendations to optimize their resumes for desired roles.

FitForward: Resume-Based Job Finder with Feedback:

Building on the principles of resume-job alignment, this project aimed to facilitate personalized job discovery for users. By integrating key functionalities such as keyword extraction, similarity scoring, and feedback generation, the system offered tailored job suggestions and insights to enhance employability. While the initial concept involved real-time resume evaluations against job descriptions, the limited availability of sufficient data led the team to pivot toward developing the FitForward system. This pivot allowed the project to focus on delivering a robust and scalable solution for job seekers, emphasizing usability and real-time feedback.

2.2 Individual Contributions

Resume Feedback and Recommendation System:

1. Data Cleaning:
    - Cleaned and preprocessed the resume dataset to remove irrelevant details, handle missing values, and standardize the format for analysis.
    - Utilized NLP techniques, including tokenization, stop-word removal, and consistency checks, to ensure high-quality data for further processing.
2. Feedback Generation:
    - Implemented a feedback system that identified missing skills and areas of improvement by comparing cleaned resumes with job descriptions.
    - Categorized the generated feedback into technical skills, domain knowledge, and soft skills to enhance interpretability for users.
3. Deployment:
    - Developed and deployed a streamlined system using Streamlit to allow users to view processed feedback in a clear, accessible format.
    - Focused on providing a clean interface for viewing structured feedback without requiring resume uploads during the feedback generation phase.

FitForward: Resume-Based Job Finder with Feedback:

1. **Data Cleaning:**
    - Preprocessed resumes to align them with job descriptions, ensuring compatibility for keyword extraction and similarity analysis.
2. **Deployment:**
    - Deployed the application using Streamlit, creating a platform where users could interact with the system to find job matches and view feedback insights.
    - Enabled functionality for users to explore job matches and review similarity-based alignment through a user-friendly interface.

3. **Interface Design:**
    - Contributed to designing an engaging and intuitive user interface for the application, allowing seamless navigation and interaction.
    - Integrated elements such as job titles, similarity scores, and structured feedback insights for an enhanced user experience.

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3. Detailed Work

Resume Feedback and Recommendation System

Data Cleaning:

- Processed raw resume data by eliminating redundant information, handling missing values, and ensuring structural consistency across all entries.
- Employed NLP techniques such as tokenization, stop-word removal, and normalization to prepare resumes for comparison with job descriptions.

Feedback Generation:

- Designed an NLP-based system to extract and categorize keywords from resumes and job descriptions.
- Identified missing skills and highlighted improvement areas by comparing extracted keywords.
- Categorized feedback into three main groups:
    1. **Technical Skills**: Emphasized domain-specific tools and technologies.
    2. **Domain Knowledge**: Focused on industry expertise and professional terminology.
    3. **Soft Skills**: Highlighted interpersonal and organizational skills.
- The feedback was presented in a concise, actionable format for easy comprehension by users.

Deployment:

- Implemented the system using Streamlit, creating an interface that displayed pre-processed feedback directly to users.
- Developed a visual feedback dashboard, enabling users to explore categorized insights, such as missing technical skills or domain knowledge.

FitForward: Resume-Based Job Finder with Feedback

Data Cleaning:

- Conducted preprocessing on uploaded resumes to standardize text for compatibility with NLP models.
- Ensured that resumes were cleaned and formatted for effective comparison with job descriptions.

Deployment:

- Deployed the application using Streamlit, focusing on a user-centric design.
- Implemented features to:
    - Allow users to upload resumes.
    - Display matching jobs along with similarity scores and categorized feedback.

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4. Results

4.1 Accuracy and Performance

Resume Feedback and Recommendation System:

- **Keyword Extraction Accuracy:** Successfully identified relevant keywords from resumes and job descriptions using KeyBERT, ensuring precise alignment of extracted skills with role-specific requirements.
- **Categorization Efficiency:** Categorized feedback into technical skills, domain knowledge, and soft skills with high interpretability, aiding users in identifying improvement areas effectively.

FitForward: Resume-Based Job Finder with Feedback:

- Processed **200+ resumes** and job descriptions with the system.
- Achieved high accuracy in identifying relevant skills and calculating similarity scores.

4.2 Feedback Examples

Resume Feedback and Recommendation System:

- **Technical Skills Feedback:**
    - Example: "Add 'Python' and 'data visualization' under the 'Skills' or 'Experience' section to align with job requirements for a Data Analyst role."
- **Domain Knowledge Feedback:**

    - Example: "Consider highlighting domain expertise in 'Retail Management' to enhance alignment with the Store Manager position."
- **Soft Skills Feedback:**
    - Example: "Add examples of 'leadership' and 'team collaboration' under the 'Achievements' section to showcase interpersonal skills."

FitForward: Resume-Based Job Finder with Feedback:

1. Missing skills such as "Python," "AWS," or "Leadership" highlighted for candidates.
2. Suggestions provided for improving resumes, such as adding domain-specific skills.

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5. Summary and Conclusions

Summary

This report outlines the development and deployment of two distinct yet interconnected projects: the Resume Feedback and Recommendation System and the FitForward: Resume-Based Job Finder with Feedback.

- **Resume Feedback System:** Focused on analyzing and providing feedback on resumes by comparing them with job descriptions. The project leveraged NLP techniques for text preprocessing, keyword extraction, and feedback categorization. Deployment via Streamlit enabled seamless user interaction with processed feedback.
- **FitForward: Resume-Based Job Finder with Feedback:** Built to identify and rank the most relevant job descriptions for a given resume. The system utilized cosine similarity to rank jobs and generate insights on how resumes aligned with job descriptions. The streamlined interface supported resume uploading, similarity scoring, and feedback visualization.

Conclusions

- **Resume Feedback and Recommendation System:** Successfully demonstrated the potential of NLP in extracting and categorizing feedback. However, the project faced limitations in live feedback generation due to insufficient data availability for diverse job descriptions and resumes.
- **FitForward:** Pivoting to this project resolved data limitations by emphasizing job-matching instead of live resume review. It provided job seekers with actionable insights and clear suggestions for improvement based on relevance scoring and detailed feedback.

Future Improvements

Resume Feedback System

- Integrate advanced NLP models like BERT to provide more tailored and industry-specific feedback.
- Incorporate OCR for handling image-based resumes and improve structured data extraction.
- Enable real-time suggestions for resumes to optimize keyword density and skill alignment.
- Deploy on a cloud platform for better global access and enhanced performance.

FitForward:

- Develop a feature for live feedback on resume tweaks to improve job match scores.
- Use advanced embeddings like SBERT for a better alignment between resumes and job descriptions.
- Allow users to save resumes, track applications, and store feedback history.
- Provide trending skills and certification recommendations to align with current job market demands.

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6. Code Attribution

Resume Feedback System:

- Lines of Code Sourced: 40
- Lines of Code Modified: 10
- Lines of Code Added: 50

Total Lines = Sourced Lines+Added Lines
Total Lines=40+50=90

Calculation:
Percentage = ((Sourced Lines−Modified Lines)/Total Lines)×100
Percentage = ((40−10)/90)×100 = 33.33%

FitForward Job Finder System:

- Lines of Code Sourced: 50
- Lines of Code Modified: 15
- Lines of Code Added: 70

Total Lines=Sourced Lines+Added Lines
Total Lines = 50+70=120

Calculation:
Percentage = ((Sourced Lines−Modified Lines)/Total Lines)×100
Percentage = ((50−15)/120)×100 = 29.17%

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7. References

- K. Appadoo, M. B. Soonnoo and Z. Mungloo-Dilmohamud, "Job Recommendation System, Machine Learning, Regression, Classification, Natural Language Processing," 2020 IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE), Gold Coast, Australia, 2020, pp. 1-6, doi: 10.1109/CSDE50874.2020.9411584. keywords: {Computer science;Conferences;Decision making;Data engineering;Natural language processing;Classification algorithms;Interviews;Job Recommendation System;Machine Learning;Regression;Classification;Natural Language Processing}
- P. Senarathne, M. Silva, A. Methmini, D. Kavinda and S. Thelijjagoda, "Automate Traditional Interviewing Process Using Natural Language Processing and Machine Learning," 2021 6th International Conference for Convergence in Technology (I2CT), Maharashtra, India, 2021, pp. 1-6, doi: 10.1109/I2CT51068.2021.9418115. keywords: {Deep learning;Organizations;Writing;Natural language processing;Human voice;Interviews;Python;Human Resources Management;Smart Interviewing System;Deep}
- P. Ghadekar, A. Kabra, K. Gangwal, A. Kinage, K. Agarwal and K. Chaudhari, "A Semantic Approach for Automated Hiring using Artificial Intelligence & Computer Vision," 2023 IEEE 8th International Conference for Convergence in Technology (I2CT), Lonavla, India, 2023, pp. 1-7, doi: 10.1109/I2CT57861.2023.10126463. keywords: {Text recognition;Computational modeling;Resumes;Semantics;Text categorization;Companies;Transformers;Computer Vision;Malpractices;Resume Screening;Web Scraping}
- S. I. Horat, K. Can Kara and A. Karakaş, "Job Pre-Interview System with Artificial Intelligence," 2019 1st International Informatics and Software Engineering Conference (UBMYK), Ankara, Turkey, 2019, pp. 1-4, doi: 10.1109/UBMYK48245.2019.8965497. keywords: {Semantic Analysis;Competence Ontology;Classification Algorithms;Natural Language Processing;Virtual İnterview},

- S. Chopra and S. Urolagin, "Interview Data Analysis using Machine Learning Techniques to Predict Personality Traits," 2020 Seventh International Conference on Information Technology Trends (ITT), Abu Dhabi, United Arab Emirates, 2020, pp. 48-53, doi: 10.1109/ITT51279.2020.9320879. keywords: {Interviews;Feature extraction;Predictive models;Market research;Information technology;Computational modeling;Regression tree analysis;prosodic features;feature selection;regression;non-verbal behavior;job interviews},
- C. Czejdo and S. Bhattacharya, "Support for Interview Preparation with Deep Learning Based Language Model," 2021 International Conference on Emerging Techniques in Computational Intelligence (ICETCI), Hyderabad, India, 2021, pp. 16-20, doi: 10.1109/ICETCI51973.2021.9574063. keywords: {Deep learning;Computational modeling;Training data;Data models;Interviews;Computational intelligence;Pedagogical Techniques;Deep Learning (DL);Natural Language Processing (NLP);Multiple Mini Interview (MMI);Educational Inequity;Language Model (LM)}.

Kaggle Datasets :

https://www.kaggle.com/datasets/snehaanbhawal/resume-dataset

Github Link to our Source Code :

https://github.com/sanjayram01/Final-Project-Group-FitForward

Github Link Resume Feedback System Code :

https://github.com/sanjayram01/Final-Project-Group-FitForward/tree/Dinesh

The nlp_final_dinesh.py file serves as the source code for this project, while app_dinesh.py handles the Streamlit component for deployment.

Libraries Used:

- spaCy Documentation: https://spacy.io/usage
- KeyBERT Documentation: https://github.com/MaartenGr/KeyBERT
- NLTK Documentation: https://www.nltk.org/
- Scikit-learn Documentation: https://scikit-learn.org/stable/documentation.html
- streamlit: https://streamlit.io/