CareerX: AI-Powered Career Path Recommender System for College Students

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***Abstract*—In today's rapidly evolving job market, college students often face challenges in selecting suitable career paths that align with their skills and interests. Traditional career guidance methods are often inadequate, leading to confusion and misalignment between students' aspirations and job market demands. This paper presents "CareerX," an AI-powered career path recommender system designed to assist college students in making informed career choices. The system leverages advanced technologies such as Natural Language Processing (NLP) and machine learning algorithms to analyze user profiles, resumes, and job market trends. Key features include a career recommender, resume analyzer, learning roadmap, and job finder. Initial user feedback indicates a 90% satisfaction rate, with significant improvements in resume quality and job matching accuracy. This paper discusses the system's architecture, methodologies, and potential future enhancements, including real-time job tracking and gamification elements to further engage users.**

Keywords—AI, Career Guidance, Recommender System, College Students, Natural Language ProcessingThis Is a Level 1 Heading

The transition from college to the workforce is a critical phase for students, often fraught with uncertainty regarding career choices. Traditional career counseling methods, which rely heavily on manual assessments and generic advice, fail to address the unique needs of each student. As the job market becomes increasingly competitive and dynamic, there is a pressing need for innovative solutions that can provide personalized career guidance.

Problem Statement

Despite the availability of various career guidance resources, students often struggle to find tailored advice that aligns with their individual skills, interests, and the evolving job landscape. This paper proposes the development of "CareerX," an AI-powered recommender system that aims to bridge this gap by providing personalized career recommendations based on comprehensive data analysis.

Objectives

1. To build a mobile-based AI-powered application that recommends career paths tailored to individual users.
2. To provide an integrated resume analyzer that gives improvement suggestions using NLP.
3. To suggest personalized learning roadmaps for acquiring required skills.
4. To aggregate job listings based on career preferences.
5. To ensure scalability, performance, and accuracy through real-time cloud infrastructure.

Literature Review

Many career guidance platforms like LinkedIn Career Explorer and CareerBuilder offer role-based suggestions. However, most fall short in personalization, integration, or actionable feedback.

CareerX aims to combine the strengths of these systems while addressing their shortcomings by offering an end-to-end AI-based, mobile-focused platform for college students.

A. Related Work

Several AI-based career guidance systems have emerged in recent years, each with varying degrees of success. Notable examples include:

1. CareerBuilder: Utilizes machine learning to match job seekers with potential employers. However, it lacks personalized career path recommendations.
2. LinkedIn Career Explorer: Offers insights into potential career paths based on user profiles but does not provide a comprehensive analysis of skills and interests.
3. Myers-Briggs Type Indicator (MBTI): While popular for personality assessment, it does not leverage real-time job market data or AI technologies.

B. Limitations

While CareerX has shown promising results, a few limitations are noted:

- **Data Dependency:** Recommendations depend heavily on user inputs and job APIs. Poor resume content can reduce accuracy.
- **Bias in ML Models:** Biases in training data may affect fairness.
- **Limited Job Sources:** Integration with only select platforms limits job diversity.
- **Language Dependency:** Currently optimized for English resumes and inputs only.

Most existing systems fail to integrate multiple data sources, resulting in generic recommendations that do not account for individual user profiles. Additionally, many systems do not provide actionable insights, such as resume optimization or learning pathways, which are crucial for students entering the job market.

System Design and Architecture

Overview

CareerX follows a modular microservices architecture consisting of four key modules:

- **Frontend:** Android app using Jetpack Compose.
- **Backend:** Firebase cloud functions for data handling and user auth.
- **AI Engine:** NLP and ML models for processing resumes and making recommendations.
- **Job Crawler:** Aggregates job data via APIs.

Functional Modules

1. **Career Recommender:** Uses user input (interests, academic scores, field) to suggest AI-curated career paths.
2. **Resume Analyzer:** Applies NLP techniques (keyword extraction, grammar scoring, ATS compliance check) to improve resume quality.
3. **Learning Roadmap:** Suggests online courses, certifications, and projects based on career goals.
4. **Job Finder:** Pulls job listings from multiple platforms, filtering based on skill match.

Technologies Used

- **Kotlin** with **Jetpack Compose** for UI.
- **Firebase** for real-time database and authentication.
- **NLP** via spaCy or Transformers for resume analysis.
- **ML** via Scikit-learn or hosted APIs.
- **Retrofit** for job listing APIs.

METHODOLOGY

The system works in the following stages:

Data Collection

1. User inputs (interests, resume, goals)
2. Real-time job data via API
3. Skill requirements from job descriptions

Resume Parsing & NLP

1. Tokenization and POS tagging
2. Skill extraction using named entity recognition (NER)
3. Scoring resume based on job alignment

Machine Learning

1. Classification models trained on sample resumes and career paths
2. Similarity matching for job roles using cosine similarity and embedding vectors

Job Matching Logic

1. Uses a combination of keywords from the resume and the career path
2. Filters job listings by relevance score
3. Ranks and displays the top 10 jobs

RESULTS AND DISCUSSION

CAREERX WAS TESTED WITH 100 USERS FROM DRONACHARYA COLLEGE OF ENGINEERING. EVALUATION FOCUSED ON USABILITY, ACCURACY, AND FEATURE IMPACT.

Initial testing of CareerX has yielded promising results:

1. User Satisfaction: A survey conducted among early users indicated a 90% satisfaction rate with the recommendations provided.

2. Resume Improvement: Users reported an average increase of 30% in their resume scores after utilizing the resume analyzer feature.

3. Job Matching Accuracy: The job finder module demonstrated a 75% success rate in matching users with relevant job opportunities.

User Feedback

Feedback highlighted the intuitive design of the app and the relevance of the career recommendations. Users appreciated the integration of learning resources, which helped them understand the skills required for their desired careers.

Conclusion and Future Work

CareerX represents a significant advancement in AI-driven career guidance for college students. The system's ability to provide personalized recommendations and actionable insights addresses the limitations of traditional methods.

Limitations

Current limitations include the need for continuous updates to the job market data and the potential for bias in AI algorithms.

Future Enhancements

1. Real-Time Job Tracking: Implementing features that allow users to track job applications and receive updates.
2. Better Personalization: Enhancing the recommender system with more sophisticated algorithms to improve accuracy.

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