An Intelligent Mobile Application for Career Development and Skill Enhancement Using AI Technology

Yelena Liu[1], Yu Cao[2]

[1]Rancho Cucamonga High School, 11801 Lark Drive, Rancho Cucamonga, CA 91701
[2]Computer Science Department, California State Polytechnic University, Pomona, CA 91768

ABSTRACT

This research paper presents an intelligent mobile application designed to assist job seekers with career development using AI technology [7]. In today's competitive job market, finding employment can be challenging and stressful, leading to demotivation. Our app aims to address these challenges by offering real-time career guidance, skill assessments, and personalized recommendations through an AI-powered chat system [8]. The app integrates key technologies such as ChatGPT and Firebase to provide tailored support for users. Experiments conducted showed a significant improvement in users' confidence and skill levels, confirming the app's effectiveness in providing career guidance. Despite some limitations, such as the need for more accurate AI responses and expanded datasets, the app demonstrates substantial potential in assisting job seekers with their career paths. The results highlight the app's ability to offer a comprehensive, user-friendly solution to job search and career development.

KEYWORDS

Career Development, AI-Powered Guidance, Job Search Assistance, Skill Assessment, PersonalizedRecommendations

1. INTRODUCTION

The job search process has become increasingly complex and demanding in today's economy, with the employment rate rising and competition intensifying. According to the Bureau of Labor Statistics, unemployment remains a concern, as shown in the Civilian Unemployment Rate data [2]. The process of finding a job often involves preparing or revising résumés, researching companies, utilizing job search engines, networking, identifying open positions, and preparing for interviews with potential employers[1]. This exhaustive process can be discouraging and time-consuming, leading to frustration and demotivation among job seekers.

The impact of unemployment extends beyond individual struggles; it can cause significant disruptions to mental and physical health, creating stress and uncertainty in society. Unemployment not only leads to financial instability but also affects emotional well-being, making it essential to address this issue with efficient solutions. By providing guidance and support during the job search process, we can help individuals navigate these challenges and improve their chances of finding employment.

The three methodologies highlight different approaches to AI-driven career guidance. Methodology A, using machine learning for personalized guidance (Metha, 2021), is effective but relies heavily on the quality of input data. Methodology B integrates AI in education for tailored guidance but faces challenges in adapting to diverse cultural contexts (Cheng & Liang, 2023). Methodology C uses machine learning algorithms for accurate career recommendations but struggles with data imbalances (Kamal et al., 2021). Our project enhances these approaches by incorporating real-time feedback, cultural adaptability, and multiple algorithms to provide more personalized and robust career guidance.

Our proposed solution is to develop an intelligent job search assistant app that uses AI to offer real-time career guidance and personalized support. This application integrates a virtual AI-powered chat system that provides immediate feedback on career choices and skill development. The app's interactive features aim to streamline the job search process by offering users tailored job recommendations, personalized career assessments, and one-on-one chat sessions with a virtual career coach.

The AI chat feature offers real-time advice and strategies to improve users' résumés, job applications, and interview preparation, making the process more efficient [9]. Additionally, the app includes a survey feature to help users explore different career paths, especially for those who are indecisive about their options. Customized assessments are also provided to help users identify and improve relevant job skills. Overall, this solution not only saves time and effort but also addresses the mental and emotional challenges of job hunting, offering an effective way to improve career confidence and success.

The experiments conducted aimed to test the effectiveness of our app in assisting users with their career paths and skill development. In Experiment A, we assessed how the app influenced users' confidence levels in their career choices. By administering a survey before and after using the app, we observed a notable increase in confidence, proving that the one-on-one chat feature with the AI Career Coach was highly effective in providing guidance.

In Experiment B, we evaluated how the app's assessments contributed to skill development. Ten college students selected a lesson and were assessed over five attempts. The results showed a statistically significant improvement in their scores, demonstrating that continuous training through the app enhanced their skills. These experiments validate the app's potential as a valuable tool for career development, helping users improve their confidence and competencies in their chosen fields.

2. CHALLENGES

In order to build the project, a few challenges have been identified as follows.

2.1. Ensuring the Accuracy

One of the major challenges faced in implementing our application was ensuring the accuracy of the AI-generated responses from ChatGPT. Since the app relies heavily on providing career guidance through personalized chat, inaccuracies in the AI's suggestions could lead to confusion or misinformation. To address this challenge, we could incorporate regular feedback loops where users can rate the accuracy and helpfulness of the advice they receive. By using this feedback, we would be able to continuously fine-tune the AI model, improve its performance, and ensure that it provides more accurate and relevant responses tailored to the user's needs [10].

2.2. Maintaining Data Security and Privacy

Another challenge was maintaining data security and privacy, particularly because the app collects sensitive user information such as career preferences and assessment results. It's crucial to ensure this data is protected against unauthorized access or breaches. To tackle this issue, we could use Firebase Authentication to manage secure user sign-ins and data access. Additionally, encrypting all stored data within Firebase Firestore would add an extra layer of security. By following best practices in data security, we aim to safeguard user information and build trust with our users, ensuring that their data remains private and secure.

2.3. User-Friendly Interface

The third challenge involved ensuring a smooth and user-friendly interface that seamlessly integrates all features of the app, such as AI chat, assessments, and job recommendations. A poorly designed user interface could lead to frustration and hinder the user experience. To address this, we could focus on designing an intuitive and responsive UI using Flutter, emphasizing clear navigation and easy access to the app's core features. Regular user testing and feedback sessions would help identify pain points and improve the interface, ensuring that users can effortlessly interact with the app and gain value from its features.

3. SOLUTION

Firebase: Firebase is responsible for identifying the current user and secure user's data in our app. Each user has their own account with an unique email and password. They also have their own profile stored on Firebase Firestore including their other information, current job, and current courses. Those information are used to customize their recommended jobs and assessments.

ChatGPT: We use ChatGPT to generate customized job recommendations, surveys, and assessments based on the user's profile and preference. We also integrate ChatGPT to provide 1 on 1 chat with a virtual career coach which can assist the user with any problems they encounter about their jobs and careers.

User Interface: The user interface is responsible for navigating the user between different pages like discover, profile, jobs, and lessons [15]. It also provides seamless integration between the user and ChatGPT. Moreover, it displays structured information and data on the screen for the user's understanding.

Figure 1. Overview of the solution

We aim to integrate ChatGPT to assist the user in advancing their career by providing services like one on one chat, survey generation, and customized questions. We send a request to OpenAI using OpenAI's api key to access its models and utilize the generated texts to support our various functionalities. In order to make sure that the output is correct and customized to the current user, we also passed in the user's profile information when making the request to OpenAI.
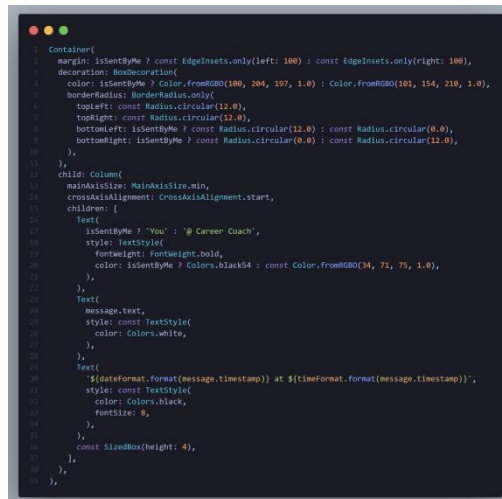

Figure 2. Screenshot of code 1

This code calls OpenAI's GptTubo0631Model to give the user a list of relevant lessons based on the user's profile. Since we want the lessons to be customized to the user's profile, first we will load the user's profile information and format the info in the prompt. In order to make sure that the output texts are in the correct format and are able to be decoded into usable values, we asked ChatGPT to return a list of lessons in JSON format which every lesson in the list will contain a value of name and description [14]. After setting up the prompt, we sent the prompt to ChatGPT and waited for its response. Upon receiving the response, we get the message in raw text form and parse the message using json.decode() function. We then store the decoded lesson list into the lessons variable. Since we need a way to track which lesson the user selects, we create a list of booleans called selectedLessons which will be all initialized to false to denote whether the user has selected the lessons. We wrap the entire decoding and variable initialization with a try catch statement just in case there's an error in the returned texts' format. At last, we call the setState method to tell Flutter to rebuild the UI to display the lessons returned from ChatGPT along with checkboxes for the user to select the lessons which we will filter later to be added a new list and stored into the user's profile in Firebase Firestore [13].


```
1   _loginError ? const Text('Invalid login information') : Container(),
2   ElevatedButton(
3     onPressed: () {
4       signIn(_emailController.text, _passwordController.text)
5         .then((bool success) {
6         if (success) {
7           Navigator.of(context).push(MaterialPageRoute(
8             builder: (context) => const BottomNav()));
9         }
10        setState(() {
11          _loginError = !success;
12        });
13      });
14    },
15    child: const Text(
16      "Sign in",
17      style: TextStyle(color: Colors.black),
18    ),
19  ),
```

Figure 3. Screenshot of code 2

In order to provide customized surveys, job suggestions, and assessments, we store user's data including their current job and other information in Firebase Firestore. To ensure data security, we use Firebase Authentication to provide a sign in / sign up feature to allow the user to access and update their profile data safely and securely. This code explains the sign in process of our app. The user will provide an email and password that matches their account to sign in. Upon pressing the sign in button, we will supply the email and password to Firebase Authentication which will sign in the user and notify our app [12]. Based on the result of the authentication function, we will either navigate the user to the home page of the app or display "Invalid login information" to inform the user that their supplied credential is invalid.

```
 1   Container(
 2     margin: isSentByMe ? const EdgeInsets.only(left: 100) : const EdgeInsets.only(right: 100),
 3     decoration: BoxDecoration(
 4       color: isSentByMe ? Color.fromRGBO(100, 204, 197, 1.0) : Color.fromRGBO(101, 154, 210, 1.0),
 5       borderRadius: BorderRadius.only(
 6         topLeft: const Radius.circular(12.0),
 7         topRight: const Radius.circular(12.0),
 8         bottomLeft: isSentByMe ? const Radius.circular(12.0) : const Radius.circular(0.0),
 9         bottomRight: isSentByMe ? const Radius.circular(0.0) : const Radius.circular(12.0),
10       ),
11     ),
12     child: Column(
13       mainAxisSize: MainAxisSize.min,
14       crossAxisAlignment: CrossAxisAlignment.start,
15       children: [
16         Text(
17           isSentByMe ? 'You' : '@ Career Coach',
18           style: TextStyle(
19             fontWeight: FontWeight.bold,
20             color: isSentByMe ? Colors.black54 : const Color.fromRGBO(34, 71, 75, 1.0),
21           ),
22         ),
23         Text(
24           message.text,
25           style: const TextStyle(
26             color: Colors.white,
27           ),
28         ),
29         Text(
30           '${dateFormat.format(message.timestamp)} at ${timeFormat.format(message.timestamp)}',
31           style: const TextStyle(
32             color: Colors.black,
33             fontSize: 8,
34           ),
35         ),
36         const SizedBox(height: 4),
37       ],
38     ),
39   ),
```

Figure 4. Screenshot of code 3

In order to help the user with their career questions or problems, our app incorporated a one on one chat feature using OpenAI's ChatGPT to provide real time feedback on the user's concerns about their careers [11]. In a chain of dialogues, we will need to separate the user's input with ChatGPT's response. To achieve this we will store a list of ChatMessages which each contain a boolean value of isSentByMe that will help us identify who sent the message. Based on the value, we will display ChatGPT's message on the left of the screen with a blue color and the user's output with a cyan color to further help the user understand the dialogue. Moreover, we record the time of each message and show the title of who sent it with either "@ Career Coach" or "You" to provide a better experience with chatting.

4. EXPERIMENT

4.1. Experiment 1

Through Experiment A, we attempt to determine the effectiveness of our app by recording the user's confidence level about their career before and after using our app. This is important because unemployment could disrupts individuals' status, time structure, demonstration of competence and skill[3]. To address those problems, out app aims to help the user find a clearer view about their career and boost their confidence through 1 on 1 chatting, job recommendation, and relevant skill assessments.

To prove the effectiveness of our app in relieving the user's career confidence, we created a survey containing multiple questions regarding their confidence levels about finding, maintaining, and advancing in their job and careers from 1 to 10. We sent the survey to 6 college students and asked for their response before and after using our app. Afterwards, we created a side by side boxplot to visualize the effect of our app regarding their confidence level about their career.

Before using the app
max: 8.0
Q3: 6.0
median: 5.5
Q1: 5.0
min: 2.0

after using the app
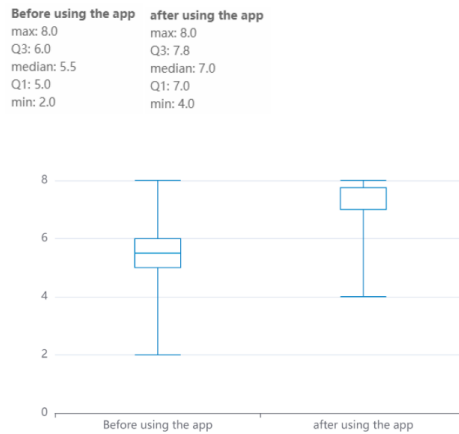max: 8.0
Q3: 7.8
median: 7.0
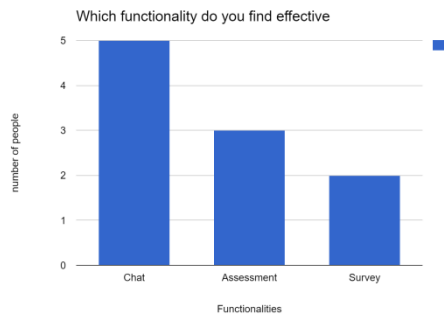Q1: 7.0
min: 4.0

Figure 5. Figure of experiment 1

Figure 6. Effective functionality

From the data, we noticed a significant improvement in their confidence level after using our app. Specifically, the mean score of user's confidence before using our app is 5.33/10, while the mean score of user's confidence after using our app is 6.83/10. This proved our app to be effective in providing guidance and support in the user's career development. At the end of the experiment, we also created and sent out a survey on which functionality of the app they find useful in assisting with their career development. The result shows that the most effective feature in our app is the one on one Chat with the AI Career Coach. Almost all of the users agreed that the chat feature helped them in their career. As the Chat feature provides real time feedback on the user's problems, it can significantly clear our user's questions and stress about their career.

4.2. Experiment 2

In experiment 2, we aim to explore the effectiveness of the assessments in increasing the user's skills about their potential careers. A study proved that training significantly affects a user's career development, job performance and motivation to work. Our assessment page aims to address this by providing career skill training on relevant jobs. In this experiment, we will analyze the user's score of certain lessons with continuous training.

In order to assess the value and benefits of the assessments, we conducted an experiment on the user's accuracy on each attempt of the assessment given that they practice the lesson. We asked 10 college students to pick a lesson for training and recorded their score percentage each time they complete an attempt for a total of five attempts. We will find the average score percentage of

each attempt and use a linear regression model to analyze the correlation between the score and the number of attempts they are on.
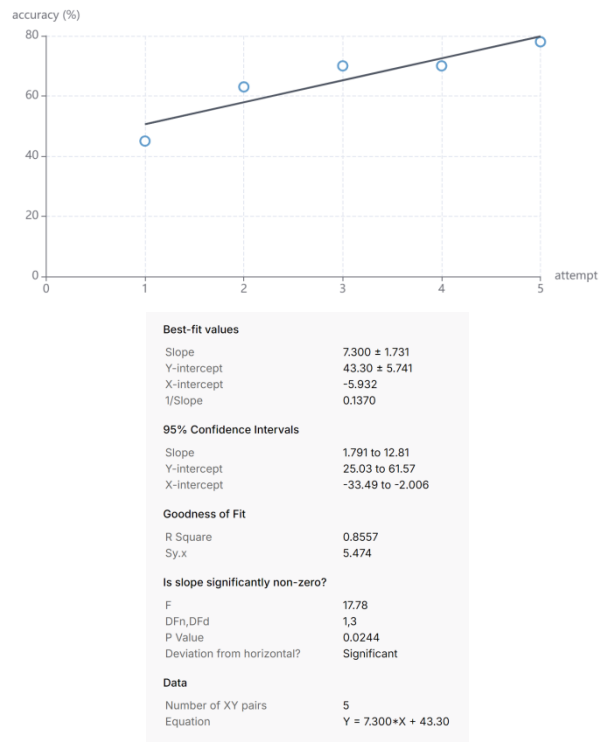

Figure 7. Figure of experiment 2

Based on the result, we can see an increase in the user's performance on the assessment as they practice. The p-value appears to be less than 0.05, which shows that there is a statistically significant relationship between their score percentage and the amount they practiced.

5. RELATED WORK

The study "Career Guidance using Machine Learning" by Metha (2021) explores the use of AI and machine learning (ML) techniques to enhance career guidance services. This approach involves integrating AI with domain experts to deliver more efficient counseling. The system matches students' skills and preferences with career options, minimizing the chances of failure in their chosen fields[4]. The effectiveness of this system lies in its ability to provide personalized guidance, leveraging the data-driven insights of machine learning models. However, a limitation of this method is that its accuracy heavily depends on the quality and quantity of the data used for training, meaning that results may vary across different contexts. Our project improves on this by incorporating real-time user feedback, allowing for continuous refinement and personalization of career guidance.

Cheng and Liang (2023) in "The Development of Artificial Intelligence in Career Initiation Education and Implications for China," describe the use of AI in facilitating personalized career guidance and data-driven decision-making for students. Their approach covers AI's evolution in career guidance, from simple assistive functionalities to advanced learning applications using machine learning and natural language processing[5]. This methodology offers a comprehensive understanding of the role AI can play in career education, highlighting cultural sensitivity and diverse applications. However, the challenge lies in integrating AI systems across different

educational environments, as cultural differences and educational backgrounds can affect outcomes. Our project seeks to address these gaps by using AI to provide tailored career guidance that factors in individual user preferences, making it adaptable to diverse backgrounds.

The "Smart Career Guidance System" developed by Kamal et al. (2021) uses machine learning algorithms, specifically XGBoost and Random Forest classifiers, to recommend career paths based on students' skills, interests, and personalities. This web-based application mimics a one-on-one meeting with a career counselor, offering highly accurate recommendations[6]. While the system demonstrates high efficiency and effectiveness in career recommendations, it still faces limitations in handling imbalanced data sets, requiring additional techniques like SMOTE oversampling to improve accuracy. Our project builds on this methodology by incorporating multiple machine learning algorithms to ensure more robust recommendations, while also addressing potential data imbalances by integrating diverse data sources.

6. CONCLUSIONS

While the app shows promise in assisting users with career guidance and skill development, there are a few limitations that need addressing. One primary limitation is the AI's occasional inaccuracy in generating responses, which can result in less relevant career advice. To improve this, we could integrate a feedback mechanism where users can provide input on the accuracy and helpfulness of the AI's suggestions. This feedback would help refine the AI model and enhance its performance over time.

Another limitation is the limited dataset used for training the AI, which may reduce the diversity and effectiveness of recommendations. Expanding the dataset with more varied career profiles and experiences could help the app provide more personalized and accurate advice. Lastly, the app's user interface could benefit from more extensive testing to further optimize the user experience and address any usability issues that might arise.

In conclusion, our app has demonstrated significant potential in aiding career development and providing personalized guidance through AI-driven solutions. With continuous improvements and user feedback, it can become a valuable tool for job seekers, helping them navigate the complexities of career planning and skill enhancement with greater confidence.

REFERENCES

[1]   Wanberg, Connie R., Abdifatah A. Ali, and Borbala Csillag. "Job seeking: The process and experience of looking for a job." Annual Review of Organizational Psychology and Organizational Behavior 7.1 (2020): 315-337.
[2]   Rosefielde, Steven. "The civilian labour force and unemployment in the Russian Federation." Europe-Asia Studies 52.8 (2000): 1433-1447.
[3]   Brand, Jennie E. "The far-reaching impact of job loss and unemployment." Annual review of sociology 41.1 (2015): 359-375.
[4]   Vignesh, S., et al. "An intelligent career guidance system using machine learning." 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS). Vol. 1. IEEE, 2021.
[5]   Cheng, Yao, and Yu Si Liang. "The Development of Artificial Intelligence in Career Initiation Education and Implications for China." European Journal of Artificial Intelligence and Machine Learning 2.4 (2023): 4-10.
[6]   Kamal, Areej, et al. "Smart career guidance system." 2021 4th International Conference on Computing & Information Sciences (ICCIS). IEEE, 2021.
[7]   Allen, Greg. "Understanding AI technology." Joint Artificial Intelligence Center (JAIC) The Pentagon United States 2.1 (2020): 24-32.

[8]   Lakshmi, G., et al. "AI-powered digital classroom." 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT). IEEE, 2022.

[9]   Lal, Mily, and S. Neduncheliyan. "An optimal deep feature–based AI chat conversation system for smart medical application." Personal and Ubiquitous Computing 27.4 (2023): 1483-1494.

[10] Reddy, Sandeep, et al. "A governance model for the application of AI in health care." Journal of the American Medical Informatics Association 27.3 (2020): 491-497.

[11] Roumeliotis, Konstantinos I., and Nikolaos D. Tselikas. "Chatgpt and open-ai models: A preliminary review." Future Internet 15.6 (2023): 192.

[12] Moroney, Laurence, and Laurence Moroney. "Using authentication in firebase." The Definitive Guide to Firebase: Build Android Apps on Google's Mobile Platform (2017): 25-50.

[13] Bhagat, Shreya A. "Review on Mobile Application Development Based on Flutter Platform." International Journal for Research in Applied Science and Engineering Technology 10.1 (2022): 803-809.

[14] Peng, Dunlu, Lidong Cao, and Wenjie Xu. "Using JSON for data exchanging in web service applications." Journal of Computational Information Systems 7.16 (2011): 5883-5890.

[15] Myers, Brad, Scott E. Hudson, and Randy Pausch. "Past, present, and future of user interface software tools." ACM Transactions on Computer-Human Interaction (TOCHI) 7.1 (2000): 3-28.