ENHANCING JOB SEARCH EFFICIENCY FOR HIGH SCHOOL STUDENTS: A COMPREHENSIVE STUDY OF CAREERCOMPASS UTILIZING AI AND MAPPING TECHNOLOGIES

Jayden Szeto[1], Rodrigo Onate[2]

[1]American High School, 36300 Fremont Blvd, Fremont, CA 94536
[2]Computer Science Department, California State Polytechnic University, Pomona, CA 91768

ABSTRACT

The problem addressed by CareerCompass is the inefficiency and stress of the job search process, particularly for high school students [1]. CareerCompass integrates advanced mapping technologies and artificial intelligence to create a visual, easy-to-interact-with platform that displays job opportunities on a map, making it easier to find jobs based on specific geographical preferences [2]. Key technologies include Google Maps for better geolocation, Selenium for web scraping, and OpenAI GPT for job assessment and personalized lesson generation [3]. An experiment testing the accuracy of the job assessment system showed a 80% accuracy rate, highlighting its reliability and areas for potential improvement. By providing a user-friendly solution to job searching, the app reduces the time and stress associated with traditional job searching, empowering high school students to make better career decisions and bridging the gap between their current skills and job market requirements. This approach not only streamlines the job search process but also supports users in achieving their career goals through personalized learning paths, making CareerCompass a transformative tool for younger job seekers.

KEYWORDS

CareerCompass, Job Search Efficiency, AI-Powered Career Guidance, Geolocation Technology

1. INTRODUCTION

Navigating the job search process presents several challenges that many high school students and adults face. Traditional methods of job searching, which involve looking through countless listings on different job sites, often feel overwhelming and inefficient. Without a clear understanding of where these jobs are located, it becomes hard to tell their suitability based on logistical factors.

Recent statistics highlight the competitiveness of the job market and the inefficiencies in the job search process. As of July 2024, the national unemployment rate stands at 4.1% (6.8 million people), emphasizing the need for efficient job search methods [4]. Reports indicate that the average duration of unemployment in the United States is approximately 20.7 weeks, meaning that job searchers often spend a lot of time finding suitable positions (U.S. Bureau of Labor Statistics). Moreover, with an increasing number of people wanting to work remotely, location flexibility has become increasingly important.

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For high school students, the challenge is even greater. They often lack the experience and resources to navigate job search platforms effectively. Many high school students are looking for part time jobs, internships, or beginner level jobs that fit around their school schedules. Students need to find jobs that are geographically convenient and aligning with their very limited availability. The stress caused by this process can deter students from getting employed, impacting their ability to gain valuable work experience and financial independence.

In Section 5, CareerCompass was compared with three scholarly methodologies [5]. The first comparison was with the paper "Ethics of AI-Enabled Recruiting and Selection," which focuses on the ethical implications of AI in recruitment. Unlike CareerCompass, which provides job assessments for high school students, this paper emphasizes ethical guidelines. The second comparison was with "Collaboration among recruiters and artificial intelligence," which highlights AI's role in reducing human bias in recruitment. CareerCompass aligns with this goal but extends it by offering personalized lesson plans which the users can take with a grain of salt. The third comparison was with "Implementing AIRM: a new AI recruiting model for the Saudi Arabia labour market," which presents an AI model for job matching in the Saudi labor market. While AIRM focuses on general job matching, CareerCompass offers detailed assessments and skill-building resources, providing a more comprehensive solution, especially for high school students.

CareerCompass aims to simplify and enhance the job search process specifically for high school students by integrating mapping technologies, a simple UI, and AI. The concept behind the app is to provide a visual and interactive platform that displays job opportunities on a map, helping users easily locate job positions based on their geographical preferences and commuting options. This approach addresses the stress associated with traditional methods, which often include going through countless text-based listings without a clear sense of location. The app solves the problem by allowing users to visualize job locations, calculate distances, access detailed job information, and learn or at least get an introduction on what is required of the job, all from one place. By utilizing Google Maps and geolocation services, the app provides real-time updates on job listings and their proximity to the user's location. By utilizing AI, the user is also able to learn what is required for the job, or at least get an introduction. What also stands out about CareerCompass is its simple and intuitive user interface, designed to be easily understandable for younger users. The straightforward design makes sure that users can quickly access and understand the information without feeling overwhelmed.

CareerCompass is expected to be more effective than other solutions due to its user-friendly interface and useful approach to job searching. By addressing both the logistical and informational parts of job searching, it provides a more holistic solution to the specific needs of high school students. This app has the potential to reduce job search time, lower stress levels, and improve overall job matching efficiency, making it a valuable tool for everyone.

In section 4, an experiment was conducted to test the accuracy of the CareerCompass job assessment system, which evaluates user qualifications based on their profiles. The experiment involved creating 20 different profiles with diverse backgrounds, skills, and education. For each input, the expected and actual assessment outputs were recorded. The most significant findings were that the system had an overall accuracy of around 80%, with most discrepancies being minor. The results indicated that the system is reliable but showed areas for improvement, especially in handling more different qualifications. The experiment successfully identified both the strengths and weaknesses of this system.

2. CHALLENGES

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

2.1. Job Assessment and Checking for User Qualification Using AI

Description: The job assessment system utilizes AI to evaluate a user's qualifications for specific job roles. It analyzes the user's profile information, such as skills, experience, and education, to provide an assessment score and detailed feedback on their suitability for the job.

Skeptical Question:

How can you ensure the accuracy and fairness of the AI's job assessment?

Addressed:

The AI model is trained on a diverse range of public and private datasets to minimize bias. Regular checks and updates are conducted to ensure the model remains fair and accurate. Additionally, user feedback is continuously incorporated to improve the assessment criteria.

2.2 Creating Lessons for the user based on the job and profile using AI

Description: This system uses AI to generate personalized lessons for users based on their qualifications and job requirements to create lessons specifically to each user's needs.

Skeptical Question:

How do you ensure lessons generated by AI are relevant and effective for the user?

Addressed:

The AI uses a combination of user profile data and job requirements to create lessons. These lessons are created by educational experts to ensure that they are industry standard and are relevant to the market.

2.2. Map-Based Interface

Description: The map-based interface allows users to visualize job opportunities geographically. By integrating Google Maps, users can see job locations, calculate distances, and access detailed information about each job, making it easier to find positions that fit their preferences.

Skeptical Question:

How do you handle the privacy and accuracy of location data?

Addressed:

The system sticks to strict privacy policies, ensuring user location data is anonymized and only used with explicit consent. Google Maps' reliable geolocation services are utilized to provide accurate job data.

3. SOLUTION

CareerCompass is designed to simplify job searching and enhance career readiness through a map-based interface and personalized learning tools. The app has a UI built with Google Maps API and Geolocation API, allowing users to visualize job locations and interact with job listings

[6]. Web scraping, powered by Selenium, gets job data from Google Jobs, extracting information like job titles, descriptions, company information, and application links. The assessment system uses OpenAI GPT Plus and Firebase to evaluate user qualifications and create lessons [7]. Users start by creating an account, then search for a job. Results will appear on a map, where users can view the job descriptions, apply, and also receive lessons that will give them an idea of what is needed for the job.

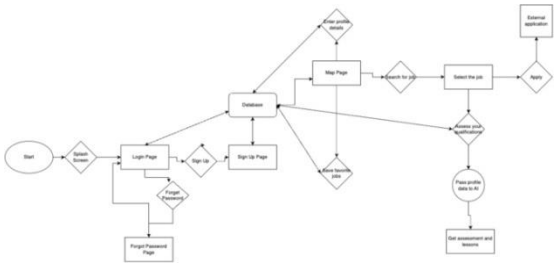

Figure 1. Overview of the solution

Users begin at the login screen, where they can choose to either create an account or to log in. From there, the user is welcomed by a map-based interface that helps better visualize the distance between the user and the desired jobs. The user can search for jobs by typing keywords into the search bar, with job listings appearing in a pop-up window and marked on the map. In addition to the popup, the jobs also show up on the map, and once the users click on the jobs from the pop up, the user is brought to that location. Once the job is clicked on, users can view detailed job descriptions and they may apply using the apply links at the bottom. A key feature of the app is that it also assesses your qualifications for that specific job. Based on this assessment, users are introduced to tailored lessons that help them qualify for the job they are applying for. These lessons can either help users learn new skills or provide an overview of what they need to know. Additionally, users have the option to save jobs and lessons for future references as well. This approach ensures that users are qualified for their career goals, making the app a valuable tool for anyone job hunting.

This component's purpose is to gather job listings and additional information from Google Jobs. It extracts data such as job title, descriptions, company details, and application links. There is also a backend that handles data processing, storage, management, and gives the data to the frontend.

Figure 2. Screenshot of google map

```
def get_job_info(job_type):
    job_list = []
    driver = get_driver(job_type)
    jobs = get_jobs(driver)
    try:
        for job in jobs:
            title = job.find_element(By.CSS_SELECTOR, ".PUpOsf").text
            company = job.find_element(By.CLASS_NAME, "vNEEBe").text
            location = job.find_element(By.CLASS_NAME, "Qk80Jf").text
            job.click()
            apply_links = get_apply_links(driver)
            text_content = get_content(driver)
            result = get_coord(company, location)
            result.update({'content': text_content, 'title': title, 'location': location, 'company': company,
                           'apply_links': apply_links})
            job_list.append(result)
    except Exception as e:
        print(e)
    finally:
        driver.close()
    return job_list
```

Figure 3. Screenshot of code 1

The code begins by creating an empty list called ‘job_list.’ It then initializes a Selenium webdriver for working with web pages. The job elements are then fetched from the webpage and stored in the variable ‘jobs.’ Extract the text content of the page with the class name ‘.PUpOsf’ from the job element and assign it to the variable title. Extract the text content of the page with the class name ‘vNEEBe’ from the job element and assign it to the variable company. Extract the location of the job with the class name ‘Qk80Jf’ from the job element and assign it to the variable location. The collected data is then structured into a dictionary and then compiled into a list, which is then returned. The code uses Selenium webdriver to interact with web pages, fetch job listings, and click on job elements. Additionally, it uses functions defined elsewhere in the code to handle tasks like setting up the web driver and fetching the different job elements, application links, and locations.

The Assessment page is designed to evaluate a user’s qualifications for a specific job and generate personalized lessons based on their profile information. It utilizes ChatGPT’s Plus model to provide detailed feedback on the user’s qualifications and create personalized learning content. The component relies heavily on natural language processing (NLP) to analyze user data and generates relevant content [8]. Additionally, it interacts with Firebase services, including Firebase Authentication for user authentication and Firebase for storing and retrieving user information.

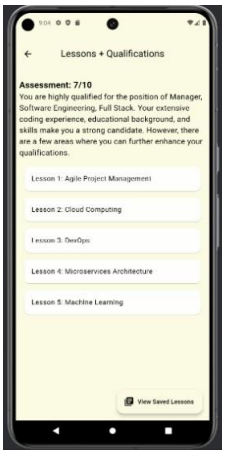

Figure 4. Screenshot of assessment

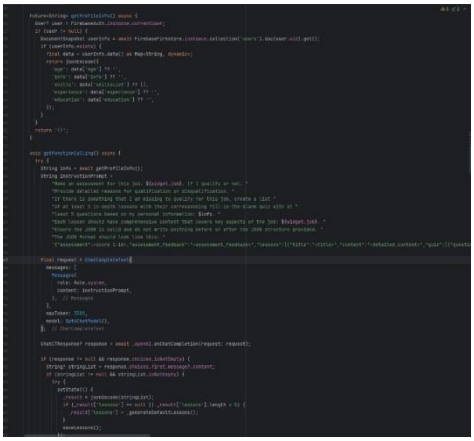

Figure 5. Screenshot of code 2

The provided code in the Assessment Page uses the OpenAI GPT Plus model to assess user qualifications for a job and generate personalized lessons. An OpenAI instance is initialized using an API key, which prepares the application to make requests to the OpenAI API. The 'getProfileInfo' method retrieves the current user's profile information from Firebase Firestore. If the user is authenticated, their data, including age, skills, experience, and education, is fetched and returned as a JSON string. This profile information is used in the 'gptFunctionCalling' method, which constructs a prompt for GPT Plus to generate an assessment and lessons based on the job and user profile [9]. Upon receiving a response, the code attempts to parse the JSON output. If the response is valid and contains lessons, they are stored in the '_result' map and saved using the '_saveLessons' method. The 'build' method constructs the user interface, which displays the assessment score, feedback, and list of lessons. Each lesson is shown as a clickable card, leading to the 'lessonDetailPage' when clicked. The 'QuizPage' allows users to answer quiz questions and reveals the correct answers upon request.

The MapPage component in the application is designed to help users find job opportunities by visualizing them on a map. It integrates Google Maps to display job locations as markers, and it uses external API to fetch job data based on user searches. Additionally, it uses Google's Geolocation API to determine the user's current location and the Distance Matrix API to calculate distances between the user's location and job locations. This component relies on geolocation and mapping technologies to enhance the user's experience by providing a spatial perspective on job search results.

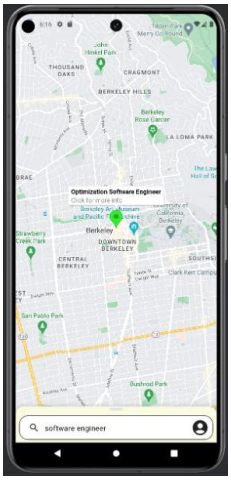

Figure 6. Screenshot of map

Figure 7. Screenshot of code 3

The code for the MapPage enables users to search for jobs and view them on a map. The user's current location is obtained using Google's geolocation API. The 'fetchJobs' method is responsible for retrieving job data from an external API based on the user's search. Once job data is fetched, the 'addMarkers' method adds markers to the map for each job location. This method also calculates the distances between the user's location and job locations using the Distance Matrix API [10]. Markers are updated with job details and an onTap event that goes to the 'JobDetailsPage' for more information. The UI contains a map and a sliding panel for displaying search results and additional options. This panel allows users to view and interact with the list of jobs, showing distance and other details. There is a feature for searching jobs,

viewing profiles, and accessing favorite jobs through a profile icon.

4. EXPERIMENT

The experiment would be to test out the accuracy of a specific system in the CareerCompass system that assesses how qualified the user is for a job based on the user's profile information. This experiment is important because it ensures that the app's assessment is reliable and accurate, which is crucial for making sure that the user is making informed career decisions.

A set of 20 varied inputs for the system, each representing different profiles with diverse backgrounds, skills, and experiences, will be used. For each input, there will be an expected assessment output. These inputs are designed to cover a range of qualifications to make sure the system's accuracy is high. By using varied inputs, it can be verified that the system consistently produces accurate and relevant assessments across different scenarios. This approach is important to identify any potential biases or inaccuracies in the system, ensuring it can be trusted for real-world applications.Grading Scale:

A - Same expected and actual results

B - Score off by 1

C - Score off by 2

D - Score off by 3

	Input	Expected Output	Actual Output	Accurac y
1	Profile 1: { "age": 25, "skills": ["Python", "Java"], "experience": "2 years as Software Engineer", "education": "Bachelor's Degree" }	8/10	7/10	B
2	Profile 2: { "age": 30, "skills": ["JavaScript", "React", "Node.js"], "experience": "5 years in Full-Stack Development", "education": "Bachelor's Degree" }	8/10	8/10	A
3	Profile 3: { "age": 28, "info": "Backend Developer", "skills": ["Java", "Spring Boot", "SQL"], "experience": "3 years as Backend Developer", "education": "Bachelor's Degree" }	7/10	8/10	B
4	Profile 4: { "age": 35, Engineer", "skills": ["C++", "Python", "Machine Learning"], "experience": "10 years in Software Engineering", "education": "Master's Degree" }	9/10	9/10	A
5	Profile 5: { "age": 22, "skills": ["HTML", "CSS", "JavaScript"], "experience": "1 year as Intern", "education": "Bachelor's Degree" }	5/10	6/10	B

6	Profile 6: { "age": 40, "info": "DevOps Engineer", "skills": ["AWS", "Docker", "Kubernetes"], "experience": "15 years in IT", "education": "Bachelor's Degree" }	8/10	8/10	A
7	Profile 7: { "age": 27, "skills": ["Swift", "Objective-C", "iOS"], "experience": "4 years in Mobile App Development", "education": "Bachelor's Degree" }	7/10	8/10	B
8	Profile 8: { "age": 32, "skills": ["Python", "SQL", "Hadoop"], "experience": "6 years as Data Engineer", "education": "Master's Degree" }	8/10	8/10	A
9	Profile 9: { "age": 29, "skills": ["React", "Redux", "TypeScript"], "experience": "5 years in Frontend Development", "education": "Bachelor's Degree" }	8/10	8/10	A
10	Profile 10: { "age": 26, "skills": ["Python", "Django", "REST APIs"], "experience": "3 years as Software Engineer", "education": "Bachelor's Degree" }	7/10	8/10	B
11	Profile 11: { "age": 34, "skills": ["Python", "TensorFlow", "Keras"], "experience": "7 years in Machine Learning", "education": "PhD" }	9/10	8/10	B
12	Profile 12: { "age": 31, "skills": ["C", "C++", "Microcontrollers"], "experience": "6 years in Embedded Systems", "education": "Master's Degree" }	8/10	8/10	A
13	Profile 13: { "age": 24, "skills": ["JavaScript", "Vue.js", "Node.js"], "experience": "2 years as Web Developer", "education": "Bachelor's Degree" }	6/10	8/10	
14	Profile 14: { "age": 38, "skills": ["Java", "Spring", "Microservices"], "experience": "12 years in Software Architecture", "education": "Master's Degree" }	9/10	8/10	B
15	Profile 15: { "age": 27, "skills": ["Python", "Network Security", "Penetration Testing"], "experience": "4 years in Cybersecurity", "education": "Bachelor's Degree" }	7/10	7/10	A
16	Profile 16: { "age": 29, "skills": ["AWS", "Azure", "GCP"], "experience": "5 years in Cloud Engineering", "education": "Bachelor's Degree" }	8/10	8/10	A

17	Profile 17: { "age": 36, "skills": ["Python", "Docker", "Kubernetes"], "experience": "10 years in SRE", "education": "Master's Degree" }	9/10	8/10	B
18	Profile 18: { "age": 33, "skills": ["Selenium", "JUnit", "TestNG"], "experience": "7 years in QA Engineering", "education": "Bachelor's Degree" }	8/10	8/10	A
19	Profile 19: { "age": 28, "skills": ["Gaming", "Sleeping"], "experience": "Can type 50 words a minute", "education": "High School" }	1/10	2/10	B
20	Profile 20: { "age": 26, "skills": ["C#", ".NET", "Azure"], "experience": "3 years in Software Development", "education": "Bachelor's Degree" }	7/10	7/10	A

Table 1. Table of experiment

5. RELATED WORK

Comparison to “Ethics of AI-Enabled Recruiting and Selection: A Review and Research Agenda”

Authors: Anna Lena Hunkenschroer & Christoph Luetge

Summary: This paper explores the ethical implications of AI in recruiting, with a focus on bias, fairness, and discrimination in machine learning models used in recruitment [11]. It reviews the existing literature on AI in recruitment, emphasizing the need for ethical considerations and proposing ideas for fair AI applications when hiring.

Comparison: Unlike the CareerCompass system, which focuses on assessing job qualifications based on a user’s profile, this paper primarily addresses the ethical concerns around AI in recruitment. CareerCompass offers a direct application by creating specific job qualification assessments and lesson plans, whereas the paper tries to make guidelines for ethical AI use. The app’s practical focus on user-specific recommendations provides fast, useful insights, which the review does not directly talk about.

Comparison to “Collaboration among recruiters and artificial intelligence: removing human prejudices in employment”

Author: Zhisheng Chen

Summary: This research goes through how AI can reduce human bias in recruitment by automating tasks such as job posting, applicant screening, and assessment [12]. It emphasizes the evolution of digital recruitment and the role of AI in enhancing the efficiency and fairness of the hiring process.

Comparison: The paper's focus on reducing biases aligns with the project's goal of providing unbiased job qualification assessment. However, CareerCompass goes further by offering personalized lesson plans to improve the users' qualifications. While both try to focus on improving the recruitment process, CareerCompass provides a more holistic solution by not only assessing but also actively helping users become more qualified.

Comparison to "Implementing AIRM: a new AI recruiting model for the Saudi Arabia labour market"

Authors: Monirah Ali Aleisa, Natalia Beloff, and Martin White

Summary: This paper presents the AI Recruiting Model (AIRM) designed to improve the efficiency of job matching in the Saudi labor market using Data Lake (DL), Machine Learning (ML), and Artificial Intelligence (AI) [13]. The AIRM model achieved a 84% accuracy rate and significantly reduced the time taken for finding a suitable candidate for a job from 6 days to 2.4 minutes.

Comparison: The AIRM focuses on general job matching in the Saudi job market, while CareerCompass specifically assesses qualifications for a large variety of jobs. The app also provides personalized lesson plans and quizzes that help bridge the skill gaps, which the AIRM does not.

6. CONCLUSIONS

While CareerCompass offers a solution for job searching tailored to high school students, there are several limitations to the current implementation. One significant limitation is the reliance on the availability and accuracy of third-party APIs for geolocation and job data. Any inaccuracies in these services can impact the functionality and effectiveness of the app. Additionally, the AI models used for job assessment and lesson generation are only as good as the data they are trained on; gaps in this data could impact the fairness and relevance of the search results [14].

Given more time, several areas could be improved or expanded. Enhancing or using better AI models would be a priority to ensure fairer and more accurate feedback. Implementing machine learning algorithms that learn from user interactions and feedback could also improve personalization and relevance over time. Another important improvement would be to enhance the user interface even more, making the application more intuitive and engaging for high school students.

Expanding the program could involve adding features such as internship and volunteer opportunities, tutor connections, and career guidance resources. Integrating social features where users can share experiences and tips with others could also add a lot of value. If starting over, implementing more machine learning algorithms would definitely be the top priority [15].

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