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# Job Recommendation System Using NLP

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**ABSTRACT:** We address the problem of recommending suitable jobs to people who are seeking a new job. We formulate this recommendation problem as a supervised machine learning problem. Our technique exploits all past job transitions as well as the data associated with employees and institutions to predict an employee's next job transition. We train a machine learning model using a large number of job transitions extracted from the publicly available employee profiles in the Web. Experiments show that job transitions can be accurately predicted, significantly improving over a baseline that always predicts the most frequent institution in the data.

**KEYWORDS:** Job Recommendation, NLP, KNN, Cosine Similarity

## I. INTRODUCTION

The highly competitive and dynamic nature of the job market as well as personal preferences and goals lead individuals to change their jobs at some point in their lives. moving to a new job, however, is not an easy decision, which may depend on many factors, such as salary, job description, and geographical location. making successful job transitions is essential for a successful professional career. in this work, we build an automated system that can recommend jobs to people based on their past job histories in order to facilitate the process of selecting a new job. we believe that such a system can successfully exploit the job transitions performed by other employees. that is, we propose recommending jobs to people based on inference from the job transition patterns observed in the past. these patterns may involve features extracted from the business profiles of employees (e.g., years of experience, educational degree, job title), the profiles of institutions<sup>1</sup> (e.g., industry, type, size), and the job transitions themselves (e.g., frequency of transitions between jobs, average time spent in a job). the framework we propose is based on supervised machine learning. given an employee's past job history, the objective of the learning model is to accurately predict the next institution that the employee will move to. the predicted institution can then be recommended to the employee as the next step in his/her career. to evaluate our framework, we use a large sample of job transitions extracted from the publicly available employee profiles in the web. from this sample, we extract a number of features that we use to train and test our machine learning model. the results of our experiments demonstrate that the transition of an employee to an institution can be quite accurately predicted, significantly improving over a baseline predictor that always predicts the most frequent institution in the data. our results indicate that the most important feature in predicting a job transition is the current institution of the employee.

## II. RELATED WORK

[1] The developed system is job recommendation system for campus recruitment which helps college placement office to match company's profiles and student's profiles with higher precision and lower cost. For profile matching, two matching methods are used: semantic matching, tree-based knowledge matching and query matching. These methods are integrated according to representations of attributes of students and companies, and then the profile similarity degree is acquired. Based on profile similarity degree, preference lists of companies and students are generated. Also students can perform keyword based search for job profiles from various job recruitment sites (e.g.



Naukari.com,indeed.com). For obtaining data from online recruitment sites system uses web crawling. With loop matching, matching results would be further optimized and provide more effective guidance for recommendation.

[2] Dealing with the enormous amount of recruiting information on the Internet, a job seeker always spends hours to find useful ones. To reduce this laborious work, we design and implement a recommendation system for online job hunting. In this paper, we contrast user-based and item-based collaborative filtering algorithm to choose a better performed one. We also take background information including students' resumes and details of recruiting information into consideration, bring weights of co-apply users (the users who had applied the candidate jobs) and weights of student used liked jobs into their commendation algorithm. At last, the model we proposed is verified through experiments study which is using actual data. The recommended results can achieve higher score of precision and recall, and they are more relevant with users' preferences before.

[3] In this paper, we first provide a comprehensive investigation of four online job recommender systems (JRSs) from four different aspects: user profiling, recommendation strategies, recommendation output, and user feedback. In particular, we summarize the pros and cons of these online JRSs and highlight their differences. We then discuss the challenges in building high-quality JRSs. One main challenge lies on the design of recommendation strategies since different job applicants may have different characteristics. To address the aforementioned challenge, we develop an online JRS, iHR, which groups users into different clusters and employs different recommendation approaches for different user clusters. As a result, iHR has the capability of choosing the appropriate recommendation approaches according to users' characteristics. Empirical results demonstrate the effectiveness of the proposed system.

### III. METHODOLOGY

#### 3.1 Modules

We have different modules in this web application. They are:

- 1) Candidate Details: Here the candidate feeds his/her personal information into the system through the web interface.
- 2) Rating Details: Once the user has registered himself to the system he/she will be redirected to Ratings Page where he has to provide his ratings to the skills asked as per his best knowledge.
- 3) Recommendations: Once the user fills his/her ratings he will be redirected to Recommendation Page where he will get recommendations as per the skill ratings entered.

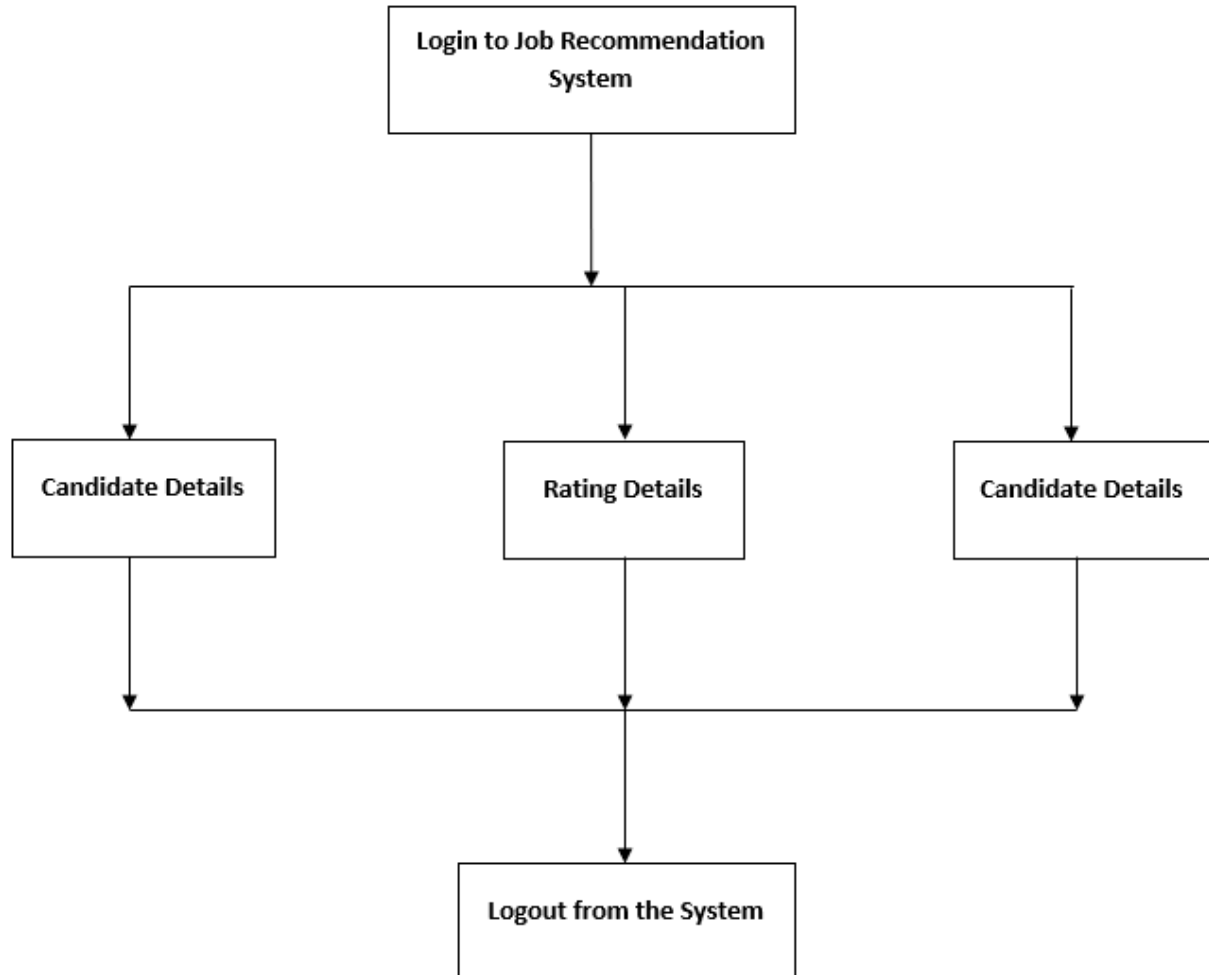


Figure1: Modular design

### 3.2 Pre-Requisites

1) HTML: HTML is a hypertext markup language which is, in reality, a spinal cord of any website. Any website can't be structured without the knowledge of HTML. If we make our web page only with the help of HTML, then we can't add many of the effective features in a web page, for making a web page more effective we use various platforms such as static and dynamics methods. And here we are using this language to make our web pages more effective as well as interactive for users to understand. And to make our web pages dynamic we are using JavaScript and CSS.

2) CSS: CSS stands for Cascading Style Sheet. Cascading style sheets are used to format the layout of Web pages. They can be used to define way of writing or style, size of various tables, and other aspects of Web pages that previously could only be defined in a static page's HTML. The main work of CSS is to separate content of a web document (written in any markup language) that is written using Cascading Style Sheets. There are lots of benefits that one can extract through this like improved content accessibility, better flexibility and gives a level of control over various presentation characteristics of the document. It also helps in reducing the problems and helps in saving access time. It gives the option of selecting various style schemes and rules according to the necessity.

### 3.3 Proposed Methodology

The front-end is done using web technologies like HTML, CSS, Bootstrap, Flask. The back-end is constructed using python using PyCharm IDE. Once the user sign's up he will be redirected to candidate details page where he need to fill out all his details. In this page there is a dropdown named 'branch' which contains three streams namely Computer Science Engineering, Electronics and Communication Engineering, Mechanical Engineering. The user will be redirected to ratings page which will contain the skill ratings corresponding to the branch chosen by the user. Here at backend we use KNN model along with cosine similarity which is used for recommending the appropriate job for the user. Once the results are calculated it is then displayed back to the user.

### 3.4 Architecture

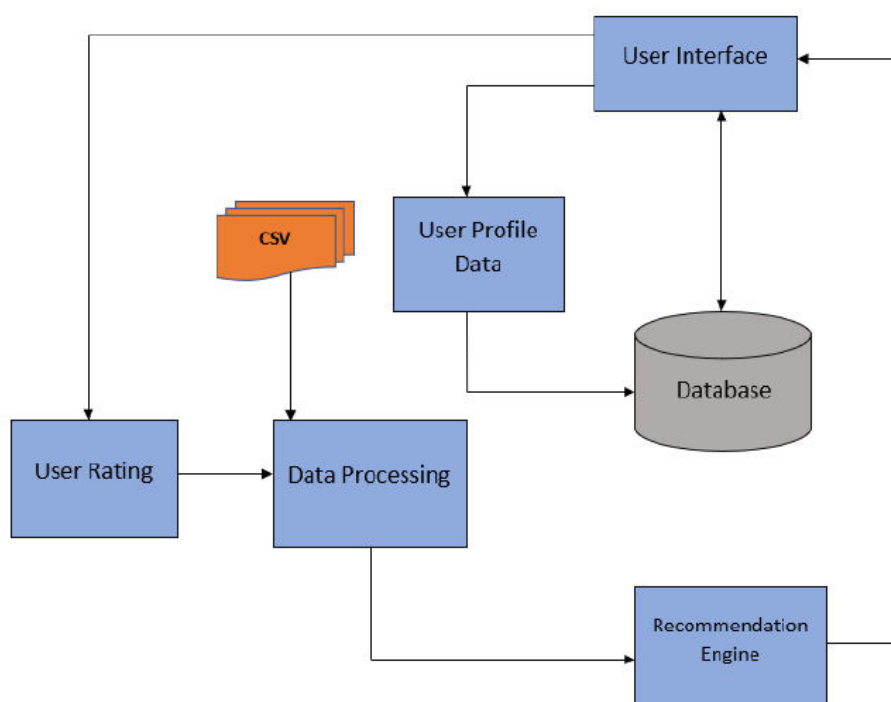


Figure 2: Architectural Diagram

The user enters to the application using the web interface. All the users data will be stored into the database. The user enters his ratings via the web interface. Which is then extracted at the back end. The ratings and the csv file then undergo data processing. These data are then passed to the recommendation engine. The recommendation engine generates appropriate recommendations. The recommendations are then displayed back to the user. The only user of this website is the candidate.



#### IV. RESULT

Home page: This is the first page of the website. This is the first thing that the user will see.

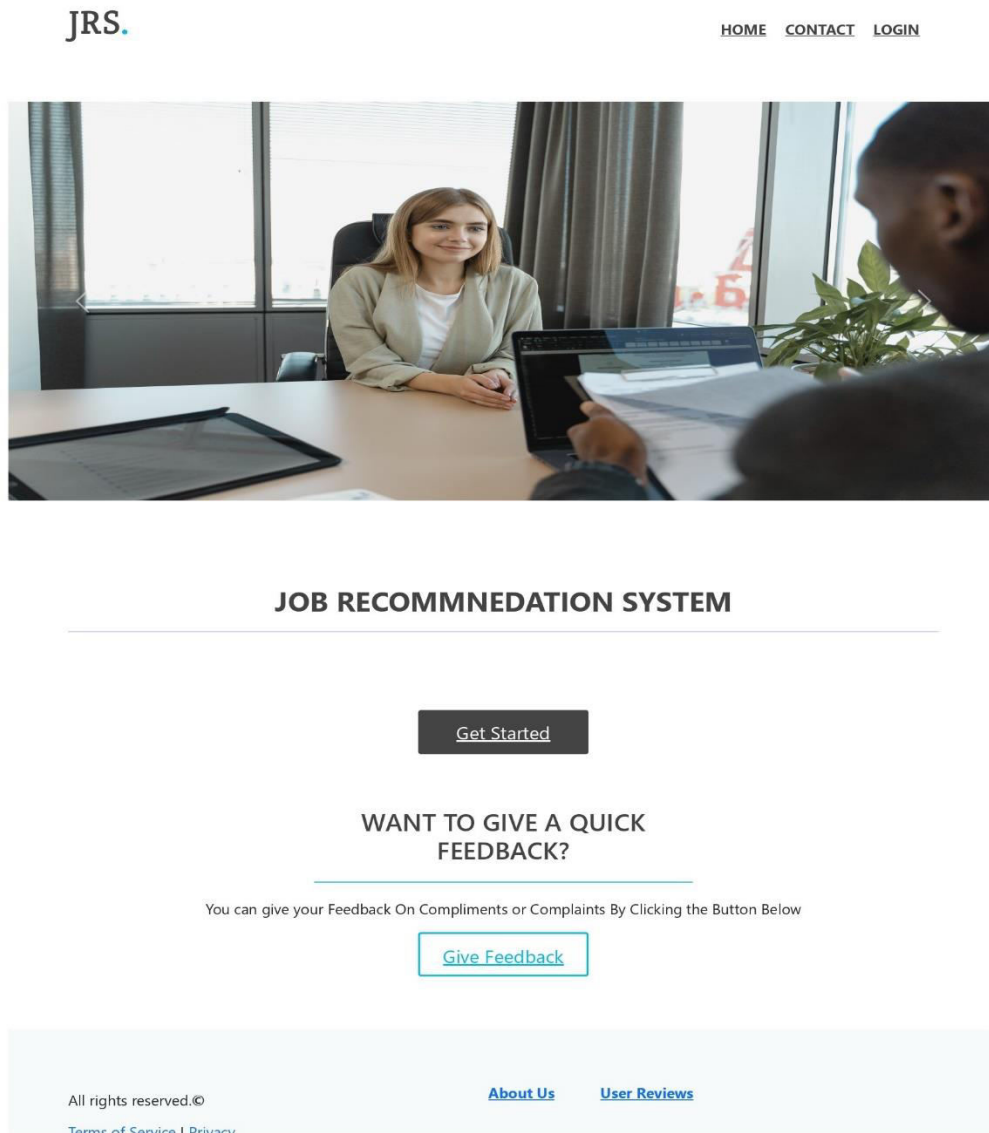
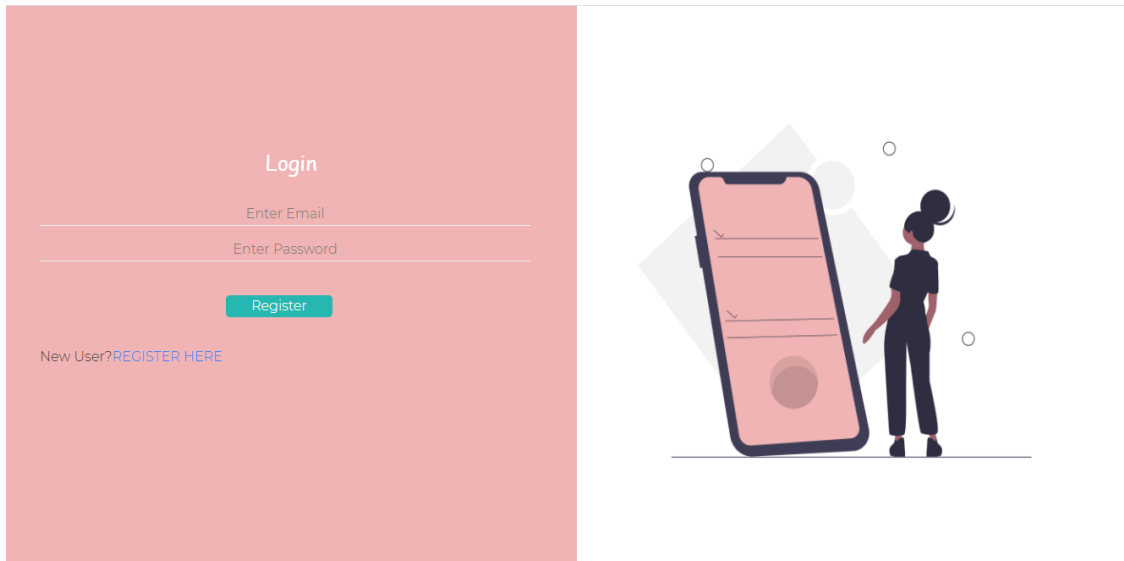


Figure3: Home page

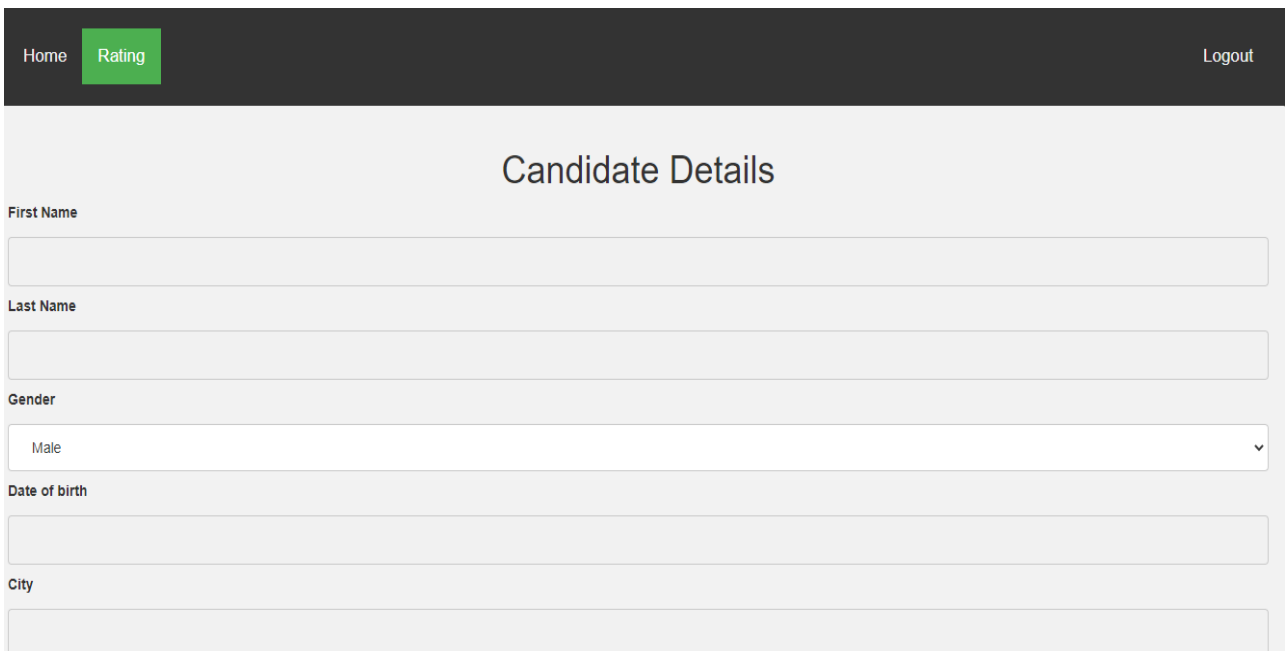
Login Form: The system starts with a login page where the registered user can enter username and password before he can proceed further.



The figure shows a login form on the left and an illustration on the right. The login form has a pink background and contains the following elements: a 'Login' title, an 'Enter Email' input field, an 'Enter Password' input field, a green 'Register' button, and a link for 'New User? REGISTER HERE'. The illustration on the right depicts a person standing next to a large smartphone that displays a login interface with checkmarks, suggesting a successful login process.

Figure4: Login Form

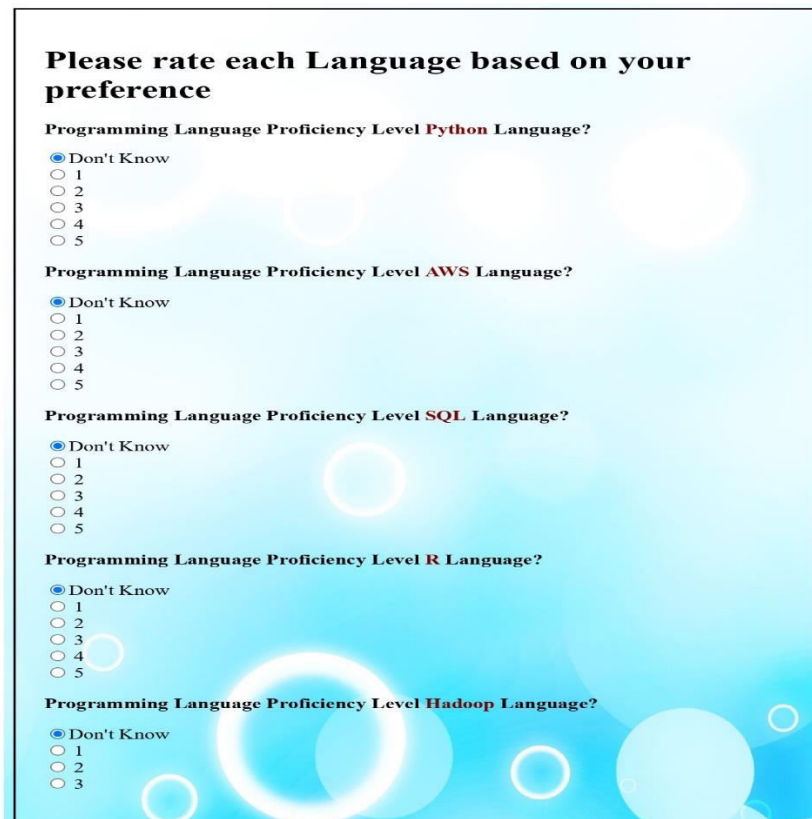
Candidate Details: This is the page where the candidate needs to inform his/her details once and it gets stored in the database



The figure shows a web page titled 'Candidate Details'. At the top, there is a navigation bar with 'Home' and 'Rating' (highlighted in green) on the left, and 'Logout' on the right. The main content area has a light gray background and contains the following form fields: 'First Name' (text input), 'Last Name' (text input), 'Gender' (dropdown menu with 'Male' selected), 'Date of birth' (text input), and 'City' (text input).

Figure 5: Candidate Details Page

Rating Details: This is the page where the candidate needs to enter his skill ratings ranging from 0-5 as per his best knowledge.



**Please rate each Language based on your preference**

**Programming Language Proficiency Level Python Language?**

☒ Don't Know  
☐ 1  
☐ 2  
☐ 3  
☐ 4  
☐ 5

**Programming Language Proficiency Level AWS Language?**

☒ Don't Know  
☐ 1  
☐ 2  
☐ 3  
☐ 4  
☐ 5

**Programming Language Proficiency Level SQL Language?**

☒ Don't Know  
☐ 1  
☐ 2  
☐ 3  
☐ 4  
☐ 5

**Programming Language Proficiency Level R Language?**

☒ Don't Know  
☐ 1  
☐ 2  
☐ 3  
☐ 4  
☐ 5

**Programming Language Proficiency Level Hadoop Language?**

☒ Don't Know  
☐ 1  
☐ 2  
☐ 3

Figure 6: Ratings Page

Recommendation Page: Once the user submits his ratings he will be redirected to Recommendations Page where he will get a job recommendation. The user can also search for the particular job recommended to him by clicking on the results which will redirect him to another site.

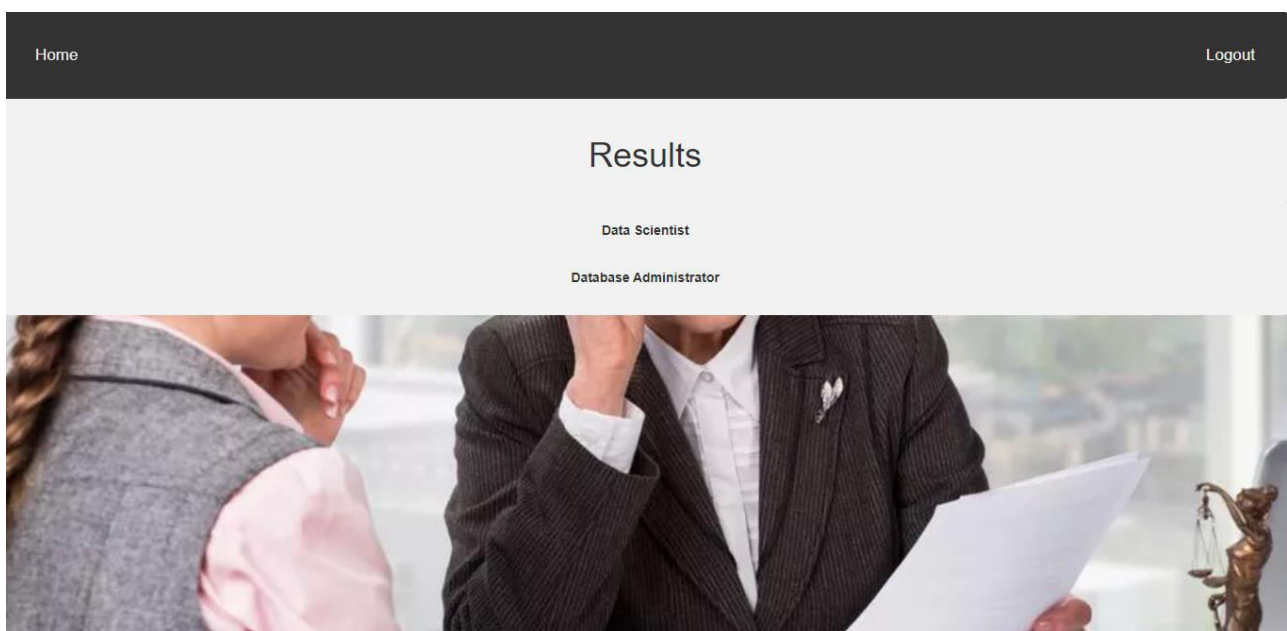


Figure 7: Recommendation Page





## V. CONCLUSION

We have implemented a web-application which will recommend jobs to the candidates based on the skill ratings that the user has given as an input. Here in this application we have used KNN as a model which will take the inputs from the user and based on the training data on which it is taught it will recommend the corresponding job

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