Project Report Format

Date	19 November 2022
Team ID	PNT2022TMID16344
Project Name	Skill/ Job Recommender Application
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College and Department	R.M.K. Engineering College / Information Technology

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Introduction:

Project Overview:

Recently, most job-seekers exploit the internet to look for jobs online recruiting systems. However, with the rapid growth of information on these systems causes job searching become a time-consuming task. In other words, applicants have been dealing with the problem of information overload. Therefore, there is a need to develop job recommender systems that automatically suggest a ranked list of jobs matching users' particular interest. Nobody can deny the fact that these systems play a significant role in connecting between employees and employers. Normally, job recommender systems do not only serve for employers but also serve for applicants. Automatically, applicants obtain a ranked list of recommended jobs associated with their preference, while employers receive a ranked list of potential candidates matching their recruiting need. In this paper, we concentrate on recommending associated jobs for applicants. The question is which method should be applied for job recommender system. In order to choose a suitable algorithm, the aim of this study is to conduct a comparison study of popular methods for job recommendation. The key contributions of this study are summarized as follows: Building an experimental dataset for the problem of job recommendation. Providing a comparison study of popular methods (CB, CF, Linear-Hybrid) for job recommendation. The rest of the paper is organized as follows. In section II, formal definition of job recommendation is presented.

With the rapid development of the information society, a vast amount of information is now available from many diverse sources. To deal with this information overload problem, recommender systems, which assist users to discover relevant information, products and services, have now been successfully deployed in many domains [1, 2]. In this paper, we consider the task of job recommendation, where suitable jobs are recommended to users based on their past job application history. Recent research has also focused on this task. For example, in [3] jobs are recommended based on a graph constructed from the previously observed job transition patterns of users. These patterns were based on various features relating to employer sector and size, employee experience and education, etc. A supervised machine learning approach was then adopted to recommend suitable new jobs to users. In [4], a graph-based hybrid recommender is proposed which considers both content-based user and job profile similarities and interaction-based activities (e.g., applying to or liking a job). Personalized recommendations of candidates and jobs are then generated using a PageRank-style ranking algorithm. Further, a collaborative filtering approach based on implicit profiling techniques was proposed in [5] to deliver personalized, query-less job recommendations to users. For other work in this area, see [6, 7, 14]. To date, research in the area of job recommendation has not considered an in-depth analysis of traditional content-based or case-based approaches to recommendation. Thus, the core contributions of this work are as follows. Firstly, a number of content-based approaches to job recommendation are proposed.

Literature Survey:

There are lots of paper works and a few projects done on Skill/Job recommender and the problems that are associated with the existing solution is to be detected and the references are mentioned while finding problems in one of the papers that is as follows.

Existing Solution:

"The hybrid job recommendation approaches presented combined two or more techniques to overcome the problems that suffer from using each technique separately. For example , while the probability hybrid approaches in paragraph A realized a bidirectional recommendation and tried to cover different selection dimensions, they need to enhance by including more features for individuals and extending by various relational aspects other than trust. Additionally, they only adopted the binary representation with Yes and No when state user preferences, and it cannot measure the degree of users preferences for each index well, so the quality of recommendation is not high (Yu et al., 2011). As for the content-based job recommender systems, it is presented some approaches and systems based on CBF techniques. As mentioned in the CBF, it is limited by the features that explicitly associated with recommended objects. Therefore, since the applicants‟ resumes are usually represented by their most important features using some key words, CBF systems cannot distinguish between different keywords meaning. In addition, the problem usually associated with the pure CBF systems; it cannot recommend jobs that are different from anything the user has seen before. Jobs will be recommended if they are similar to other jobs that the applicant has already interested. Thus, the applicants have to rate a sufficient number of jobs before a CBF recommender system can really understand the applicants preferences and present reliable recommendations. For example, the machine learned recommender system in paragraph 0 builds an automated system to recommend jobs for applicants based on their past job histories. This system is used a classifier that makes a recommendation by training them on content information. It suffered from scalability and data sparsity problems (Ghazanfar and Pr¨ugel-Bennett, 2010). In addition to, this system performs the recommendation as a unary relation and ignores the person-team fit when matching candidates with jobs. Table 4 summarizes the advantages and dis-advantages of these approaches and systems. Finally, from our research and findings from existing literature, we showed the increasing importance of information technology for the recruitment process. Thus, the important challenge for most organizations as identified by the literature analysis is the low qualification of applicants, where skills of applicants do not fit with the job profile

References:

1. Title: Job Recommendation based on Job Seeker Skills: An Empirical Study. Source: Researchgate. Author: Jorge Valverde-Rebaza. Date: March 2018 Website: https://www.researchgate.net/publication/356601605_Job_Recommender_Systems_A_Review

2. Title: Job Recommender Systems: A Review Source: ResearchGate Author: Corné de Rujit Date: November 2021 Website: https://www.researchgate.net/publication/325697854_Job_Recommendation_based_on_Job_Seeker_Skills_An_Empirical_Study

3. Title: Extracting Relations Between Sectors Source: ResearchGate Author: Atkan Kara. Date: August 2022 Website: https://www.researchgate.net/publication/363128874_Extracting_Relations_Between_Sectors

4. Title: Job Candidate Rank Approach Using Machine Learning Techniques Author: Lamiaa Mostafa Source: Date: March, 2020. Website: https://www.researchgate.net/publication/349816523_Job_Candidate_Rank_Approach_Using_Machine_Learning_Techniques

5. Title: JOB RECOMMENDATION USING TEXT PROCESSING A Project Report. Author: Dipanwita Saha. Source: ResearchGate Date: July 2022 Website: https://www.researchgate.net/publication/362889143_JOB_RECOMMENDATION_USING_TEXT_PROCESSING_A_Project_Report

6. Title: Job Recommendation Based on Extracted Skill Embeddings Author: anonymous. Source: ResearchGate Date: September 2022 Website: https://www.researchgate.net/publication/363190802_Job_Recommendation_Based_on_Extracted_Skill_Embeddings

7. Title: Job recommendation systems for enhancing e-recruitment process Author: Shaha Alotaibi Source: ResearchGate Date: February 2014 Website: https://www.researchgate.net/publication/323079153_Job_recommendation_systems_for_enhancing_e-recruitment_process

8. Title: Job recommendation systems for enhancing e-recruitment process Authors: Shaha T Alotaibi Abdulrahman A Mirza Source: ResearchGate Date: January 2012 Website: https://www.researchgate.net/publication/323078898_Job_recommendation_systems_for_enhancing_e-recruitment_process

9. Title: Job Recommendation based on Job Seeker Skills: An Empirical Study Authors: Jorge Valverde-Rebaza, Visibilia, Ricardo Puma Source: ResearchGate Date:March 2018 Website: https://www.researchgate.net/publication/325697854_Job_Recommendation_based_on_Job_Seeker_Skills_An_Empirical_Study

10. Title: A survey of job recommender systems Authors: Shaha Alotaibi Source: ResearchGate Date: July 2012 Website: https://www.researchgate.net/publication/272802616_A_survey_of_job_recommender_systems

The Approach to the Project:

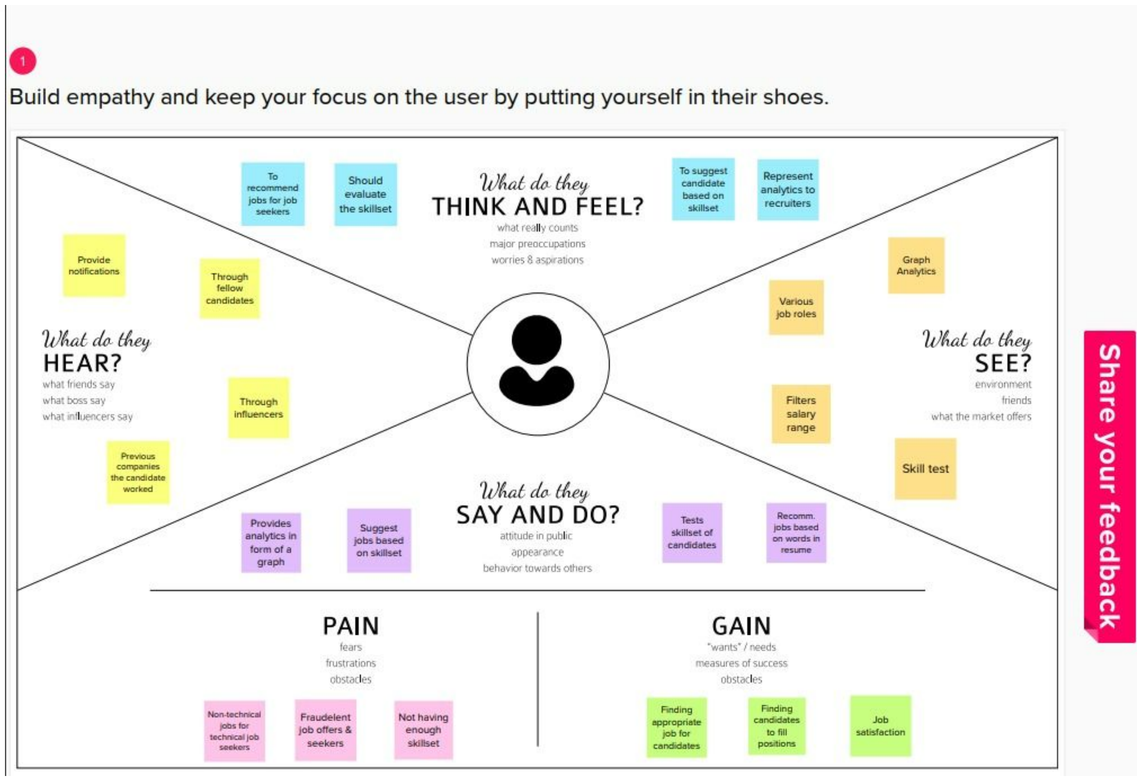
There are exceptional solutions to job recommender, but the modification needs to be applied to the existing model and a skill evaluation phase must be implemented and the users must receive job recommendations appropriately. This approach is a way to enhance the existing wide range of applications.

2.3 Problem Statement Definition

- Design a skill recommender app that can suggest new skills for users to learn based on their current skillset and career goals.
- The Skill Recommender app will allow users to input their skills and interests, and receive recommendations for other skills they might be interested in. The app will use data from the user's profile and activity to make recommendations.

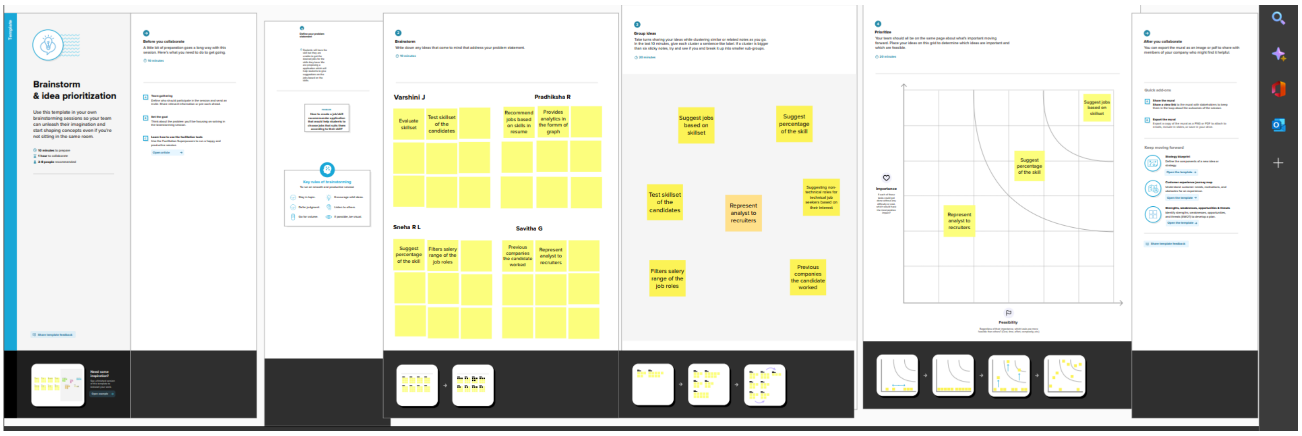
3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



1
Build empathy and keep your focus on the user by putting yourself in their shoes.
What do they THINK AND FEEL?
what really counts
major preoccupations
worries 8 aspirations
To recommend jobs for job seekers
Should evaluate the skillset
To suggest candidate based on skillset
Represent analytics to recruiters
What do they HEAR?
what friends say
what boss say
what influencers say
Provide notifications
Through fellow candidates
Through influencers
Previous companies the candidate worked
What do they SEE?
environment
friends
what the market offers
Graph Analytics
Various job roles
Filters salary range
Skill test
What do they SAY AND DO?
attitude in public
appearance
behavior towards others
Provides analytics in form of a graph
Suggest jobs based on skillset
Tests skillset of candidates
Recomm. jobs based on words in resume
PAIN
fears
frustrations
obstacles
Non-technical jobs for technical job seekers
Fraudelent job offers & seekers
Not having enough skillset
GAIN
"wants" / needs
measures of success
obstacles
Finding appropriate job for candidates
Finding candidates to fill positions
Job satisfaction
Share your feedback

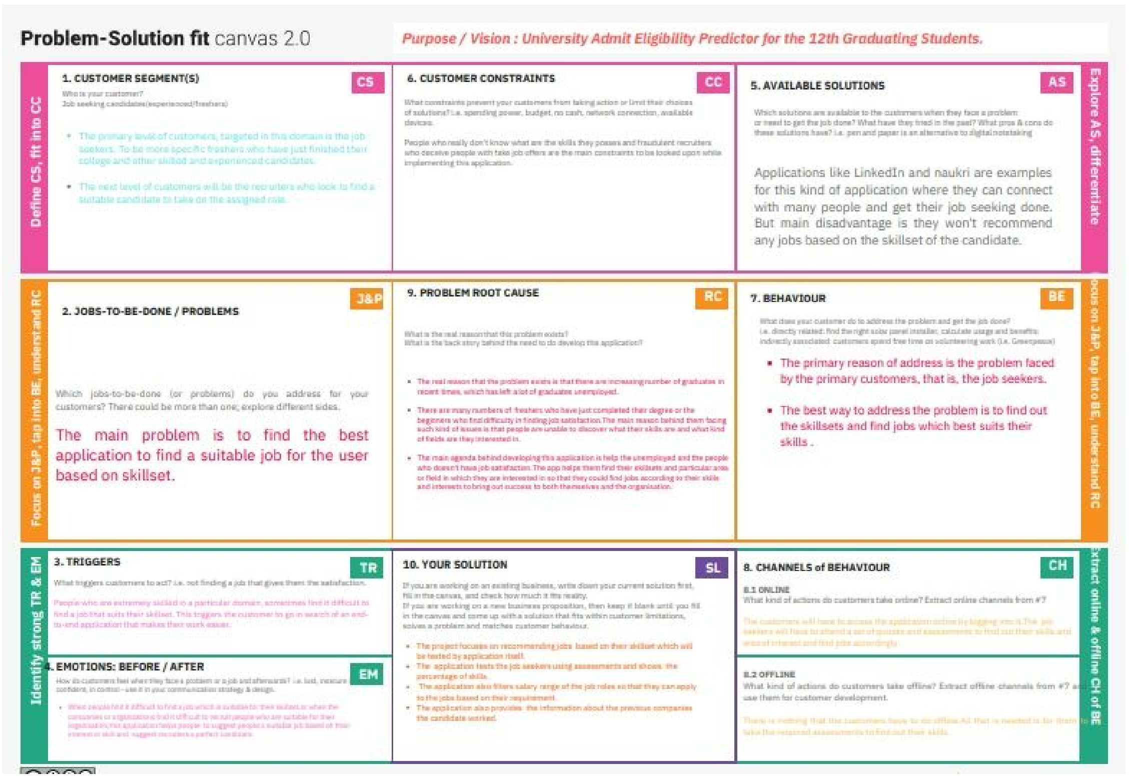
3.2 Ideation & Brainstorming


Brainstorm
& idea prioritization
Brainstorm
Write down any ideas that come to mind that address your problem statement.
Varshini J
Evaluate skillset
Test skillset of the candidates
Pradhiksha R
Recommend jobs based on skills in resume
Provides analytics in the fomm of graph
Sneha R L
Suggest percentage of the skill
Filters salery range of the job roles
Savitha G
Previous companies the candidate worked
Represent analyst to recruiters
Group ideas
Suggest jobs based on skillset
Suggest percentage of the skill
Test skillset of the candidates
Represent analyst to recruiters
Suggesting non-technical roles for technical job seekers based on their interest
Filters salery range of the job roles
Previous companies the candidate worked
Prioritize
Importance
Feasibility
Suggest jobs based on skillset
Suggest percentage of the skill
Represent analyst to recruiters

3.3 Proposed Solution

Premium policy is an issue to the users. Look for field-based jobs as searching for fields as a whole is time-consuming. Salary calculator for the estimation of the pay. Earnings estimator based on knowledge of users.Open doors for every users as there is free accessProviding recruiters with better candidatesData can be scaled up and scaled down according to the number of current job openings available.

3.4 Problem Solution fit



Problem-Solution fit canvas 2.0

Purpose / Vision : University Admit Eligibility Predictor for the 12th Graduating Students.

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
Job seeking candidates(experienced/freshers)

- The primary level of customers, targeted in this domain is the job seekers. To be more specific freshers who have just finished their college and other skilled and experienced candidates.
- The next level of customers will be the recruiters who look to find a suitable candidate to take on the assigned role.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

People who really don't know what are the skills they posses and fraudulent recruiters who deceive people with fake job offers are the main constraints to be looked upon while implementing this application.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face a problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Applications like LinkedIn and naukri are examples for this kind of application where they can connect with many people and get their job seeking done. But main disadvantage is they won't recommend any jobs based on the skillset of the candidate.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

The main problem is to find the best application to find a suitable job for the user based on skillset.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists?
What is the back story behind the need to do develop this application?

- The real reason that the problem exists is that there are increasing number of graduates in recent times, which has left a lot of graduates unemployed.
- There are many numbers of freshers who have just completed their degree or the beginners who find difficulty in finding job satisfaction.The main reason behind them facing such kind of issues is that people are unable to discover what their skills are and what kind of fields are they interested in.
- The main agenda behind developing this application is help the unemployed and the people who doesn't have job satisfaction. The app helps them find their skillsets and particular area or field in which they are interested in so that they could find jobs according to their skills and interests to bring out success to both themselves and the organisation.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

- The primary reason of address is the problem faced by the primary customers, that is, the job seekers.
- The best way to address the problem is to find out the skillsets and find jobs which best suits their skills .

Focus on J&P, tap into BE, understand RC

Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. not finding a job that gives them the satisfaction.

People who are extremely skilled in a particular domain, sometimes find it difficult to find a job that suits their skillset. This triggers the customer to go in search of an end-to-end application that makes their work easier.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

- When people find it difficult to find a job which is suitable to their skillset or when the companies or organisations find it difficult to recruit people who are suitable for their organisation,this application helps people to suggest people a suitable job based on their interest or skill and suggest recruiters a perfect candidate.

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

- The project focuses on recommending jobs based on their skillset which will be tested by application itself.
- The application tests the job seekers using assessments and shows the percentage of skills.
- The application also filters salary range of the job roles so that they can apply to the jobs based on their requirement.
- The application also provides the information about the previous companies the candidate worked.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

The customers will have to access the application online by logging into it.The job seekers will have to attend a set of quizzes and assessments to find out their skills and area of interest and find jobs accordingly.

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

There is nothing that the customers have to do offline.All that is needed is for them to take the required assessments to find out their skills.

Extract online & offline CH of BE

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Functional Requirements:

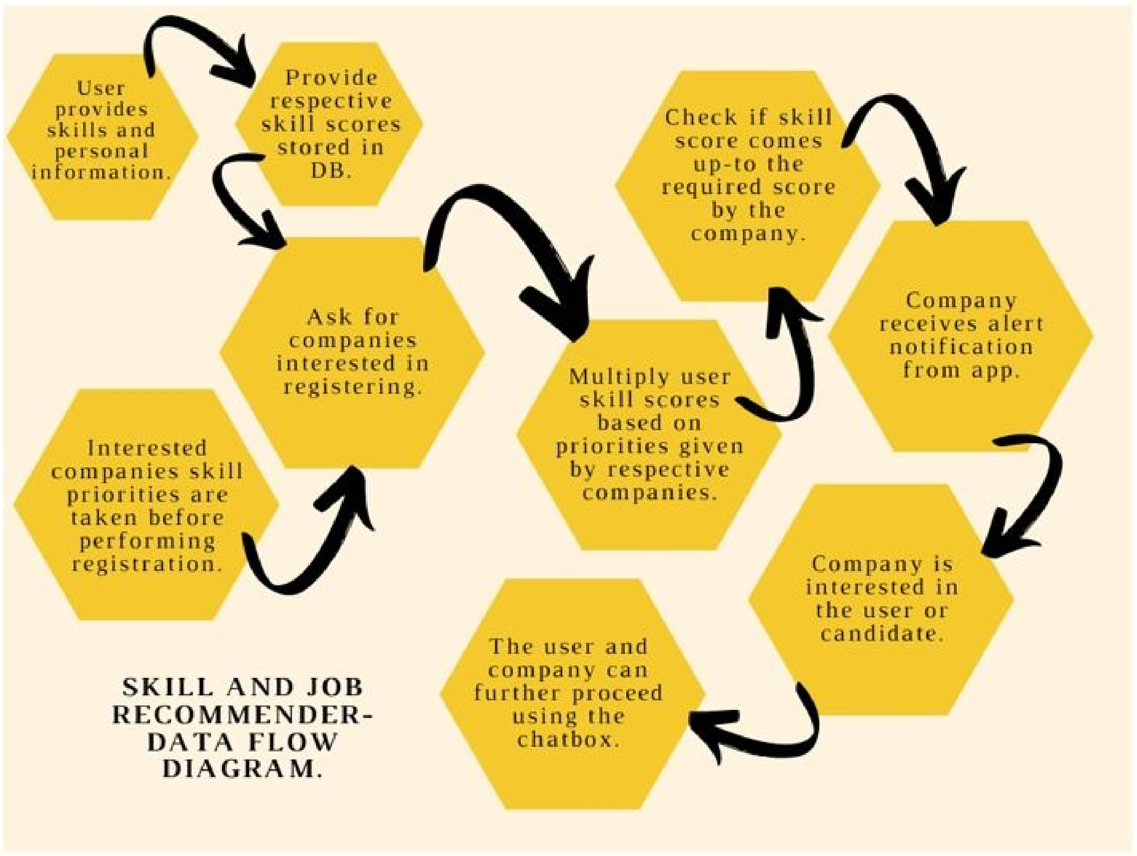
Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3		
FR-4		

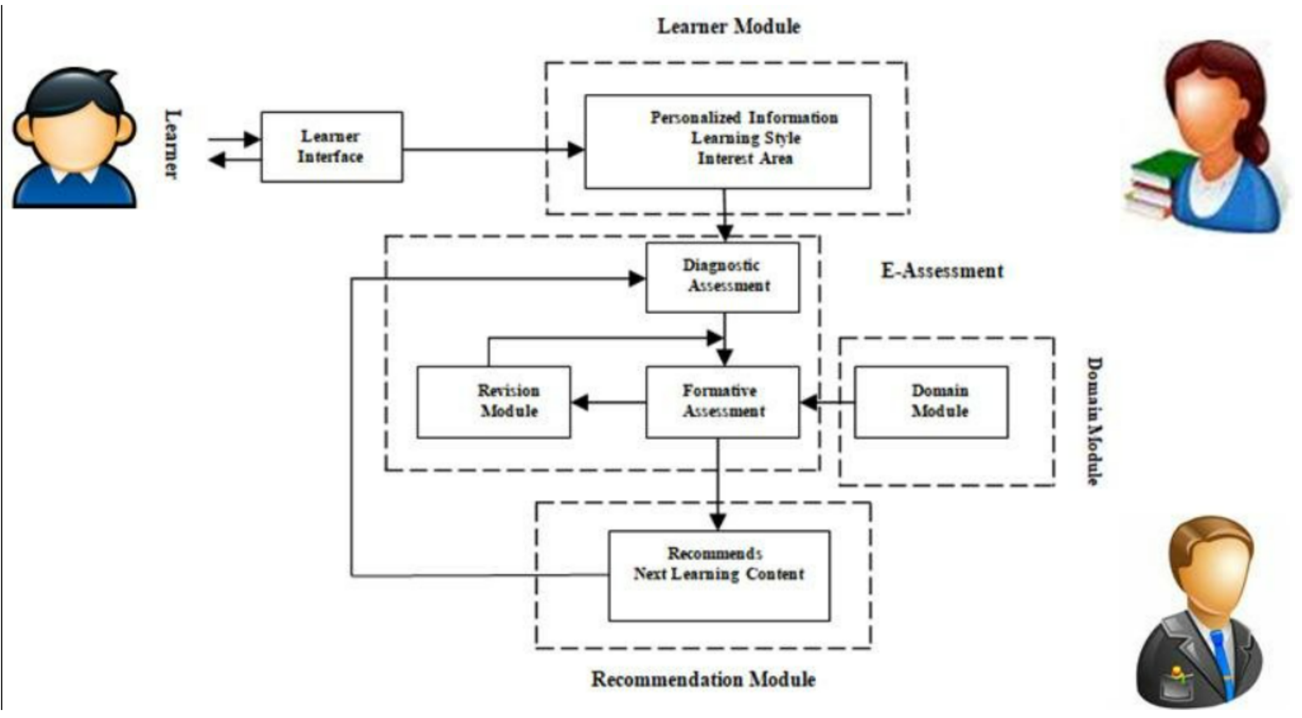
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Once job offers and profiles are filtered, the second step is text preprocessing. In this task, we perform stopwords removal, tokenization and lemmatization for the Portuguese language. this option helps us to find the specified jobs for us.
NFR-2	**Security**	where a job seeker applies to a job by creating a profile on a job portal by providing all his/her work preferences. These work preferences of each user can be collected from each user and provide job recommendations based on their preference. This helps us to avoid the fake job recommendations.
NFR-3	**Reliability**	The scraper is set up to avoid duplicate job offers, thus all the job offers are unique. To making the user reliabile.
NFR-4	**Performance**	Once job offers and profiles are filtered, the second step is text preprocessing. In this task, we perform stopwords removal, tokenization and lemmatization for the Portuguese language. this option helps us to find the specified jobs for us
NFR-5	**Availability**	The user can get the available resources about the job information. Also, getting notified about job availabilities.
NFR-6	**Scalability**	Here a seeker looks up for the job he would find relevant to him and apply for it. As there are many job boards, applicants tend to use the tool that provides better services to them, services such as writing a CV, creating a job profile, and recommending new jobs to a job seeker

5. PROJECT DESIGN

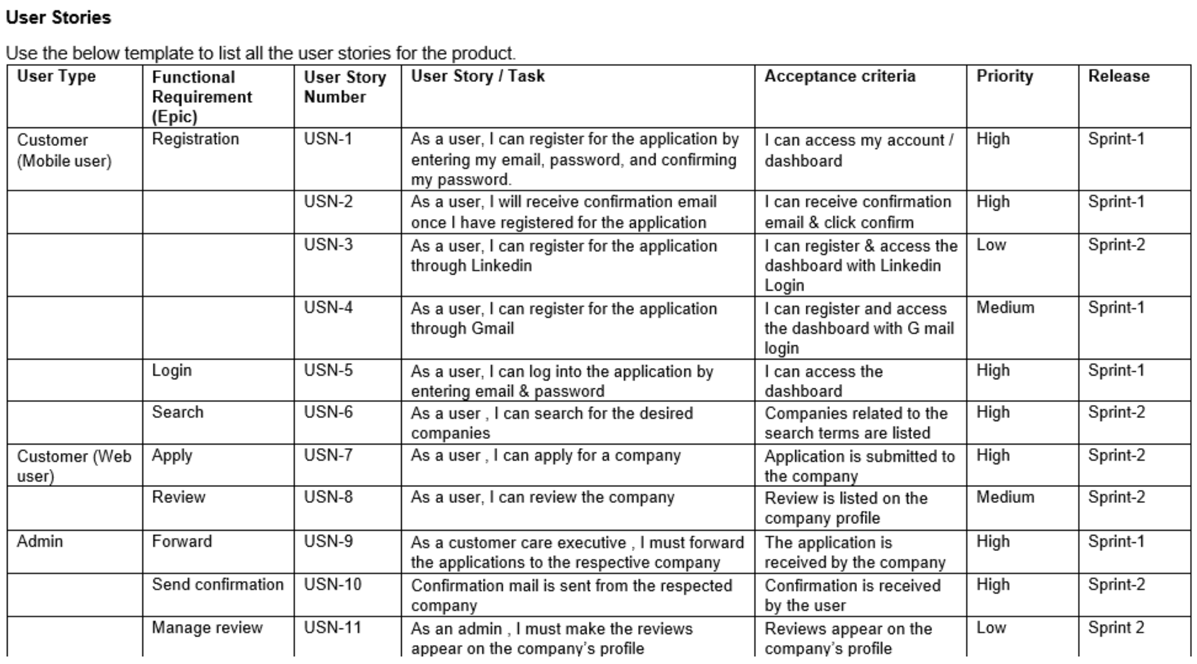
5.1 Data Flow Diagrams


User provides skills and personal information.
Provide respective skill scores stored in DB.
Ask for companies interested in registering.
Interested companies skill priorities are taken before performing registration.
Multiply user skill scores based on priorities given by respective companies.
Check if skill score comes up-to the required score by the company.
Company receives alert notification from app.
Company is interested in the user or candidate.
The user and company can further proceed using the chatbox.
SKILL AND JOB RECOMMENDER- DATA FLOW DIAGRAM.

5.2 Solution & Technical Architecture



5.3 User Stories



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Linkedin	I can register & access the dashboard with Linkedin Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register and access the dashboard with G mail login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access the dashboard	High	Sprint-1
	Search	USN-6	As a user , I can search for the desired companies	Companies related to the search terms are listed	High	Sprint-2
Customer (Web user)	Apply	USN-7	As a user , I can apply for a company	Application is submitted to the company	High	Sprint-2
	Review	USN-8	As a user, I can review the company	Review is listed on the company profile	Medium	Sprint-2
Admin	Forward	USN-9	As a customer care executive , I must forward the applications to the respective company	The application is received by the company	High	Sprint-1
	Send confirmation	USN-10	Confirmation mail is sent from the respected company	Confirmation is received by the user	High	Sprint-2
	Manage review	USN-11	As an admin , I must make the reviews appear on the company's profile	Reviews appear on the company's profile	Low	Sprint 2

Project Planning

Sprint Planning and Delivery:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint 1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Varshini J
		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Sneha R L
	Login	USN-3	As a user, I can log into the application by entering email & password	1	High	Savitha G
	Dashboard	USN-4	Logging in takes to the dashboard for the logged user.	2	High	Pradhiksha R
	Bug fixes, routine checks and improvisation by everyone in the team *Intended bugs only					

Sprint 2	Workspace	USN-1	Workspace for personal expense tracking	2	High	Varshini J
	Charts	USN-2	Creating various graphs and statistics of customer's data	1	Medium	Sneha R L
	Connecting to IBM DB2	USN-3	Linking database with dashboard	2	High	Savitha G
		USN-4	Making dashboard interactive with JS	2	High	Pradhiksha R
Sprint-3		USN-1	Wrapping up the server side works of frontend	1	Medium	Varshini J
	Watson Assistant	USN-2	Creating Chatbot for recommending jobs and forclarifying user's query	1	Medium	Sneha R L
	SendGrid	USN-3	Using SendGrid to send mail to the user about their expenses	1	Low	Savitha G
		USN-4	Integrating both frontend and backend	2	High	Pradhiksha R

Bug fixes, routine checks and improvisation by everyone in the team *Intended bugs only						
Sprint-4	Docker	USN-1	Creating image of website using docker/	2	High	Savitha G
	Cloud Registry	USN-2	Uploading docker image to IBM Cloud registry	2	High	Varshini J
	Kubernetes	USN-3	Create container using the docker image and hosting the site	2	High	Sneha R L
	Exposing	USN-4	Exposing IP/Ports for the site	2	High	Pradhiksha R

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

7.1 Feature 1

```
<script>
  window.watsonAssistantChatOptions = {
    integrationID: "1df8b62f-ee5c-42bb-9a2f-6edcb89d85f7", // The ID of
this integration.
    region: "jp-tok", // The region your integration is hosted in.
    serviceInstanceID: "ee519db2-aba8-4373-a6a2-e4e6fea336d7", // The
ID of your service instance.
    onLoad: function(instance) { instance.render(); }
  };
  setTimeout(function(){
    const t=document.createElement('script');
    t.src="https://web-
chat.global.assistant.watson.appdomain.cloud/versions/" +
(window.watsonAssistantChatOptions.clientVersion || 'latest') +
"/WatsonAssistantChatEntry.js";
    document.head.appendChild(t);
  });
 </script>
```

7.2 Feature 2

Job_post.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
    <meta name="viewport" content="width=device-width, initial-scale=1.0"
/>
    <title>Document</title>
    <link rel="stylesheet" href="static/css/job_post.css" />
  </head>
    <body style="background-color: rgb(255, 204, 0)" height="40%"
width="80%">
    <script>
      window.watsonAssistantChatOptions = {
       integrationID: "6e54406e-1b6b-4b7c-8b9e-a21f9adbb3de", // The ID of
this integration.
        region: "au-syd", // The region your integration is hosted in.
         serviceInstanceID: "bc1d370b-fe79-4e14-be04-a0cacaef09e2", // The
ID of your service instance.
        onLoad: function (instance) {
          instance.render();
        },
      };
      setTimeout(function () {
        const t = document.createElement("script");
        t.src =
                                                                        "https://web-
    chat.global.assistant.watson.appdomain.cloud/versions/" +
          (window.watsonAssistantChatOptions.clientVersion || "latest") +
          "/WatsonAssistantChatEntry.js";
        document.head.appendChild(t);
      });
    </script>
    <header>
      <div class="wrapper">
        <div class="logo">
          <a href="/"><img src="static/img/job_logo.png" alt="" /></a>
        </div>

        <ul class="nav-area">
          <li><a href="posts">post Jobs</a></li>
          <li><a href="list">view job</a></li>
        </ul>
      </div>

      <section>
        <div class="contentBx">
          <div class="card">
            <div class="formBx">
              <h2>Job Posting form</h2>
```

```
<br />
<form action="{{ url_for('addrec') }}" method="get|post">
  <div class="inputBx">
    <span>Company name</span>
    <input
      type="text"
      name="dname"
      id="dname"
      placeholder=""
      required
      class="form-control"
    />
  </div>
  <br />

  <div class="inputBx">
    <span>Job title</span>
    <input
      type="text"
      name="dtitle"
      id="dtitle"
      placeholder=""
      required
      class="form-control"
    />
  </div>
```

```
<br />
<div class="inputBx">
 <span>Job role</span>
 <input
  type="text"
  name="drole"
  id="drole"
  placeholder=""
  required
  class="form-control"
 />
</div>
<br />
<div class="inputBx">
 <span>Job Description</span>
 <label for="Description"></label>
 <textarea
  rows=""
  cols=""
  name="description"
  id="description"
 ></textarea>
</div>
<br />
<div class="remember">
 <input type="checkbox" id="rem1" name="" value="" />
```

```
            <label for="rem1"
              >I agree to the terms and condition of the form</label
            ><br />
          </div>
          <br />
          <div class="inputBx">
            <input type="submit" value="Submit" name="" />
          </div>
        </form>
      </div>
    </div>
   </div>
  </section>
 </header>

 <div class="grid-container">
  <div class="grid">
   <img
    src="../static/img/33172-01-finishig-studies.gif"
    width="100px"
    height="100px"
   />
      <h5>Get your dream job within a week.<br />Gain on-demand
skills.</h5>
  </div>
  <div class="grid">
```

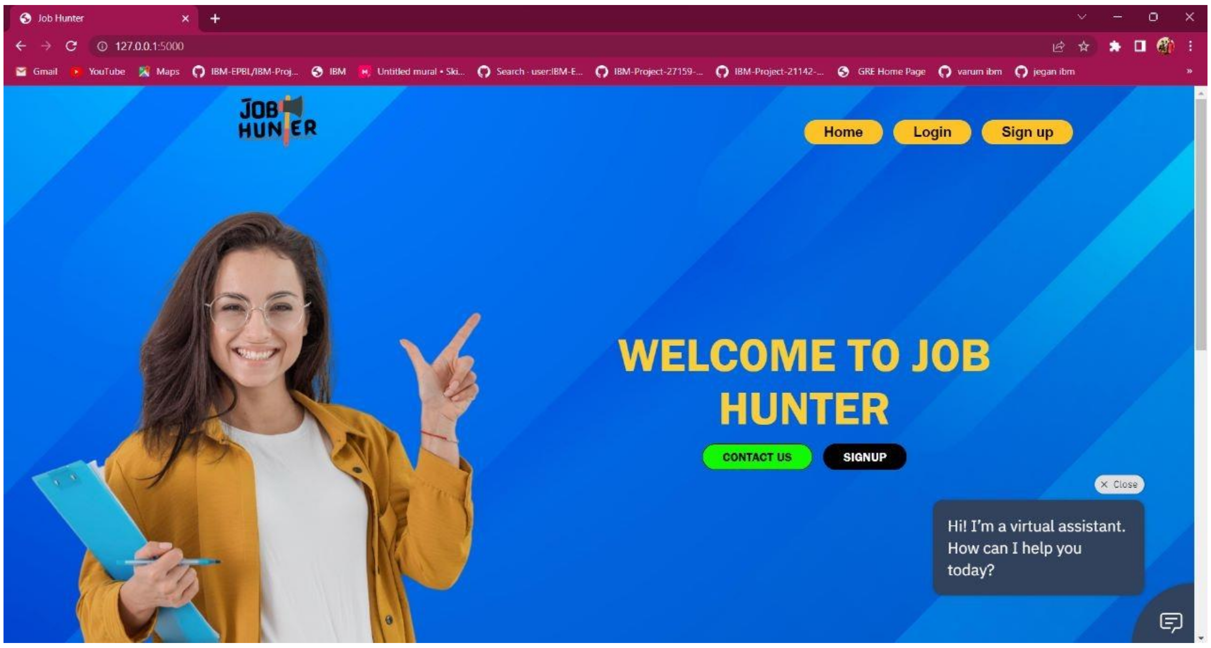
```
                    <img     src="../static/img/27425-train.gif"     width="100px"
height="100px" />
        <h5>Personalized Recommendation.</h5>
      </div>
      <div class="grid">
        <img
          src="../static/img/75164-glurtr-anmation.gif"
          width="100px"
          height="100px"
        />
        <h5>Learn at your own pace, with lifetime access.</h5>
      </div>
    </div>

    <hr id="start" />
    <div class="job-sign">
      <br /><br />
      <h1>Find the best job for your career</h1>
      <button id="sign-center">View jobs</button>
    </div>
  </body>
</html>
```

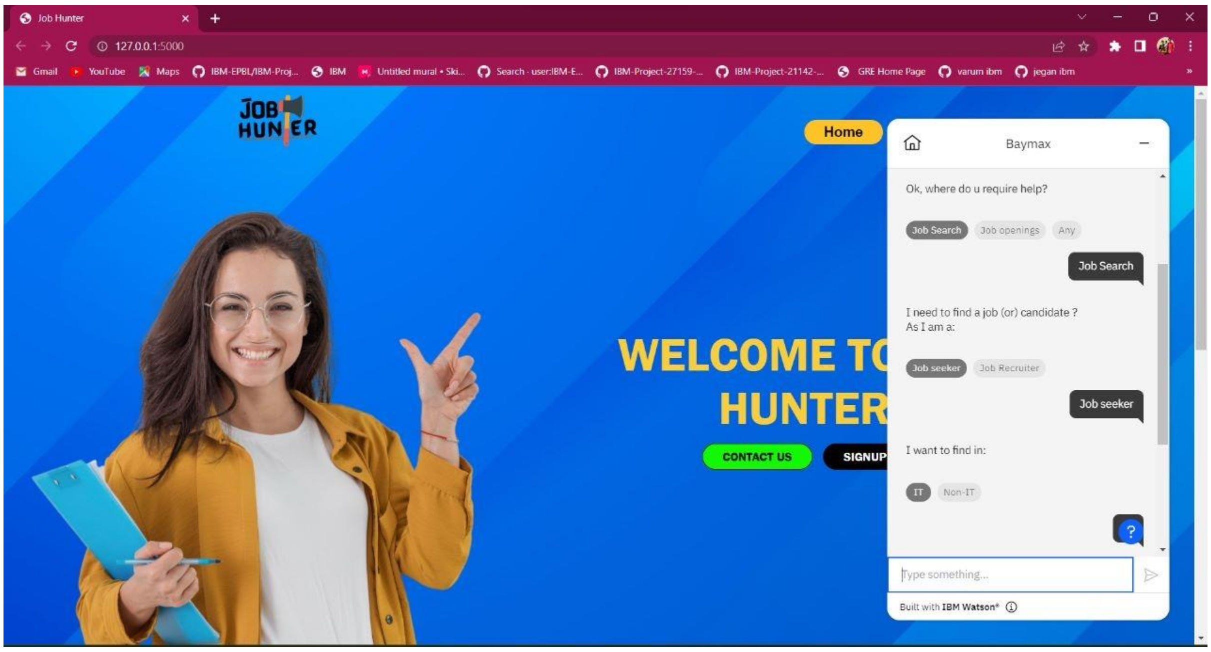
8. TESTING

Black Box testing is the method that does not consider the internal structure, design, and product implementation to be tested. In other words, the tester does not know its internal functioning. The Black Box only evaluates the external behaviour of the system. The inputs received by the system and the outputs on responses it produces are tested. The White Box test method is the one that looks at the code and structure of the product to be tested and uses that knowledge to perform the tests. This method is used in the Unit testing phase, although it can also occur in other stages such as Integration tests. For the execution of this method, the tester or the person who will use this method must have extensive knowledge of the technology used to develop the program.

9. RESULTS



Hi! I'm a virtual assistant. How can I help you today?



Ok, where do u require help?

Job Search · Job openings · Any

Job Search

I need to find a job (or) candidate ?
As I am a:

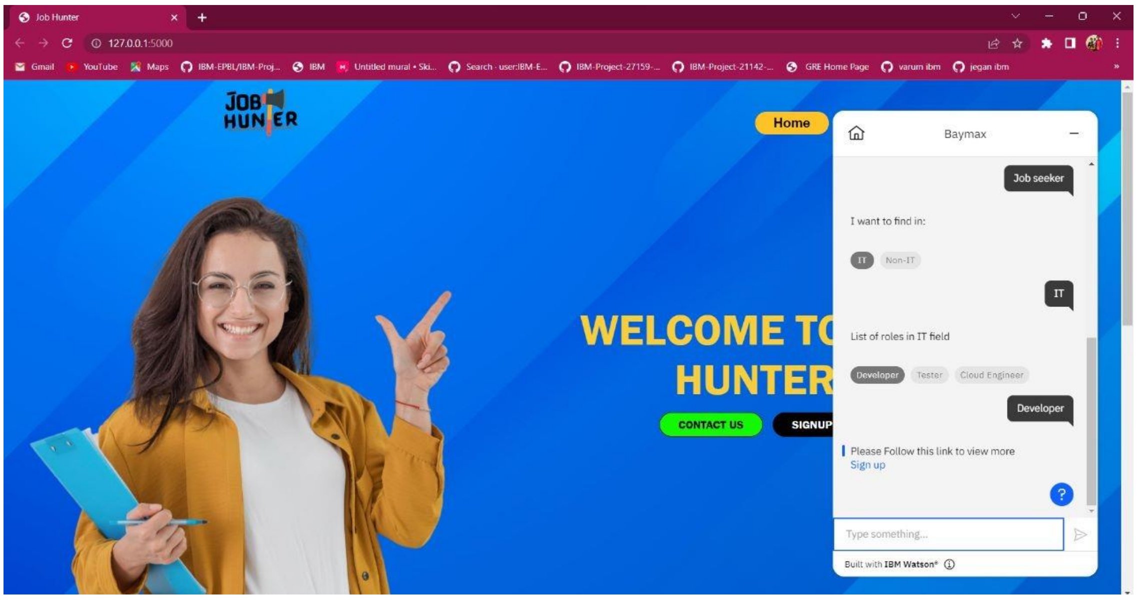
Job seeker · Job Recruiter

Job seeker

I want to find in:

IT · Non-IT

Type something...



Job seeker

I want to find in:

IT Non-IT

IT

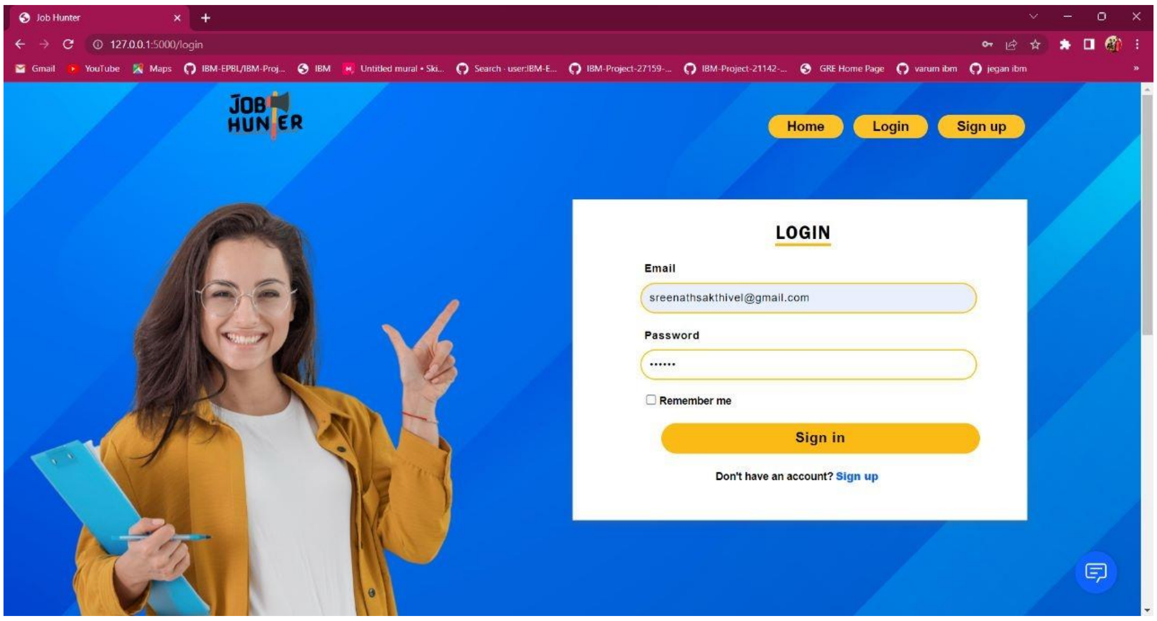
List of roles in IT field

Developer Tester Cloud Engineer

Developer

Please Follow this link to view more
Sign up

Type something...



LOGIN

Email

sreenathsakthivel@gmail.com

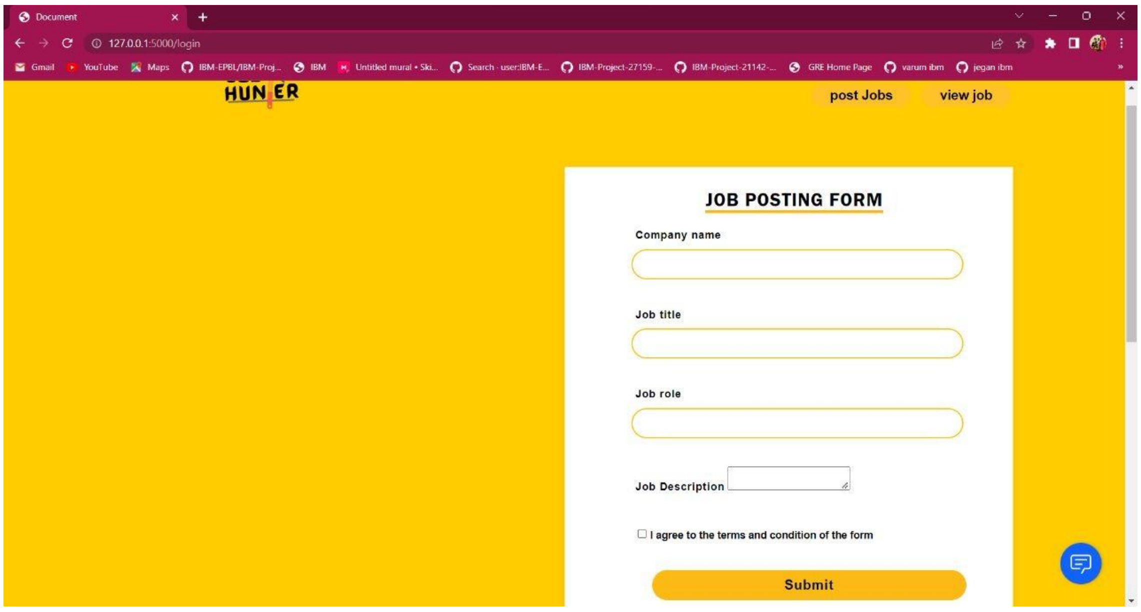
Password

••••••

☐ Remember me

Sign in

Don't have an account? Sign up



JOB POSTING FORM

Company name

Job title

Job role

Job Description

☐ I agree to the terms and condition of the form

Submit

9.1 Performance Metrics

The performance of a recommendation algorithm is evaluated by using some specific metrics that indicate the accuracy of the system. The type of metric used depends on the type of filtering technique. Root Mean Square Error (RMSE), Receiver Operating Characteristics (ROC), Area Under Cover (AUC), Precision, Recall and F1 score is generally used to evaluate the performance or accuracy of the recommendation algorithms.

Root-mean square error (RMSE). RMSE is widely used in evaluating and comparing the performance of a recommendation system model compared to other models. A lower RMSE value indicates higher performance by the recommendation model. RMSE, as mentioned by [69], can be as represented as follows:

RMSE=√ 1/Np∑u,i(pui−rui)^2 (1)

where, N_p is the total number of predictions, p_{ui} is the predicted rating that a user u will select an item i and r_{ui} is the real rating.

Precision. Precision can be defined as the fraction of correct recommendations or predictions (known as True Positive) to the total number of recommendations provided, which can be as represented as follows:

Precision=True Positive (TP)/True Positive(TP)+False Positive (FP)(2)

It is also defined as the ratio of the number of relevant recommended items to the number of recommended items expressed as percentages.

Recall. Recall can be defined as the fraction of correct recommendations or predictions (known as True Positive) to the total number of correct relevant recommendations provided, which can be as represented as follows:

Recall=True Positive (TP)/True Positive(TP)+False Negative (FN) (3)

It is also defined as the ratio of the number of relevant recommended items to the total number of relevant items expressed as percentages.

F1 Score. F1 score is an indicator of the accuracy of the model and ranges from 0 to 1, where a value close to 1 represents higher recommendation or prediction accuracy. It represents precision and recall as a single metric and can be as represented as follows:

F1 score=2×Precision∗Recall/Precision+Recall (4)

Coverage. Coverage is used to measure the percentage of items which are recommended by the algorithm among all of the items.

Accuracy. Accuracy can be defined as the ratio of the number of total correct recommendations to the total recommendations provided, which can be as represented as follows:

Accuracy=TP+FN/TP+FN+TN+FP (5)

Intersection over union (IoU). It represents the accuracy of an object detector used on a specific dataset [70].

IoU=TP/TP+FN+FP (6)

ROC. ROC curve is used to conduct a comprehensive assessment of the algorithm's
performance [57].

AUC. AUC measures the performance of recommendation and its baselines as well as the quality of the ranking based on pairwise comparisons [5].

Rank aware top-N metrics. The rank aware top-N recommendation metric finds some of the interesting and unknown items that are presumed to be most attractive to a user [71]. Mean reciprocal rank (MRR), mean average precision (MAP) and normalized discounted cumulative gain (NDCG) are three most popular rank aware metrics.

MRR. MRR is calculated as a mean of the reciprocal of the position or rank of first relevant recommendation [72,73]. MRR as mentioned by [72,73] can be expressed as follows:

MRR=1/Nu ∑u∈Nu 1/Lnu[k]∈Ru (7)

where u, N_u and R_u indicate specific user, total number of users and the set of items rated by the user, respectively. L indicates list of ranking length (n) for user (u) and k represents the position of the item found in the he lists L.

MAP: MAP is calculated by determining the mean of average precision at the points where relevant products or items are found. MAP as mentioned by [73] can be expressed as follows.

$MAP=1Nu|Ru|\sum nk=1k(Lnu[k]\in Ru)Pu@k$ (8)

where Pu represents precision in selecting relevant item for the user.

NDCG: NDCG is calculated by determining the graded relevance and positional information of the recommended items, which can be expressed as follows [73].

$NDCGu=\sum nk=1G(u,n,k)D(k)/\sum nk=1G{*}(u,n,k)D(k)$ (9)

where D (k) is a discounting function, G (u, n, k) is the gain obtained recommending an item found at k-th position from the list L and G^* (u, n, k) is the gain related to kth item in the ideal ranking of n size for u user.

10. ADVANTAGES & DISADVANTAGES

Advantages

- 1. Job recommendations can help you find a job that fits your skills and interests.

- Job recommendations can save you time by showing you jobs that are more likely to be a good match for you.

- Job recommendations can help you discover new opportunities that you may not have considered otherwise.

- The biggest advantage of job recommendation systems for recruiters is that they can help save time by automating the process of finding and recommending candidates for open positions.

- Job recommendation systems can also provide a more objective perspective on candidates by using data and algorithms to identify which candidates are the best match for a specific job.

- In addition, job recommendation systems can help recruiters keep track of a large pool of candidates and automatically notify them when new job openings that match their skills and experience become available.

- Job recommendations can help you find jobs that are not advertised to the general public.

- Job recommendations can help you connect with recruiters and hiring managers.

- Job recommendations can help you find jobs that match your salary requirements.

- Job recommendations can help you find jobs that are located in your desired geographical area..

Disadvantages

- The app may not have all the skills you need in its database.

- The app may not be updated regularly, so you could end up with outdated information.

- The app may not be able to recommend skills based on your specific needs.
- The system may not be able to accurately recommend jobs that are a good fit for the user, leading to frustration and wasted time.

- Job recommendations may not be accurate or tailored to the user. The system may not be able to take into account the user's preferences or specific situation.

- The system may be biased. For example, if the system relies on input from previous employers, it may favor candidates who have already worked for the company.
- The system may be expensive to implement and maintain.

- The system may be abused. For example, users may try to game the system by entering inaccurate or misleading information.

11. CONCLUSION

In this project, we proposed a framework for skill/job recommendation application. This framework facilitates the understanding of the job recommendation process as well as it allows the use of a variety of text processing and recommendation methods according to the preferences of the job recommender system designer. Moreover, we also contribute making publicly available a new dataset containing job seekers profiles and job vacancies. Future directions of our work will focus on performing a more exhaustive evaluation considering a greater amount of methods and data as well as a comprehensive evaluation of the impact of each professional skill of a job seeker on the received job recommendation.

FUTURE SCOPE

The app could be expanded to include a social media component, where users could connect with each other and share tips and tricks. The app could also be expanded to include a gamification element, where users could earn points and badges for using the app frequently or for completing tasks.

There are many ways in which the skill recommender app could be improved. For example, the app could be made more personalized by taking into account the user's specific skills and interests. Additionally, the app could be made more interactive, perhaps by incorporating game-like elements or by allowing users to ask questions of the app's artificial intelligence (AI) system. Finally, the app could be made more comprehensive, perhaps by including a database of all known skills and by allowing users to search for skills by keyword.

12. APPENDIX

Source Code

```
from flask import Flask,render_template,request,session, redirect,url_for
import ibm_db
from dotenv import load_dotenv
import os

load_dotenv()

app = Flask(__name__)
app.secret_key= os.getenv("SECRET_KEY")

#Cloud Connection values
database_name = os.getenv("DATABASE")
host_name = os.getenv("HOSTNAME")
port = os.getenv("PORT")
uid = os.getenv("UID")
password = os.getenv("PASSWORD")

try:
   conn = ibm_db.connect(
        f"DATABASE={database_name};HOSTNAME={host_name};PORT={port
};SECURITY=SSL;SSLServiceCertificate=DigiCertGlobalRootCA.crt;UID={uid
};PWD={password}",'',''
   )
   print(conn)
   print("connection successful...")
```

```
except:
    print("Connection Failed")
    print(ibm_db.conn_error())



@app.route('/')
def home():
    return render_template('index.html')

@app.route('/contacts')
def contacts():
    return render_template('contacts.html')

@app.route('/forgot')
def forgot():
    return render_template('forgotten-password.html')

@app.route('/signup', methods=['POST','GET'])
def signup():
    if request.method == 'POST':
        # conn = connection()
        try:
                                        sql = "INSERT INTO user_data
VALUES('{}','{}','{}','{}')".format(request.form["name"],request.form["email
"],request.form["phone"],request.form["password"])
            ibm_db.exec_immediate(conn,sql)
            #flash("successfully Registered !")
            return render_template('login.html')
        except:
          #flash("Account already exists! ")
          return render_template('signup.html')
   else:
          return render_template('signup.html')
       # name = request.form['name']
        #email = request.form['email']
        #phone = request.form['phone']
        #password = request.form['password']

        #sql ="INSERT INTO users VALUES (?,?,?,?)"
        #stmt = ibm_db.prepare(conn,sql)
        #ibm_db.bind_param(stmt, 1, name)
        #ibm_db.bind_param(stmt, 2, email)
        #ibm_db.bind_param(stmt, 3, phone)
        #ibm_db.bind_param(stmt, 4, password)
        #ibm_db.execute(stmt)
  # return render_template('signup.html')

@app.route('/login', methods=['POST','GET'])
def login():
    if request.method == 'POST':
      # conn =connection()
       email = request.form["email"]
       password = request.form["password"]
          sql = "SELECT COUNT(*) FROM user_data WHERE EMAIL=? AND
PASSWORD=?"
       stmt = ibm_db.prepare(conn,sql)
```

```
        ibm_db.bind_param(stmt, 1, email)
        ibm_db.bind_param(stmt, 2, password)
        ibm_db.execute(stmt)
        res = ibm_db.fetch_assoc(stmt)
        if res['1'] == 1:
            session['loggedin'] = True
            session['email'] = email
            return render_template('job_post.html')
        else:
            #flash("email/ Password isincorrect! ")
            return render_template('login.html')
    else:
            return render_template('login.html')

        #email = request.form['email']
        #password = request.form['password']

        #sql = "SELECT * FROM users WHERE email=%s AND password=%s"
        #stmt = ibm_db.prepare(conn, sql)
        #ibm_db.bind_param(stmt,1,email)
        #ibm_db.bind_param(stmt,2,password)
       # user = ibm_db.execute(stmt).fetchone()

  #    return render_template('login.html' ,msg="success")

@app.route('/posts')
def posts():
    return render_template('job_post.html')

@app.route('/addrec',methods=['POST','GET'])
def addrec():
        arr = []
        sql = "SELECT * FROM job_list"
        stmt = ibm_db.exec_immediate(conn,sql)
        dictionary = ibm_db.fetch_both(stmt)
        while dictionary != False:
         inst={}
         inst['DNAME']=dictionary['JOBNAME']
         inst['DTITLE']=dictionary['JOBTITLE']
         inst['DROLE']=dictionary['JOBROLE']
         inst['DESCRIPTION']=dictionary['JOBDESCRIPTION']
         arr.append(inst)
         dictionary = ibm_db.fetch_both(stmt)

        return render_template('list.html',arr=arr)

@app.route('/list')
def list():
        arr = []
        sql = "SELECT * FROM job_list"
        stmt = ibm_db.exec_immediate(conn,sql)
        dictionary = ibm_db.fetch_both(stmt)
        while dictionary != False:
         inst={}
         inst['DNAME']=dictionary['JOBNAME']
```

```
            inst['DTITLE']=dictionary['JOBTITLE']
            inst['DROLE']=dictionary['JOBROLE']
            inst['DESCRIPTION']=dictionary['JOBDESCRIPTION']
            arr.append(inst)
            dictionary = ibm_db.fetch_both(stmt)
        print(arr)
        return render_template('list.html',arr=arr)


if __name__=='__main__':
    app.run(debug=True)
```

GitHub & Project Demo Link

~~https://github.com/IBM-EPBL/IBM-Project-23741-1659924454~~

https://drive.google.com/file/d/19gUDcI6yo_cquFi_02nA4XADR0hm4VdD/view