SKILL AND JOB RECOMMENDER

PROJECT REPORT

Team Id	PNT2022TMID30883
Project name	Skill/Job recommender application
Team members	Keerthana. V-(620119106041) Gowsika. P-(620119106025) Indhusri. A-(620119106031) Latha. M-(620119106045)

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1. INTRODUCTION

Nowadays, job search is a task commonly done on the Internet using job search engine sites like LinkedIn1,Indeed2, and others. Commonly, a job seeker has two ways to search a job using these sites: 1) doing a query based on keywords related to the job vacancy that he/she is looking for, or 2) creating and/or updating aprofessional profile containing data related to his/her education, professional experience, professional skills and other, and receive personalized job recommendations based on this data. Sites providing support to the former case are more popular and have a simpler structure; however, their recommendations are less accurate than those of the sites using profile data.Personalized job recommendation sites implemented a variety of types of recommender systems, such as content-based filtering, collaborative filtering, knowledge-based and hybrid approaches.

Moreover, most of these job recommender systems perform their suggestions based on the full profile of job seekers as well asby considering other data sources such as social networking activities, web search history, etc. Despite the fact that many data sources can be useful to improve the job recommendation, previous studies showed that the best person-job fit is possible when the personal skills of a job seeker match with the requirements of a joboffer [Den15].Based on the person-job fit premise, we propose a framework for job recommendation based on professional skillsof job seekers.

1.1 PROJECT OVERVIEW

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. We also take background information including students' resumes and details of recruiting information into consideration. The recommended results can achieve higher score of precision and recall, and they are more relevant with user's preferences before

Recommendation systems is a type of software tools designed to provide suggestions for items, that a user might find useful. The suggestion can refer to any decision-making process such as buying a product, seeing a movie or applying for a job. The term "item" generally refers to any entity that a system recommends to a user. Similarly, the term "user" refers to any entity to whom an item is recommended [3].The popularity of recommendation systems has grown during the recent years and proof for that is the fact that many globally popular platforms such as Netflix, Amazon and YouTube use

recommendation systems to provide their users with more quality content. For example, Netflix uses recommendation systems to suggest shows and movies to their users based on previous watching experience. Amazon also employs recommendation systems to recommend products or books to their users based on ratings or previously liked products. The list of examples could be infinite since the application of recommendation systems is vast.Recommendation systems tend to be beneficial to both service providers and users. They bring the possibility of reducing transaction costs of finding and selecting items in, say, an online shopping environment.

1.2 PURPOSE

Enormous amounts of jobs are posted on the job websites on daily basis and large numbers of new resumes are also added to job websites daily. In such scenario it‟s a very tough job to suggest matching jobs to the job applicants. A recommendation system can solve this problem to the great extent. A recommendation system has already been proved to be very effective in the area of Online shopping websites and Movie recommendation. Given a user, the goal of an employment recommendation system is to predict those job positions that are likely to be relevant to the user. An Employment recommendation system would suggest matching jobs to the users using matching, collaborative filtering and content based recommendation based on ranking.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

A lot of research has been carried out in job recommender systems. A large variety of job recommendation systems already exist that try to provide one or the other aspect of the information by applying different methods [4]. The key problem is that most of job hunting websites just provides recruitment information to website viewers. Students have to retrieve information among those displayed by websites to find jobs they want to apply. The whole procedure is lengthy and inefficient. In addition, many e- commerce websites, uses collaborative filtering algorithm without considering user’s resume and item’s properties [9]. W. Hong et al. developed iHR an online job recommendation system that classifies users into groups by using historical behaviours of users and individual information and then uses the appropriate recommendation

approach for each group of users. This approach is suitable for the cases in which different users may have different attributes and a single recommendation approach may not be appropriate for all users [10]. Another approach, the Austrian job board for graduates Absolventen [11], uses an RS to suggest appropriate jobs to applicants. This system considers input as a CV to create the user profile. These user profiles are then compared with the available jobs. Moreover, the RS has been enhanced with implicit relevance feedback, which allows the system to find out user preferences. Mamadou et al. presented an online social network-based recommender system that extracts users' interests for jobs and then make recommendations according to user's interest [12]. Yao et al. proposed a hybrid recommender system that exploited the job and user profiles and the actions undertaken by users in order to generate recommendations. Unfortunately, they did not satisfy both job seekers and recruiters at the same time to achieve a successful recommendation. Different from these previous works, we model the relations among users by cross-similarity which indicates the two-sided matching to generate preference for both job seekers and recruiters

2.2 REFERENCES

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Linneuniversitetet.

6. Job Recommendation Systems for Enhancing E-recruitment Process Shaha T.Al-Otaibi, M.Ykhetef, Published 2012 Business, Computer Science

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9. INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCHAND ENGINEERING TRENDS WWW.IJASRET.COM 29-Job Recommendation System Using Profile Matching And Web-Crawling,Deepali V Musale 1, Mamta K Nagpure2, Kaumudini S Patil3, Rukhsar F Sayyed4 ,Students, Computer Science & Engineering,KK Wagh College of Engineering, Nashik, India 12

2.3 PROBLEM STATEMENT DEFINITION

The key problem is that most of job-hunting websites just display recruitment information to website viewers. Websites just display recruitment information to website viewers. Students have to retrieve among all the information to find jobs they want to apply. The whole procedure is tedious and inefficient. By creating an easy job recommendation system where everyone will have a fair and square chance. This saves a lot of potential time and money both on the industrial as well as the job seeker's side. Moreover, as the candidate gets a fair chance to prove his talent in the real world it is a lot more efficient system. The basic agenda of every algorithm used in today's world be it a traditional algorithm or a hybrid algorithm is to provide a suitable job that the user actually seeks and wishes for.

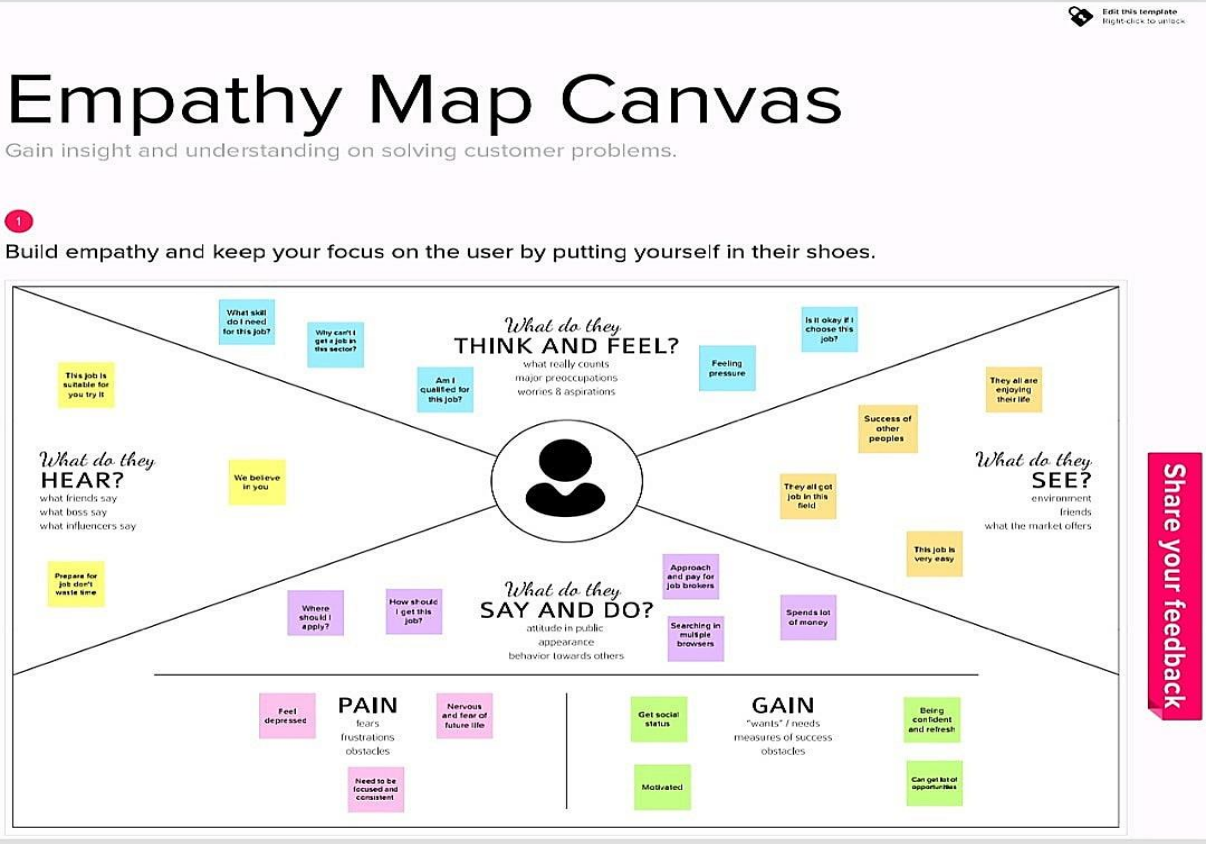
3. IDEATION AAND PROPOSED SOLUTION

Here we provide a website which provides the user recommendations of jobs and

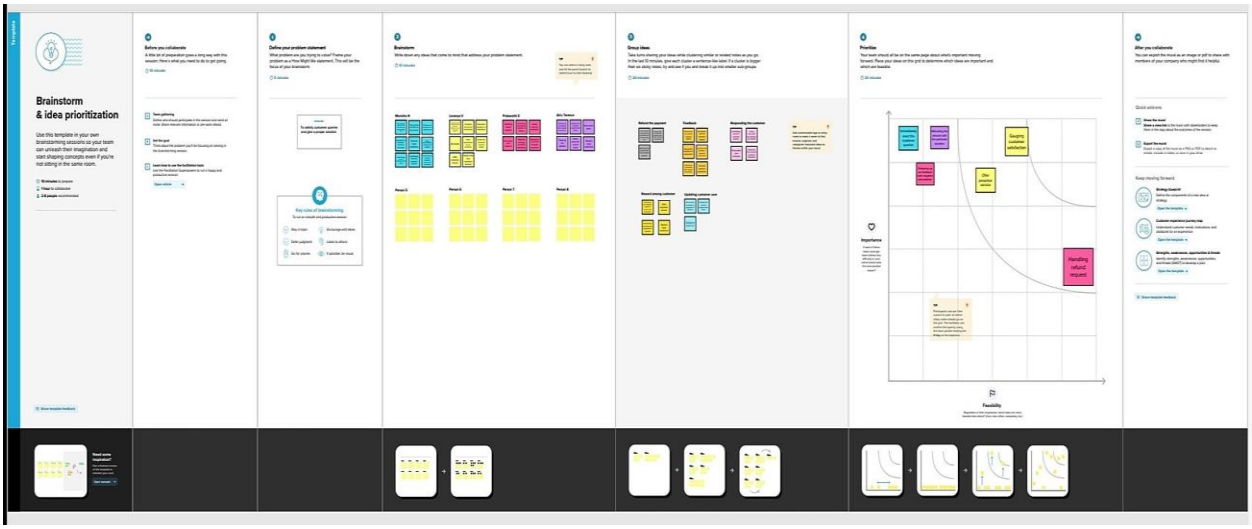
skills that they need to built for their career. It recommends the employee, graduate, unemployed and freshers the companies that are hiring. The final year students can be recommend with the skills and companies that are hiring the final years. The web application recommends the users the job that best suits them based on the information they provide like, field of interest, previous experience current position. The users have their individual profiles .The users can chat with chatbot for any queries. Thechat bot helps the users for their queries .

The web application uses the information provided by them and based on that the personalized recommendations of jobs and skills are made to the users. The product uses cloud hence the storage, server are easy to manage. The web application provides security and data privacy to the users .The users can report any issues and provide feedbacks .The chatbot helps the users in with their queries

3.1 EMPATHY MAP CANVAS



3.2 IDEADTION AND BRAINSTROMING



3.3 PROPOSED SOLUTION

S.no	Parameter	Description
1	Problem Statement (Problemto be solved)	Nowadays, the rate of unemployment is increasing drastically and most of the people suffer because of unemployment. The freshers are unaware of that , which companies are currently hiring and skills required to behired. The graduates with less experience like with one or two year experience doesn't know the skills needed to be built for their career growth. The experienced employees who needs to switch their company as they are unsatisfied with the currentjob are unaware of which company suits them well.
2	Idea / Solution description	Here we provide a website which provides the user recommendations of jobs and skills that they need to

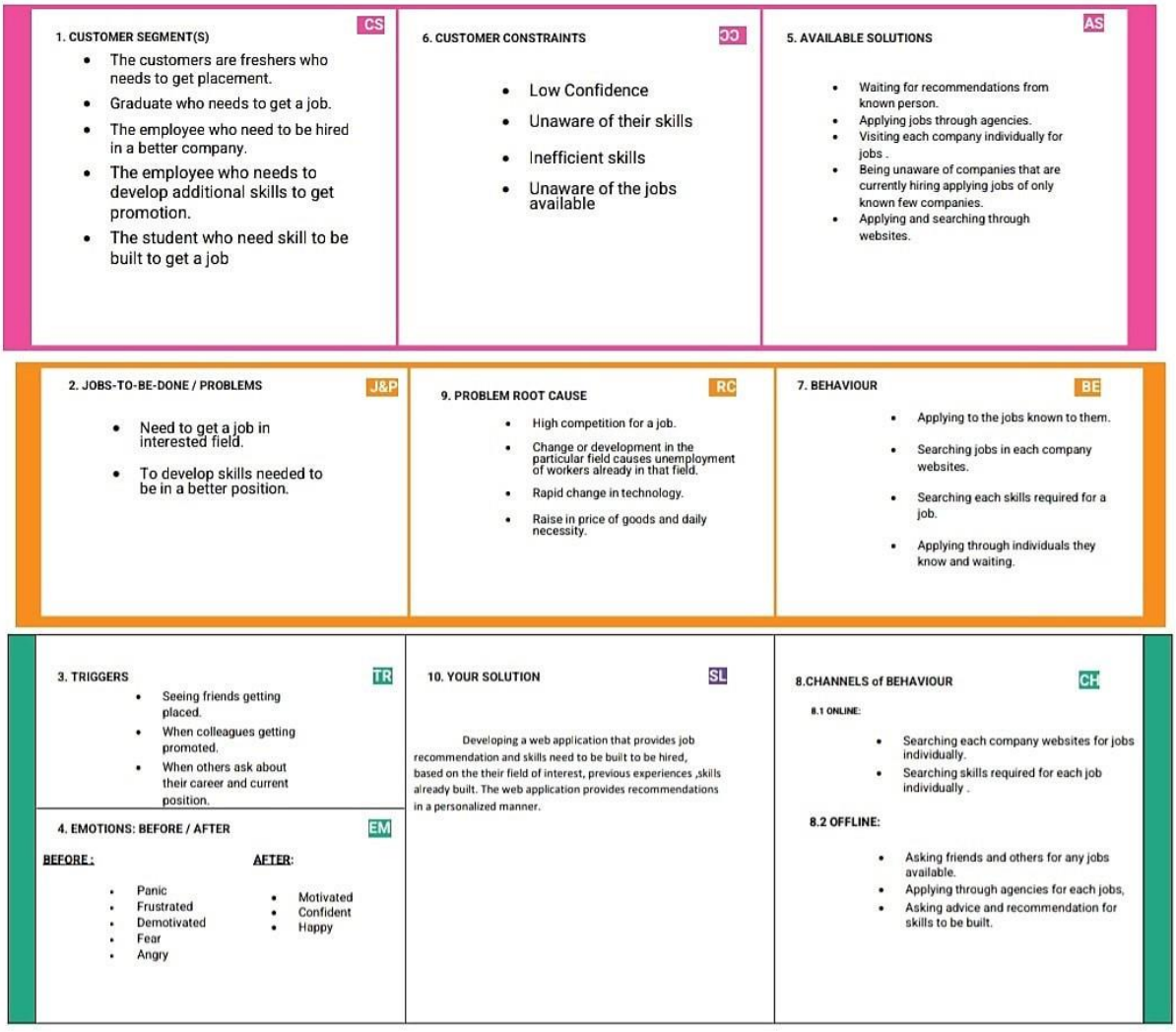
		built for their career. It recommends the employee, graduate, unemployed and freshers the companies that are hiring. The final year students can be recommend with the skills and companiesthat are hiring the final years.The web application recommends the users the job that best suits them based on the information theyprovide like, field of interest, previous experience current position. The users have theirindividual profiles .The users can chat with chatbot for anyqueries. The chat bot helps the users for their queries .
3	Novelty / Uniqueness	The web application uses the information provided by them and based on that the personalized recommendations of jobs and skills are made to the users. The product uses cloud hence the storage, server are easy to manage. The web application provides security and data privacy to the users .The users can report any issues and providefeedbacks .The chatbot helps the users in with their queries.
4	Social Impact /Customer Satisfaction	The customer will get personalized job recommendation hence it is easy for them to find suitable jobs for them, they also get recommendation of skills that

		they can develop in order to be hired or to get promotionsand it helps in their career growth .The product providesbest search results. The users can update their profileanytime, anywhere . The users can provide feedback of using this web application based on their experience. The web application recommends the users as soon as the company announces hiring and they can apply quickly hence application will be before the deadline. The web applicationhas the chatbot where the users can interact and clarify their doubts .
5	Business Model	The product can be used by the educational institutions for their students who will begraduating soon and it can help them with their placement. The final year students can have account which can recommend the skills that need to be built that helps them to be hired and the vacancies available for them. The training centrecan use this application to recommend their trainees. The product can be used by the unemployed graduates toacquire new skills to be hiredand can get recommendationof jobs in their field of interest. The web application

		can be used by the employees who are unsatisfied with their currentposition and need to get promotions. It can also can be used by the employees who are willing to switch to a better company.
6	Scalability of the Solution	The web app is easy to use and the using guides will be provided. It provides quick job and Skill recommendations . The chatbot provides user friendly and interactive applications The users can use this web application in all kinds of devices like tab, desktop, mobile phones .It is a user friendly application and doesn't require any high storage or processing requirements.

3.4 PROBLEM SOLUTION FIT

Project Title : Skill/Job Recommender Application **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID34417



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR NO	FUNCTIONAL REQUIREMENT	SUB REQUIREMENT
1	User Registration	Registration through FormRegistration through GmailRegistration through LinkedIN

2	User Confirmation	Confirmation via EmailConfirmation via OTP
3	User Login	Login with username and password
4	User Profile	Filling the user details like experience, skill already have, area of interest.
5	Chatbot	User can interact and seek guidance through chatbot Raise queries and help through chatbot.
6	Access Dashboard	User can access the dashboard to get access toall the features of the application.
7	User profile updation	Update of the user's current status Updateuser's profile
8	User Privacy	User data must be protected and privacy mustbe maintained.The user data should not be disclosed with third party and the user must be aware of the data that is collected
9	User data maintenance	User data is maintained inthe database.When the user update their profile the database should get updated quickly.The data of the individual user should be maintained in a efficient way as the application provides personalized

		recommendations
10	Upload documents	User uploads the certificates and resumes.

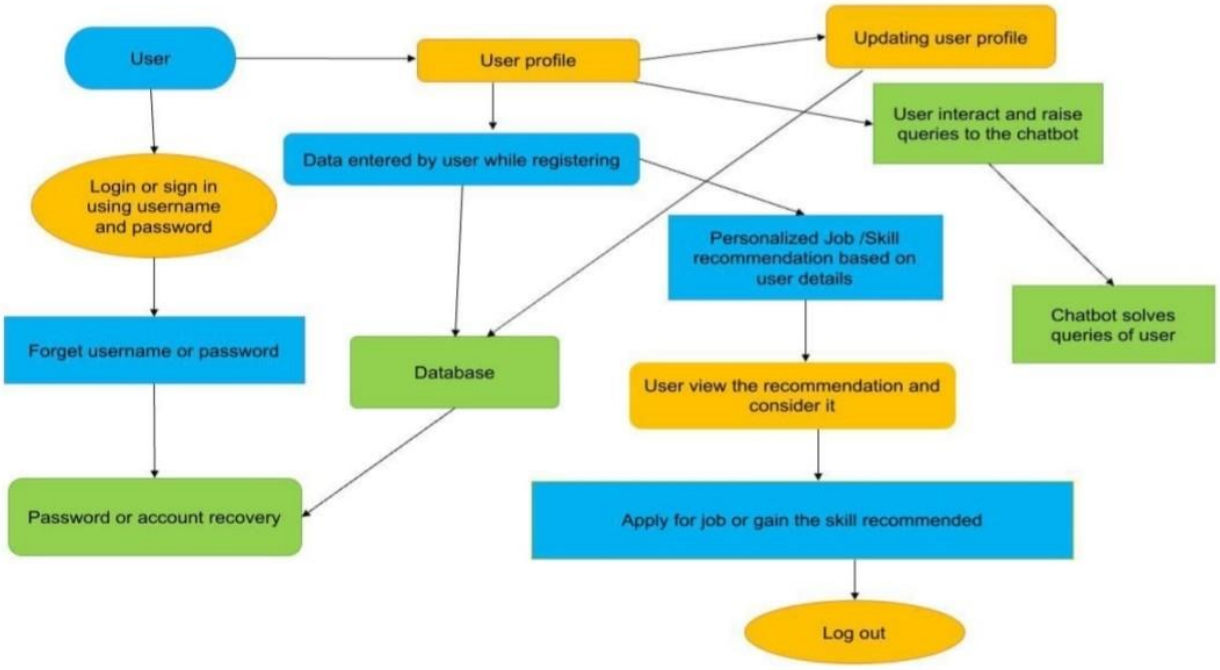
4.2 NON-FUNCTIONAL REQUIREMENT

NFR NO	NON-FUNCTIONAL REQUIREMENTS	DESCRIPTION
1	Usability	The application should be user-friendly and doesn't require any prior knowledge to use. The application features should be easy to use and access.
2	Security	The security of user data should be ensured and should be disclosed to the third party. The user must know what is the security policy used and what kind of data are collected.
3	Reliability	The application should be highly reliable. The job and skills recommended should be trustworthy. Theweb application should provide detailed description of job recommended . The jobs whose deadline has met should not be recommended.
4	Performance	The performance of the application should be

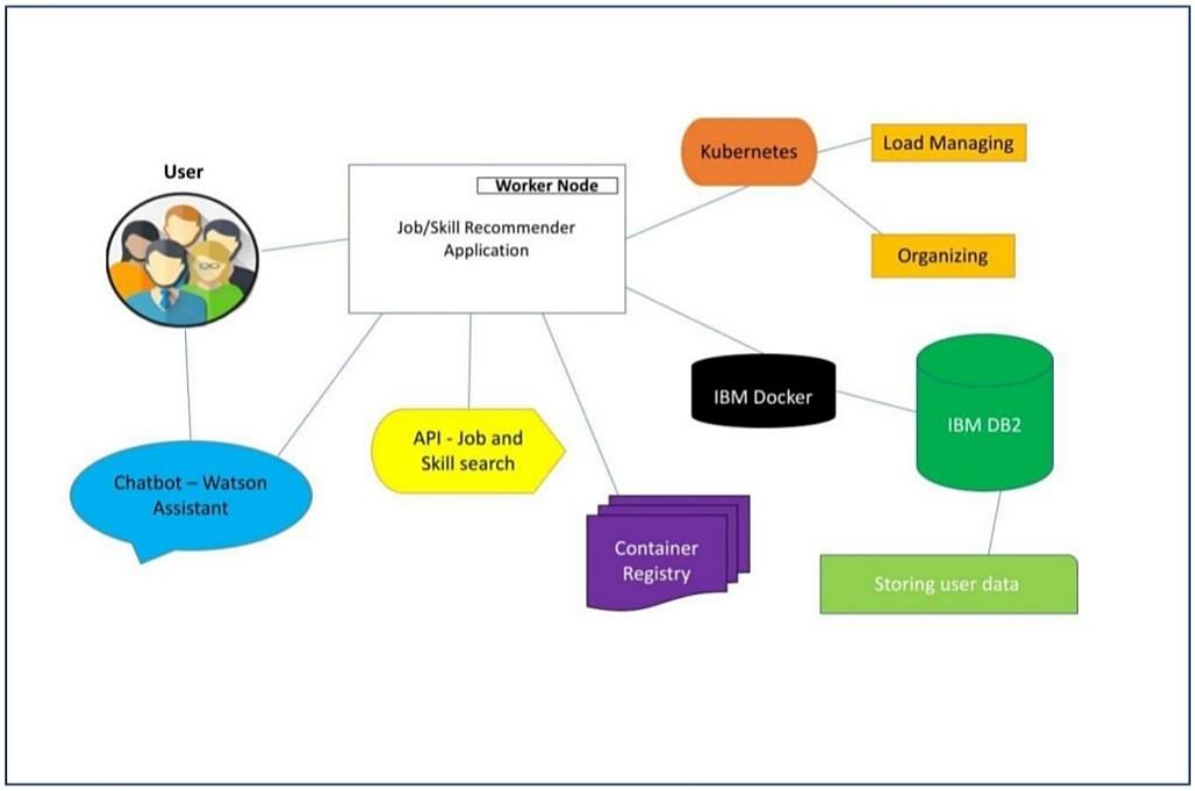
		good. It must provide services for users in high speed and should have quick search results. The performance should not vary for different devices like tab or mobile or desktop.
5	Availability	The application should be available anywhere and anytime. The updating should not slowdown the availability or performanceof the application. It should provide 100% availability.
6	Scalability	The application should not decline the response even when large number of users access at the same time

5. PROJECT DESIGN

5.1 DATAFLOW DAGRAM



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



5.3 USER STORIES

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 confirmi	I can access my account/dashboard	High	Sprint-1

			ng my password.			
		USN-2	As a user,I will receive confirmation email once I have registeredfor the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user ,I can registerfor the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user,I can log into the application by entering email &		High	Sprint-1

			password			
	Dashboard	USN-6	As a user,I can access allthe featuresfrom dashboard			
Customer(Web user)	Registration	USN-7	As a user,I can register for the application with usernameand passwordand then confirmi ng it.	I can access my account/d ashboard	High	Sprint-1
		USN-8	As a user,I will receive confirmation email after registrati on	I can receive confirmati on email & click confirm	High	Sprint-1
		USN-9	As a user, I can register the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2

		USN-10	As a user,I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-11	As a user ,I can log into the applicati on by entering email& password		High	Sprint-1
	Dashboard	USN-12	As a user ,I can access allthe featuresfrom dashboard			
Customer Care Executive	Support customer with their queries	USN-13	As a customer care executive,I should help and support the customer problems. I should		High	Sprint-2

			solve their queries.			
	Guide customers	USN-13	As a customer care executive, I should guide the customer begining from registration till applying for jobs.		High	Sprint-2
	Encourage customer	USN-14	As a customer care executive, I should encourage customer to use this applicatio n.		Low	Sprint-2
Administr ator	Login	USN-15	As a administra tor, I can login with my username and password	I can accessthe applicati on from administra tive side.	High	Sprint-2
	Monitorthe applicati	USN-16	As a administra tor ,I		High	Sprint-2

	on		should monitor the application whether it is working properly without any error			
	Monitorthe chatbot	USN-17	As a administrator , I should monitor the chatbot daily , Whether it solves the customer queries effectively.		Low	Sprint-3
	Monitorthe database	USN-18	As a administrator ,I should monitor the database.		Medium	Sprint-3
	Ensure security	USN-19	As a administrator, I should ensure the		High	Sprint-2

			security of the web applicati on whether there any bugs or any other.			
	Ensure privacy	USN-20	As a administra tor ,I should ensure the privacy of user data and it should not disclosed with the third party		High	Sprint-3
	Ensure performance	USN-21	As a administra tor, I should ensure the performan ce of the applicati on is goodand it givesquick, best and personalized recomme		Medium	Sprint-2

			ndations. The recommendations should be reliable			

6. PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

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	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-1		USN-2	As a user,I will receive confirmation email once I have registered for the	1	High	Keerthana. V Latha. M Indhusri. A Gowsika. P

			applicati on			
Sprint-1		USN-3	As a user,I can register for the application throughthe Facebook	2	Low	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-1		USN-4	As the user ,I can register for the application through the email	2	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-2	Login	USN-5	As a user,I can log into the applicati on by entering email&pas sword	1	High	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-2	Dashboard	USN-6	As a user,I can access allthe featuresfrom Dashboa	2	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P

			rd			
Sprint-2	Admin	USN-7	As a administrator ,I can login with my username and password	2	High	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-2		USN-8	As a administrator,I should monitor the application whether itis workinf properly without any error	2	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-3	Security	USN-9	As a administrator,I should ensure securityand privacy of user data	2	High	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-3	Technical Support	USN-10	As a administrator, I	1	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P

			should provide technical support to the users			
Sprint-3	Database	USN-11	As a administrator,I should maintain the database	1	Low	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-3		USN-12	As a user,I can store my data in database	2	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-4	Chatbox	USN-13	As a administrator,I should develop a chatbox to help the users with their queries	1	Medium	Keerthana. V Latha. M Indhusri. A Gowsika. P
Sprint-4	Testing	USN-14	As a administrator,I should	2	High	Keerthana. V Latha. M Indhusri. A Gowsika. P

			perform testing of the web application before making it public.			
Sprint-4		USN-15	As a administrator, I should ensure that the web application works proper;y by performing various tests	2	High	Keerthana. V Latha. M Indhusri. A Gowsika. P

6.2 SPRINT DELIVERY AND SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date(planned)	Story Points Completed (as on planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022

Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	18 Nov 2022

7. CODING AND SOLUTIONING:

7.1 FEATURE 1:

- Registration page
- Login page
- Profile page
- Job Recommendation page
- Log out user

7.2 FEATURE 2:

In this application theuser can create an acount and upload their CV and they can also select their interested fields. We can update the user about their progress and information from the company they have applied for. User can also ask for the support of Chatbot which is really user friendly.

Code:

app.py:

```
import hashlib
import re
import sqlite3
import uuid
from datetime import datetime, timedelta

import jwt
from flask import (Flask, jsonify, make_response, redirect, render_template,
                   request, url_for)
from flask_bcrypt import Bcrypt
from flask_login import (login_required, login_user, logout_user)

app = Flask(_name_)
bcrypt = Bcrypt(app) salt
= "5gz"
```

```
app.config["KEY"] = "Hello"


def verify(token):
   data = jwt.decode(token, "Hello", algorithms='HS256')return
   data["email"]

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

@app.route("/hr/sign in", methods=['GET', 'POST'])def
hrSignIn():
   if request.method == "GET":
      return render_template("./sign/hrsignin.html")else:
      email = request.form["email"]
      password = request.form["password"]
      with sqlite3.connect('hr.db') as connection:cursor =
         connection.cursor()
         cursor.execute(
            "SELECT email FROM RECRUITER WHERE email=?",
         (email,))user = cursor.fetchone()
         if user == None:
            print("No user")
            return redirect("/hr/profile")else:
            db_password = password+salt
            pw_hash = hashlib.md5(db_password.encode())

            cursor.execute(
                        "SELECT email,password FROM RECRUITER WHERE email=?",
(email,))
            details = cursor.fetchone()
            print(details)
            if pw_hash.hexdigest() == details[1]:
```

```
        token = jwt.encode({"email": email, 'exp': datetime.utcnow(
        )+timedelta(minutes=30)}, "Hello", algorithm='HS256')
        print(token)

        response = make_response(
            render_template("./feed/feed.html"))
        response.set_cookie('token', token)
        return response

    else:
        return "wrong password"
```

The other code features are in the below git hub link
https://github.com/IBM-EPBL/IBM-Project-38627-1660383769

8. TESTING

8.1 TESTING:

- Login page
- Registration page
- Profile page
- Job recommender page

8.2 USER ACCEPTANCE TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

Section	Total Cases	Not Tested	Fail	Pass

Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3

This report shows the number of resolved or closed bugs at each severity level, and how theywere resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

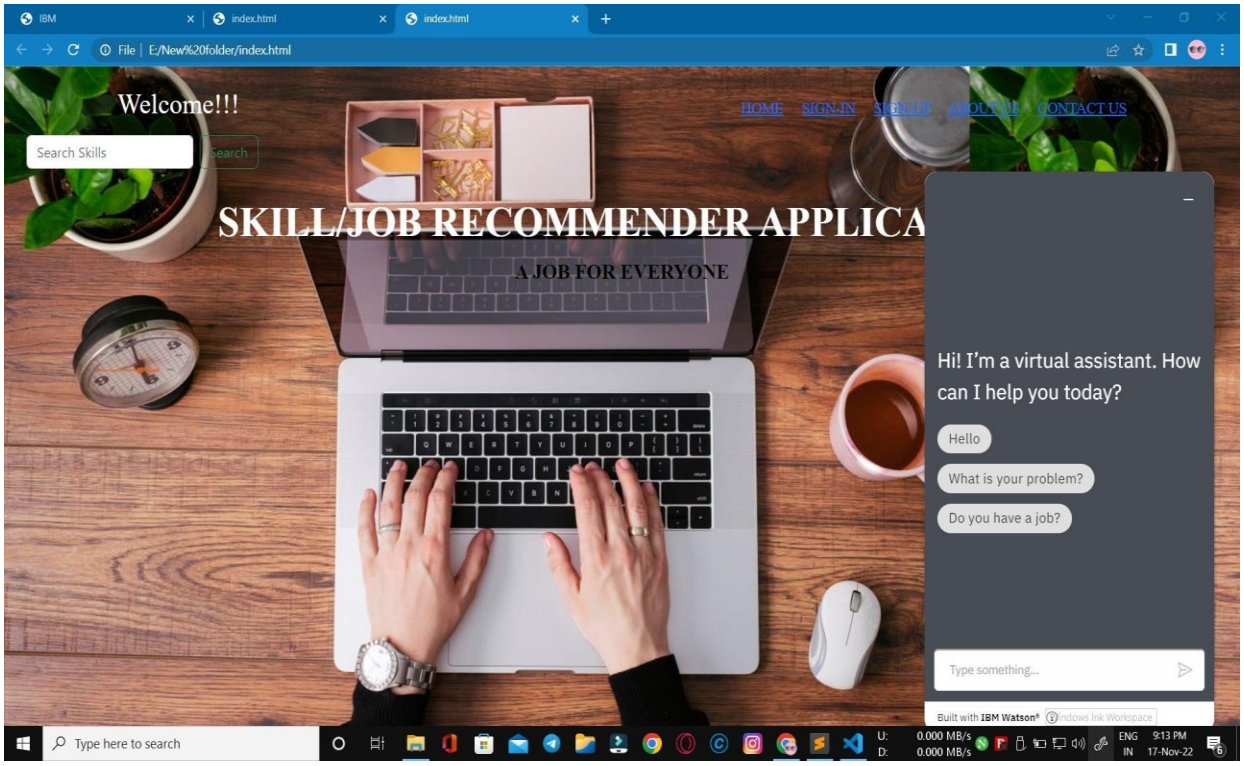
3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

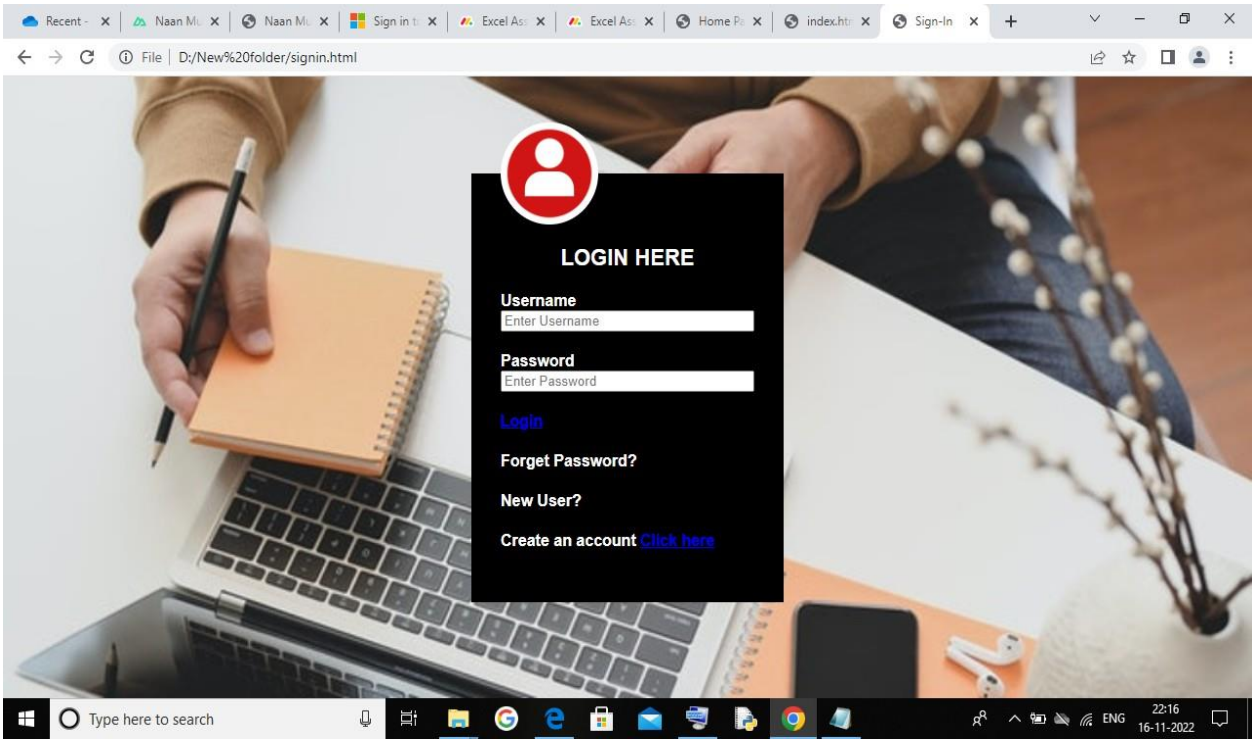
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

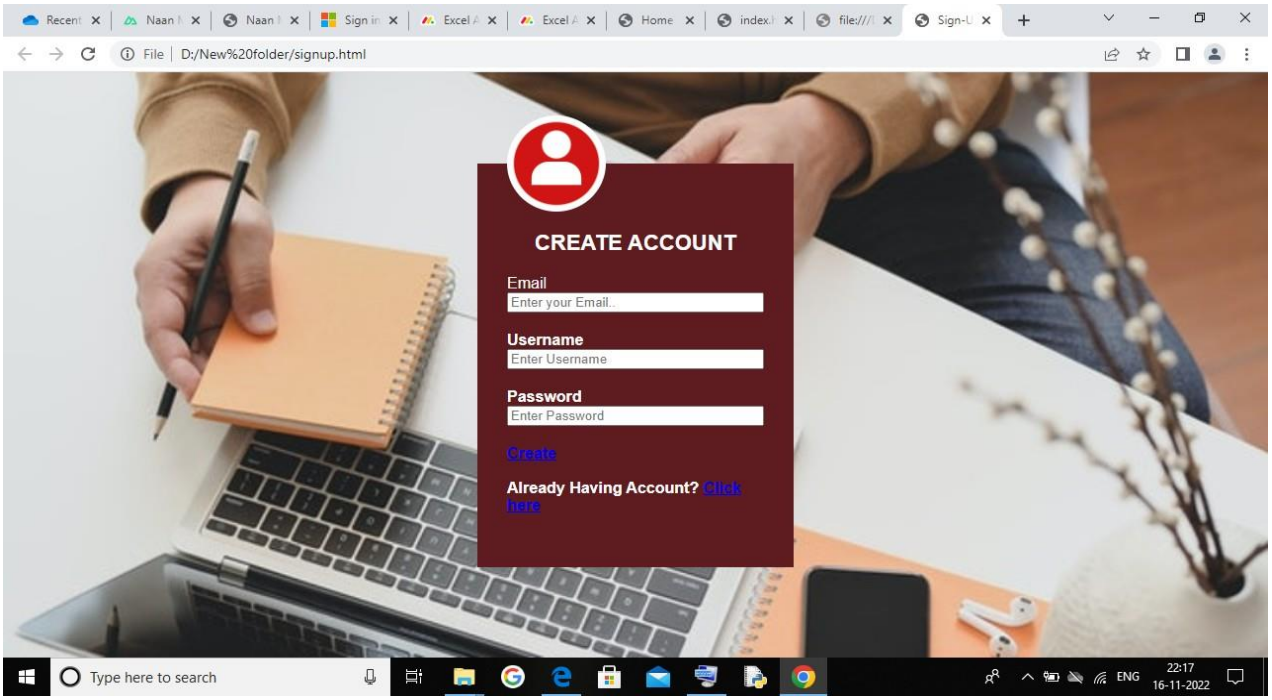
9.1 Home page:



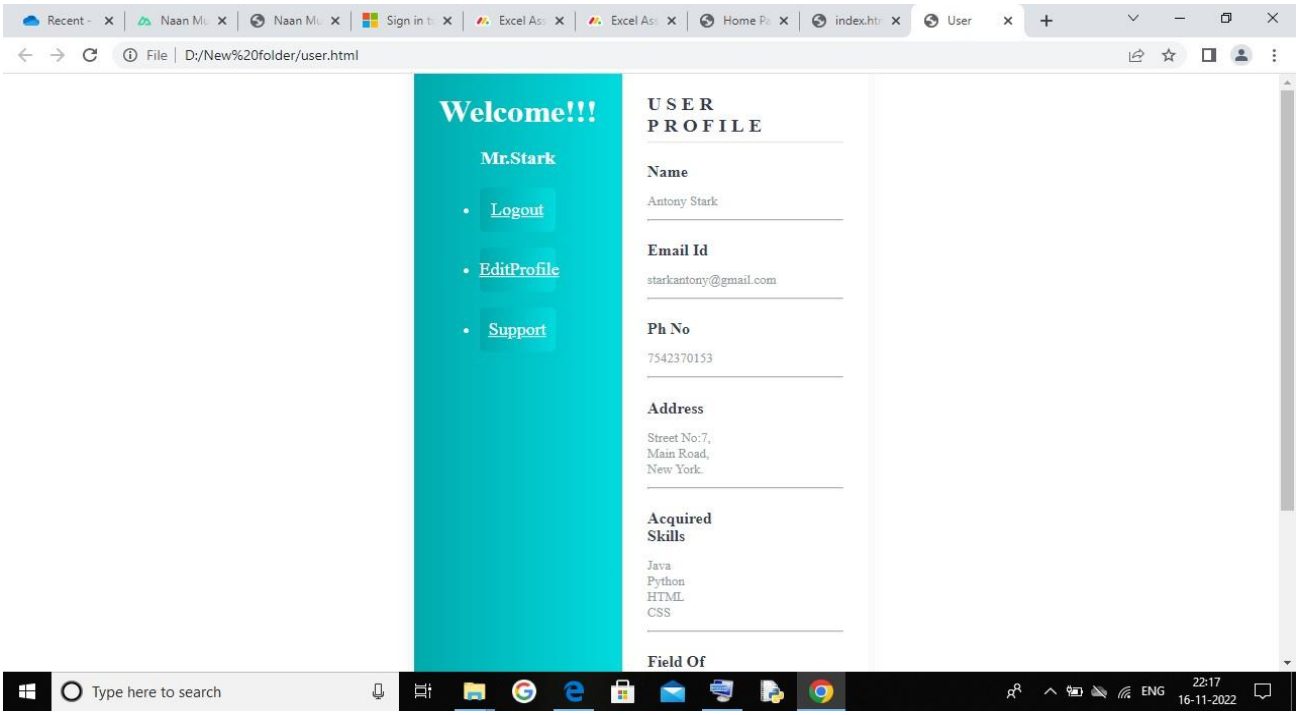
9.2 Login Page:



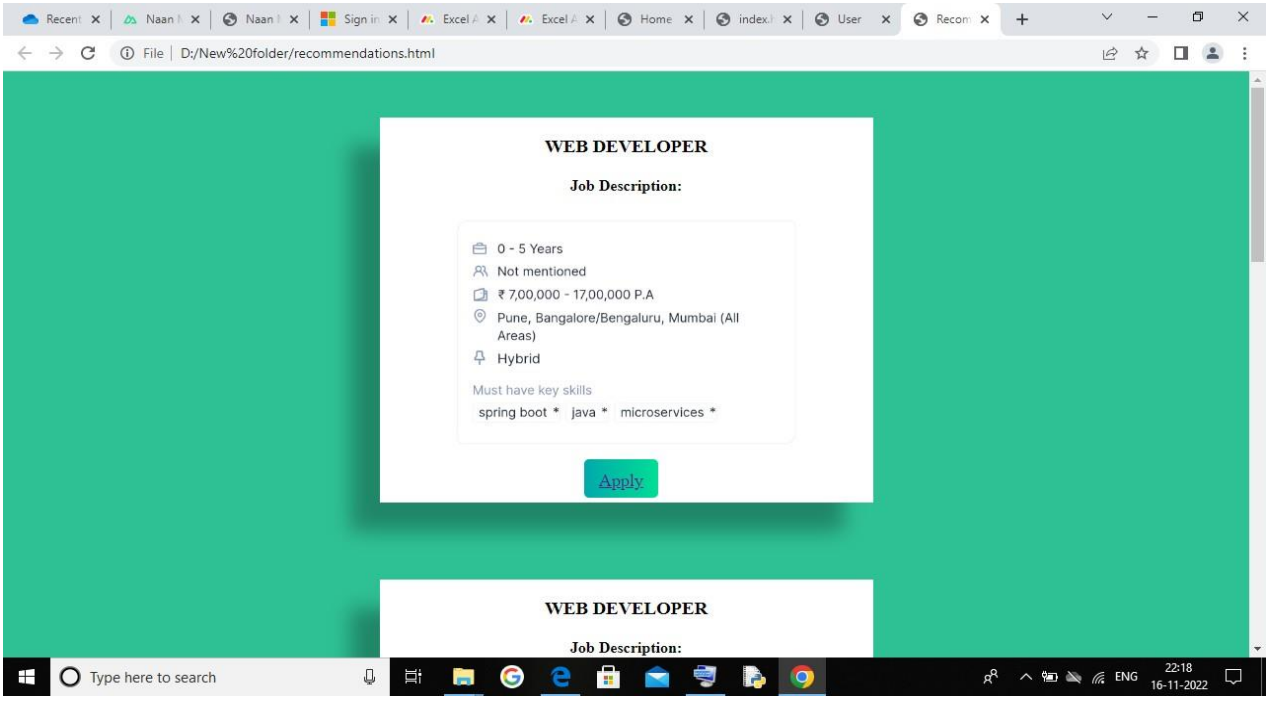
9.3 Sign up page:



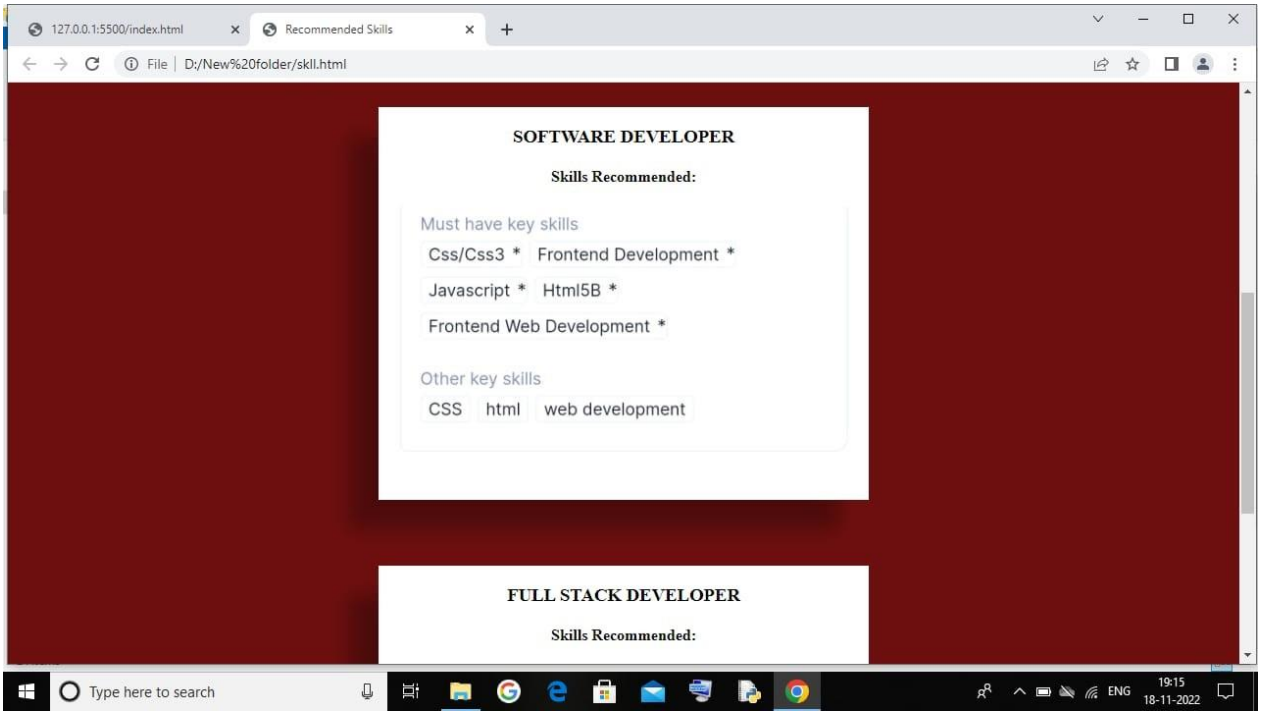
9.4 User profile:



9.5 Job recommender page:



9.6 Skills page:



10. ADVANTAGES AND DISADVANTAGES

10.1 ADVANTAGE

The System would benefit those users who have to use search engines to locate relevant content. They have to scroll through pages of results to find relevant content. Rather than searching for quality web pages, the users of this system would be directly taken to quality web pages matching their personal interests and preferences.The system would deliver quality web pages as it is not just dependent on the rating given by other users which could be deceiving at times. It provides personalized recommendations of Skill and jobs. User can easily search jobs of their field of interest. The user can easily search the skill that they need to improve for the jobs they are interested. There is no paperwork required. No manual work is needed. It is user-friendly and doesn't require any prior knowledge to use.

10.2 DISADVANTAGE

To access the application we need stable internet connection. The correctness of the user profile is question mark. The dataset need to be regulated and updated on the regular basis and it is a tiring process. The recommendation system

only recommends the jobs or skill and that doesn't mean that we are hired ,hence the users need to undergo next steps to to be hired which frustrate the user.The correctness of the data recommended is a question that makes the recommendation meaningless to the user. The Recommender doesn't have user moral support to the user who are demotivated.Limitation of dataset is a crucial disadvantage in recommending the skill or jobs to the user.

11. CONCLUSION

Developing a web application that provides job recommendation and skills need to be built to be hired, based on the their field of interest, previous experiences ,skills already built. The web application provides recommendations in a personalized manner. Existing system is error prone and slow as it includes human intervention. There are more chances of errors and incorrect results. The proposed system will help college placement office, job seekers to match the companies and help the users to get the skill they need to improve. We are mainly focusing on profile matching.

12. FUTURE SCOPE

The proposed recommendation system provides, only the recommendations and in future users who needs moral support can be provided by the support group. The validation of the user profile and the job notification will be ensured. The dataset can be improved so that the data will be feed to the system and no need of updating the dataset. The support group which provides motivation and support the users who are frustrated, panicked, depressed due to unemployment. The volunteer organization can be asked to collaborate to provide workshops , seminar for the key skills that required to be hired. Can collaborate with the companies to conduct a off- campus drive , so that all the users can attend them.

13. APPENDIX

Source code:

The source code has been uploaded in the following github link

https://github.com/IBM-EPBL/IBM-Project-38627-1660383769

Github and Projct demo link:

The Github link:

https://github.com/IBM-EPBL/IBM-Project-38627-1660383769

Demo link:

https://drive.google.com/file/d/1QoJq3qpgpp9UgLvdGL5KRfzwGNXgo9ze/view?usp=sharing