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CAREER ENGINE

By

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Bachelor of Technology, Jawaharlal Nehru Technological University Kakinada, 2018

GRADUATE CAPSTONE SEMINAR PROJECT

Submitted in partial fulfillment of the requirements

For the Degree of Master of Science,

With a Major in Computer Science



Governors State University
University Park, IL 60484

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ABSTRACT

People's education is so widely available in this age of tough competition that openings for them in jobs are getting harder to find. Companies need people in their fields with a solid educational foundation and maximum years of job experience. Finding people who are talented, intelligent, and competent enough to be given a position at that time is challenging. Companies are working harder than ever to find people who can meet their needs.[1] Thousands of applicants are competing for one job opening. When considering these difficulties, one may come up with a strategy or approach that can help manage and control them while also simplifying the work.

The goal of this project is to find that one thing that will not only connect job searchers and employers but also streamline the online application process. Here, the hiring procedure is managed by the system. This project will make it possible for job seekers from various walks of life to apply for a position in the organization for a potentially exciting job opening. Job seekers can utilize the application to update their profile information, competencies, and skill set. When job seeker applies for a position, they create an account and are referred to as the applied user.[1] User will get in touch with the recruiter to get updates if user were qualified. The recruiters, on the other hand, have the opportunity to post any new job openings they may have in their companies, interact with applicants if necessary, and interview qualified applicants. This system will be entirely under the admin's control, with the lone exception of the evaluation procedure, which is company-specific and hence unpredictable. The management of users, roles, and job listings is also included.

Although this is a modernized and improved version of the current process or system, it is by no means a novel concept. It's anticipated that this application will go live in the first week of December 2022.

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1 Project Description

In this era of intense competition, people's education is so widespread that job vacancies for them are becoming scarce. Companies want individuals who are professionals in their domains, who have a strong background and minimum no of work experience. It is difficult to locate individuals who are brilliant, smart and professional enough to be offered a job at that time. Companies' efforts to identify people who can satisfy their requirements are also growing.[2] For one job vacancy hundreds and thousands of candidates are applying. Wondering about these challenges, one can think about a method or some kind of solution that can manage, and control them as well as make the job less complicated.

This project is about that one solution which will not only become the bridge between job seekers and recruiters but also simplify this process which is done online. The system manages the hiring process here. This project will enable job seekers from across all backgrounds to apply for a position in the company for an interesting job opening that may be available. Job applicants can use the application to update their information and proficiencies or skillset.[3] After applying for the respective position, the job seekers will have an account and will be referred to as the applied user. If users were eligible, they will indeed communicate with the recruiter to receive updates. Coming to the recruiters have the option to upload new job opportunities they have in their respective companies, can connect with job seekers if required and conduct interviews for eligible candidates. The admin will have absolute control over this system, with the sole exception of the evaluation process, which is company-specific and thus cannot be predicted. It also includes the administration of users, roles, and job postings.

Although this isn't a novel idea, it will help us locate a qualified candidate in a crowd. However, this application has all the same capabilities as other job portals, including the ability to search for employment and filter results depending on needs. In addition, this solution will stand out and exceed the current system because of the four unique characteristics that we have included. The first is the Profile Score, which functions somewhat like a rating system for job applicants based on the specific positions they frequently apply for. Employers and recruiters can assess the suitability of applicants using this score. Second, fresh grads have limited chances in our expertise during the past few years. As we all know, early careers are driven by theoretical information, and they call for a chance and an opportunity to turn that knowledge into practical, hands-on experience. Third, here we give these individuals a quick and easy way to find particular positions that are relevant to them. We have something called an online resume/CV that is shared when applying for a job, along with the generated profile score because Easy Apply - Career Engine is designed to make the process as simple as possible. It consequently makes it simpler for recruiters to discover the ideal individual. Last but not least, there is ChatOn, which allows job searchers and recruiters to communicate openly and without making assumptions. By utilizing this function, the user can create a solid network and relationship that will benefit both of them.

This application is being built with the .NET web form framework. This includes HTML3, CSS, Bootstrap, JavaScript, ASP.NET, and C#, as well as a Microsoft SQL Server database

1.1 Competitive Information

In the market for job application portals, we faced other rivals, including monster, indeed, and linkedIn, all of which already had a sizable customer base. Our application, however, differs from linkedIn or indeed in that it offers new features that they do not, such as an early career option for recent graduates, and profile scoring, which is used to evaluate the user profile for the particular job to which the user wishes to apply, and most importantly, it is user-friendly. Our application ensures a quick and hassle-free job application process. We anticipate that these features will persuade more users to utilize our application.

1.2 Relationship to Other Applications/Projects

This project or application is in no way related to any other application. But this is an improved version of the already-available application on the market. Our application is independent and does not rely on any external information or software.

1.3 Assumptions and Dependencies

Below are the assumptions made on the career engine application

- There is no separate registration for the recruiters, by default all registered users will be considered job seekers initially. Once the user registered, users can apply for recruiter access.
- Career engine has a feature called “online resume” which is mandatory to be updated before applying to any job.
- The users have sufficient knowledge of computers.
- The computer should have an Internet connection and Internet server capabilities.
- The users know the English language, as the user interface will be provided in English
- The project can access the member's database.

1.4 Future Enhancements

We intend to launch our application, which is currently only available in the United States, globally after making the necessary improvements. In addition, we intend to launch a mobile application.

2 Project Technical Description

Audience & Purpose:

Individuals looking to explore and apply to new opportunities in their area of interest are target for this application.[4] Career engine is a job portal application which is designed to eliminate the existing process and transform the manual hiring process to automatic. This application is simple to use because of its 4 unique feature which is nowhere available in the market.

Technology Stack:

- Framework: .NET V4.5 (Asp web form)
- Front End: ASP.NET, HTML5, CSS3, Bootstrap
- Back End: C Sharp (#)
- Database: SQL Server Management Studio (SSMS)

Definition & Function:

Similar to other job portals, career engine allows users to search for career opportunities and filter results based on criteria. In addition, it is designed to focus on the problems that the current system has and offer the following solutions.

- **Easy to Apply:** In most of the existing systems job portals ask job seekers to submit their resumes and then fill out multiple forms and then submit them. We have a simple solution, after registering to the career engine, the user will be asked to fill up an online resume once. Later, whenever a user applies for any job, our tool will calculate the profile score and the online resume will be shared with the recruiter.
- **Profile Score:** As discussed in the first point to resume manual work and form filling, we have come up with a concept of profile scoring which works using an “N-Gram Algorithm”. It compares job-required skills and job descriptions posted by a recruiter to that job seeker’s entire profile and calculates scores in terms of percentage.
Ex: Score < 40 – Weak profile, Score > 40 and Score < 75 – Average Profile
Score > 75 – Strong profile
So, using this, job seekers can get to know how much their profile is inclined towards a job and what are the chances to get a job. Similarly, when a job seeker applies to that job, the profile score is shared with a recruiter as well. Which will also help them to determine which candidate is more suitable for them.
- **Early Careers:** Recent graduates are full of theoretical knowledge but they don't have any practical or real-time skills. And also, industry expects always the best candidate. So here we have a separate category for fresher/new graduates/early careers. Whenever a recruiter posts a job, we ask one question, is this job available for early careers? “YES/NO” based on the input we are showing the jobs. Job seekers can go to find a job and filter jobs using the dropdown provided.
- **ChatOn – Communication Channel:** We all believe communication is the best way we can build relationships and networks. In the existing system, we didn’t find any way to communicate between job seekers and recruiters through which there is a possibility that many lost a good opportunity, and few may didn’t understand the job market expectation, skills and job responsibilities. Let us assume If all of them who lost a job have this option to directly connect with a recruiter or vice versa. This is where we have incorporated the communication channel in our web portal which is the best way to solve the unnoticed problem.

Components/Modules & Explanations:

- **Home:** The homepage of our program serves as the default page and serves to display the header, footer, and body. We have a showcase graphic exhibiting a career engine in the body section. The goal of this module's featured job, which is used to highlight a position during job posting, is to demonstrate to job seekers that these positions are more likely to hire a larger number of applicants. As a result, recruiters view this as a feature. Online resume is an option that will take users to their profile page, where they must update their resumes before applying for jobs.
- **Find a Job:** This section offers the ability to search for jobs and filter them based on the user's preferences for the company, role, location, pay, etc. Additionally, the choice to request to be a recruiter is available. Initially, newly registered users are regarded as job seekers; however, if a user logs in and wishes to use recruiters' features, such as

posting a position, they must request to become a recruiter from the admin by using the button provided. Jobs will be listed below with apply option based on the filters user apply. Once a job seeker clicks the apply button, they are directed to another page named "applyjob.aspx," where the backend profile score is determined using the "N-Gram algorithm," basic details about the position are provided, and an application button is there.

- **My Application:** After applying for a job, job applicants can view all of the positions they've applied for in this section. There they can also choose to get in touch with the recruiter who posted the job and find out the status of their application.
- **Profile:** This part functions as an online resume; it is styled and organized similarly to the conventional resume. The bio, abilities, experience, and certification are all presented in the same format. Before applying for a job, the resume must be updated.
- **Post a Job:** This section is used to post jobs, where a list of predefined questions is asked by application, such as the role name, role description, necessary skills, cost to the company, location of the job, whether the job is a featured job, and whether or not this job is open to early career professionals. This allows us to categorize jobs depending on the information supplied by the recruiter when looking for employment. Below this, there is a grid view with a list of the jobs posted by the particular logged-in user and a "request for deletion" button. Let's say the employer received the desired number of applicants and has decided to withdraw the job posting for Job A, which is no longer available in our application. Using this option, they can request admin to remove.
- **Received Application:** This is the section where recruiters can see who has applied for their open positions. This information is added to a grid view and contains crucial details such as profile score, view profile, current application status, option to change status, and chat option to connect with specific job applicant.
- **Admin:** The person in charge of the application is known as the admin. An administrator can grant users access, revoke that permission, delete jobs, and post new jobs. Administrators have access to all of the sections that are described above. We have two grid views on this admin page. The first grid shows a list of users who have asked to become recruiters. The administrator has the choice to accept or reject this request here. Similar to the previous grid, the other one has a list of jobs that need to be deleted at the request of the recruiter. Additionally, admin has the choice to accept or deny this request here.

Database Tables & Explanations

In this project, we are using SQL Server Management Studio Database Tool to access, configure, manage, administer, and develop all sorts of database functionalities and queries.

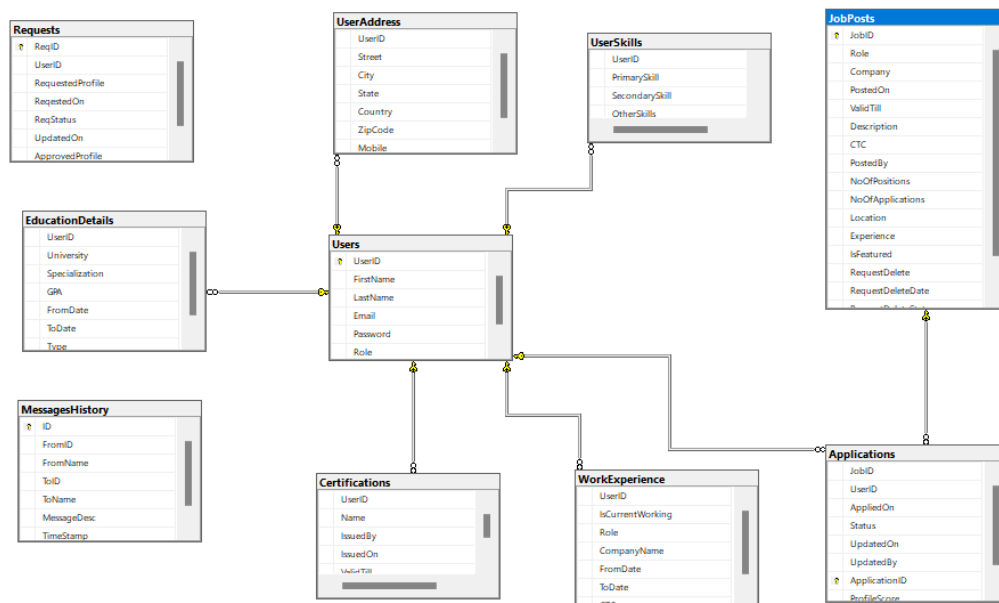


Figure 1: Career Engine Database UML Diagram

Table Name	Description
Users	This is the Schema in which user-related information like name, email, password, and bio are saved. This table is used when the user is registering or login into the portal
Applications	In this table, we keep a record of applications which are applied by job seekers.
WorkExperience	This Schema holds information about the work experience. In the Profile Section when the user updates their work experience. In this table, that information is stored.
Certification	This Schema holds the information about the certification they did. In the Profile Section when the user updates their certification. In this table, that information is stored.
EducationDetails	This Schema holds information about the educational background like school, and degree. In the Profile Section when a user updates their Education details. In this table, that information is stored.
Requests	This Schema keeps a record of the request made by job seekers to become recruiters.
UserAddress	This table is used to store the user address when they are updating their online resume in the profile section.
UserSkills	This Schema holds information about the user skills like primary, and secondary skills, In the Profile Section when user update their user skills. In this table, that information is stored.
JobPosts	This is the scheme which holds all the job postings which are made by a recruiter.

Table 1: Database Table Role & Explanation

2.1 Application Architecture

This project is developed using N-Tier architecture, which is also called multi-tier architecture because the processing, data management, and presentation tasks are physically and logically separated in the application.[3] To ensure that services are given without resource sharing and, as a result, are offered at maximum capacity, it follows that these various functions are housed on several computers or clusters.[3]

This application could be divided into three different levels using an N-tier design. In this case,

- Presentation Tier
- Logical Tier
- Data Tier

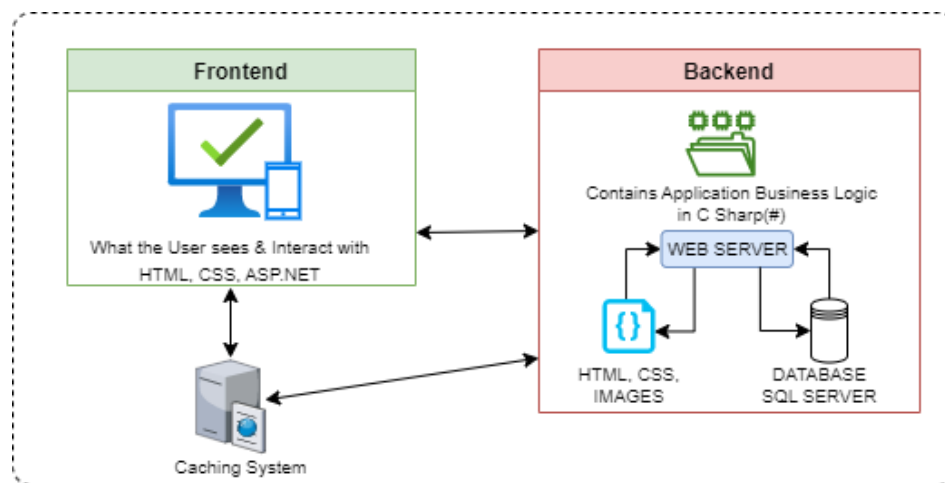


Figure 2: Career Engine Architecture

Presentation Tier

This layer contains the front-end design for our online application, which was created using ASP.NET, HTML5, CSS3, and Bootstrap. This tier's major goal is to get a feel for the user interface, which includes web pages, filter options, buttons, a navigation bar, tables, a grid, and other elements. [3]

Logical Tier

This layer serves as the intermediary layer between the two layers. This tier's primary goal is to analyze the business logic. The user hits the apply button, for example. Therefore, business logic that calculates the profile score and requests data tier to some form of data is being executed here in c sharp code. In simply making logical decisions and evaluation. [3]

Data Tier

Here the information is stored in the database in our case we have used SQL Server Management Studio. Here the data is processed and stored and then passed back to the logical tier example: a list of the job requested to be deleted. Then eventually it is bound to the frontend grid view and shown to the user. [3]

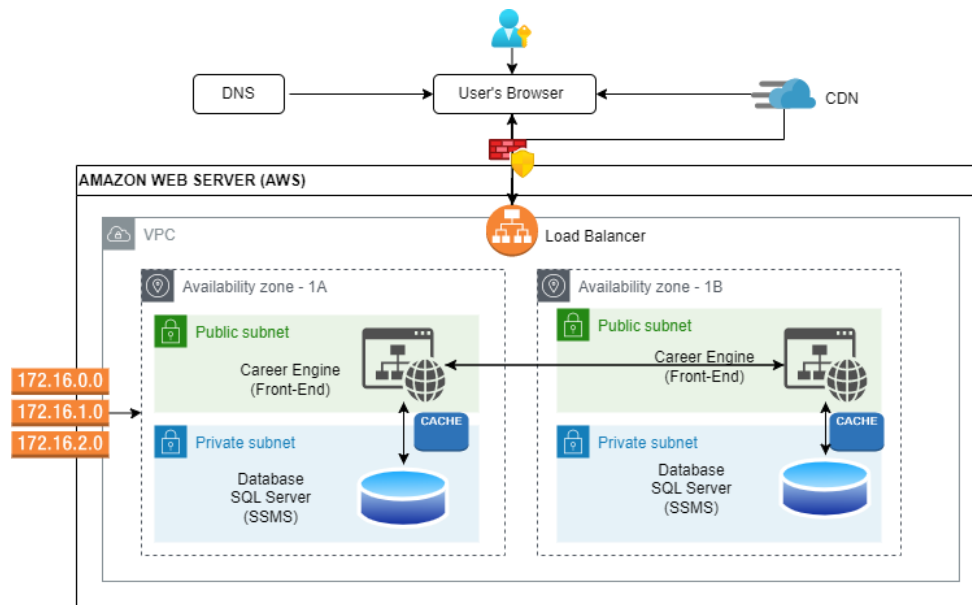


Figure 3: Cloud Deployment Architecture

In this project, we are using AWS as a cloud server in which we are expected to deploy our application i.e., career engine. In this architecture we have

- DNS - translates from machine-readable IP addresses (for example, 192.0. 2.44) to human-readable domain names (like www.careerenigine.com).
- CDN – Reduce latency and provide good user experience
- Load Balancer – To distribute the traffic to 2 different zone i.e., 1A and 1B
- Route Table – To store Private and Public subnet IP address, help to redirect traffic.
- Public Subnet – To deploy our web application in windows server using IIS web server
- Private Subnet – To use database in it, so that only our application can use.
- Cache – Storing some important information like role, email, name in session to perform business logic.

2.2 Application Information flows

Most of the information flow is occurred by the job recruiter or by the admin in Career Engine. Let us see the step-by-step process below:

- User data is updated to the database by registration process where a very little amount of information is collected like user name, password, etc.
- Once the user is registered user can able to fill out their profile which is also called an “online resume” information like previous work experience, education details, certification details, etc.
- A recruiter can post a new job in the portal by filling in the basic details like the cost to a company, company name, skills required, etc.
- Once a job seeker applies for a job, a recruiter can able to view the profile of the job seeker.
- A recruiter can request to delete the job which is posted and is no longer needed, Job seekers initially can request to become recruiter to admin. Whereas, the admin has information in their console to give access.

2.3 Interactions with other Applications

In this project, we are using SQL Server Management Studio V19. This is a database application which is been used in our application to store data and process them accordingly.

2.4 Capabilities

Capabilities in this scenario are the applications which are supporting our project to provide some sort of feature and functionalities. Below is the list of capabilities associated with this project.

- Database Application (SQL Server Management Studio)
SSMS is used in this project to provide data storing, retrieving and other CRUD operations. Using this our application can process data and showcase them to the end users. Data such as a list of job opportunities available to apply, profile data, etc.
- IIS Web Server Application
This is a windows server web deployment application using this we can deploy the files in the web server. In our case, we are using AWS in which our instance will be a windows server. IIS is a Microsoft web server that communicates with internet users to exchange static and dynamic web content. IIS can be used to host, roll out, and manage web applications built with ASP.NET and other technologies.

2.5 Risk Assessment and Management

The risk management approach for career engine projects involves systematic procedures in which we identify, score, and rank various risk estimates.[2] These risks were identified as early as possible, and are associated with the introduction of this project also this listed risk has been eliminated and no longer exists. Final project development is risk free. [2]

Here is the list of Risk Identification

- Image Quality Degradation Caused by a Network Connectivity Issue
- The database does not accept user input format strings.
- High Costs
- Profile Score was not accurately calculated.
- The integration of web applications and databases was not completed as planned.

Risk ID	Risk Name	Impact(High/Med/Low)	Priority (High/Med/Low)	Mitigation
1	Image Quality Degradation Caused by a Network Connectivity Issue	Low	Med	Ensure adequate testing is conducted. We have monitored we scenarios and converted all the images to webp format or jpg.
2	The database does not accept user input format strings.	High	High	We have changed the datatype of date formatted column to nvarchar. As ValidTill Column was not accepting default format.
3	High Costs	High	High	Estimated each element of our project accurately and stick closely to our budget.
4	Profile Score was not accurately calculated.	High	Med	We used "N Gram Algorithm" to calculate the profile score.
5	The integration of web applications and databases was not completed as planned.	Low	Low	In beginning of the project development. We have created table and procedure, Then worked on database integration.

Table 2: Risk Assessment & Mitigation

3 Project Requirements

3.1 Identification of Requirements

<GSU-GS_FA2022-1 User-Capability-000100> The project must allow new users to be added, updated, or deleted by the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000101> The project must allow new users to request as a recruiter.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000102> The project must allow all users to add, updated their profile.

Implementation: Mandatory

In profile section users are supposed to update their information such as, bio, previous work experience, certifications, education details, etc.

<GSU-GS_FA2022-1 User-Capability-000103> The project must allow recruiters to post job applications.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000104> The project must allow users to apply for the jobs by the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000105> The project must consist of different consoles based on user profile.

Implementation: Mandatory

<GSU-GS_FA2022-1 Functional-Capability-000106> The project should display and calculate the profile scoring for every job which user wants to apply by the application.

Implementation: Optional

Profile Score is used to define the worthiness' and credibility of the applicant. This score is calculated based on the resume which applicant updates using "N Gram algorithm".

<GSU-GS_FA2022-1 User-Capability-000107> The project must allow admins to accept the user request to delete the posted job and accept the role changes by the application.

Implementation: Optional

<GSU-GS_FA2022-1 Functional-Capability-000108> The project must allow users to easy apply a job by the application.

Implementation: Optional

Application is a straightforward and hassle-free job application process. There are no unnecessary questions asked when applying for jobs.

<GSU-GS_FA2022-1 User-Capability-000109> The project must allow users to filter jobs based on location, salary range, job title by the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000110> The project must allow recruiter to view and update applicants' status by the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 Functional-Capability-000111> The project must allow job seekers to check their application status by the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000112> The project must allow job seekers to chat with the recruiter in the application.

Implementation: Mandatory

<GSU-GS_FA2022-1 User-Capability-000112> The project must allow job seekers to find early career opportunities in the application using filtering.

Implementation: Optional

<GSU-GS_FA2022-1 Functional-Capability-000112> The project must allow recruiters to feature the job on home page.

Implementation: Mandatory

3.2 Operations, Administration, Maintenance and Provisioning (OAM&P)

The procedures, actions, tools, and standards involved in operating, administering, managing, and maintaining any system are referred to as operations, administration, and management (OA&M or OAM). This frequently holds for computer hardware, software and computer networks.[6]

Here we describe the operations, administration, maintenance, and provisioning (OAM&P) functions for Career Engine.

Maintenance

- Database backup and restore
We offer weekly automated backup in the AWS cloud. Customers can also request daily backups for which we will be developing a data dumping tool which will be scheduled in the windows web server. Using this automatically a backup of the database is done.
- Fault detection, isolation and reporting
As we are using AWS cloud provider, which has an inbuilt fault detection system. In case of a fault or issue, an automatic email and report will be generated and emailed to the respective team members so that developers can work on that issue as soon as possible.

Administration

- Software/Application upgrade
We will be sending the weekly update to the application, that update may be functional or non-functional. Our customers will always have the latest version of the career engine.
- Security
Security places an important role here, we are using AWS firewall to improve the security. In addition, we expect the customer to have an antivirus installed on their machine. Coming to server security we have installed Bitdefender on the windows operating server.
- Network size
This application is deployed in AWS which provides the option to scale the application based on the traffic and we will be configuring the autoscaling group in the respective AMI. So, whenever the traffic increases, we have a good number of servers available to handle.

Operations

- Technical support
We expect to deliver hassle-free service, and we know our customers are very important to us. Therefore, in case of any technical issue like password reset, fake job posting etc. We have technical support.
- Application Requirement
Once the application is live and used by our end, we may expect some real-time bugs or exceptions or may be our end user can give feedback on the developed application. Using this we are ready to understand the requirements and develop the next version of the application.

Provisioning

- Installing new servers
As the customer base increases, we expect users need latency-free applications. Thus, we install new servers based on the geographical location of the customers.

3.3 Security and Fraud Prevention

In this modern world, data is very crucial and the threat to the data is a big concern. In the career engine, we have listed below some of the possible internal and external security issues.

- Credential stuffing
Using credentials obtained from data breaches on one web app to log into another web app is referred to as "credential stuffing." They would start mass logins to bring down the website by hoping that some users will use the same username and password for numerous web apps.
- Brute force attacks
Credential stuffing is comparable to brute-force attacks. Cybercriminals would instead guess numerous different password and username combinations to overburden the online application rather than using passwords and usernames that have been discovered.

- **Cookie poisoning**
Millions of websites use cookies to store information in your web browser. When an attacker discovers the cookies used by a particular web application, they can poison them to steal all the data that the user has faith the program will keep secure. Cookies are used by millions of people to store data and simplify their lives; therefore, this can become a significant issue.
- **Sensitive data disclosure**
Sensitive data disclosure occurs when a web application accidentally exposes sensitive data. This typically happens when a web application's cybersecurity protection is insufficient.

3.4 Release and Transition Plan

We are building complete end to end CI/CD pipeline to deploy the web application in AWS cloud. The delivery of your software is automated through this pipeline.[5] Then the pipeline creates code, conducts tests (CI), and securely releases an updated application (CD). Automated pipelines eliminate human error, give developers uniform feedback loops, and facilitate quick product iterations.[5]

CI/CD Pipeline

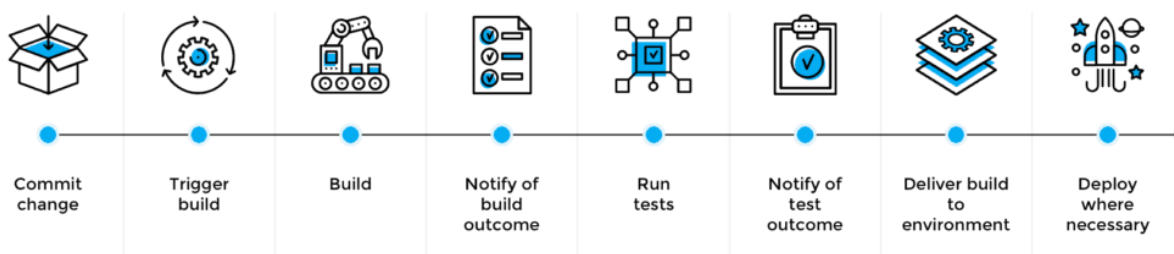


Figure 4: CI/CD Pipeline Process

Source: <https://www.plutora.com/blog/understanding-ci-cd-pipeline>

We expect to release the first version of the application in the first week of December. And based on the customer feedback we will determine the next phase and development.

4 Project Design Description

Career Engine has multiple modules, design sections and functionality which includes existing and unique characteristics.

Career Engine consists of 3 different types of users named Job seekers, Admin and Recruiters. These users have different functionality, role, and responsibility in this web application. Job seekers are the having access to register, and log in to the portal, they can search or filter the job posts. And most importantly they can update their online resume. Once done they can apply for the job and connect with the recruiter. Coming to the recruiter's perspective they can do all the stuff that job seekers can do additionally they have the option to post a job, review the application, and request some queries from administrators. Last, Admin are having full access to the application they can do what all job seekers and recruiters can do. In addition, they have the functionality to manage posts and users.

- Registration Page

This is the page where users need to come and join with the career engine to apply for the opportunity.

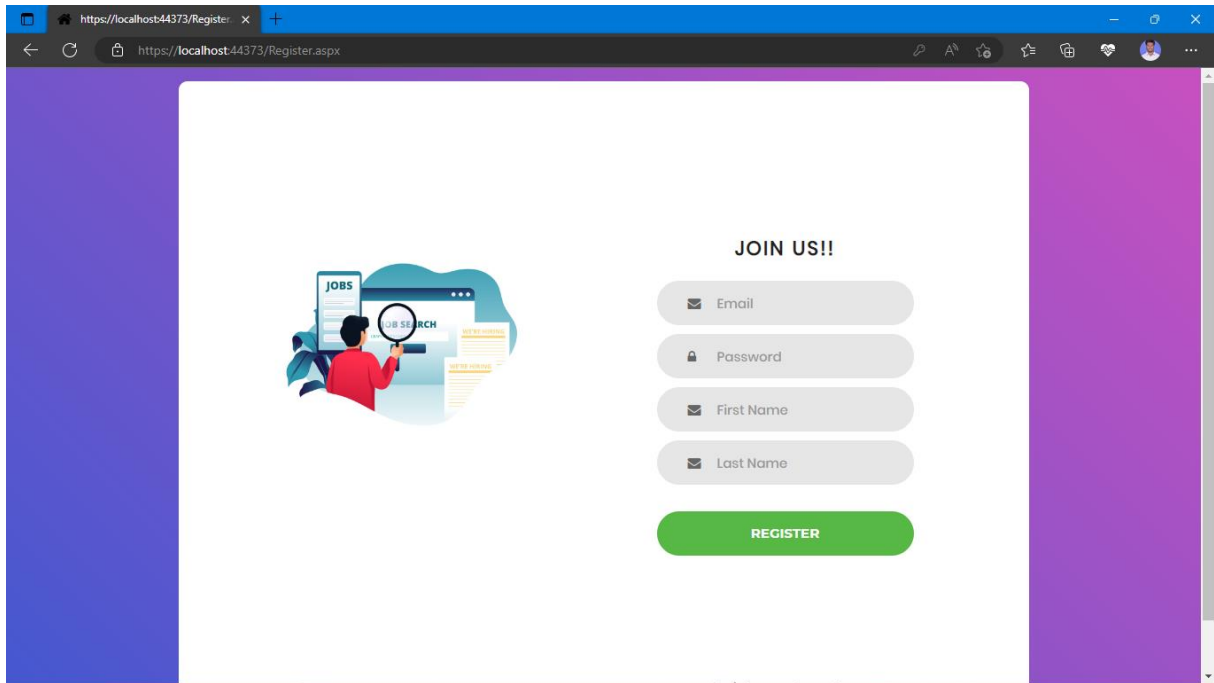


Figure 2: Registration

- Login Page

Once the user has registered with the career engine, initially they are assigned as a job seeker. To log in, they have to use the same email and password which they used while registration.

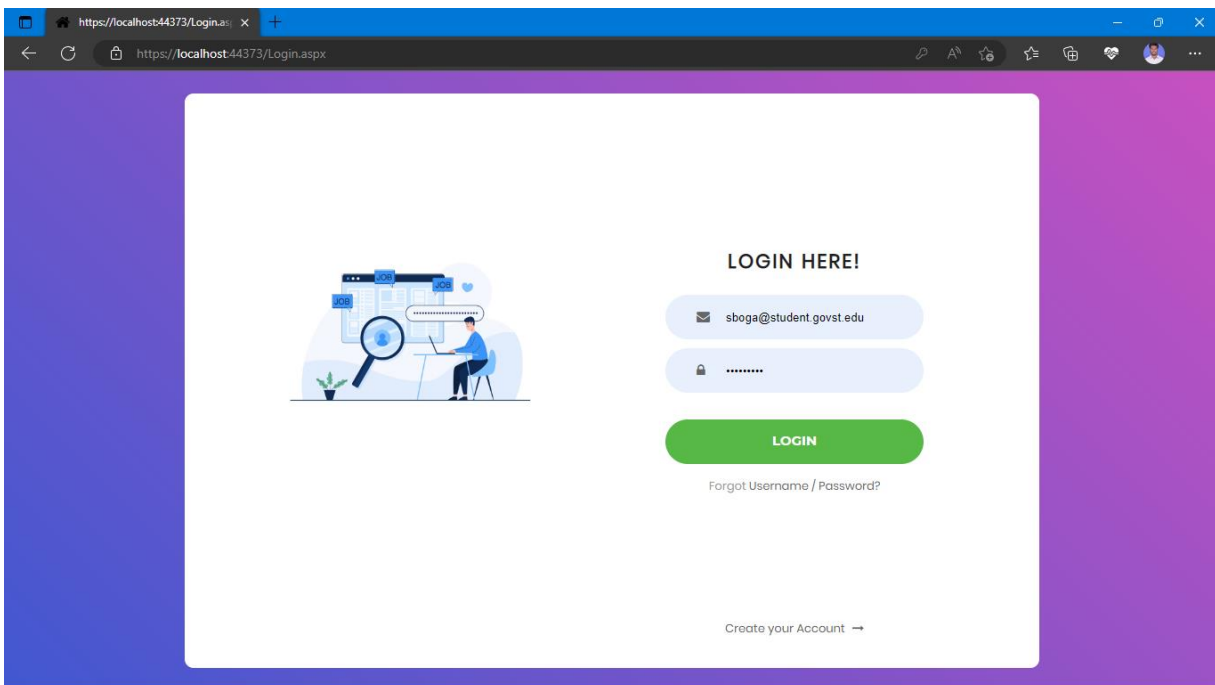


Figure 3: Login

- Home Page

This is the home page which has no major functionality except promoting job opportunities, this is the user landing whenever the user logged in to the web application.

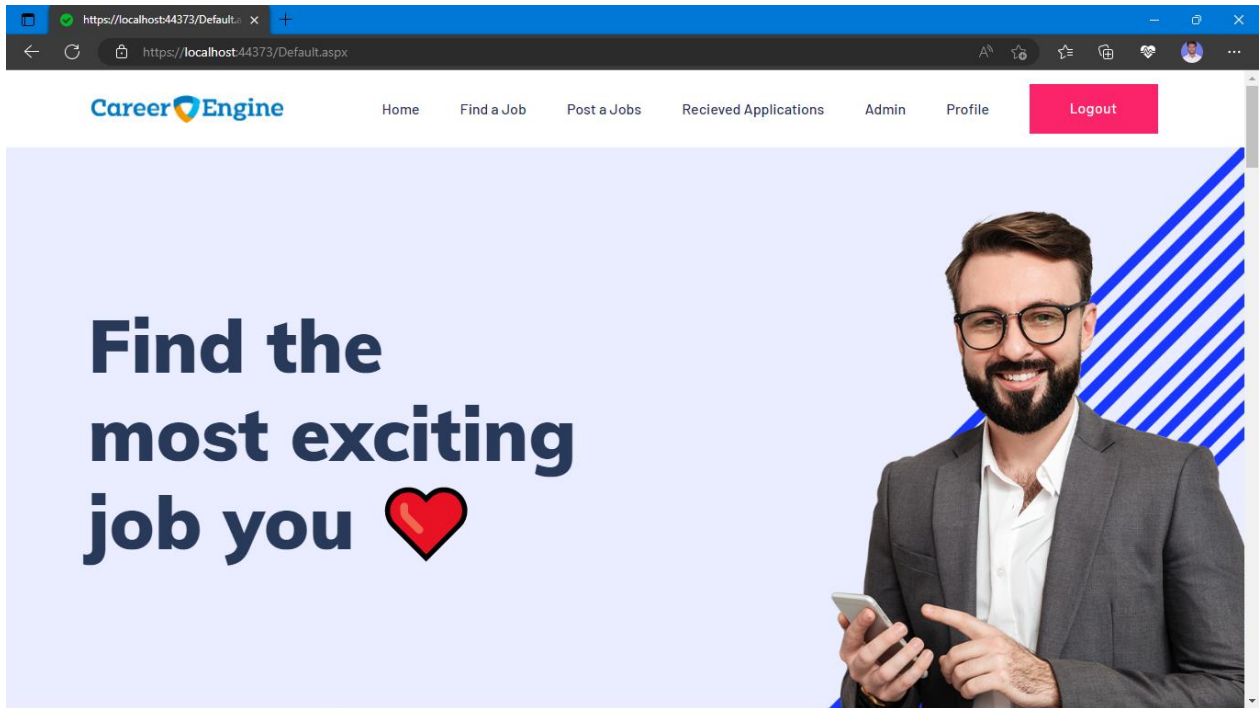


Figure 4: Home

- Home Page – Featured Section

This is the small section in home page, The goal of this module's featured job, which is used to highlight a position during job posting, is to demonstrate to job seekers that these positions are more likely to hire a larger number of applicants. As a result, recruiters view this as a feature.

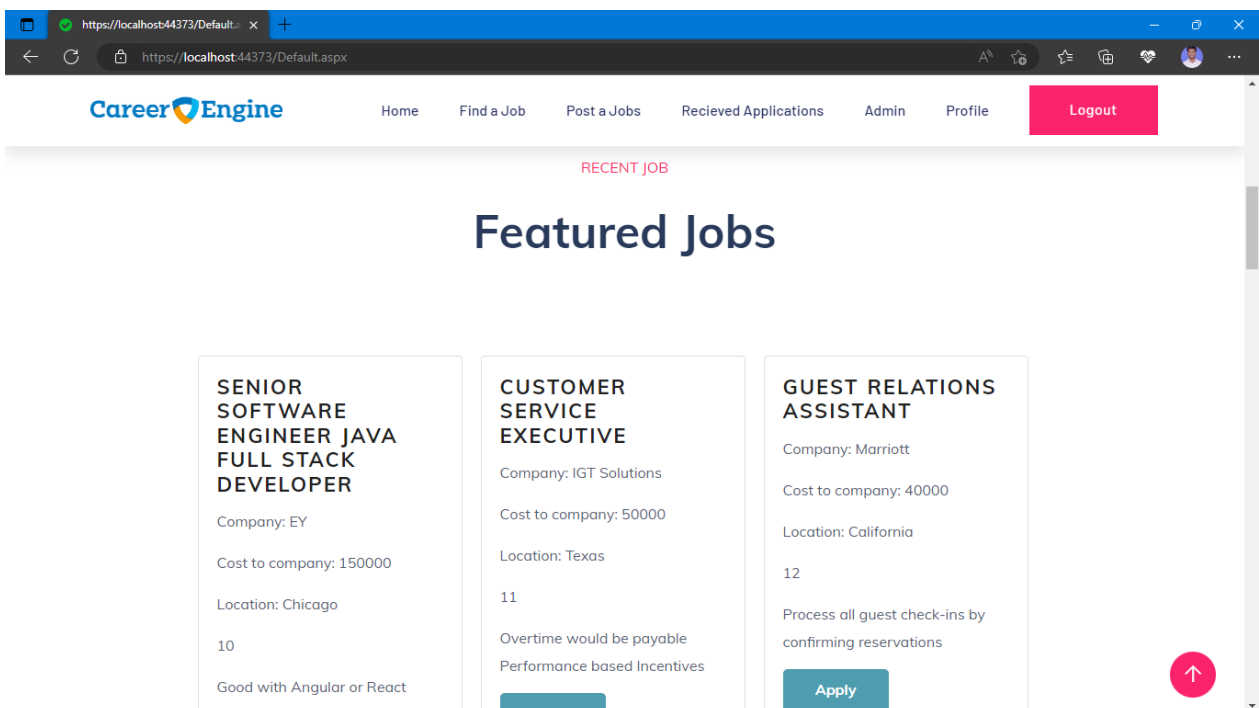


Figure 5: Featured Section

- Home Page – Online Resume
An online resume is an option that will take users to their profile page, where they must update their resumes before applying for jobs.

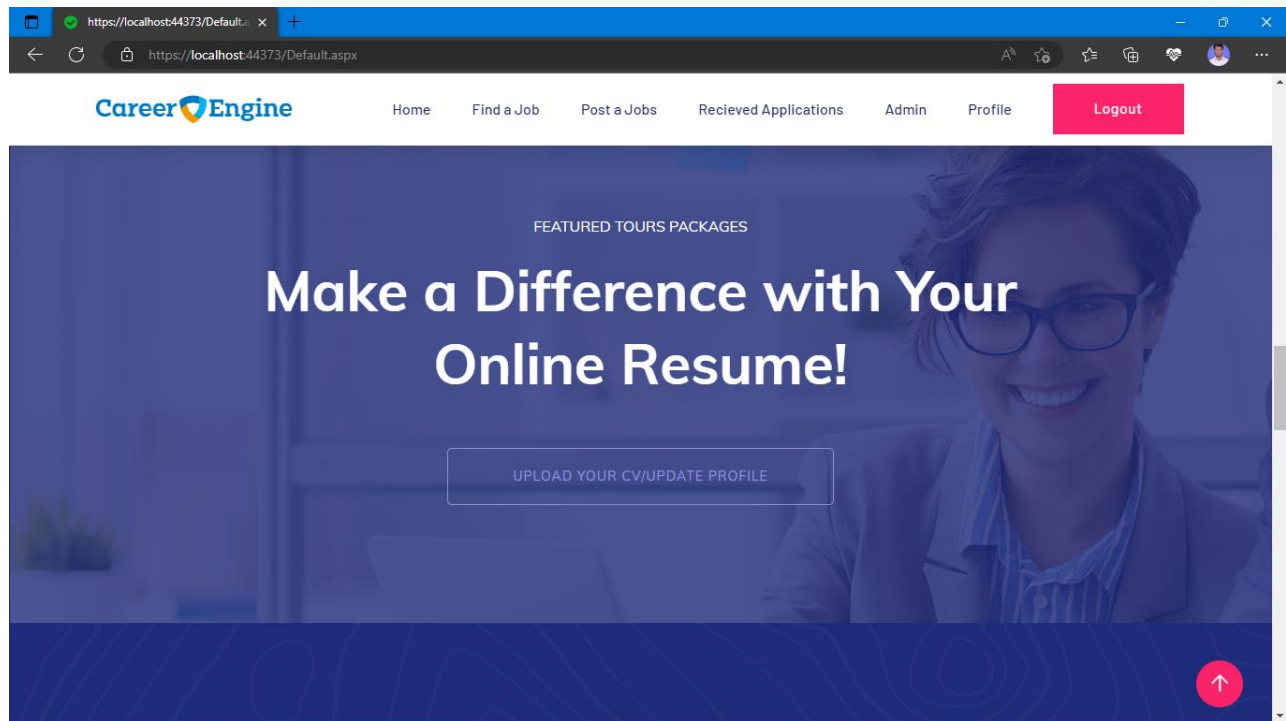


Figure 6: Online Resume

- Footer
Footer is no functionality, except that it provides the basic information about the website, contact information and most important how many recruiters and job seekers are registered with this application is shown.

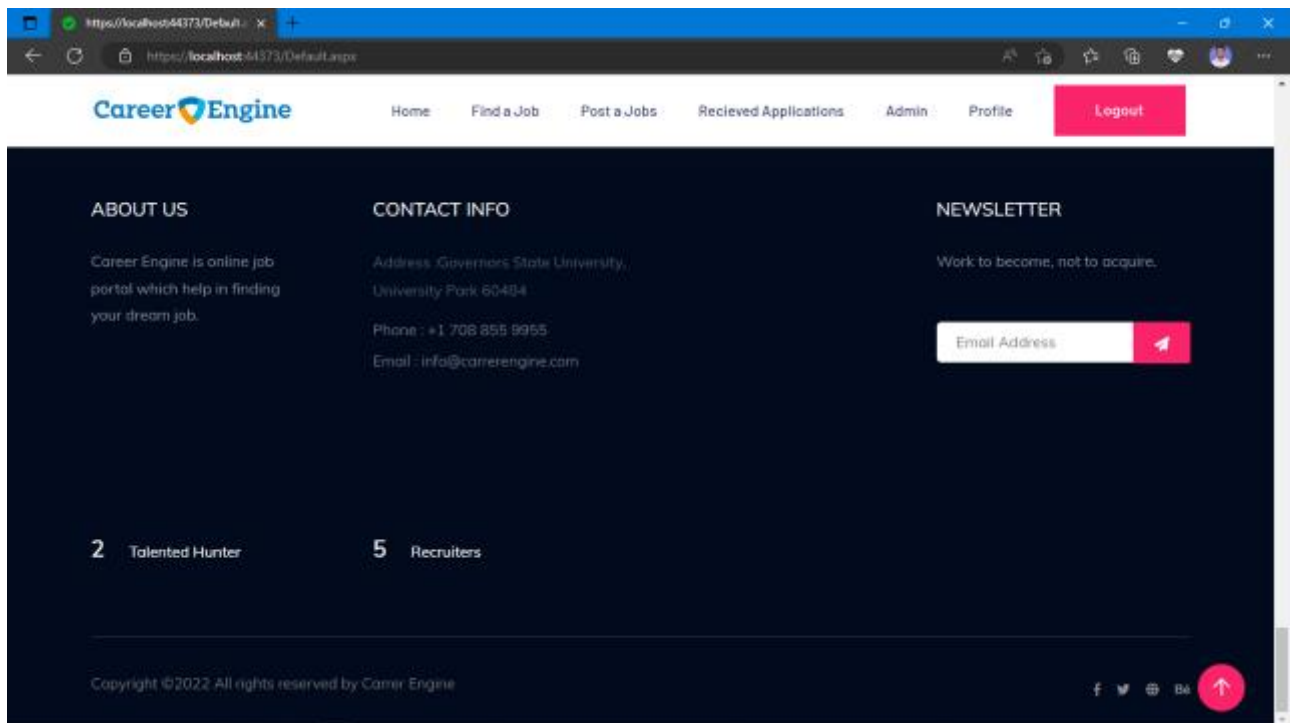


Figure 7: Footer

- Find A job**
 This section offers the ability to search for jobs and filter them based on the user's preferences for the company, role, location, pay, etc. Additionally, the choice to request to be a recruiter is available. Initially, newly registered users are regarded as job seekers.

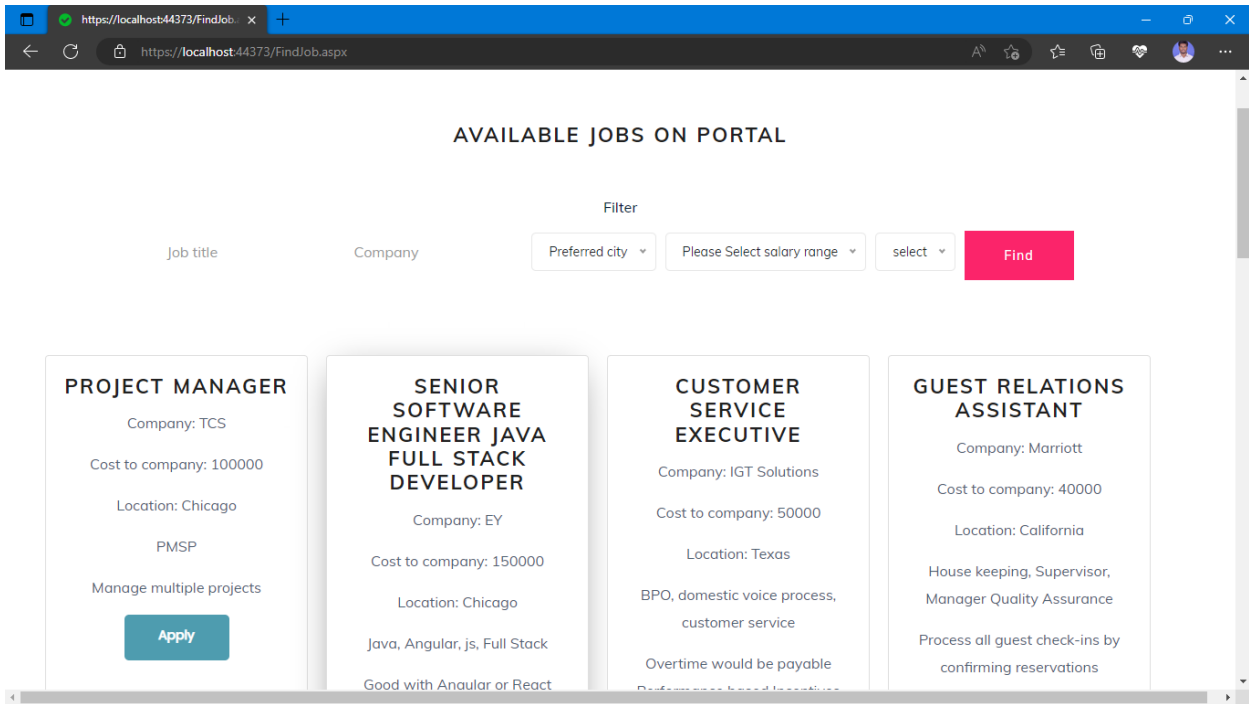


Figure 8: Find a Job Section

- Find A Job – Become Recruiter**
 If a user logs in and wishes to use recruiters' features, such as posting a position, they must request to become a recruiter from the admin by using the button provided.

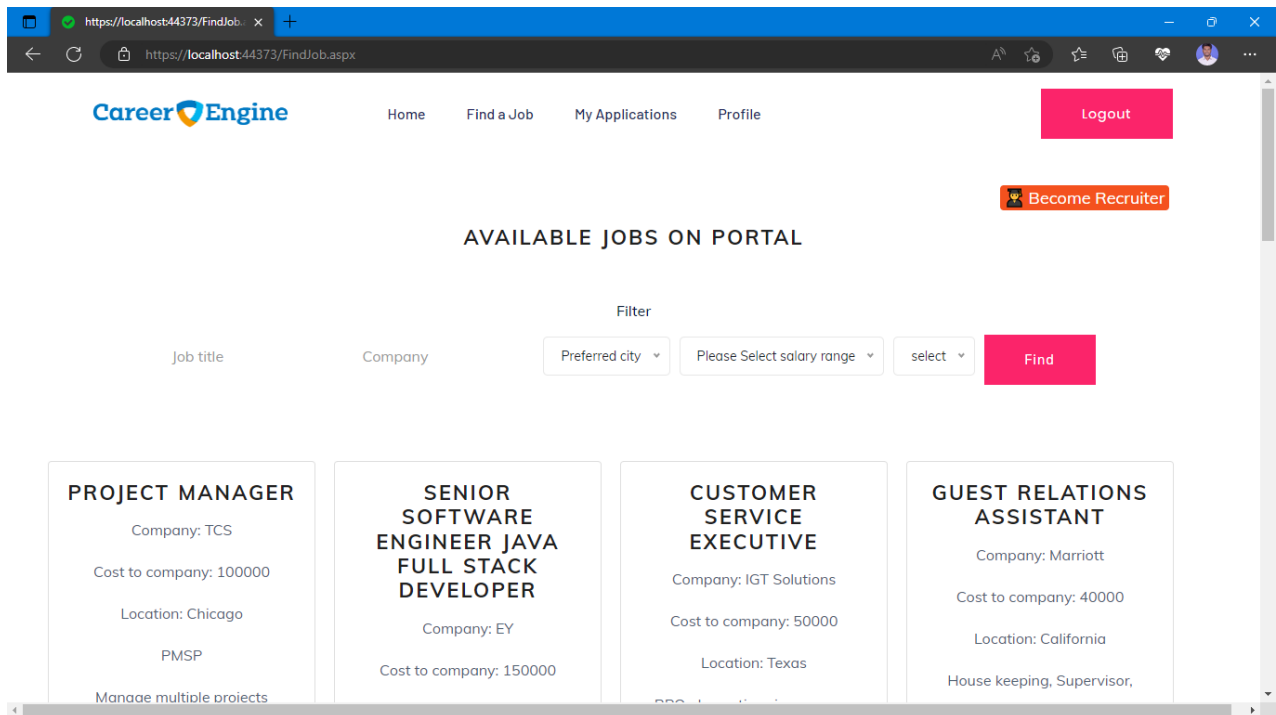


Figure 9: Become Recruiter

- Find A Job – Filtering**
 Users have given the filtering option to filter the job as they wish based on, job title, company name, location, salary and early career. Once the find button is clicked the posted job will be filtered accordingly and shown.

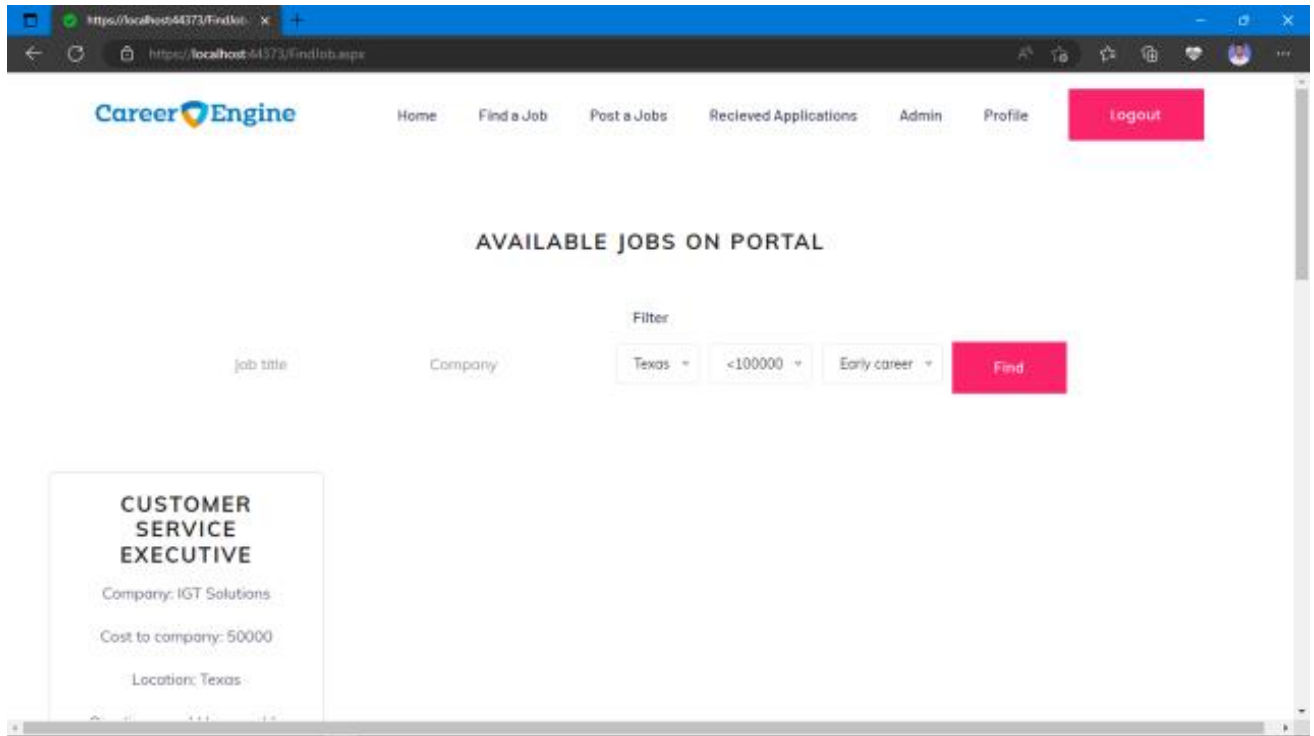


Figure 10: Job Filtering

- ApplyJob**
 When the user clicks on the above apply button they are navigated to this page. where the backend profile score is determined using the "N-gram algorithm," basic details about the position are displayed, and apply option is shown.

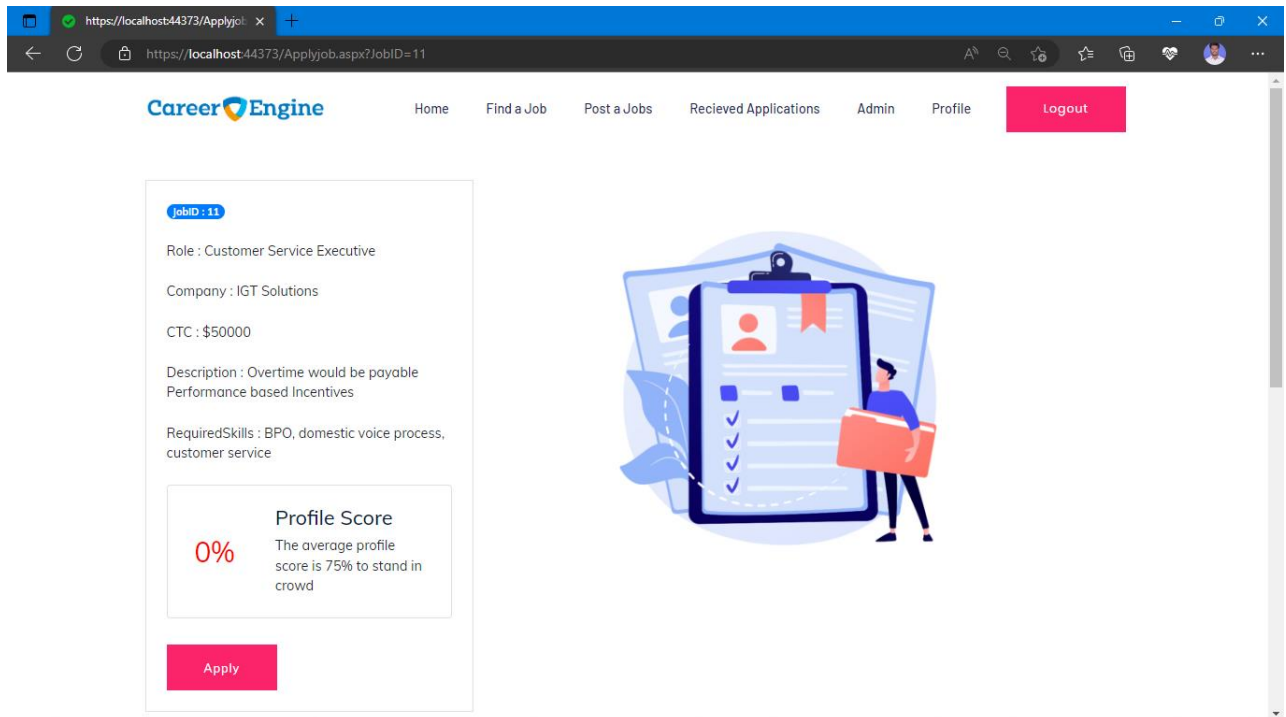


Figure 11: Apply to Job

- Post A Job

This section is used to post jobs, where a list of predefined questions is asked by application, such as the role name, role description, necessary skills, cost to the company, location of the job, whether the job is a featured job, and whether or not this job is open to early career professionals. This allows us to categorize jobs depending on the information supplied by the recruiter when looking for employment.

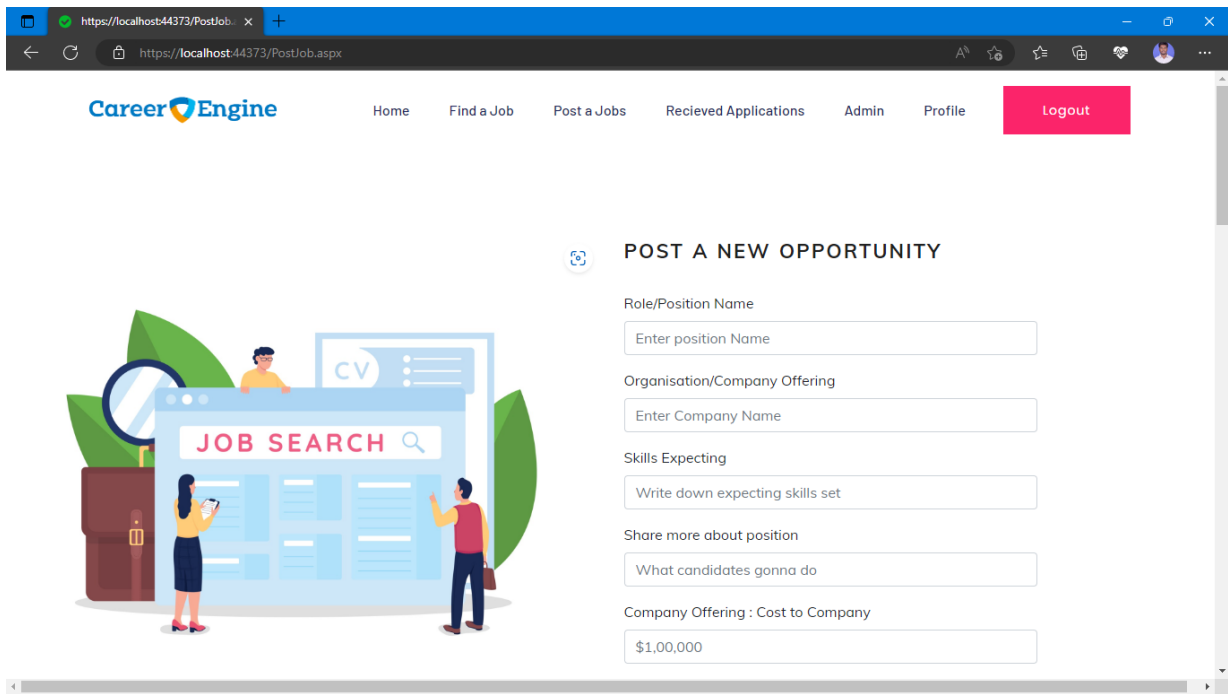


Figure 12: Post a Job

- Post A Job – Request Job Deleting

This is a grid view with a list of the jobs posted by the particular logged-in user and a "request for deletion" button. Let's say the employer received the desired number of applicants and has decided to withdraw the job posting for Job A, which is no longer available in our application. Using this option, they can request the admin to remove it.

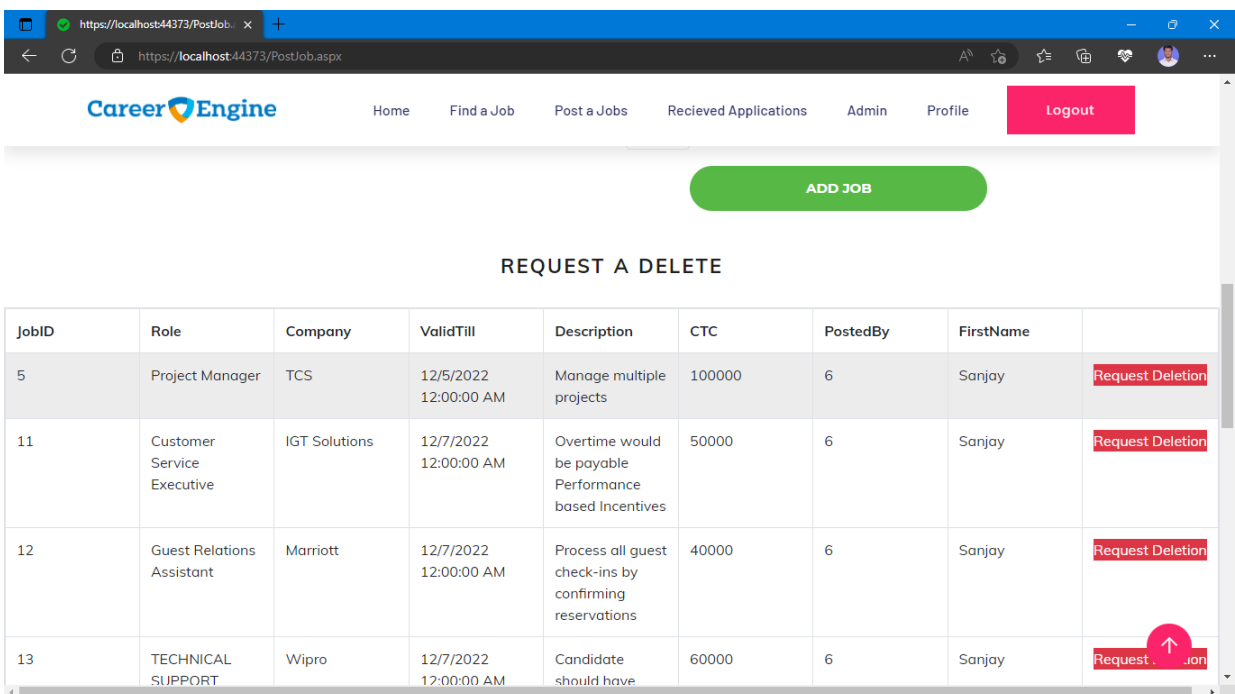


Figure 13: Request Job Deletion

- Received Application

This is the section where recruiters can see who has applied for their open positions. This information is bound to a grid view and contains crucial details such as profile score, view profile, current application status, option to change status, and chat option to connect with the specific job applicant.

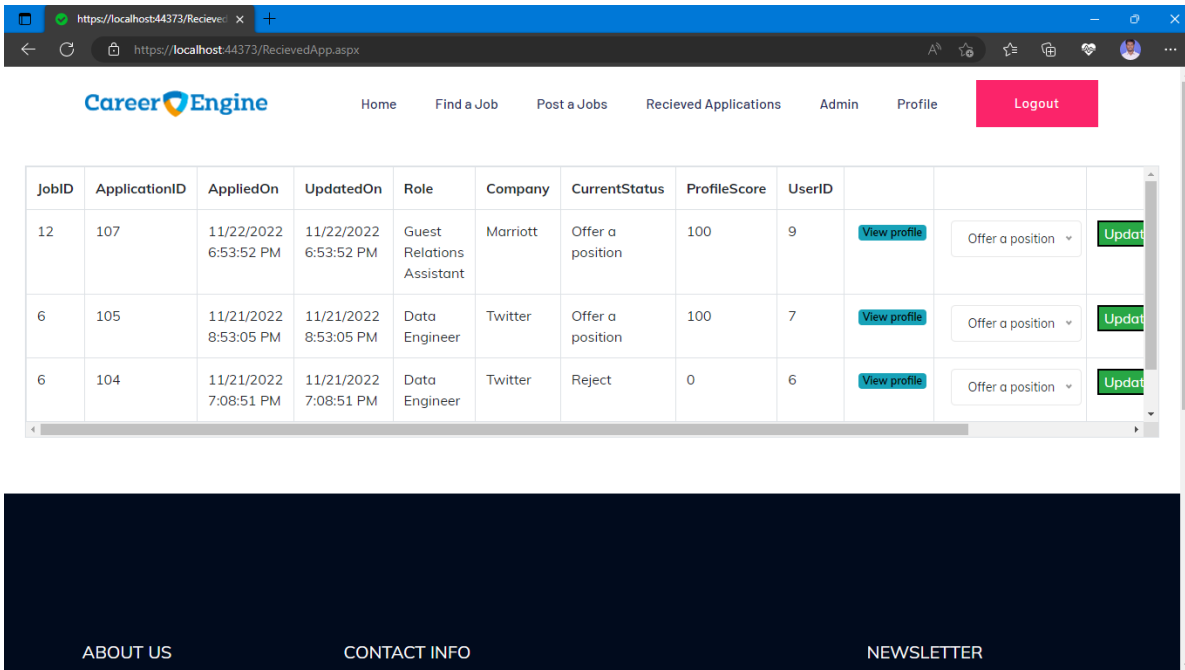


Figure 14: Received Application

- Admin Console

The person in charge of the application is known as the admin. An administrator can grant users access, revoke that permission, delete jobs, and post new jobs. Administrators have access to all of the sections that are described above. We have two grid views on this admin page. The first grid shows a list of users who have asked to become recruiters. The administrator has the choice to accept or reject this request here. Similar to the previous grid, the other one has a list of jobs that need to be deleted at the request of the recruiter. Additionally, the admin has the choice to accept or deny this request here.

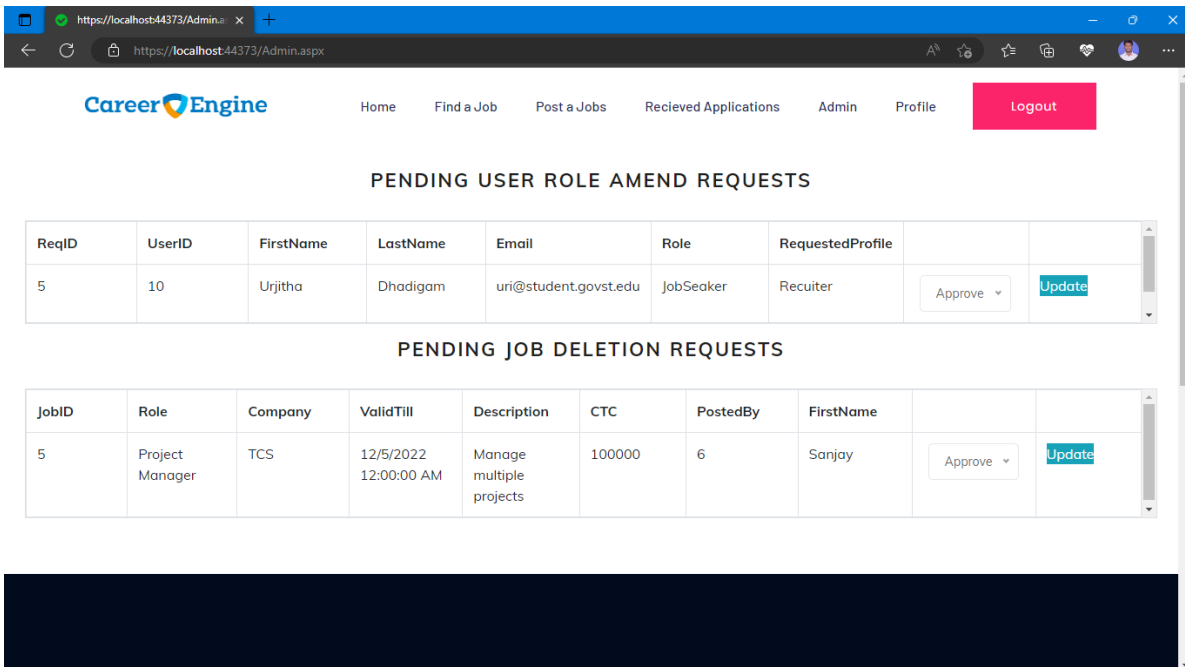


Figure 15: Admin Console

- Profile Console

This part functions as an online resume; it is styled and organized similarly to the conventional resume. The bio, abilities, experience, education, and certification are all presented in the same format. Before applying for a job, the resume must be updated.

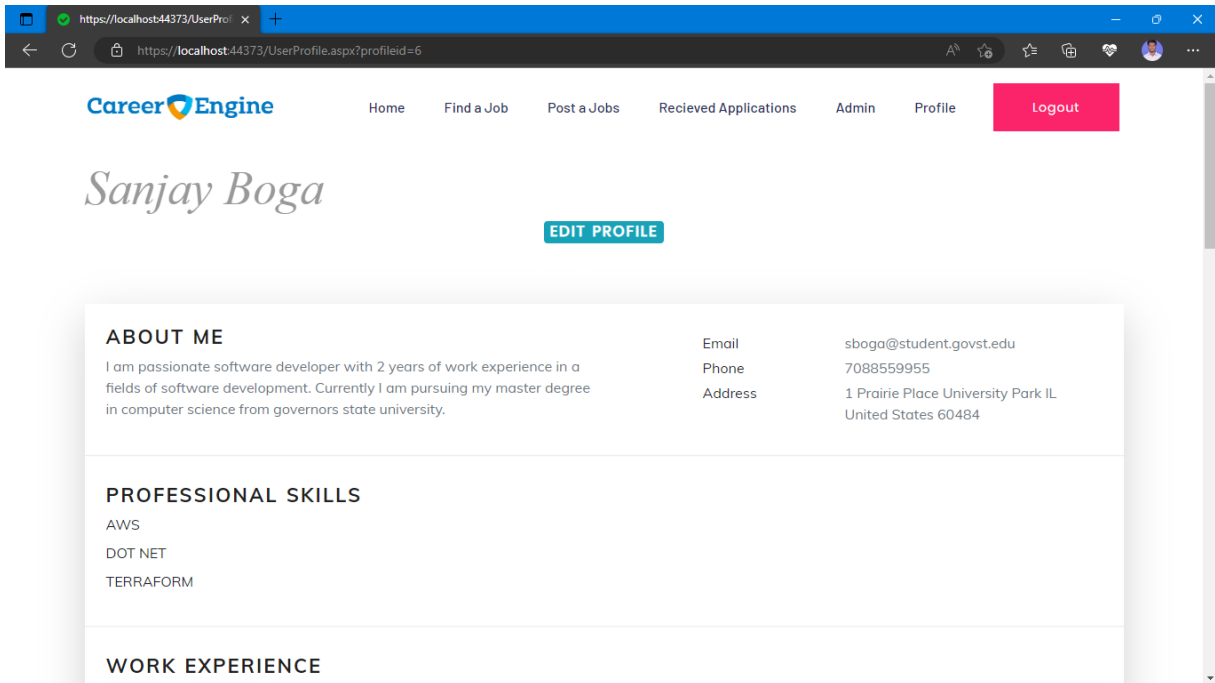


Figure 16: Profile Section

- ChatOn – Communication Channel

We all believe communication is the best way we can build relationships and networks. In the existing system, we didn't find any way to communicate between job seekers and recruiters through which there is a possibility that many lost a good opportunity, and few may didn't understand the job market expectation, skills and job responsibilities. Let us assume If all of them who lost a job have this option to directly connect with a recruiter or vice versa. This is where we have incorporated the communication channel in our web portal which is the best way to solve the unnoticed problem.

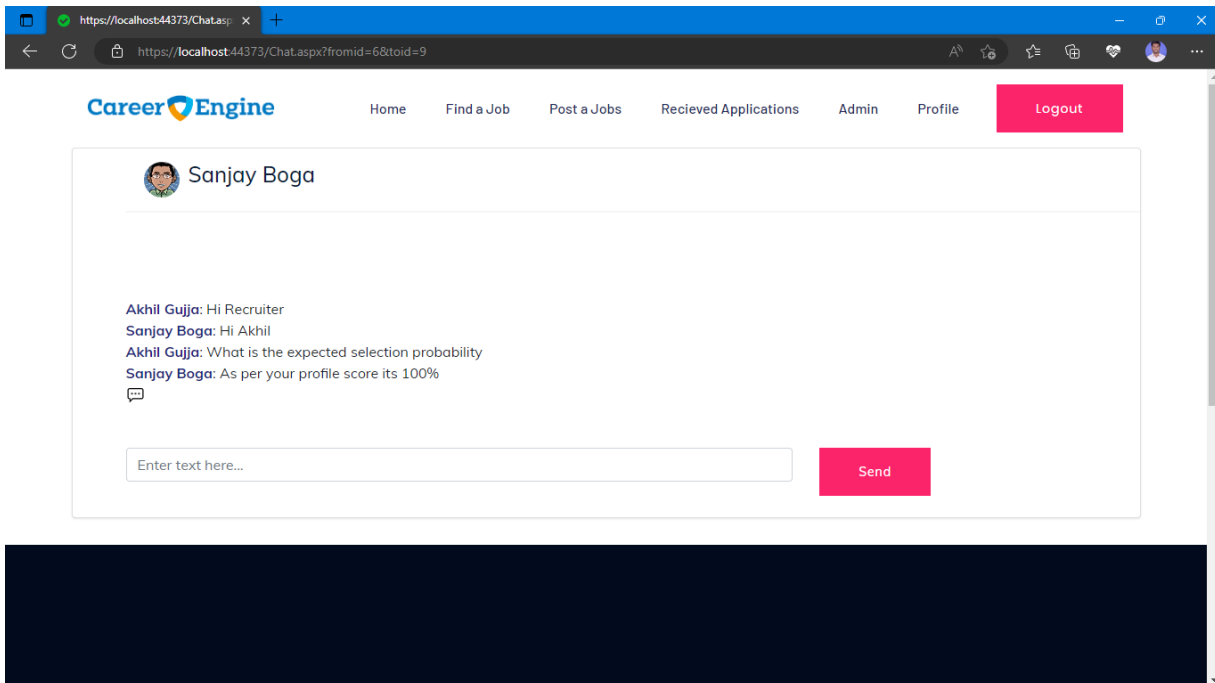


Figure 17: Communication Channel – ChatOn

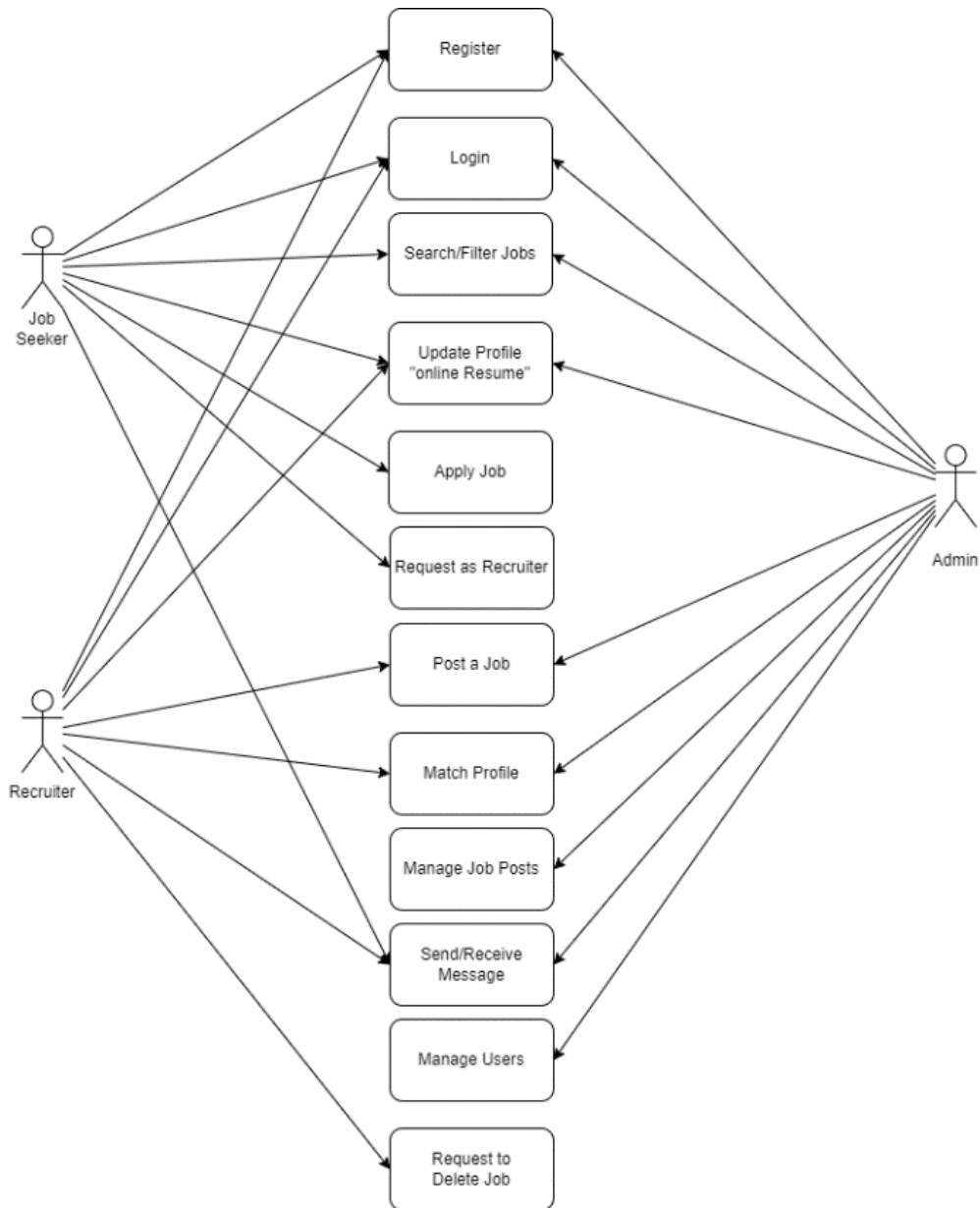


Figure 18: Career Engine Use case Diagram

5 Internal/external Interface Impacts and Specification

The concept behind Career Engine is to address an unsolved market issue. Despite the fact that there are numerous employment portals on the market, none of them attempted to address the issue that most of them, including us, were having. As a result, we develop a solution that does not automate the human hiring process while simultaneously focusing on providing their end customers with a useful solution. Career Engine possesses every competitive advantage currently available on the market, but it also has 4 exclusive features that provide our customers with a significant advantage.

- **Easy to Apply** – Here, we introduce the first move, where we don't require users to complete numerous forms and fields in order to apply for a job or always ask them to upload their resume first. Due to the online resume aspect of this tool, users can quickly apply for jobs.
- **Recommendation of Jobs** – We are all aware that the world we live in today is full of information and opportunities. However, finding the perfect employment can be very challenging. As a result, our application only allows users to apply for jobs while also calculating a score known as the profile score. This allows consumers to understand how much the applied job is Inclined toward a job. How likely are you to land the job, in percentage terms.

- Early Careers – Recent grads are like newborn babies; they lack the experience necessary to function in the real world of business and have never had to interact with clients. In that case, the majority of them miss the chance or never ever obtain it. As a result, by using our service, individuals can filter occupations based on early careers. Freshmen can now investigate jobs based on their level of interest and lack of experience, so that's good news.
- ChatOn – The messaging and communication platform included in the program is called ChatOn. This has a significant benefit. which both participants can use to connect with one another, create a strong network, and get to know one another. Assume those job seekers who are interested in learning more about a position can contact the recruiter to learn more. In a similar vein, recruiters can fully understand a person. For both of them, this is a win-win situation.

5.1 Technology Stack

- Framework: .NET 4.5 (Asp web form)
- Front End: ASP.NET, HTML5, CSS3, Bootstrap
- Back End: C Sharp (#)
- Database: SQL Server Management Studio (SSMS)
- Cloud Provider – AWS

5.2 Hardware Interface

Server Side

The web application will be hosted on one of the windows operating servers using AWS.

The ideal specifications for the server machines.

- Intel Core 2 Duo Extreme – 2 GHz
- 8GB of RAM
- Running Windows Server
- A commercial Web Application Server

Client Side

The system is a web-based application that clients are requiring using a modern web browser such as Google Chrome 107, Mozilla Firefox, Microsoft Edge and Enable cookies.

The ideal requirement for a client PC logging into the system.

- Intel Pentium IV or equivalent processor – 2.2 GHz or above
- 2GB RAM
- Running Windows Windows7/8/10/11
- Internet Connection with 1 MBPS bandwidth

5.3 Software Interface

AWS has a preinstalled firewall. So, a firewall will be used with the server to prevent unauthorized access to the system.

- Database – SQL Server Management Studio V19
- IDE – Visual Studio Community Edition 2019 and Visual Studio Code
- Graphic Designing - Adobe Photoshop CS3 and Adobe Illustrator
- Cloud – AWS (Amazon Web Server)

5.4 Communications Interfaces

- The Career Engine will be connected to the World Wide Web via the internet.
- The HTTP protocol will be used to facilitate communication between the job seeker and recruiters.

6 Design Units Impacts

6.1 Functional Area A/Design Unit A

6.1.1 Functional Overview

The career engine offers online real-time data about the jobs that are offered in the market. The Product performs in a manner that is comparable to that of its market competitors. The system's capabilities include the provision of various services depending on the user role (administrator, recruiter, or job seeker).

- Users can register and log in to the web portal using this tool.
- By default, users are considered job seekers, and they have the functionality to update their resumes online within the career engine.
- Job seekers can filter the job based on their needs such as company, location, salary etc.
- Job seekers also have the functionality to request a recruiter. If they want to post a job and create opportunities.
- Job seekers have the option to apply for the job they are interested in.
- Job seekers also have the functionality to communicate with the recruiter regarding the job they applied to.
- Recruiters can also update their online resumes using this web portal.
- Recruiters can post a job, so job seekers look for the opportunity and apply.
- A recruiter can do what all access job seekers have like find a job, profile, job applications etc.
- A recruiter has the functionality to request to delete the job which is no longer needed.
- A recruiter can also connect with job seekers using communication tools to get in and out about the applicant.
- Admin has full control over the application. They have all the access that job seekers and recruiters have like posting a job, finding a job, etc.
- Admin also has a functionality to approve or reject the request by job seekers to become a recruiter.
- Admin also has the option to approve or reject the request by recruiter to delete the job which is no longer needed.

6.1.2 Impacts

This Project once built, has a big impact on the market, as no competitors in the market have focused on this problem and tried solving these issues.

- Customers or users using this web application can now apply to the job which is inclined towards their profile. Thanks to the career engine recommendation tool which uses the “N-Gram Algorithm” to calculate the profile score. This score will let the job seeker know how much percentage of their resume is matched with the job required skills and job description.
- Another impact on the customer is they don't need any separate resume or cv, we have a predefined templated designed for them which is simpler and easier to use. Simply user has to log in to the career engine and go to the profile section to update their bio, education, skills, certification, etc.
- Now fresh graduates are free to get opportunities, using this tool they have an option to not only get the job available in the market, but now they can also find the job which is available to fresher or early career students.
- We understand email is the best way to communicate in the modern world, but seeing the job market it is difficult for job seekers to find the recruiter's email and connect with them. So here we have a solution called chatOn which is a communication channel available for both recruiters and job seekers. So, they can communicate and do their best as per their needs.

6.1.3 Requirements

Career Engine is built to resolve market issues. These issues have never been noticed by current market players and therefore to build and transform the idea into reality we have some set of requirements for the proposed system in terms of internal/external interface.

Design Requirements

- Career engines must have 3 different user roles and these roles have their duties and responsibility and all of them should have different consoles.
- Job seekers – Can set up an account with the website before applying for a position or review a company, filter jobs based on input, and contact recruiters.
- Recruiters – Can post job openings, contact applicants, and Request Admin for some requests.
- Administrator – Can manage users and job postings.
- Users can find the job post using keyword-based search box and search result listings
- Users can filter jobs based on an advanced search by location, job title, company, etc.
- A recruiter can feature their job post on the front page of the career engine.
- Communication channels has to be built between job seekers and recruiters.

Functional Requirement

- Easy to Apply: In most of the existing systems job portals ask job seekers to submit their resumes and then fill out multiple forms and then submit them. We have a simple solution, after registering to the career engine, the user will be asked to fill up an online resume once. Later, whenever a user applies for any job, our tool will calculate the profile score and the online resume will be shared with the recruiter.

- Profile Score: As discussed in the first point to resume manual work and form filling, we have come up with a concept of profile scoring which works using the “N-Gram Algorithm”. It compares job-required skills and job descriptions posted by the recruiter to that job seeker’s entire profile and calculates the score in terms of percentage.
Ex: Score < 40 – Weak profile
Score > 40 and Score < 75 – Average Profile
Score > 75 – Strong profile
So, using this, job seekers can get to know how much their profile is inclined towards a job and what are the chances to get a job. Similarly, when a job seeker applies to that job, the profile score is shared with a recruiter as well. Which will also help them to determine which candidate is more suitable for them.
- Early Careers: Recent graduates are full of theoretical knowledge but they don't have any practical or real-time skills. And also, industry expects always the best candidate. So here we have a separate category for fresher/new graduates/early careers. Whenever a recruiter posts a job, we ask one question, is this job available for early careers? “YES/NO” based on the input we are showing the jobs. Job seekers can go to find a job and filter jobs using dropdown provided.

7 Acknowledgements

I would like to extend our sincere thanks to **Keethana Kopuril, H Sylva, S. T Mol, Vivek Kumar Sehgal**, and other prior authors who have given huge contributions to job portal and related project work.

I would like to take this opportunity to express our heartfelt gratitude and our sincere thanks to **Dr Dae Wook (Wooky) Kim**, Assistant Professor, **Division of Science, Mathematics, and Technology**, our project guide at **Governors State University** who helped us a lot for the successful completion of our project “**CAREER ENGINE**”.

I also thank the entire teaching and non-teaching faculty who were instrumental in making this project is a successful one.

8 *References*

- [1] Keethana Kopuri¹, Gulam Mujtaba Hussain Aqueel², Azbar Sadiqa Jabeen³, Dr.T.K.Shaik Shavali, “An Online Job portal management system”, February 2017 | IJIRT | Volume 3 Issue 9 | ISSN: 2349-6002 IJIRT 144246 International Journal of Innovative Research in Technology 28
- [2] H. Sylva, and S. T. Mol, “E-recruitment: A study into applicant perceptions of an online application system”, International Journal of Selection and Assessment, Vol. 17, No. 3., 2009, pp. 311-323
- [3] Vivek Kumar Sehgal; Akshay Jagtiani; Meha Shah; Anupriya Sharma; Arpit Jaiswal; Dhananjay Mehta, “Job Portal-A Web Application for Geographically Distributed Multiple Clients”, December 2013 | IEEE | ISBN:978-1-4799-3251-1 Institute of Electrical and Electronics Engineers
- [4] IJARCCCE ISSN (Online) 2278-1021 ISSN (Print) 2319 5940 International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified Vol. 6, Issue 5, May 2017 Copyright to IJARCCCE DOI10.17148/IJARCCCE.2017.6519 96 A Review on: Job Portal- A Web Application for Distributed Clients Pooja T. Killewale¹, Prof A.R. Mune
- [5] Simmons, T. (2022). Understanding CI CD Pipeline. Plutora. <https://www.plutora.com/blog/understanding-ci-cd-pipeline>
- [6] Operations, administration and management. (2021, November 12). In Wikipedia. https://en.wikipedia.org/wiki/Operations,_administration_and_management

9 Appendices

Registration Page

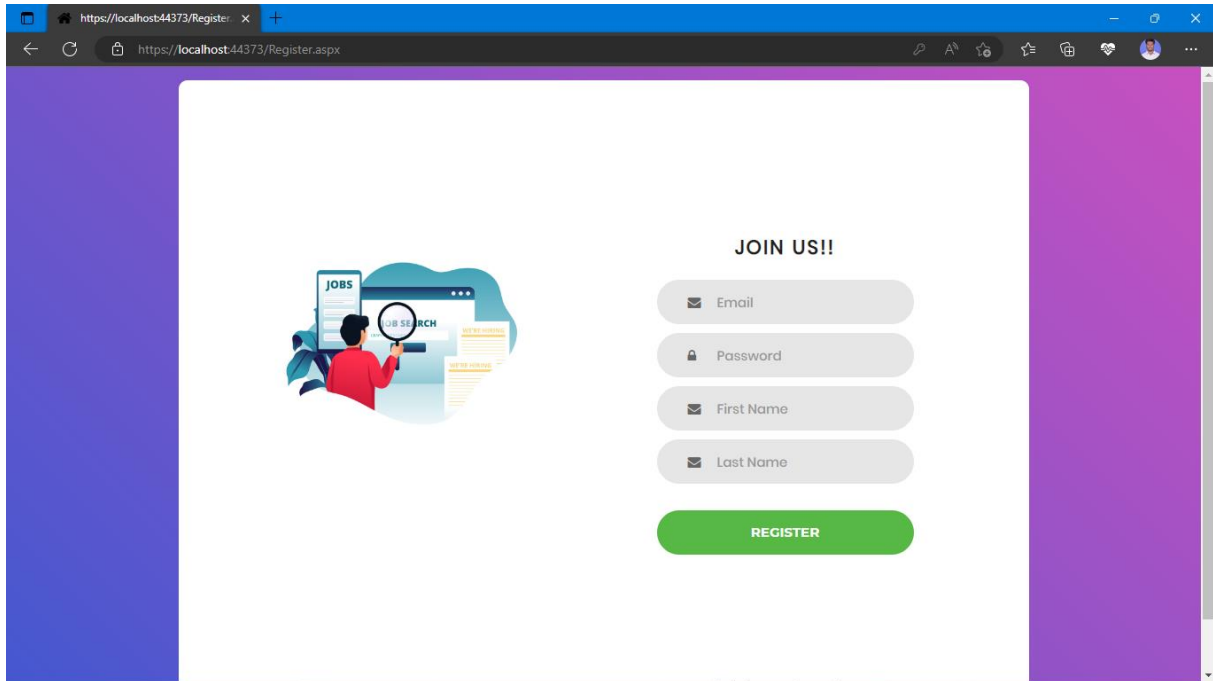


Figure 22: Registration

Login Page

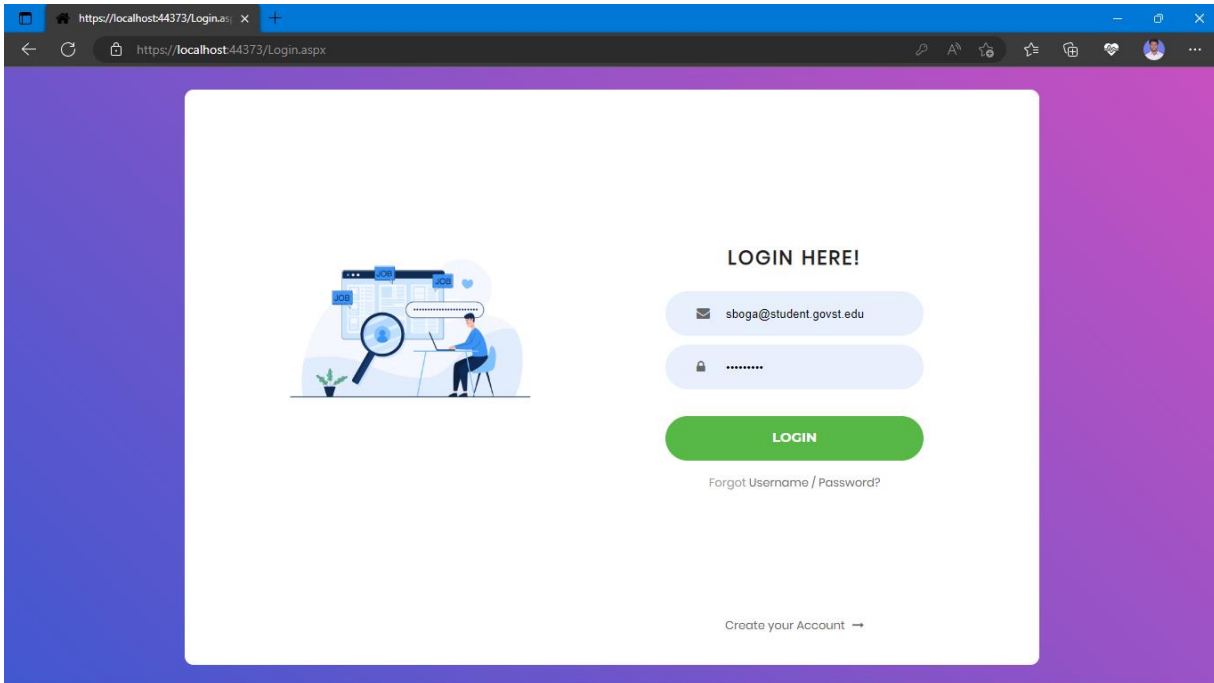


Figure 23: Login

Home Page

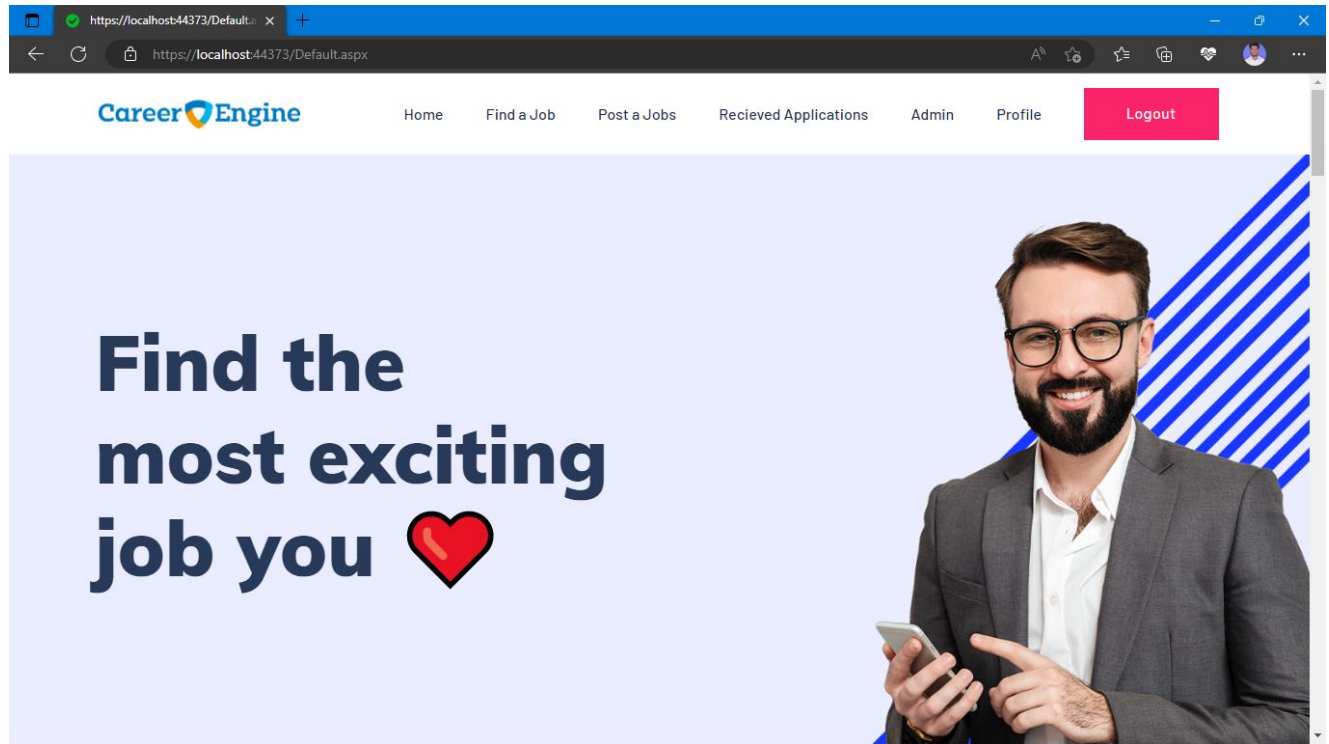


Figure 24: Home

Home Page – Featured Section

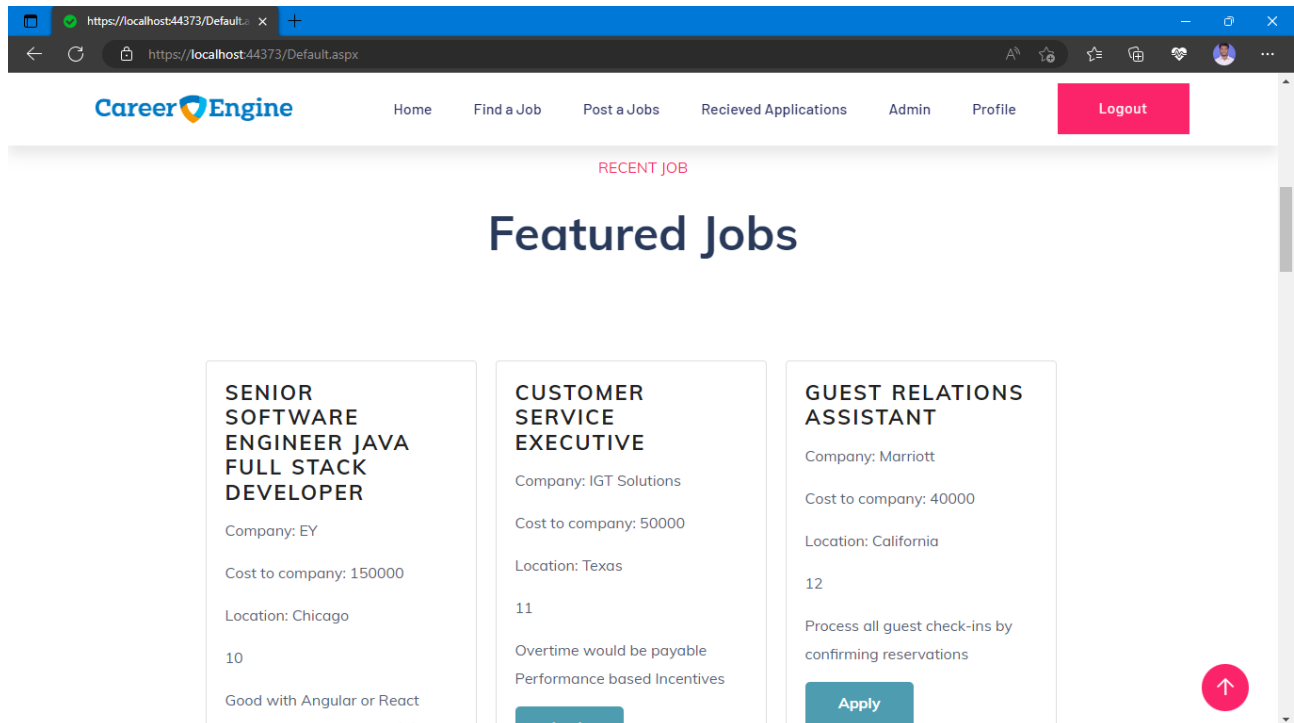


Figure 25: Featured Section

Home Page – Online Resume

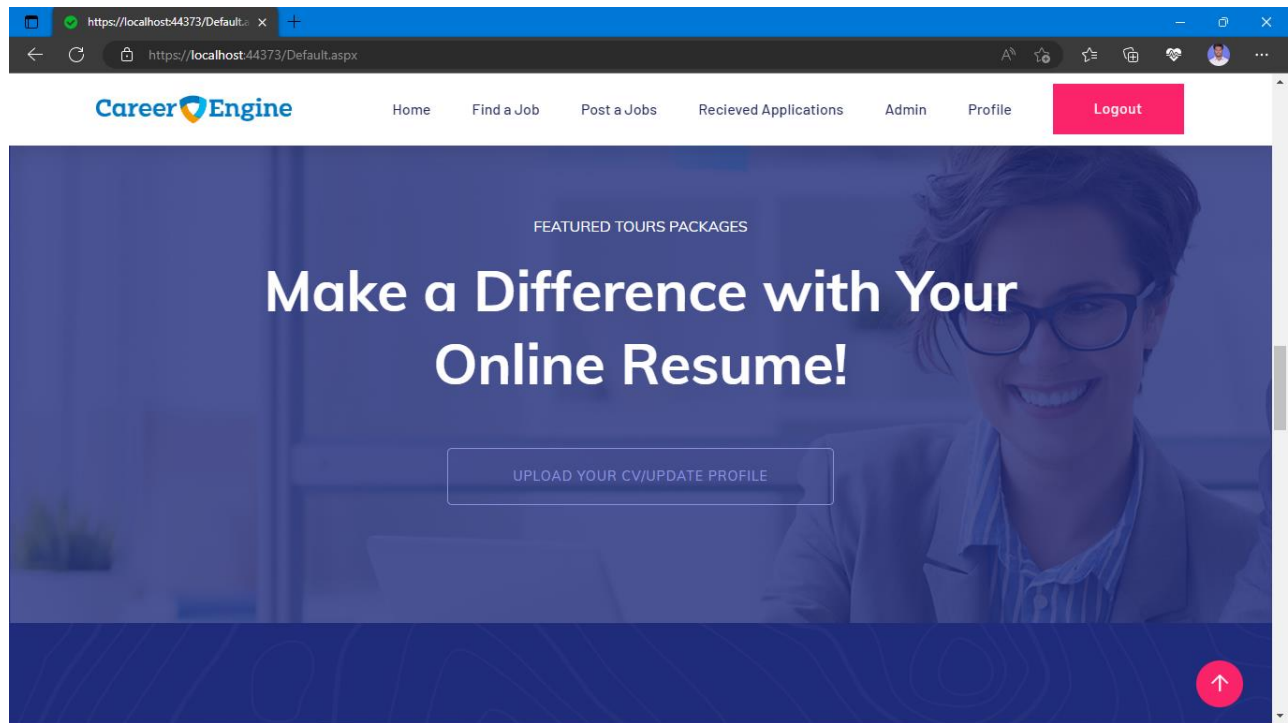


Figure 26: Online Resume

Footer

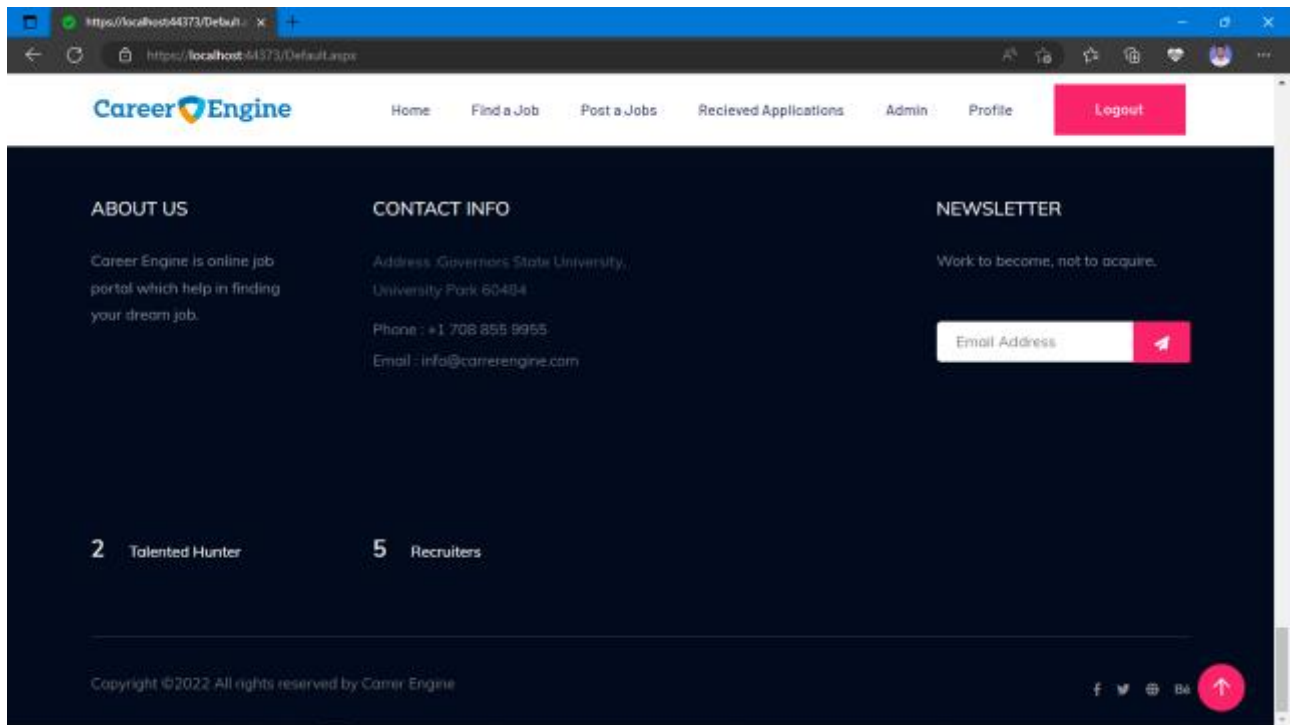


Figure 27: Footer

Find A job

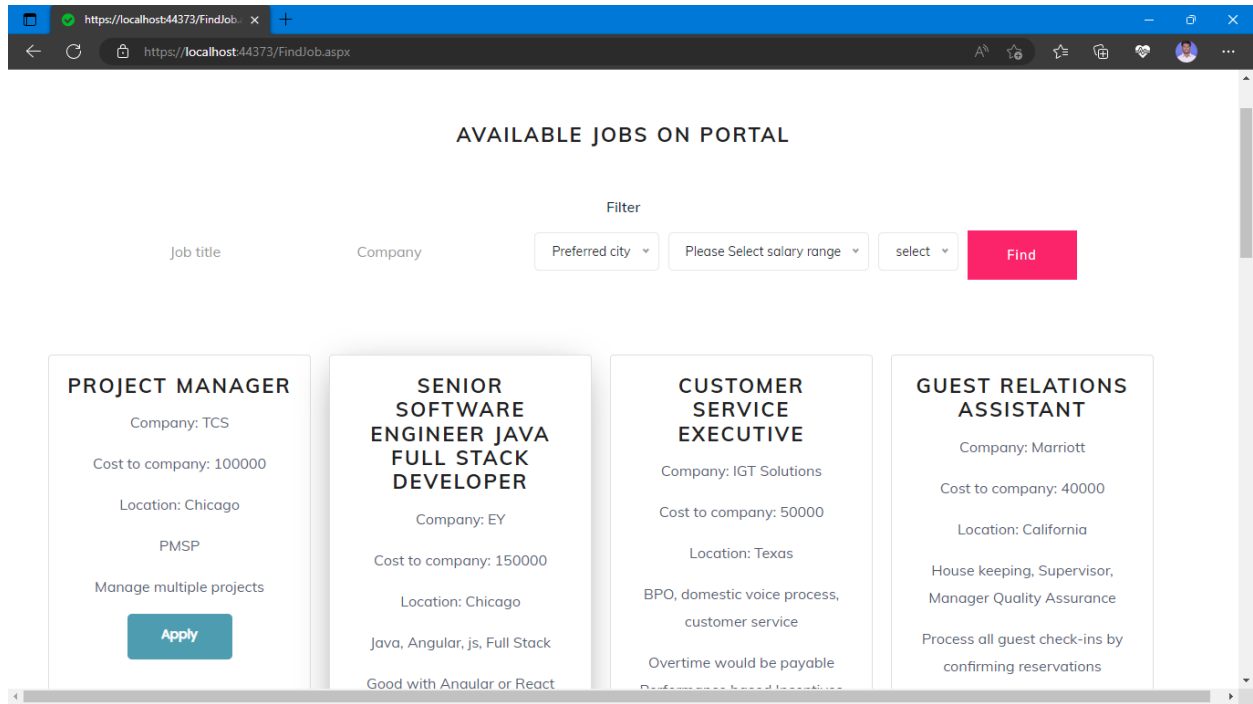


Figure 28: Find a Job Section

Find A Job – Become Recruiter

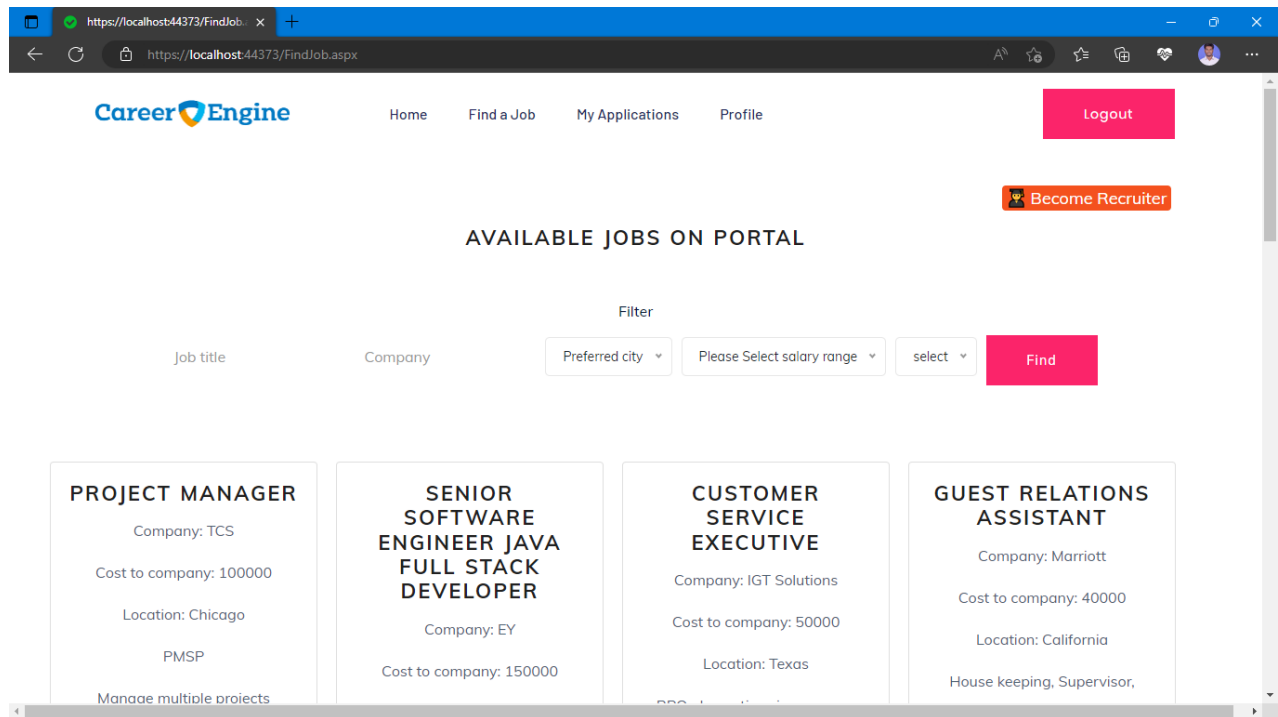


Figure 29: Become Recruiter

Find A Job – Filtering

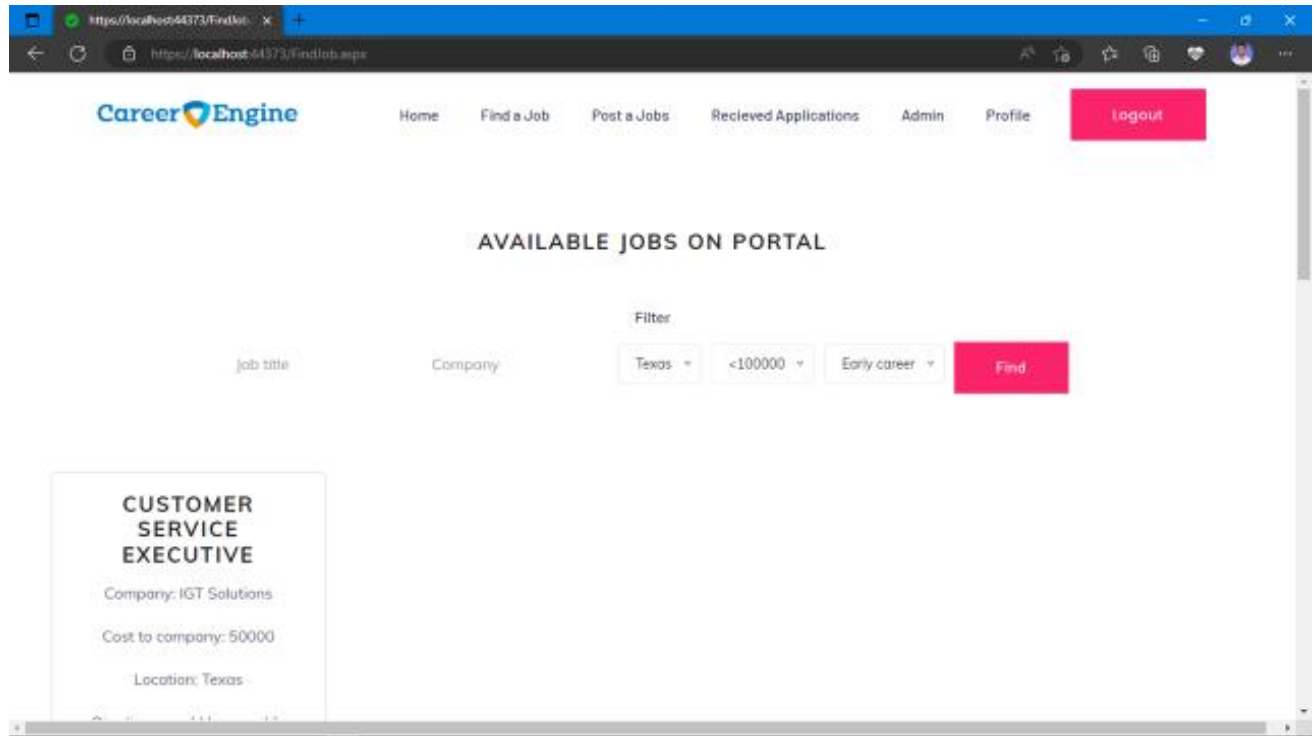


Figure 30: Job Filtering

ApplyJob

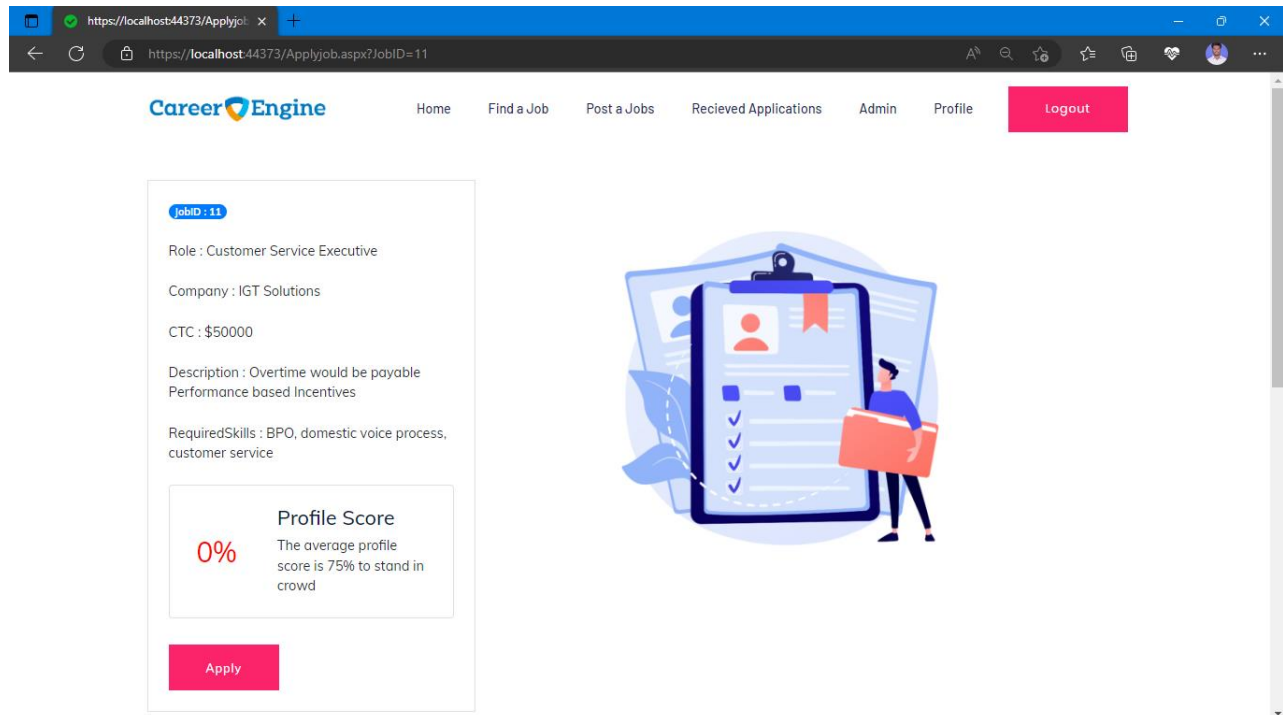


Figure 31: Apply to Job

Post A Job

CareerEngine Home Find a Job Post a Jobs Recieved Applications Admin Profile Logout

POST A NEW OPPORTUNITY

Role/Position Name

Organisation/Company Offering

Skills Expecting

Share more about position

Company Offering : Cost to Company

Figure 32: Post a Job

Post A Job – Request Job Deletng

CareerEngine Home Find a Job Post a Jobs Recieved Applications Admin Profile Logout

ADD JOB

REQUEST A DELETE

JobID	Role	Company	ValidTill	Description	CTC	PostedBy	FirstName	
5	Project Manager	TCS	12/5/2022 12:00:00 AM	Manage multiple projects	100000	6	Sanjay	Request Deletion
11	Customer Service Executive	IGT Solutions	12/7/2022 12:00:00 AM	Overtime would be payable Performance based Incentives	50000	6	Sanjay	Request Deletion
12	Guest Relations Assistant	Marriott	12/7/2022 12:00:00 AM	Process all guest check-ins by confirming reservations	40000	6	Sanjay	Request Deletion
13	TECHNICAL SUPPORT	Wipro	12/7/2022 12:00:00 AM	Candidate should have	60000	6	Sanjay	Request Deletion

Figure 33: Request Job Deletion

Received Application

The screenshot displays the 'Received Applications' section of the Career Engine web application. The browser address bar shows the URL <https://localhost:44373/RecievedApp.aspx>. The navigation menu includes 'Home', 'Find a Job', 'Post a Jobs', 'Recieved Applications', 'Admin', 'Profile', and a 'Logout' button. The main content area features a table with the following data:

JobID	ApplicationID	AppliedOn	UpdatedOn	Role	Company	CurrentStatus	ProfileScore	UserID			
12	107	11/22/2022 6:53:52 PM	11/22/2022 6:53:52 PM	Guest Relations Assistant	Marriott	Offer a position	100	9	View profile	Offer a position ▾	Update
6	105	11/21/2022 8:53:05 PM	11/21/2022 8:53:05 PM	Data Engineer	Twitter	Offer a position	100	7	View profile	Offer a position ▾	Update
6	104	11/21/2022 7:08:51 PM	11/21/2022 7:08:51 PM	Data Engineer	Twitter	Reject	0	6	View profile	Offer a position ▾	Update

The footer contains three links: 'ABOUT US', 'CONTACT INFO', and 'NEWSLETTER'.

Figure 34: Received Application

Admin Console

The screenshot displays the 'Admin Console' section of the Career Engine web application. The browser address bar shows the URL <https://localhost:44373/Admin.aspx>. The navigation menu is identical to the previous page. The main content area is divided into two sections:

PENDING USER ROLE AMEND REQUESTS

ReqID	UserID	FirstName	LastName	Email	Role	RequestedProfile		
5	10	Urjitha	Dhadigam	uri@student.govst.edu	JobSeeker	Recruiter	Approve ▾	Update

PENDING JOB DELETION REQUESTS

JobID	Role	Company	ValidTill	Description	CTC	PostedBy	FirstName		
5	Project Manager	TCS	12/5/2022 12:00:00 AM	Manage multiple projects	100000	6	Sanjay	Approve ▾	Update

Figure 35: Admin Console

Profile Console

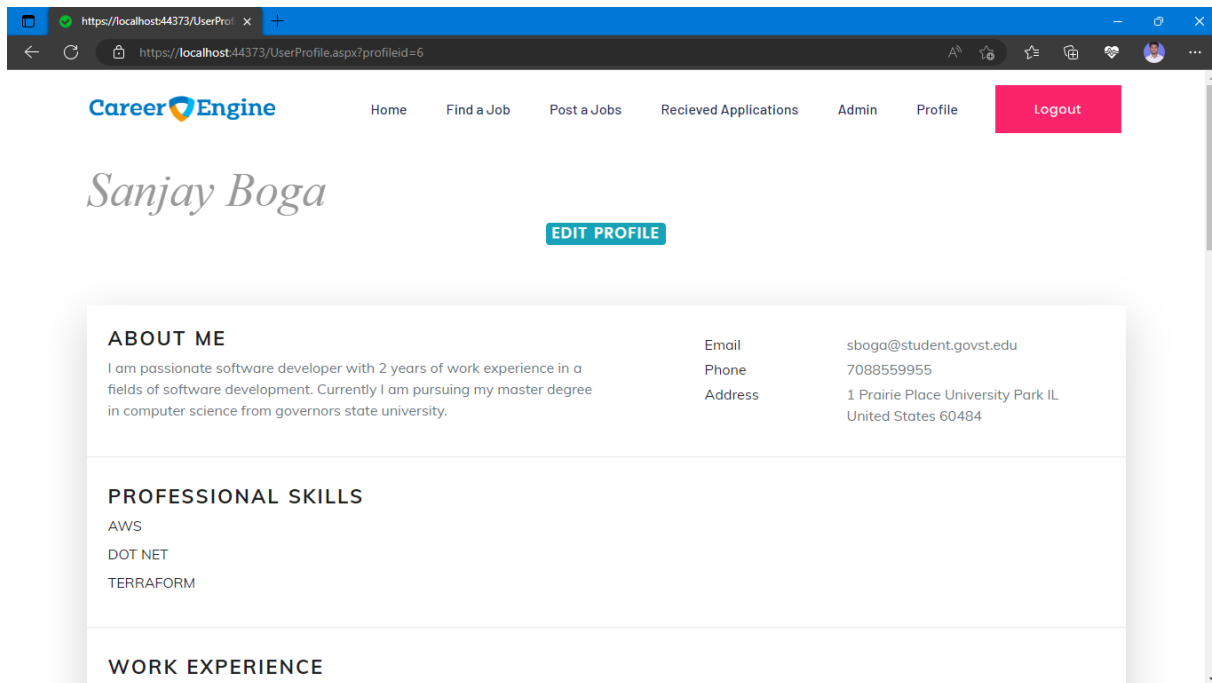


Figure 36: Profile Section

ChatOn – Communication Channel

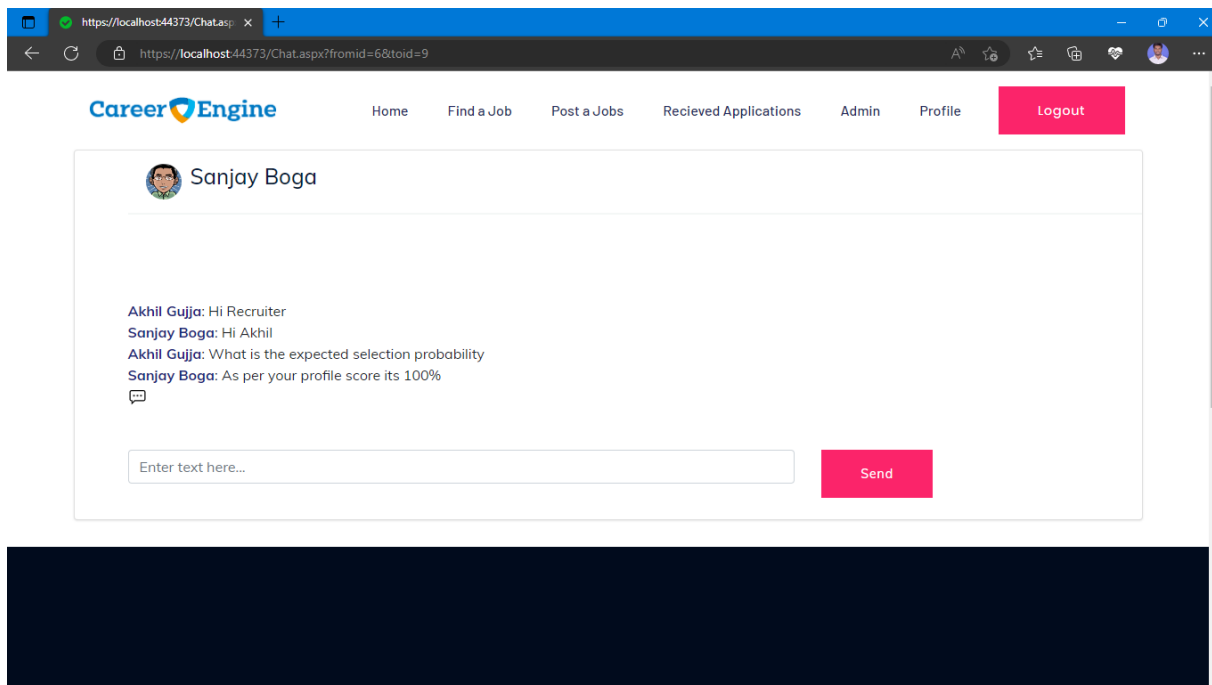


Figure 37: Communication Channel – ChatOn