BSSE FINAL PROJECT

Vision Forge

Project Advisor

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Presented by:

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Faculty of Information Technology

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Complete System

SDP Phase IV

Vision Forge

Advisor: Ms. Rubab Javaid

Group F23SE094

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Haris Naseem Butt	Backend, Integration, Database, API's
Asna Abroo	Prototypes, Front-end, Dataset Collection
Yumen Tariq	ML Model Training, Dataset Preparation

Table of Contents

Revision History

Name	Date	Reason For Changes	Version

Abstract

In response to the limited career guidance available in schools and colleges, Vision Forge steps in as a comprehensive solution to empower students facing uncertainty about their career paths. Many students lack access to dedicated counselors, leading them to make crucial career decisions without proper information and often influenced by family pressures. Vision Forge offers a user-friendly app where students can input their academic records, interests, and preferences, generating personalized career suggestions tailored to their unique profiles. Using advanced machine learning technology, the app meticulously analyzes this information to provide insightful recommendations on potential career fields, associated courses, and educational opportunities. This helps students align their academic backgrounds with their career aspirations and suggests alternative courses if necessary. Additionally, Vision Forge aids students in exploring universities and programs related to their chosen career paths, broadening their horizons and presenting them with a plethora of options. The primary aim of Vision Forge is to guide students towards making confident and well-informed decisions, ensuring a rewarding and fulfilling career journey. By providing personalized career guidance, Vision Forge empowers students to take control of their futures, fostering a generation of motivated and well-prepared professionals.

1. Introduction

1.1 Product

Vision Forge is a simple-to-use software made to assist students in making career decisions. Many schools and colleges don't provide enough help for students to plan their future careers. With this software, students can input their grades and interests. Then, they get personalized suggestions for careers. It uses smart technology not just to look at the data, but also to give advice on which jobs might be suitable, what courses they might need, and which universities offer those courses. It's more than just a program; it's a helpful tool that guides students in making smart choices about their future careers. Vision Forge lets students check their eligibility for multiple universities based on their grades and program. It combines what students tell it, smart technology, and career exploration to help students feel confident about choosing their careers.

1.2 Background

In the realm of career guidance systems, "Career Vista" focuses on providing insights through assessments, while "Future Track" offers basic career advice without advanced features. However, my project, "Vision Forge," goes beyond by integrating cutting-edge machine learning algorithms, offering personalized career counseling, learning recommendations, university eligibility assessments, and detailed course information. Unlike its predecessors, "Vision Forge" takes a holistic approach to redefine the landscape of career guidance. It stands out as a comprehensive and tailored decision- making tool, providing students with an all-encompassing resource to make well-informed and rewarding choices for their career paths.

1.3 Objective(s)/Aim(s)/Target(s)

- Create an easy-to-use career help system called "Vision Forge" that uses smart technology to give personalized advice.
- Give suggestions for careers, recommend courses to take, and check if you can get into different universities.
- Compare "Vision Forge" to other career help systems to see which one works better.
- See how "Vision Forge" affects students' decisions about their careers and what jobs they end up in.
- Make sure that "Vision Forge" covers everything students need for career help, and make sure our goals match what we can realistically do in the time we have

1.4 Scope

"Vision Forge" is a big project designed to assist students in selecting their career paths. It involves creating a user-friendly system that takes into account students' academic records and interests. Using advanced machine learning, it provides personalized career suggestions, recommends learning paths, and assesses university eligibility. The project also aims to offer comprehensive insights, making "Vision Forge" a complete tool for well-informed career decisions. Its ultimate goal is to empower students with a holistic approach to confidently navigate their academic and professional journeys.

1.5 Business Goals

Vision Forge doesn't just aid educational aims; it also fuels financial prosperity. By drawing in students and institutions, the system earns revenue through increased user visits. Simplifying administrative duties cuts expenses, boosting earnings. The software's popularity bolsters the institution's standing, drawing more students and meshing with core business goals. Additionally, after completion, we're in discussions with two companies to promote it to relevant businesses, solidifying Vision Forge's role as a tech-driven education leader, ensuring ongoing financial growth and triumph in the competitive educational field.

1.6 Document Conventions

Font Size for Text: 12
Font Size for Headings: 14
Font Size for Main Heading: 18
Line Spacing: 1.0
Highlighted Items: Enclosed in "inverted commas"
Bullet Points: Used for clear and concise understanding

2. Technical Architecture

- **System Type:**
  The current system is custom-built, specifically designed to address the unique requirements ofcareer guidance and counseling.

- **Processing Type:**
  The system is primarily responsible for online transaction processing, handling real-time datainput, and providing instantaneous career suggestions.

- **Application Components:**
  Major components include a user interface for students, an administrative interface, a machinelearning module for career prediction, and a database for storing academic and user data.

- **Data Management:**
  The system collects and manages academic records, career interest data, and university eligibility criteria, ensuring a comprehensive dataset for accurate predictions.

- **Application Architecture:**
  The basic architecture is a client-server model where the client (user interface) interacts withthe server (backend processing and data storage).

- **Programming Language:**
  The system is built using the MERN (MongoDB, Express.js, React.js, Node.js) stack, combining JavaScript technologies for efficient development.

- **Hardware Platform:**
  The system is hosted on cloud servers, ensuring scalability and accessibility. It does not rely onspecific on premise hardware.

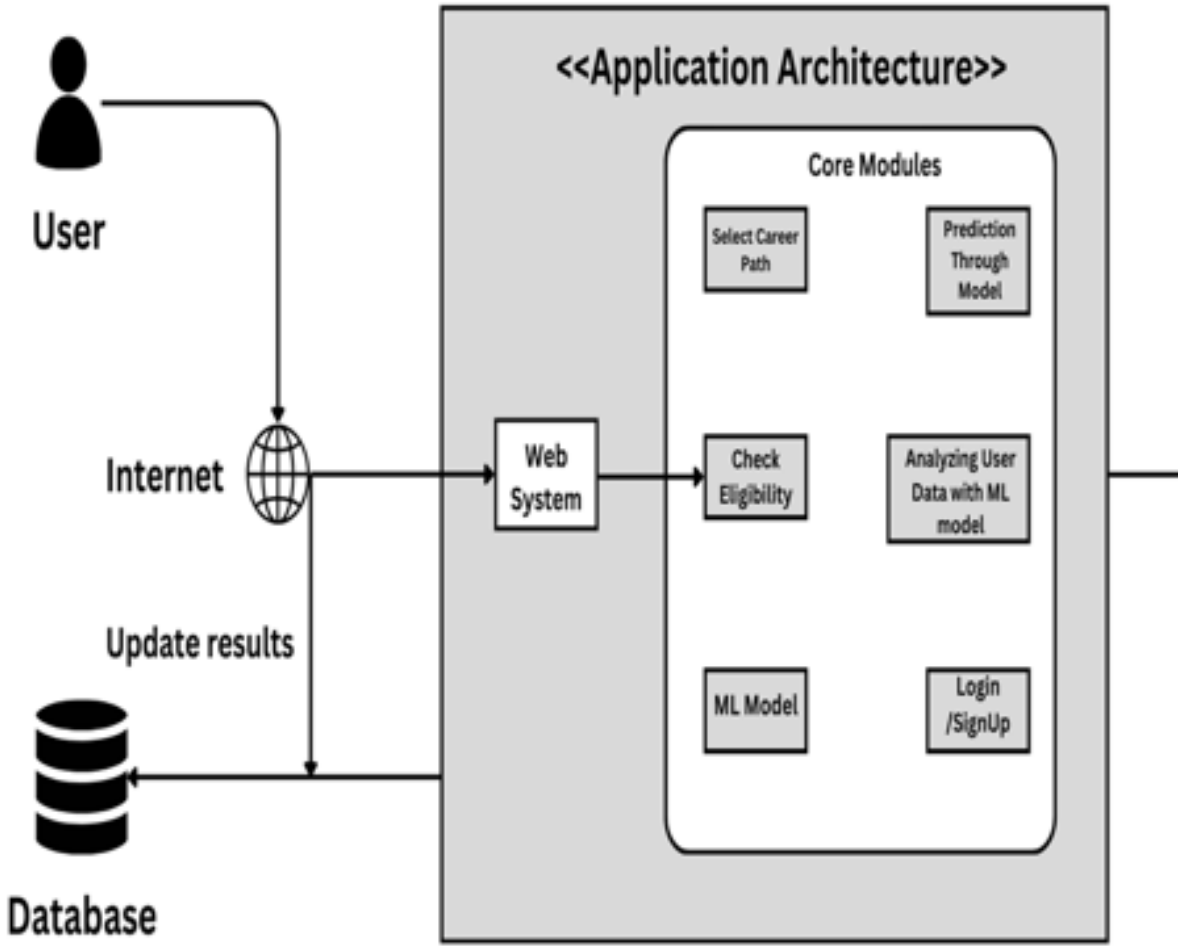
- **Database Platform:**
  MongoDB is used as the database platform, providing a flexible and scalable solution formanaging diverse data types.

- **User Interface:**
  The end-user interface is browser-based, allowing students and administrators to access thesystem through web browsers.

- **Network Architecture:**
  The system is designed to be accessible over the internet, providing flexibility for users ondifferent networks.

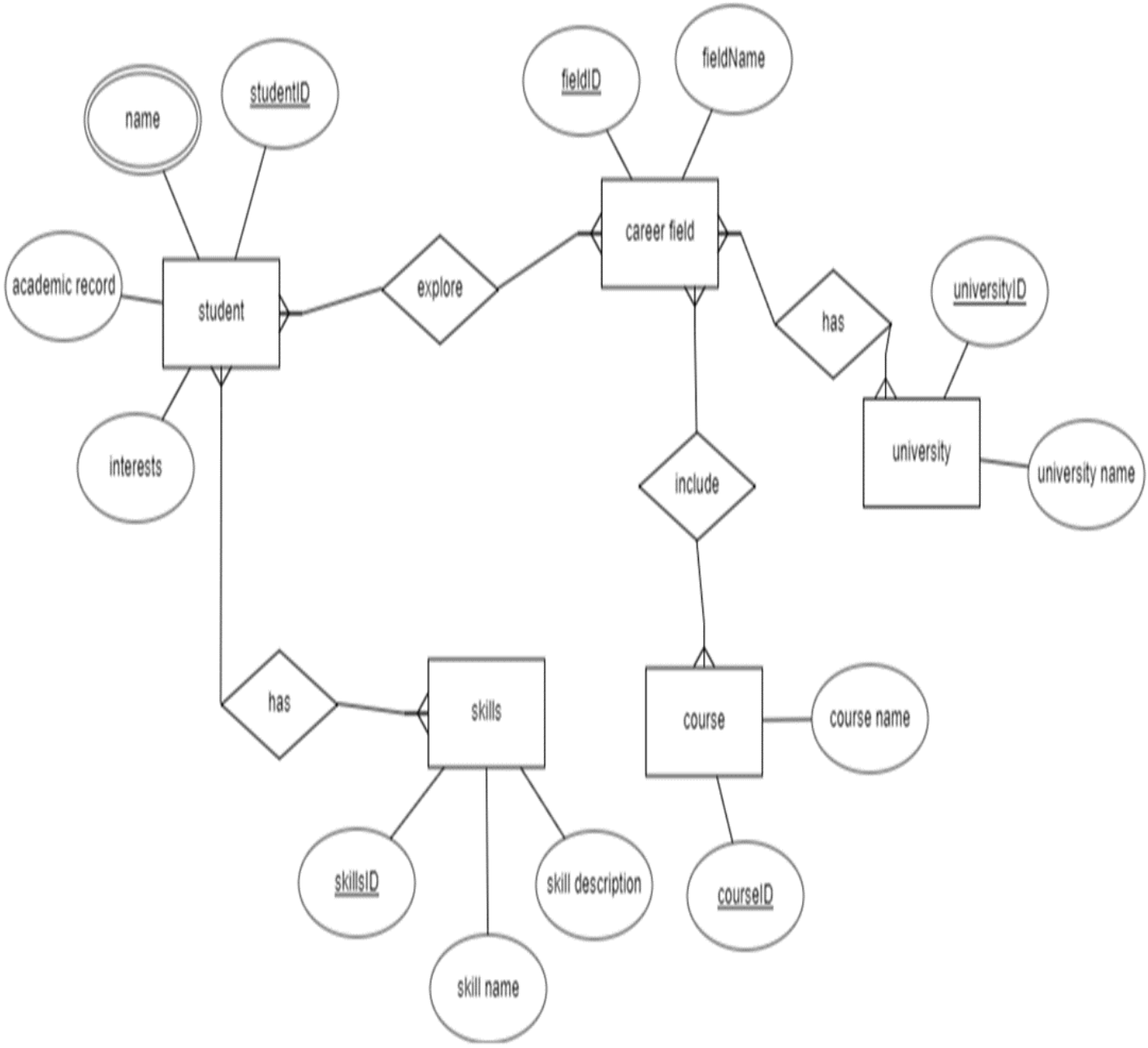
- **Hosting Environment**
  The system is hosted on external cloud servers, offering reliability and accessibility to usersfrom various locations.

Technical Architecture

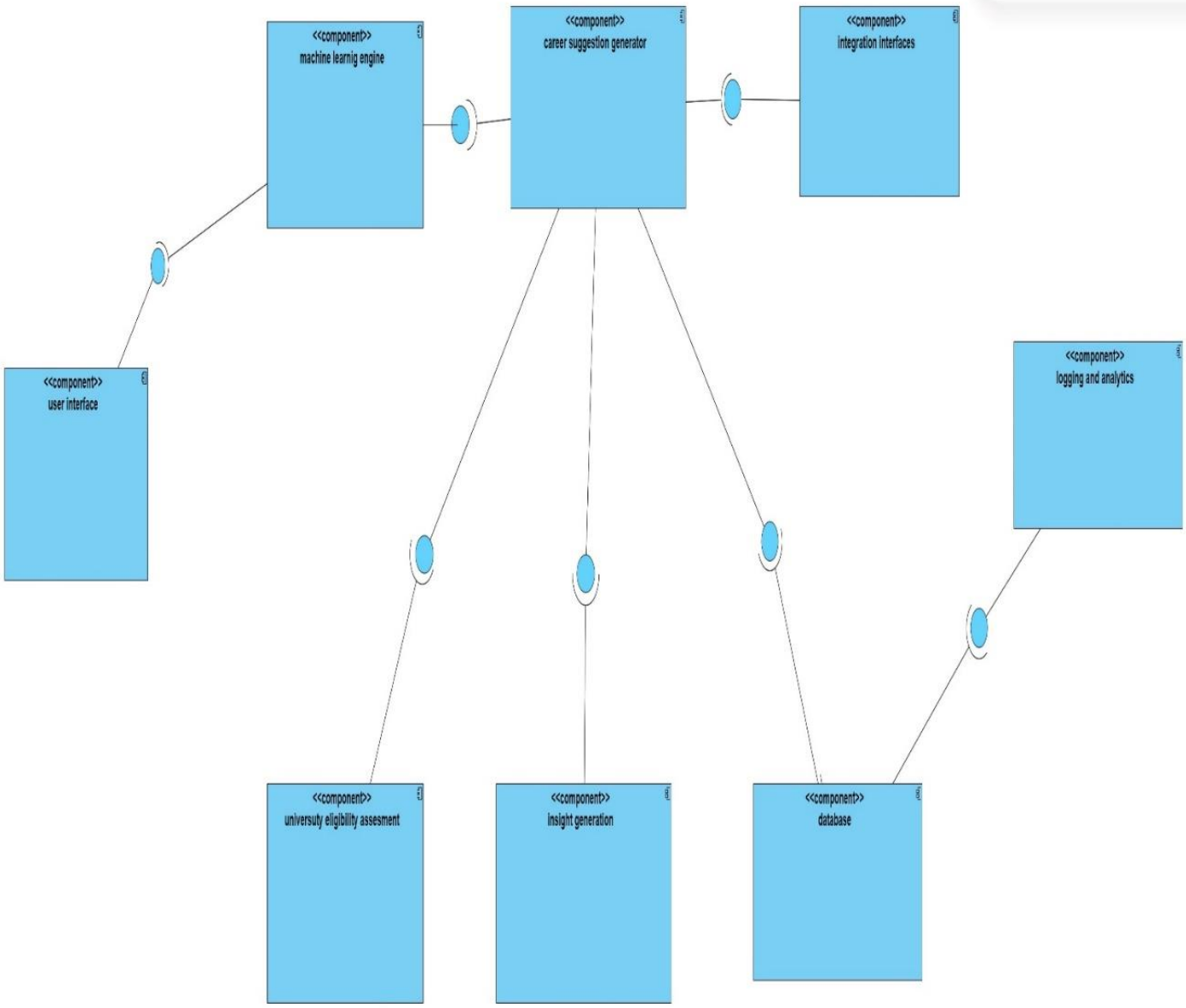


2.1 Application and Data Architecture

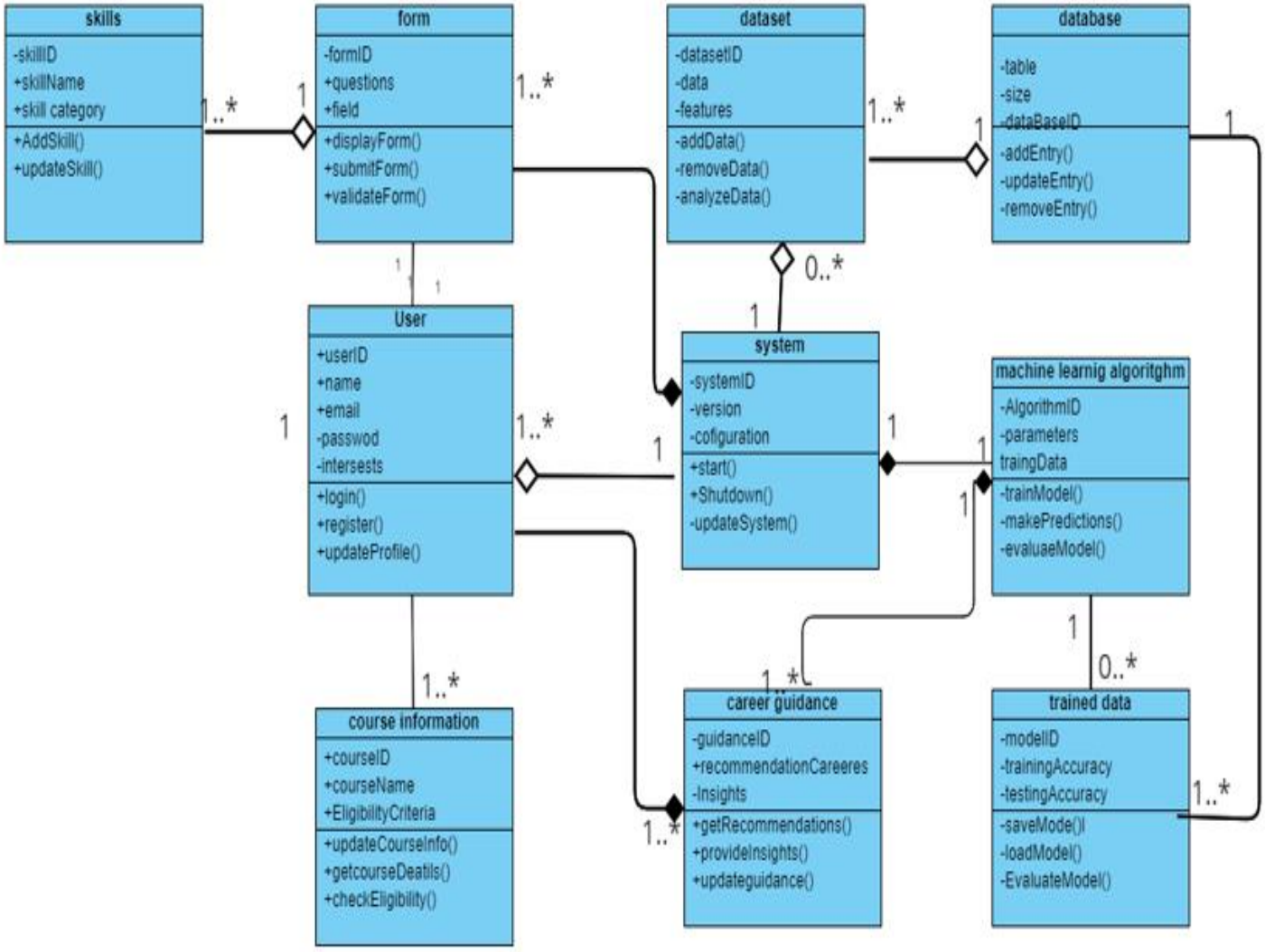
2.1.1 Entity Relationship Diagram



2.1.2 Component Diagram



2.1.3 Class Diagram



2.1.4 Decision Tables

- **Login Decision Table**

Condition	Rule 1	Rule 2	Rule 3	Rule 4
Valid Username	T	F	F	T
Valid Password	F	F	T	T
Action				
Successful Login	F	F	F	T

- **Career Path Decision table**

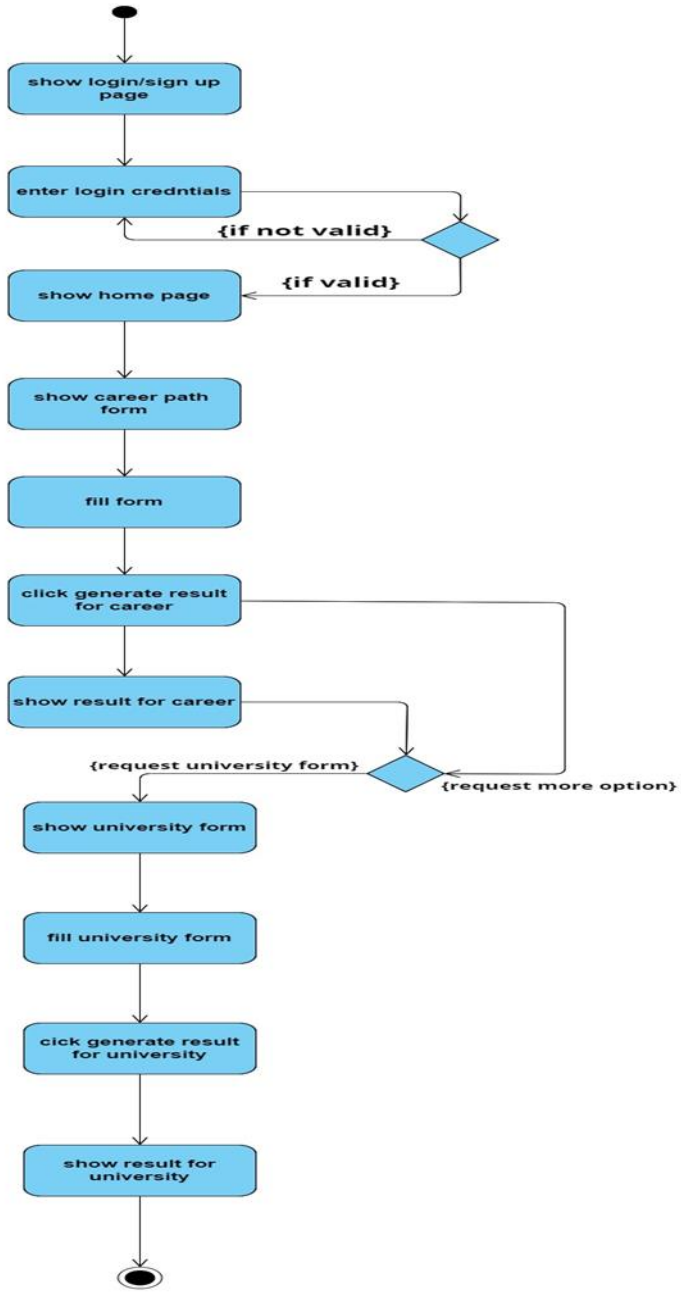
Condition	Rule 1	Rule 2	Rule 3	Rule 4
Matriculation Degree complete	T	F	F	T
Intermediate Degree complete	F	F	T	T
Action				
Career Path Prediction	F	F	F	T

- **University Eligibility decision table**

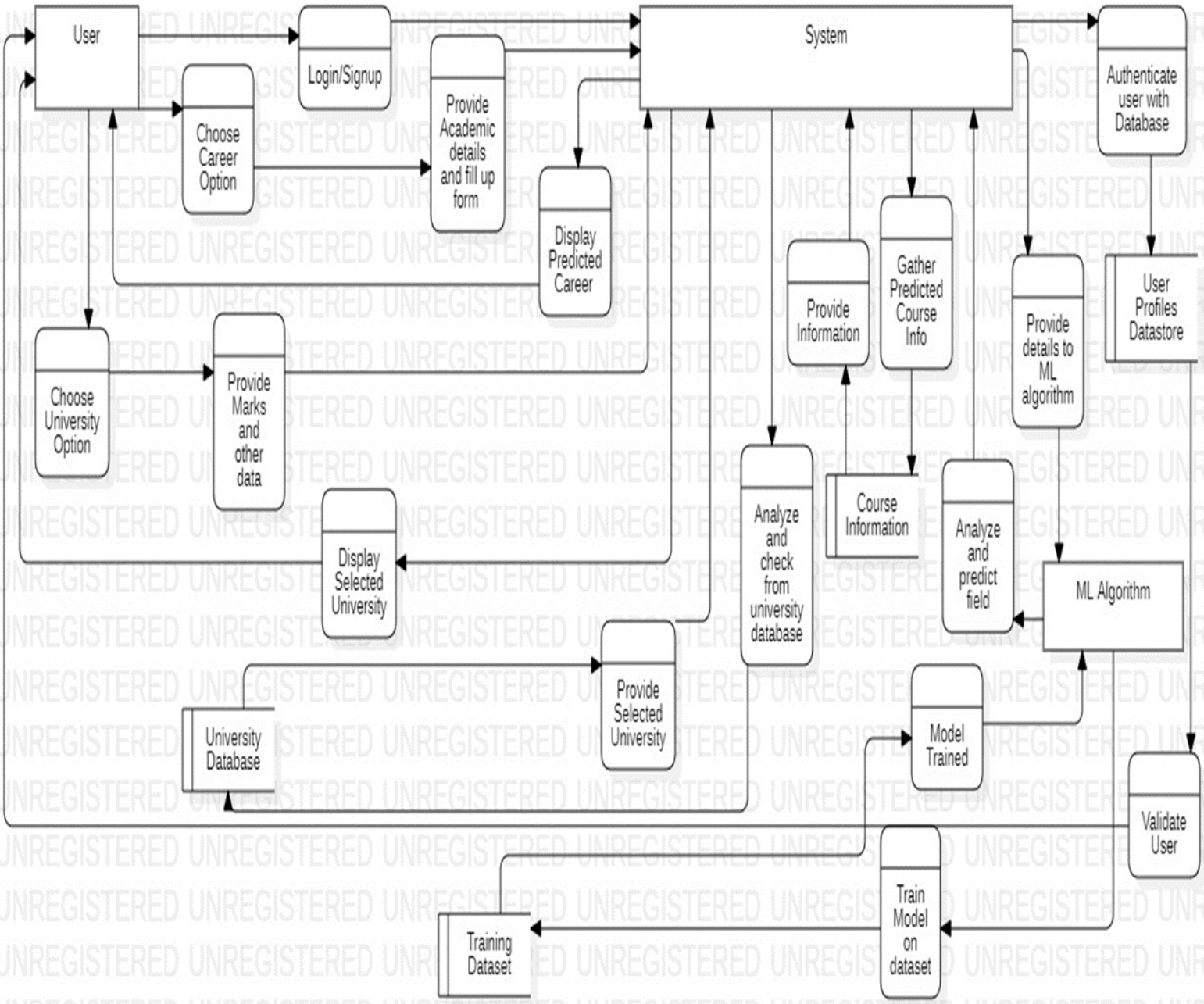
Condition	Rule 1	Rule 2	Rule 3	Rule 4	Rule 5	Rule 6	Rule 7	Rule 8
Matriculation Marks	F	F	F	F	T	T	T	T
Intermediate Marks	F	F	T	T	F	F	T	T
Career Field Name	F	T	F	T	F	T	F	T
Action								
Displaying Eligible University	F	F	F	T	F	F	F	T

2.2 Component Interactions and Collaborations

2.2.1 Activity Diagram



2.2.2 Detailed DFD



2.3 Design Reuse and Design Patterns

- **User Profile Module:**
  The user profile creation and management components are reused for various sections, ensuring a unified and consistent user experience.

- **Data Input Forms:**
  Common input forms, such as academic data entry forms, are reused across modules forcollecting relevant information from users.

- **Machine Learning Integration:**
  The machine learning prediction module is reused for different career-related predictions basedon user data and preferences.

- **University Eligibility Assessment:**
  Components used for assessing a user's eligibility for various universities are reused within the university exploration feature.

- **Result Display Components:**
  The display components for presenting career suggestions and university eligibility results arereused across relevant sections.

2.4 Technology Architecture

- **Platform:**

  The application will be designed to run on the MERN (MongoDB, Express.js, React, Node.js)stack, ensuring a robust and scalable foundation.

- **System Hosting:**

  Hosting will be cloud-based, leveraging services like AWS or Azure for flexibility, scalability,and efficient resource management.

- **Connectivity Requirements**

  Stable internet connectivity will be a prerequisite, leading to real-time data processing interactions

- **Modes of Operations:**

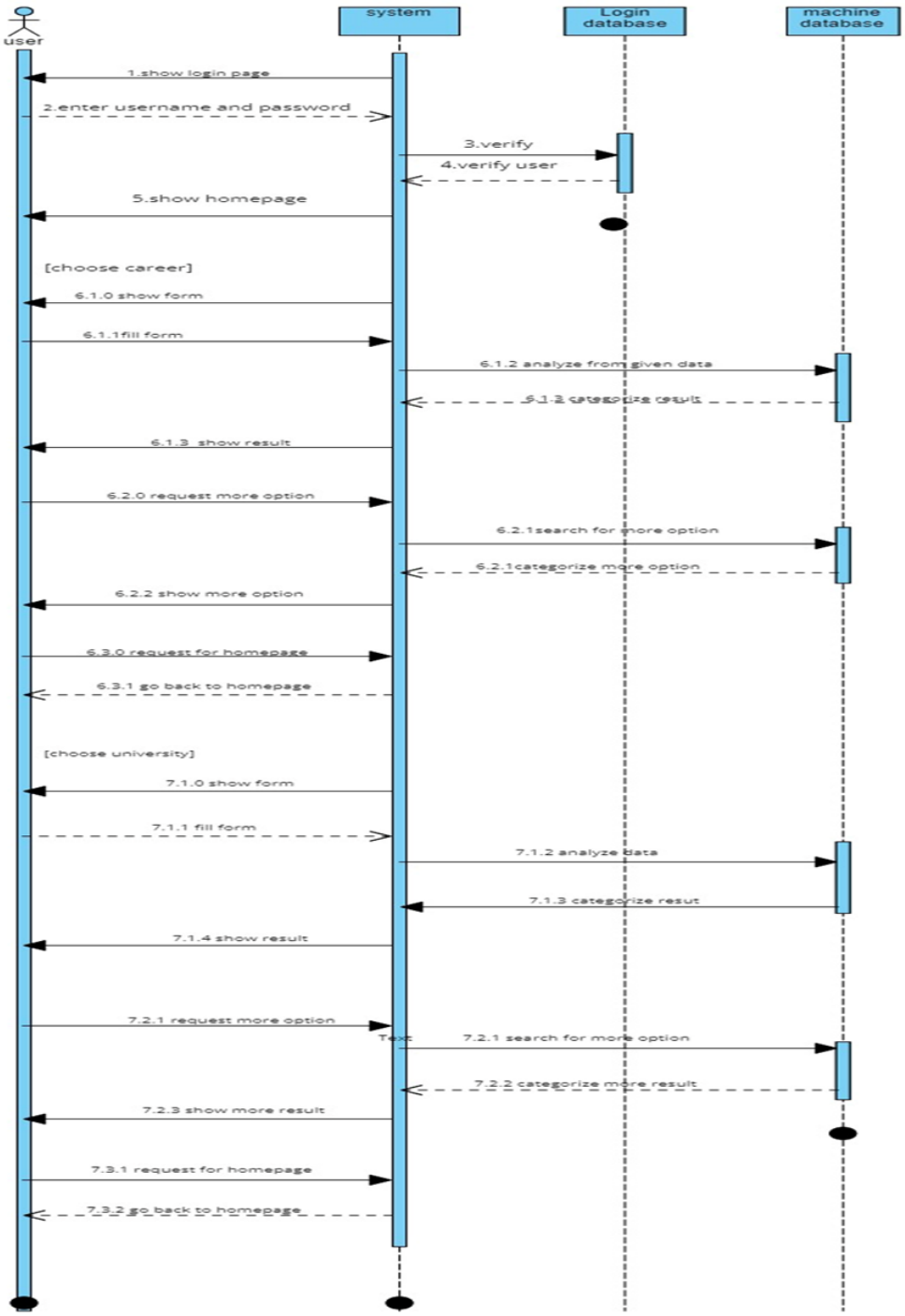
  The application will operate in online mode, providing users with instant access to personalizedcareer guidance and educational insights.

2.5 Architecture Evaluation

We chose the MERN (MongoDB, Express.js, React.js, Node.js) stack because our team knows how to use these technologies well. We've learned about them, so we understand how they work together to build web apps. Adding machine learning to our system makes it even better. Machine learning helps us understand data and make guesses, so we can give advice to users. By putting machine learning with the MERN stack, we're making our system smarter and more helpful. It's like adding an extra layer of cleverness to a strong base (the MERN stack). This makes our system a great tool for exploring jobs. We want our system to be easy for students to understand and use. We want them to feel sure about their choices for the future. With the MERN stack and machine learning, we believe we can do that. By continuously refining our approach and leveraging these advanced technologies, we aim to create a seamless and intuitive experience for all users. We are excited about the potential impact of our system in helping students confidently navigate their career paths.

3. Detailed/Component Design

3.1 Component-Component Interface



3.2 Component-External Entities Interface

- **User Authentication component:**
  This module is responsible for verifying users' identities during signup or login. It interacts with the User Profile module to access user data needed for authentication. When a user attempts to sign in, the User Authentication module requests the necessary user information from the User Profile module to verify their identity. Once authentication is successful, the User Authentication module grants access to the user.

- **User Profile component:**
  The User Profile module stores and manages user data, including preferences and academic records. It communicates with the User Authentication module to provide the required user information for authentication. Additionally, the Career Recommendation Engine interacts with the User Profile module to access user preferences and academic records needed to generate personalized career suggestions. This module serves as a central repository for user data that is utilized by various components of Vision Forge.

- **Career Recommendation component:**
  This component generates personalized career suggestions based on user data, such as preferences and academic records. It interacts with the User Profile module to access this user data and Machine Learning component to predict results. When a user requests career recommendations, the Career Recommendation Engine retrieves relevant information from the User Profile module to tailor the suggestions to the user's individual needs and aspirations.

- **Machine Learning component:**
  The Machine Learning module utilizes machine learning algorithms to analyze user data and provide insights for career recommendations. It interacts with the Career Recommendation Engine to enhance the accuracy of the recommendations. By leveraging machine learning techniques, this module can uncover patterns and trends in user data that may not be immediately apparent, leading to more refined and accurate career suggestions. The Career Recommendation Engine utilizes the insights provided by the Machine Learning module to improve the quality of its recommendations, creating a feedback loop that continuously enhances the user experience.

- **University Eligibility Module:**
  This module allows users to input their grades and courses to determine eligibility for universities. It interacts with the User Profile module to access user academic records for input. After processing, it communicates with external university APIs to fetch eligibility criteria. Once completed, it provides the eligibility list back to the User Profile module for user viewing and career exploration within Vision Forge.

3.3 Component-Human Interface

In our project, we follow several Human-Computer Interaction (HCI) norms to ensure an intuitive and user-friendly interface. Some of these norms include:

1. **Consistency**: We maintain consistency in the interface design by using standardized elements such as buttons, menus, and navigation bars across all screens. Consistency helps users predict the behavior of the interface and reduces cognitive load.

2. **Feedback**: We provide immediate and informative feedback to users for every action they perform. This includes visual feedback such as animation or color changes or toasts to indicate that an action has been successfully executed or if there's an error.

3. **Visibility**: We ensure that all important features and functionalities are visible and easily accessible to users. We avoid hiding critical elements or burying them in menus, as this can frustrate users and hinder their ability to accomplish tasks.

4. **User Control**: We give users control over the interface by allowing them to customize settings, adjust preferences, and navigate freely. Providing user control enhances the sense of agency and empowers users to tailor the interface to their needs.

5. **Simplicity**: We strive for simplicity in the interface design, avoiding unnecessary complexity and clutter. We use clear and concise language, minimize the number of steps required to complete tasks, and prioritize essential information to enhance usability.

6. **Accessibility**: We design the interface to be accessible to users with diverse needs, including those with disabilities. We follow accessibility guidelines such as WCAG (Web Content Accessibility Guidelines) to ensure that all users can access and interact with the interface effectively.

By adhering to these HCI norms, we aim to create an interface that is user-friendly, efficient, and enjoyable to use, ultimately enhancing the overall user experience of our project.

Screens that Receive Input from User

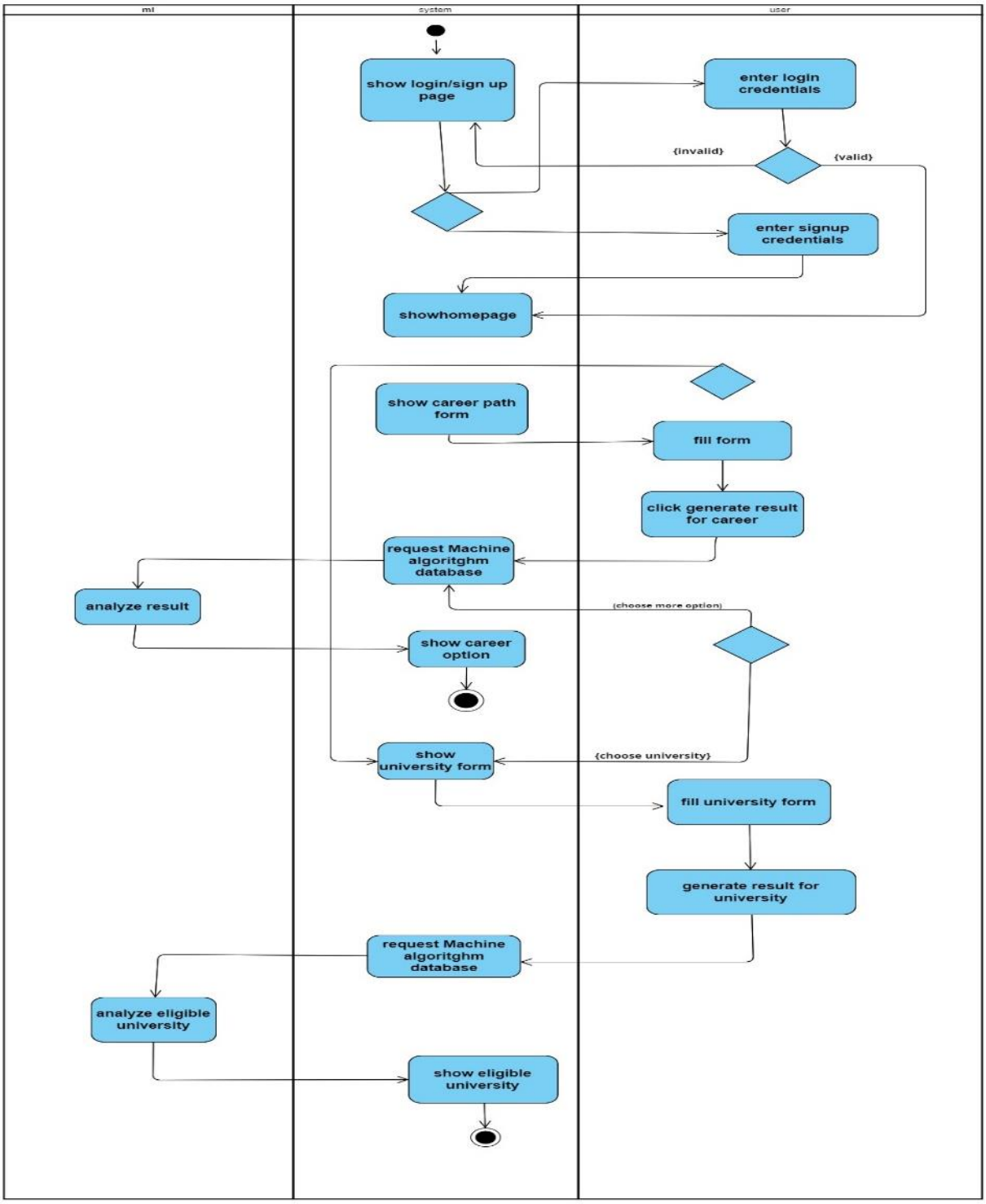
- Login Screen
- Sign Up Screen
- Career Form
- Selecting University Form

Screens That Provide Output to User

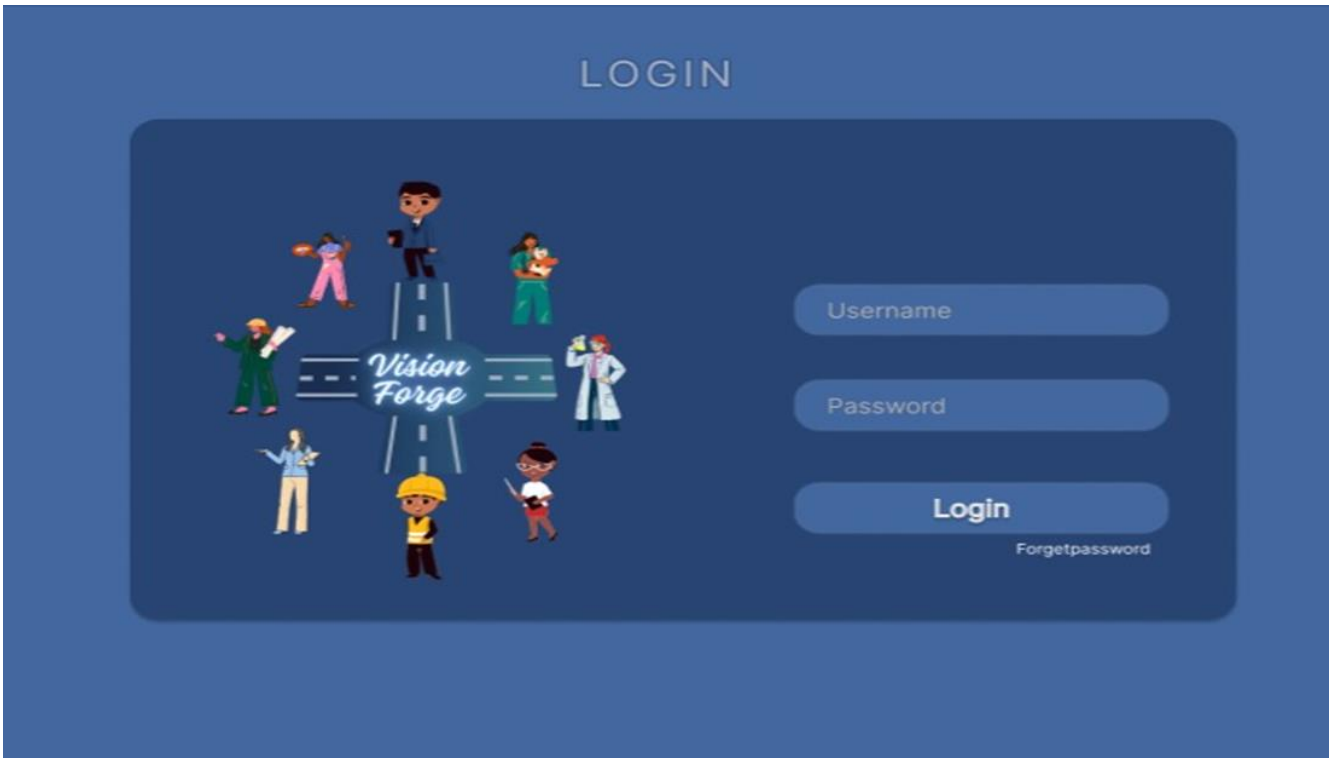
- Home Screen
- Career Suggestions Screen
- University Suggestions Screen

4. Screenshots/Prototype

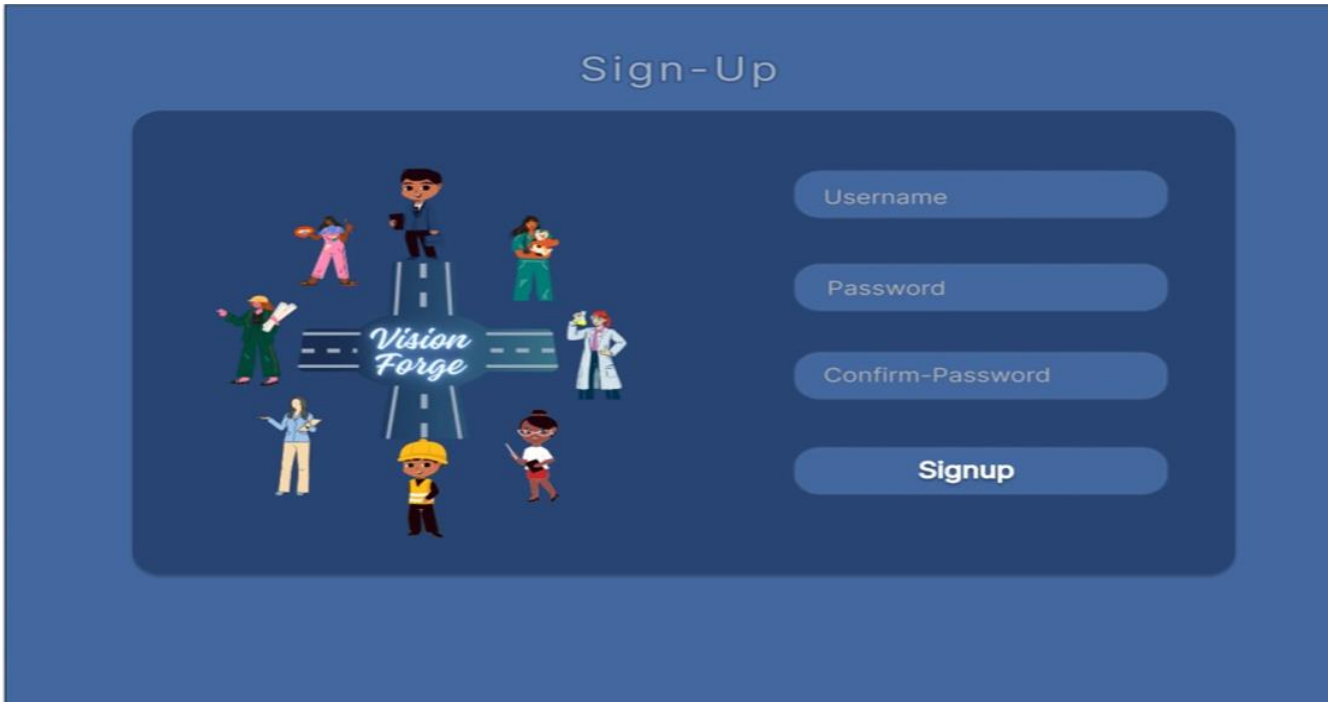
4.1 Workflow



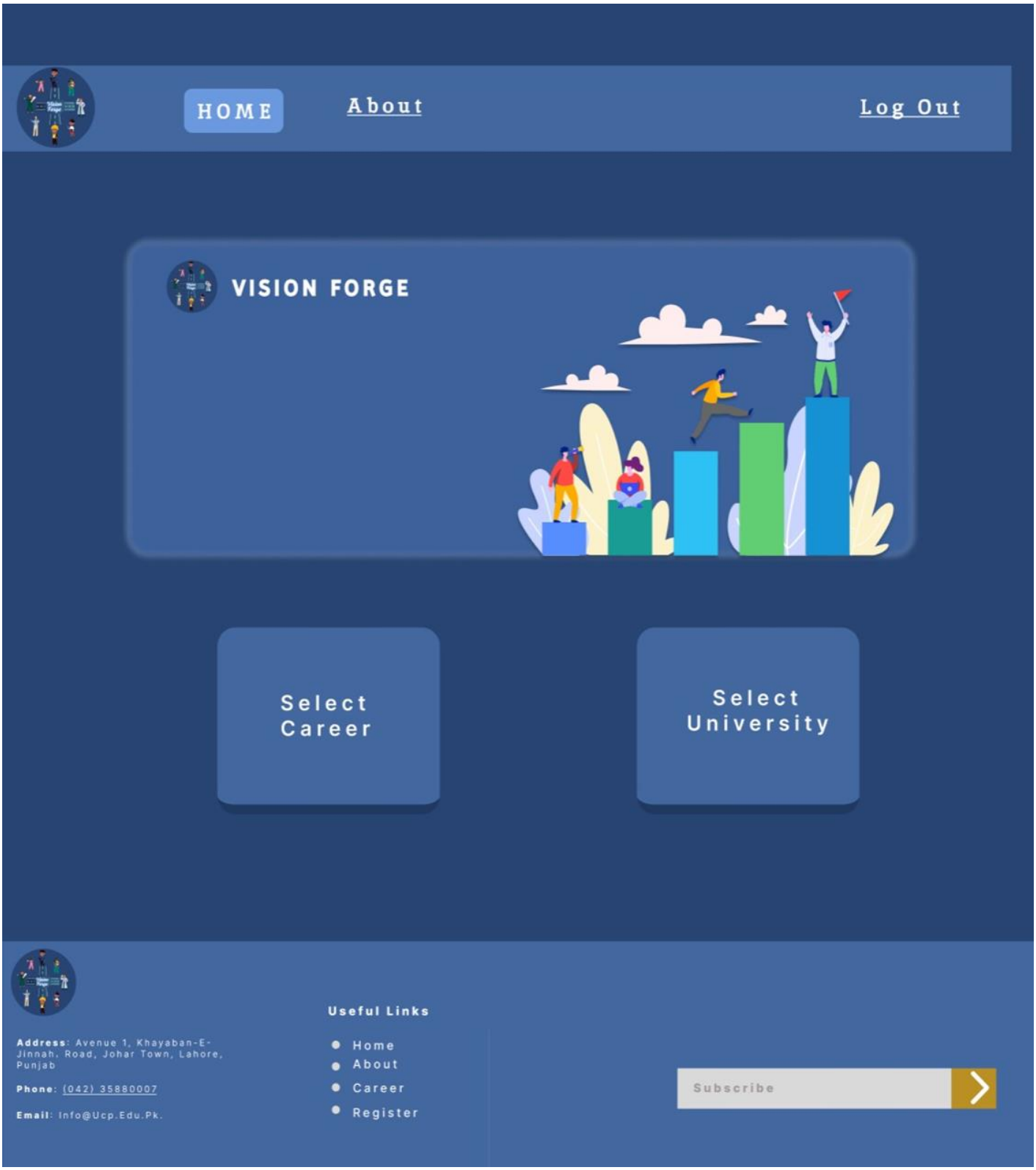
4.2 Screens



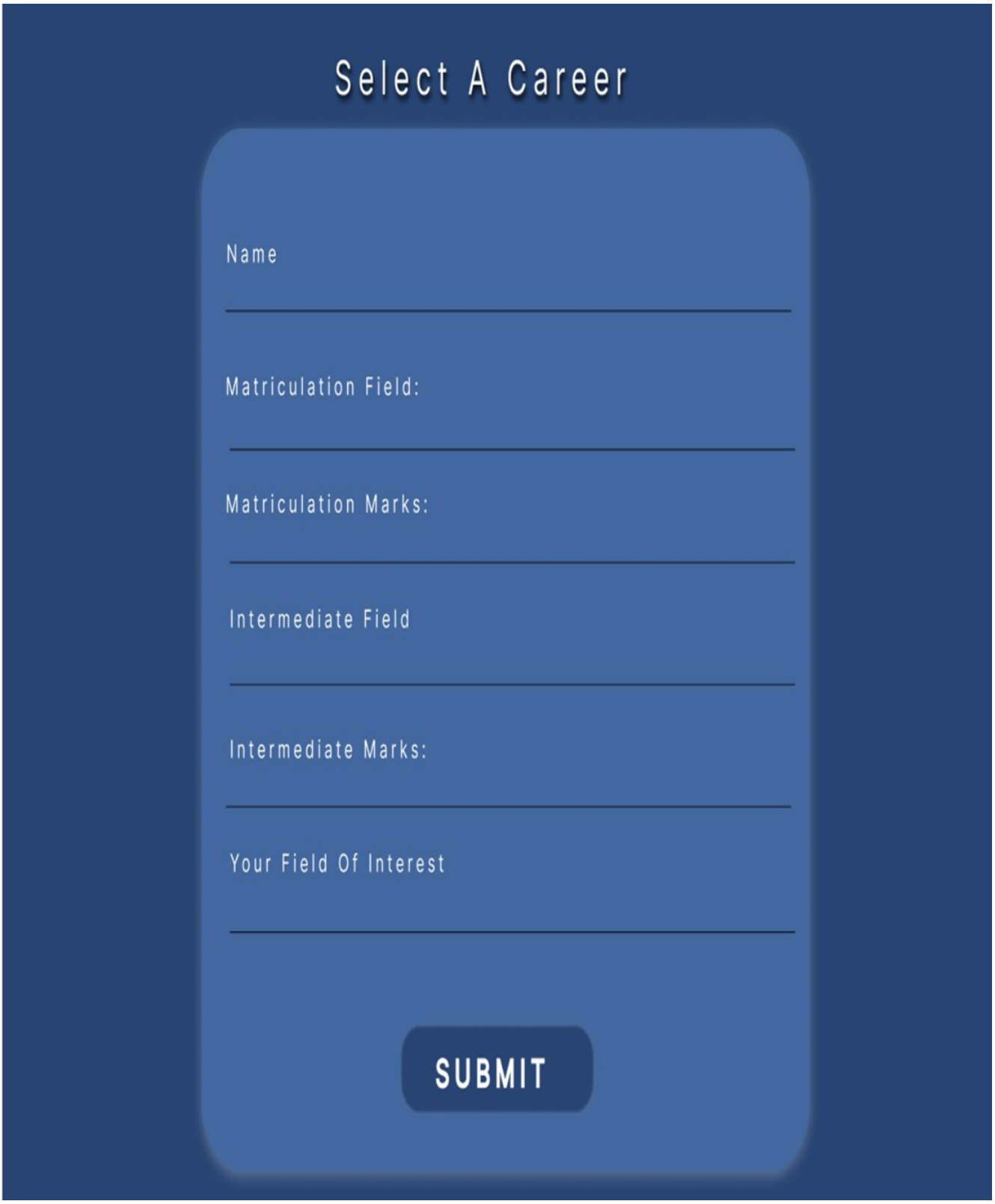
This is the login Page where user will enter his credentials through which he registered himself as a user in this and the he will be able to access the system.



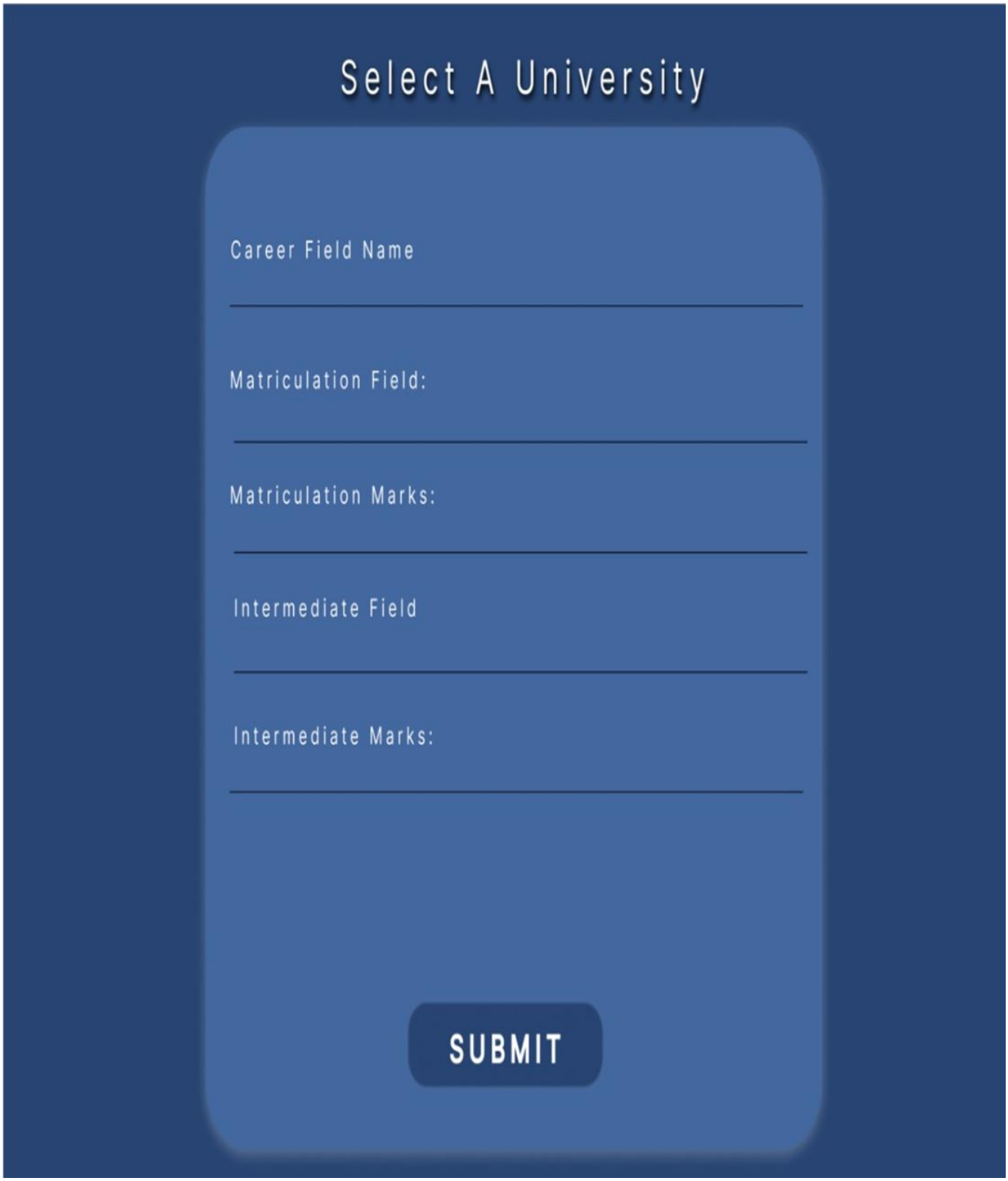
This is Sign Up page where user will enter his name, email and password to register himself as a user and he come again to use this system through these credentials.



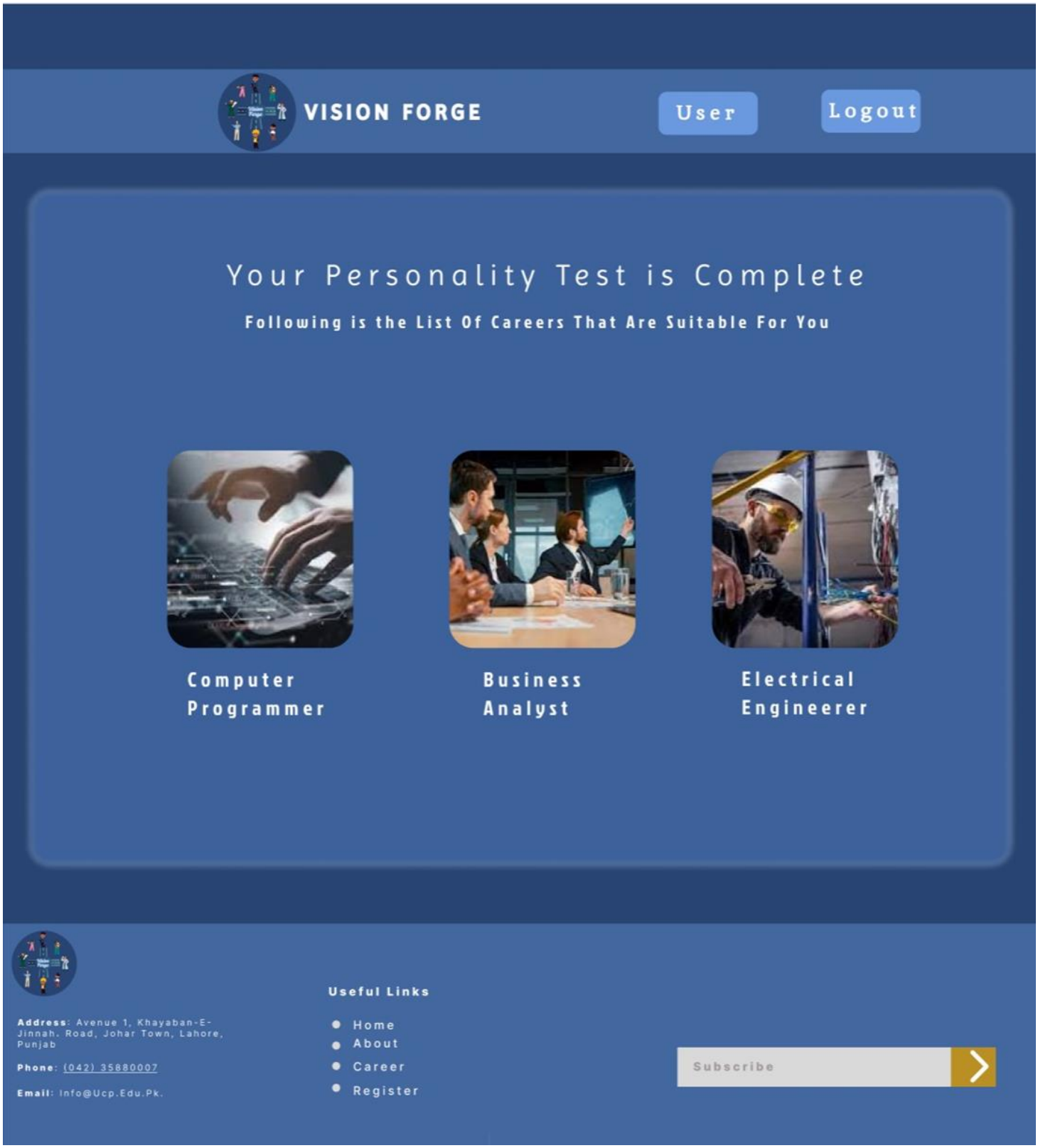
This is the home page where user will come after logging in and then he will have two features to use. One for career recommendation and other for university eligibility.



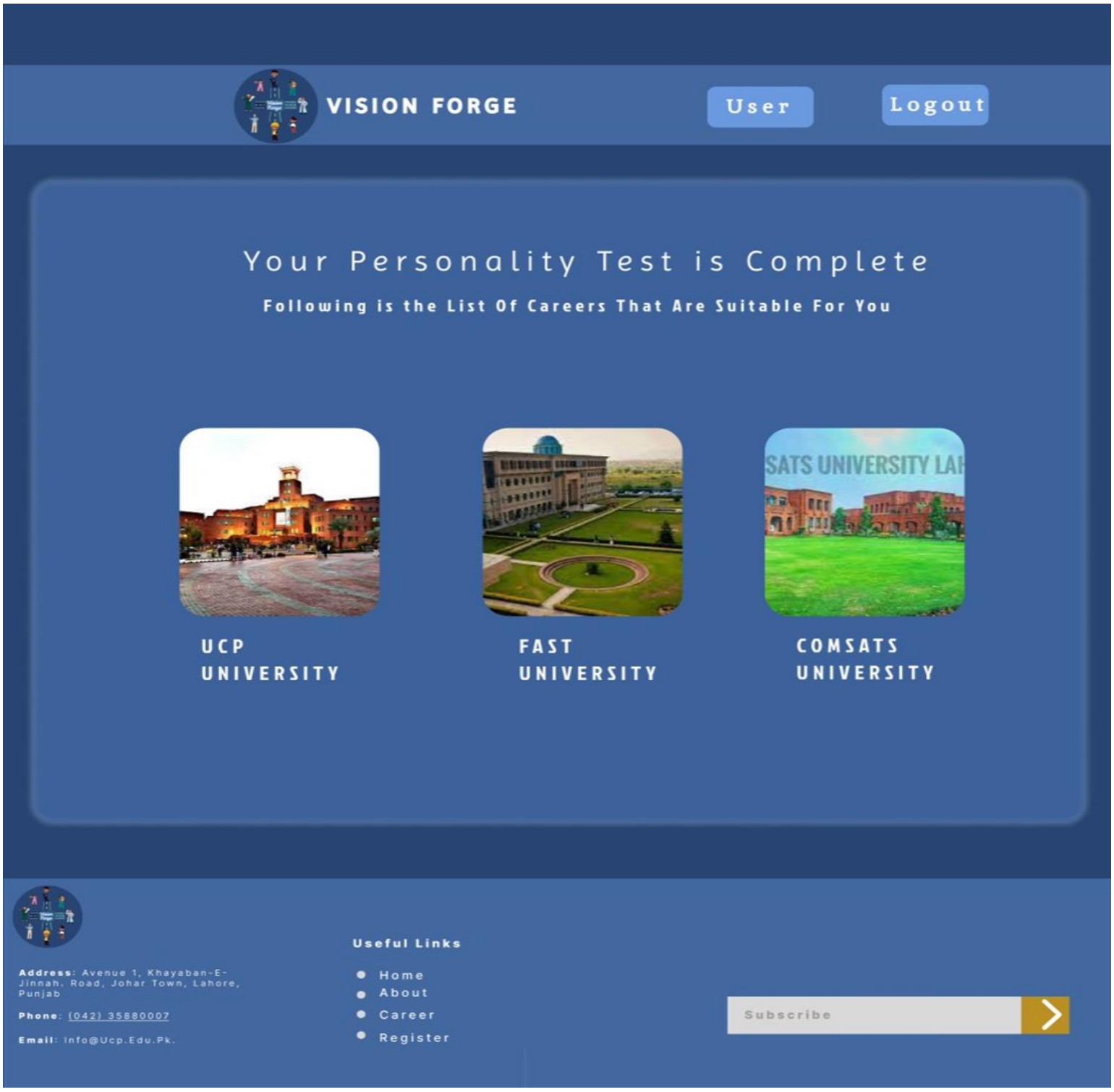
This is the career form where user will enter his previous academic data and the fields of interests he has. User can choose multiple interests.



This is the university eligibility form where user will enter his course to study and his marks. It will check through the available universities that where that course is offered and are his marks eligible to study in that university.



This is the result page for career recommendations. It will be displayed as a result of input data you gave in career form. That data will be processed and display courses suitable to that data like this.



This is the result page for university feature. It will be displayed as a result of input data you gave in university eligibility form. That data will be processed and display universities suitable to that data like this.

5. Test Specification and Results

5.1 Test Case Specification

Identifier	TC-1
Related requirements(s)	Security controls, authentication, session management
Short description	Test case for logging into the application
Pre-condition(s)	User already sign up
Input data	Username, Password
Detailed steps	1. Open the system login page. 2. Enter valid username and password. 3. Click on the "Login" button.
Expected result(s)	The system should authenticate the user and redirect them to the homepage.
Post-condition(s)	User is logged in and can access the system features
Actual result(s)	User is successfully redirected to the dashboard/homepage after entering valid credentials.
Test Case Result	Pass

Table 5.1.1

Identifier	TC-2
Related requirements(s)	Customization and personalization, data privacy and security
Short description	Test case for evaluating the functionality of assisting with career path decisions.
Pre-condition(s)	The User is already logged in
Input data	Student's academic records, interests, and career goals.
Detailed steps	1.Open the system login page. 2.Log in with valid credentials or create a new account if necessary. 3.Input academic records, including grades and courses completed. 4.Input interests 5.Specify career goals or areas of interest. 6.Submit the input data
Expected result(s)	• The system generates personalized career suggestions based on the input data. • Relevant career options are displayed, along with recommended courses to pursue.
Post-condition(s)	The user receives tailored career guidance and recommendations.
Actual result(s)	The system successfully generates personalized career suggestions, recommends relevant courses based on the input data.
Test Case Result	Pass

Table 5.1.2

Identifier	TC-3
Related requirements(s)	Accuracy, reliability, performance
Short description	Test case for evaluating the functionality of determining university eligibility based on academic records and career goals.
Pre-condition(s)	User already sign up
Input data	Student's academic records, desired career path.
Detailed steps	1.Open the system login page. 2.Log in with valid credentials or create a new account if necessary. 3.Navigate to the "University Eligibility" section. Input academic records, including grades and courses completed. 4.Specify the desired career path or area of study. 5.Submit the input data.
Expected result(s)	• The system evaluates the input academic records against admission criteria for relevant universities. • It generates a list of universities where the student meets the eligibility requirements.
Post-condition(s)	The user receives a list of universities where they are eligible for admission based on their academic records and desired career path.
Actual result(s)	The system successfully evaluates the input academic records and generates a list of eligible universities based on the specified career path.
Test Case Result	Pass

Table 5.1.3

Identifier	TC-4
Related requirements(s)	Customization and personalization, data privacy and security
Short description	Test case for evaluating the handling of invalid input data in the career guidance section
Pre-condition(s)	1.The system is accessible and properly configured. 2.User is logged in
Input data	Invalid academic records or incomplete input
Detailed steps	1.Open the system login page. 2.Log in with valid credentials or create a new account if necessary. 3.Input incomplete or incorrect academic records, such as missing grades or incomplete course information. 4.Submit the input data
Expected result(s)	• The system should detect the invalid input and display an error message indicating the issue. • It should not generate personalized career suggestions or recommendations.
Post-condition(s)	The user is notified of the invalid input and prompted to correct it.
Actual result(s)	The system fails to detect invalid input and proceeds to generate career suggestions based on incomplete or incorrect data.
Test Case Result	Fail

Table 5.1.4

5.2 Summary of Test Results

Module Name	Test cases run	Number of defects found	Number of defects corrected so far	Number of defects still need to be corrected
Authentication	TC-1	0	0	0
Career Guidance	TC-2, TC-4	1	0	1
University Eligibility	TC-3	0	0	0
Complete System	TC-1 to TC-4	1	0	1

Table 5.2.1

Defects Found:

TC-4: The system fails to detect invalid input and proceeds to generate career suggestions based on incomplete or incorrect data.

Fixing Defect: We fixed this issue by adding some validation on the form page where validations were added for marks and some validations were added for interests like if user has selected computer as interest then only computer related interest should be displayed in results. This made sure the correct execution and better predictions of courses.

6. Project Completion Status

Module Name	Status
Front-end	Completed
Dataset Collection and Preparation	Completed
Model Training On dataset	Completed
Backend of system	Completed
API's for University Data	Majorly Implemented
Documentation	Completed
Login authentication and Data retrieval	Completed
Integration of System and Machine Learning Model	Completed
Complete System	Completed

Table 6.1

Target/Objective	Status (Completed, Partially Completed, Not Completed)	Reason(s)
Create an easy-to-use career help system called "Vision Forge" that uses smart technology to give personalized advice.	Completed	_
Give suggestions for careers, recommend courses to take, and check if you can get into different universities.	Completed	_
Compare "Vision Forge" to other career help systems to see which one works better.	Completed	_
See how "Vision Forge" affects students' decisions about their careers and what jobs they end up in.	Partially Completed	Separate study to determine if the career chosen based on interest is being properly focused on
Make sure that "Vision Forge" covers everything students need for career help, and make sure our goals match what we can realistically do in the time we have.	Majorly Implemented	Some university APIs are still pending; ongoing study to determine if recommended courses match students' interests and maintain engagement.

Table 6.2

7. Deployment/Installation Guide

"Vision Forge" is a web-based system designed to assist students in selecting their career paths. Users do not need to install any software to use it. The system will be hosted on a particular domain, and users can access it through the provided URL. Simply open a web browser, enter the URL, and start using the system. "Vision Forge" is free to use, making it accessible to everyone. There is no need for complex installation procedures; just ensure you have an internet connection and a web browser to get started. Enjoy exploring career options effortlessly!

8. User Manual

This guide will help you navigate and use the features of our system efficiently. Vision Forge is designed to provide personalized career and university recommendations based on your academic records and interests.

8.1.1 Accessing Vision Forge

1. **Open Web Browser**: Launch your preferred web browser.
2. **Enter URL**: Type the Vision Forge URL (e.g., www.visionforge.com) into the address bar and press Enter.

8.1.2 Signing Up

1. **Navigate to Sign Up Page**: On the homepage, click on the "Sign Up" button.
2. **Fill Out Sign Up Form**: Enter the required information, including:
    - Full Name
    - Email Address
    - Password (create a strong password)
    - Confirm Password
3. **Submit Sign Up Form**: Click the "Submit" button to create your account.

8.1.3 Logging In

1. **Navigate to Login Page**: On the homepage, click on the "Login" button.
2. **Enter Login Credentials**: Enter your registered email address and password.
3. **Submit Login Form**: Click the "Login" button to access your profile.

8.1.4 Home Page

After logging in, you will be directed to the Home page. Here, you have two main options:

1. **Career Path**
2. **University Eligibility**

8.1.5 Career Path Feature

1. **Click Career Path**: On the Home page, click the "Career Path" button.
2. **Fill Out Career Path Form**:
    - Academic Records: Enter your grades, courses, and any other relevant academic details.
    - Interests: Select your areas of interest from the provided list.
3. **Submit Career Path Form**: Click the "Submit" button.
4. **Processing Information**: The system will process your data and display a loading message.
5. **View Recommendations**: After processing, you will see a list of recommended courses tailored to your academic background and interests.
6. **Navigate**: You can either:
    - Return to the Home page by clicking the "Home" button.
    - Visit your user profile by clicking the "Profile" button.
    - Log out by clicking the "Logout" button.

8.1.6 University Eligibility Feature

1. **Click University Eligibility**: On the Home page, click the "University Eligibility" button.
2. **Fill Out University Eligibility Form**:
    - Personal Details: Enter your name, email, and other required personal information.
    - Academic Records: Provide details about your grades, test scores, and any other relevant academic achievements.
3. **Submit University Eligibility Form**: Click the "Submit" button.
4. **Processing Information**: The system will process your data and display a loading message.
5. **View Universities**: After processing, you will see a list of universities that match your academic profile.

6. **Navigate**: You can either:
    - Return to the Home page by clicking the "Home" button.
    - Visit your user profile by clicking the "Profile" button.
    - Log out by clicking the "Logout" button.

8.1.7 User Profile

1. **Access Profile**: Click on the "Profile" button either from the Home page or after receiving recommendations.
2. **View/Edit Information**: In your profile, you can view and edit your personal and academic information.
3. **Save Changes**: After making any changes, click the "Save" button to update your profile.

8.1.8 Logging Out

1. **Click Logout**: To log out of the system, click the "Logout" button available on any page.
2. **Confirm Logout**: You will be redirected to the login page, confirming that you have been logged out.

9. References

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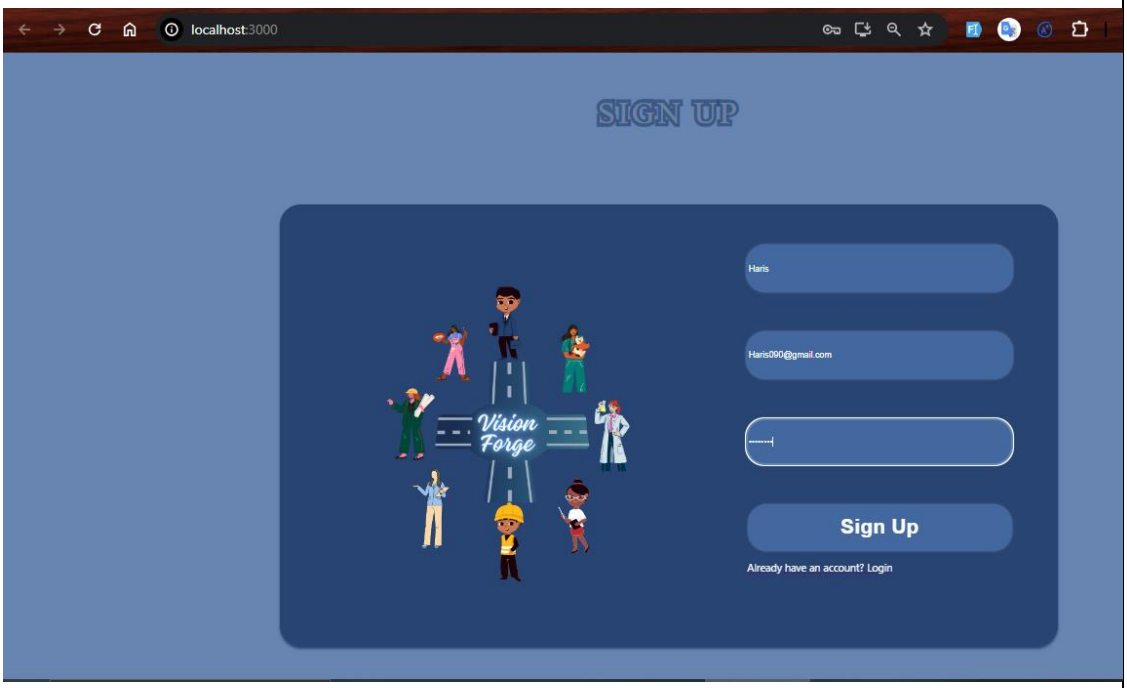
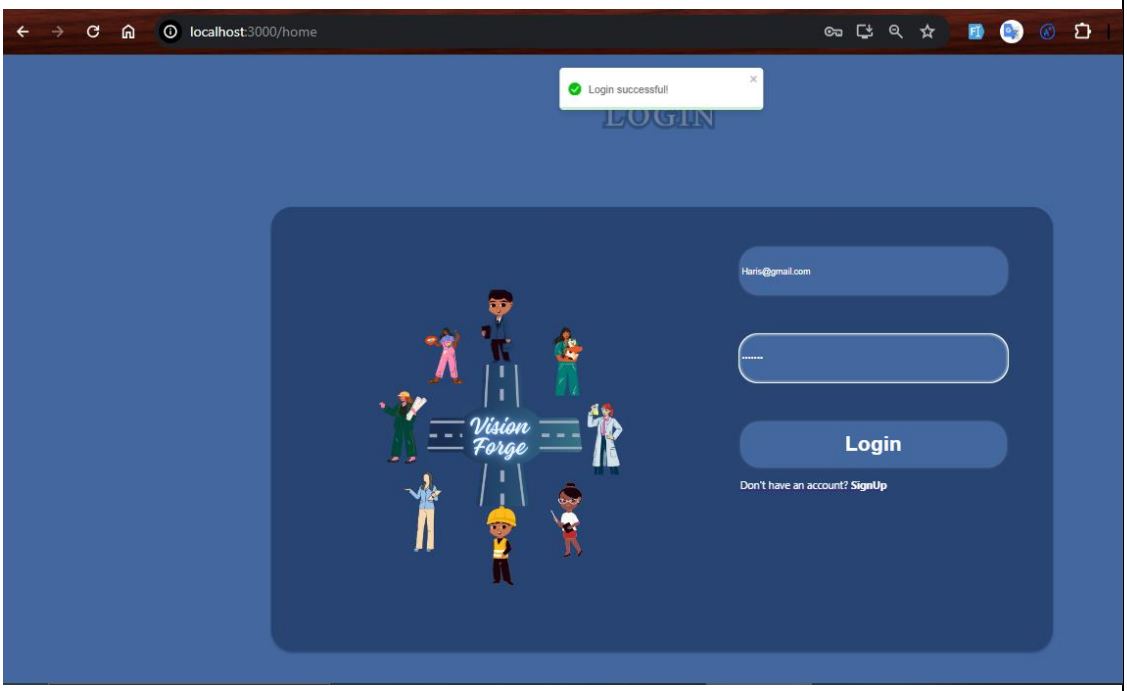
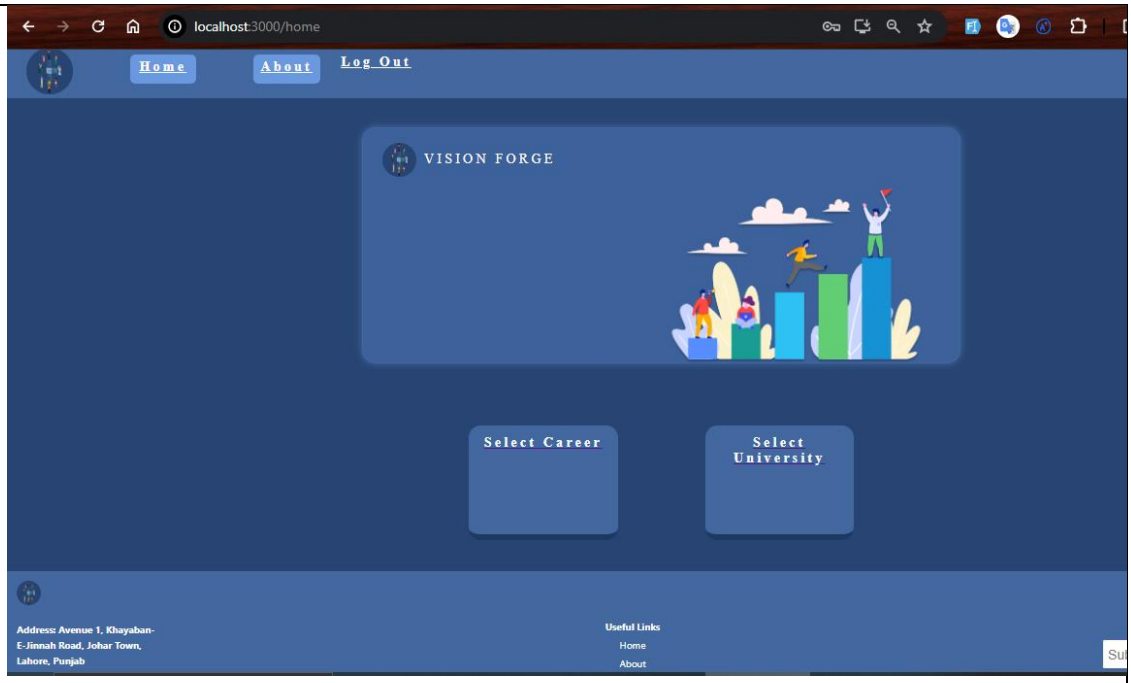
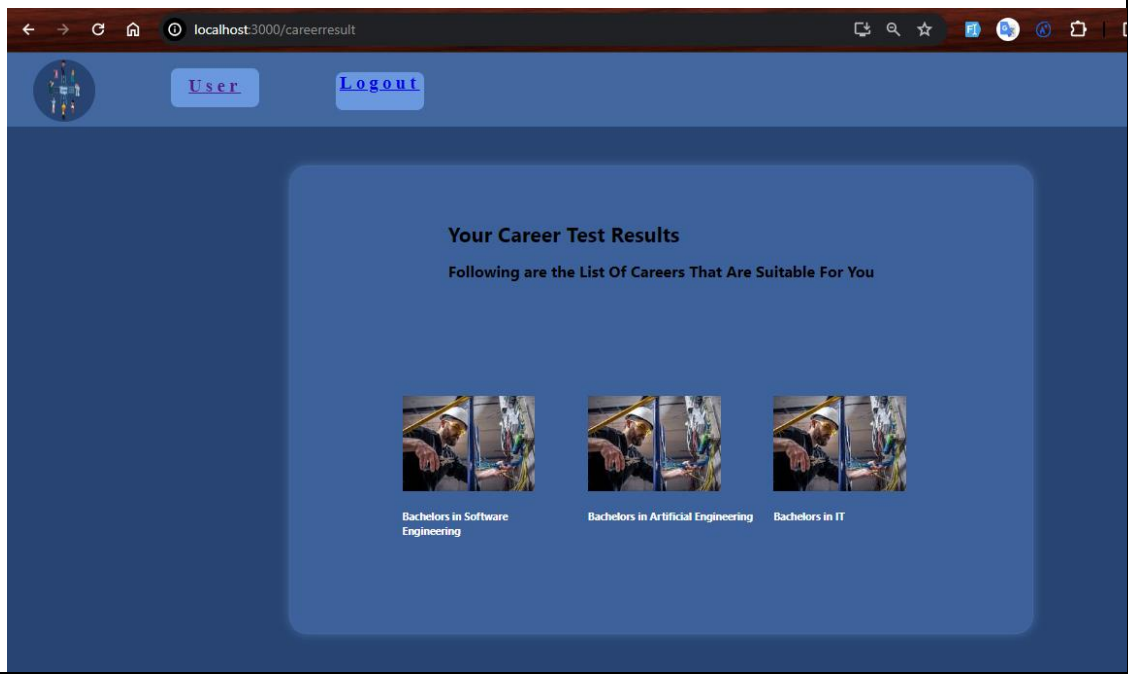
https://www.youtube.com/@codewithyousaf

10. Project Summary Form

Name of Project	Vision Forge
Project Type	Web Application
Department	Software Engineering
Start Date	12/7/2023
Completion Date	03/07/2024
Supervisor / Team Leader	Ms. Rubab Javaid
Team Members (if any)	Haris Naseem Butt Asna Abroo Yumen Tariq
Funding Agency (if any)	N/A
Amount of Funding (if any)	N/A
Assign SDGs to Project	Quality Education, Decent Work and Economic Growth
Motivation of Project	Inspired by a podcast and discussions among friends about the lack of effective career guidance.
Practical / Potential Application	"Vision Forge" can be used by educational institutions to provide students with tailored career advice, by career counselors to enhance their guidance services, and by students independently to explore career and educational opportunities
Abstract	"Vision Forge" is a web-based system designed to assist students in selecting their career paths. Utilizing advanced machine learning, it provides personalized career suggestions, recommends learning paths, and assesses university eligibility. This tool aims to empower students to make informed and confident decisions about their academic and professional futures.

Key Technical Features	"Vision Forge" leverages the MERN stack (MongoDB, Express.js, React.js, Node.js) for robust web application development. It integrates machine learning algorithms to analyze user data and provide personalized career and course recommendations. Users can sign up, log in, and access features like career path suggestions and university eligibility checks, all within an easy-to-use interface.
Projects Images / Screenshots	 


localhost:3000/home
Home
About
Log Out
VISION FORGE
Select Career
Select University
Address: Avenue 1, Khayaban-E-Jinnah Road, Johar Town, Lahore, Punjab
Useful Links
Home
About


localhost:3000/careerresult
User
Logout
Your Career Test Results
Following are the List Of Careers That Are Suitable For You
Bachelors in Software Engineering
Bachelors in Artificial Engineering
Bachelors in IT

Appendix A: Glossary

Acronym	Full Form
UML	Unified Modeling Language
SDLC	Software Development Life Cycle
AWS	Amazon Web Services
COTS	Commercial off-the-shelf
API	Application Programming Interface

Appendix B: IV & V Report

(Independent verification & validation)
IV & V Resource

Name Signature

S#	Defect Description	Origin Stage	Status	Fix Time	
				Hours	Minutes
1					
2					
3					
...					

Table B.1: List of non-trivial defects