

# BSSE FINAL PROJECT

## Design and Test Specification

### Vision Forge



Project Advisor

**Ms Rubab Javaid**

Presented by:

**Group ID: F23SE094**

<b>Student Registration No.</b>	<b>Student Name</b>
Haris Naseem Butt	L1F20BSSE0609
Asna Abroo	L1F20BSSE0608
Yumen Tariq	L1F20BSSE0617

**Faculty of Information Technology**

**University of Central Punjab**

# Design and Test Specification

## SDP Phase III

### Vision Forge

**Advisor: Ms. Rubab Javaid**

**Group F23SE094**

Member Name	Primary Responsibility
Haris Naseem Butt	Defining Points, UML Diagrams
Asna Abroo	User Interface, Test Cases
Yumen Tariq	UML Diagrams, Test Cases

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## 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 solution to empower students facing uncertainty about their career paths. Many students lack dedicated counselors, leading them to make choices without proper information and influenced by family pressures. Vision Forge offers a user-friendly app where students can input their academic records and interests, generating personalized career suggestions. Using advanced machine learning technology, the app analyzes this information to provide insights into potential fields, associated courses, and educational opportunities. It helps students align their academic backgrounds with career aspirations and suggests alternative courses if needed. It also helps students explore universities related to their chosen career path. The primary aim is to guide students towards confident and well-informed decisions, ensuring a rewarding and fulfilling career journey.

## **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

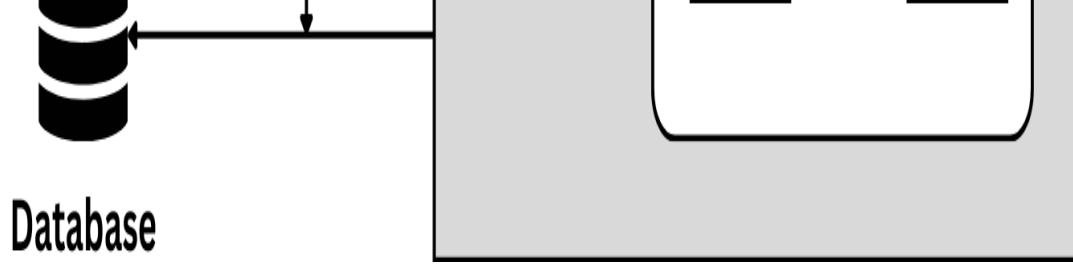
**Font Size for Main Heading:** 18

**Highlighted Items:** Enclosed in "inverted commas"

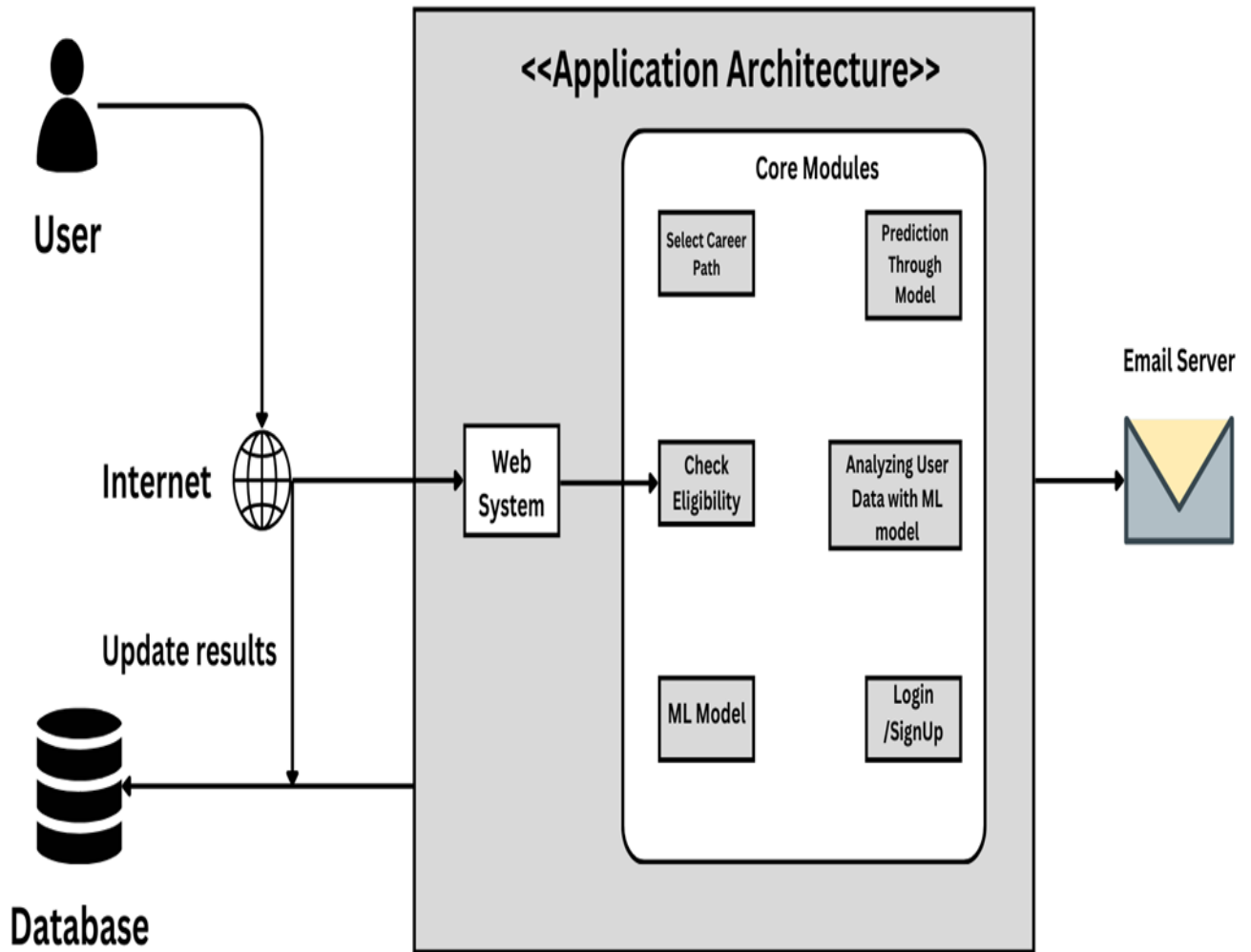
**Bullet Points:** Used for clear and concise understanding

## 2. Technical Architecture

- **System Type:**  
The current system is custom-built, specifically designed to address the unique requirements of career guidance and counseling.
- **Processing Type:**  
The system is primarily responsible for online transaction processing, handling real-time data input, and providing instantaneous career suggestions.
- **Application Components:**  
Major components include a user interface for students, an administrative interface, a machine learning 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 with the 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 on specific on-premise hardware.
- **Database Platform:**  
MongoDB is used as the database platform, providing a flexible and scalable solution for managing diverse data types.
- **User Interface:**  
The end-user interface is browser-based, allowing students and administrators to access the system through web browsers.
- **Network Architecture:**  
The system is designed to be accessible over the internet, providing flexibility for users on different networks.
- **Hosting Environment**  
The system is hosted on external cloud servers, offering reliability and accessibility to users from various locations.



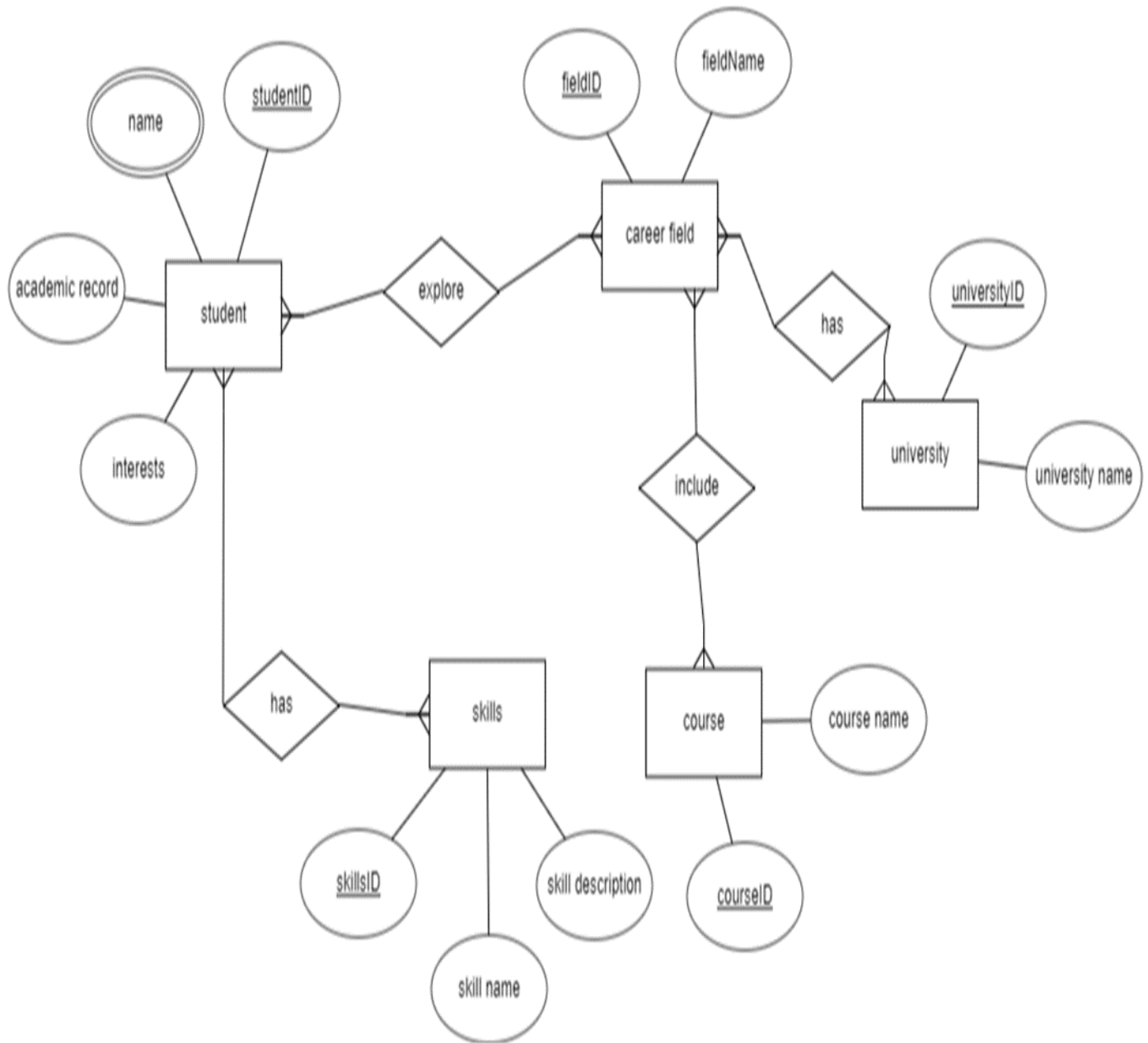
# Technical Architecture



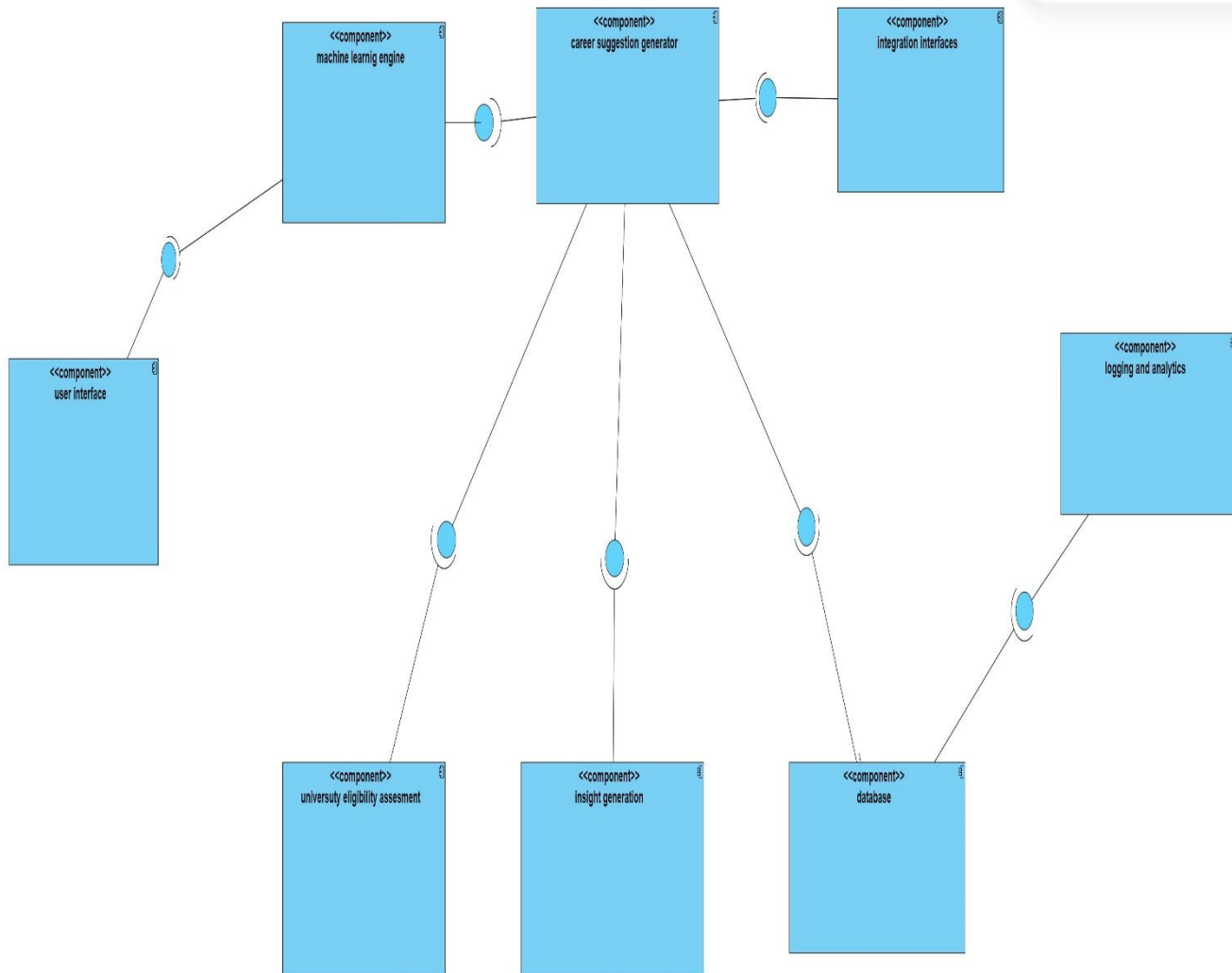


## 2.1 Application and Data Architecture

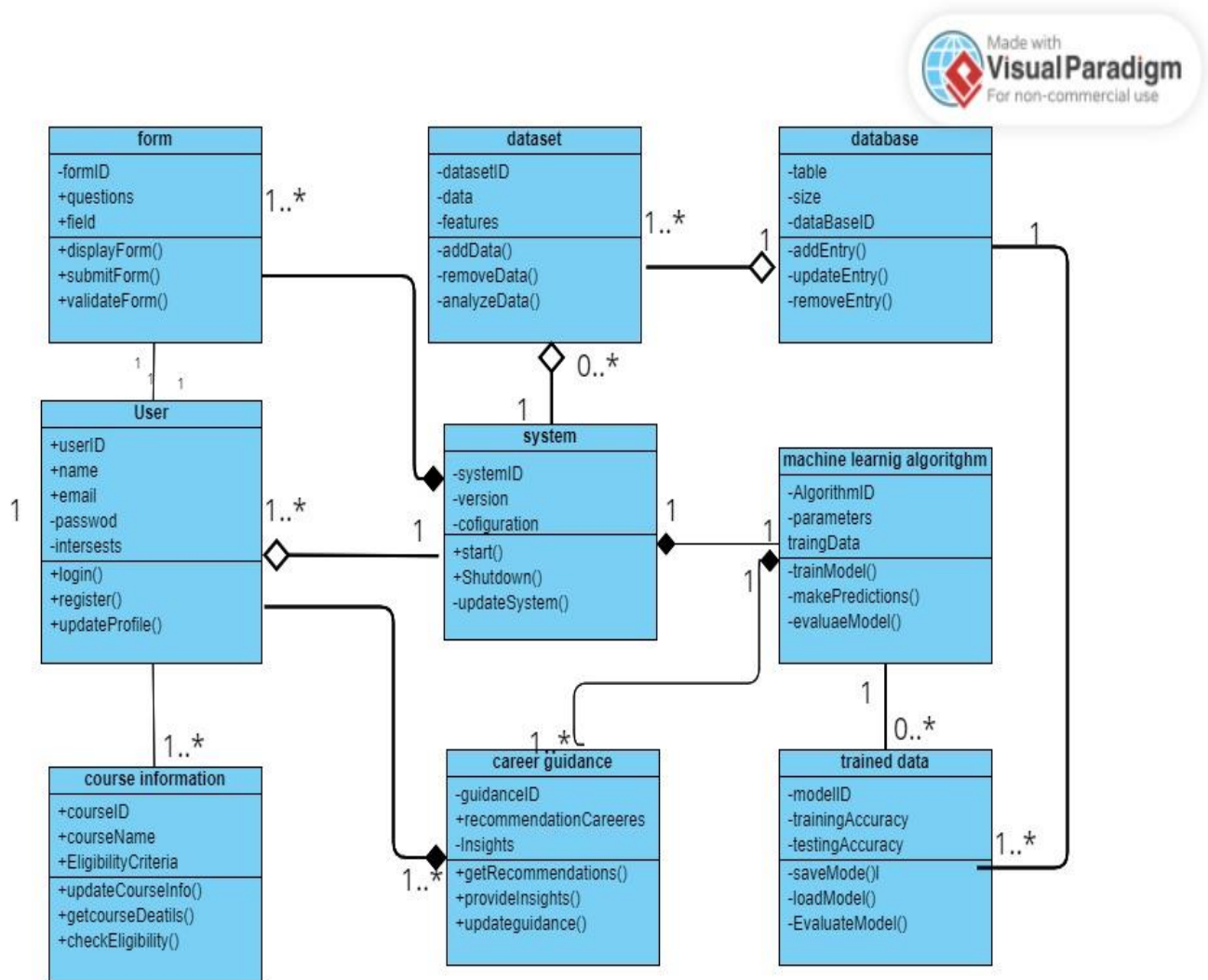
### 2.1.1 Entity Relationship Diagram



## 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**

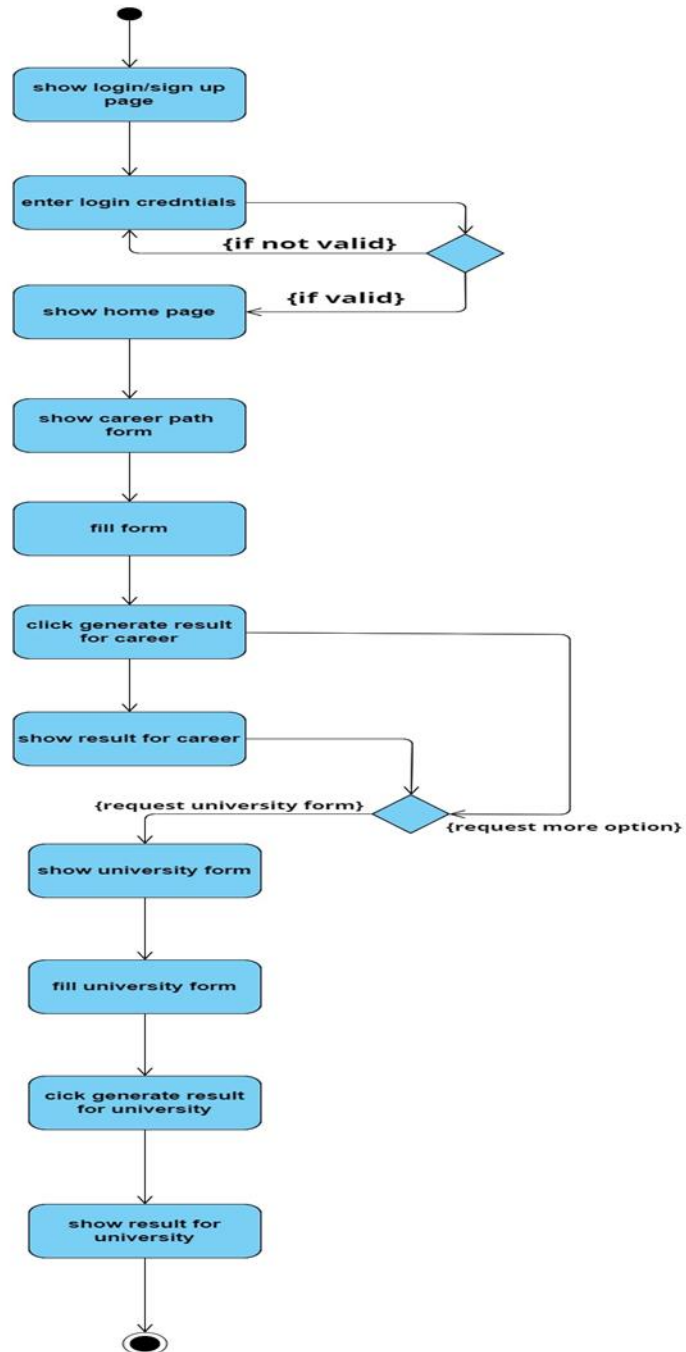
Condition	Rule 1	Rule 2	Rule 3	Rule 4
Matriculation Degree complete	T	F	F	T
Intermediate Degree complete	F	F	T	T
Action				
Career Path Prediction	F	F	F	T

- **University Eligibility decision table**

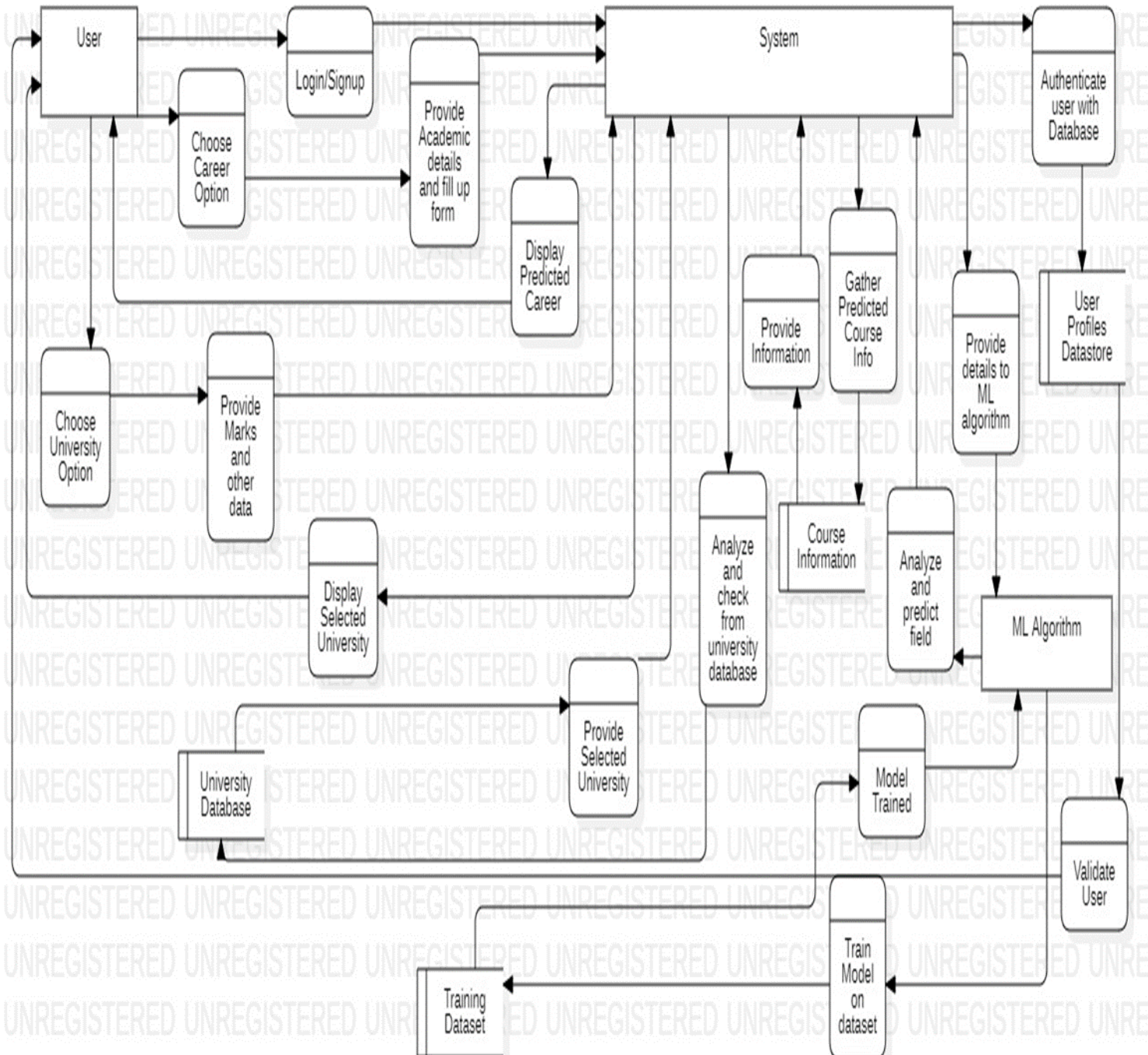
Condition	Rule 1	Rule 2	Rule 3	Rule 4	Rule 5	Rule 6	Rule 7	Rule 8
Matriculation Marks	F	F	F	F	T	T	T	T
Intermediate Marks	F	F	T	T	F	F	T	T
Career Field Name	F	T	F	T	F	T	F	T
Action								
Displaying Eligible University	F	F	F	T	F	F	F	T

## 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 for collecting relevant information from users.
- **Machine Learning Integration:**  
The machine learning prediction module is reused for different career-related predictions based on 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 are reused 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 personalized career guidance and educational insights.

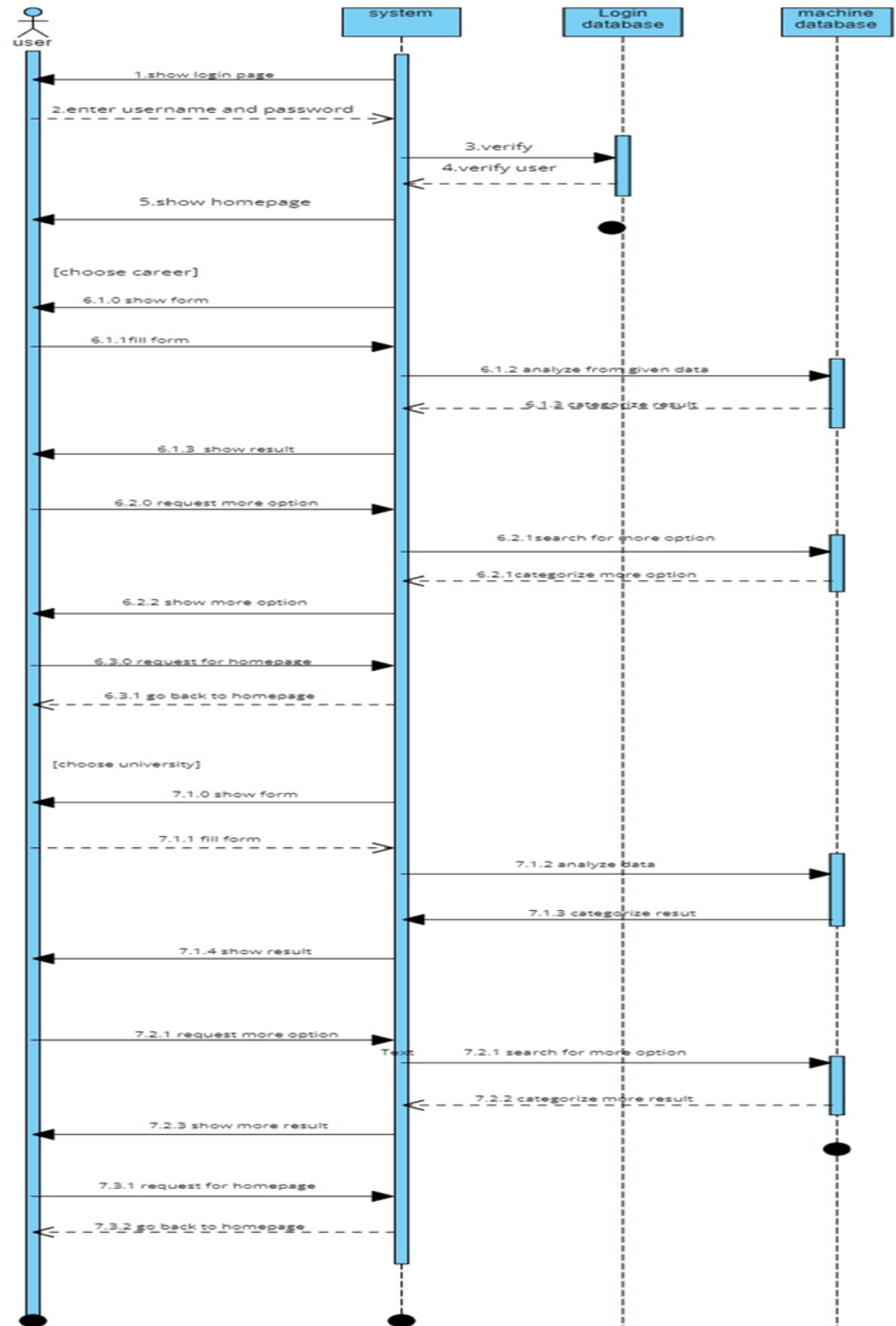
## **2.5 Architecture Evaluation**

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. We're excited to see how our system can help students find the right path for them.



### 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 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

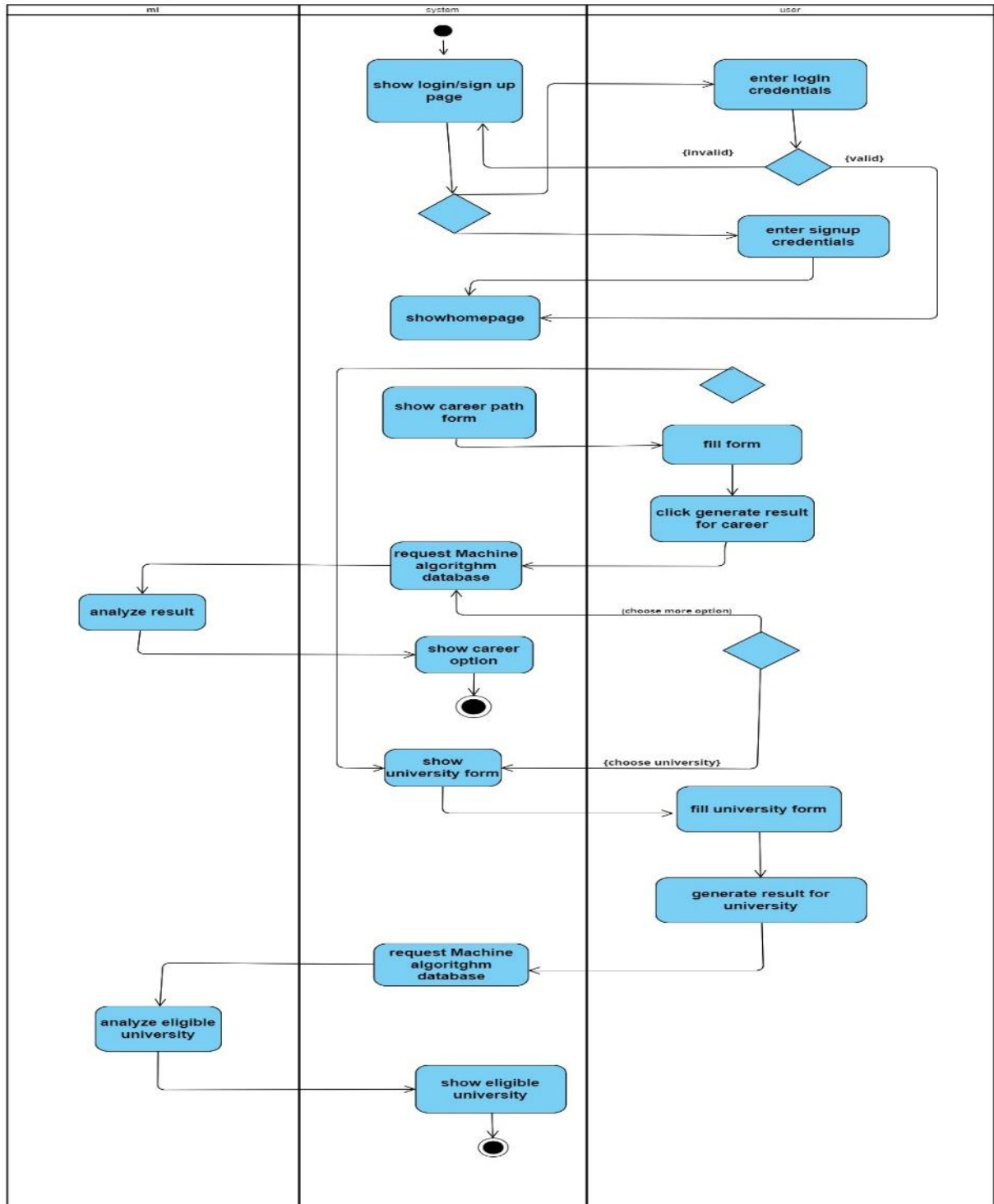
- Login Screen
- SignUp Screen
- Career Form
- Selecting University Form

#### Screens That Provide Output to User

- Home Screen
- Career Suggestions Screen
- University Suggestions Screen


## 4. Screenshots/Prototype

### 4.1 Workflow



## 4.2 Screens

### LOGIN




Username

Password

Login

[Forgetpassword](#)

### Sign-Up



Username

Password

Confirm-Password

Signup



HOME

About

Log Out



VISION FORGE



Select  
Career

Select  
University



**Address:** Avenue 1, Khayaban-E-Jinnah, Road, Johar Town, Lahore, Punjab

**Phone:** (042) 35880007

**Email:** Info@Ucp.Edu.Pk.

Useful Links

- Home
- About
- Career
- Register

Subscribe



## Select A Career

Name

---

Matriculation Field:

---

Matriculation Marks:

---

Intermediate Field

---

Intermediate Marks:

---

Your Field Of Interest

---

**SUBMIT**

## Select A University

Career Field Name

---

Matriculation Field:

---

Matriculation Marks:

---

Intermediate Field

---

Intermediate Marks:

---

**SUBMIT**





**VISION FORGE**

User

Logout

## Your Personality Test is Complete

Following is the List Of Careers That Are Suitable For You



**Computer  
Programmer**



**Business  
Analyst**



**Electrical  
Engineer**



**Address:** Avenue 1, Khayaban-E-  
Jinnah, Road, Johar Town, Lahore,  
Punjab

**Phone:** (042) 35880007

**Email:** Info@Ucp.Edu.Pk.

### Useful Links

- Home
- About
- Career
- Register

Subscribe





VISION FORGE

User

Logout

## Your Personality Test is Complete

Following is the List Of Careers That Are Suitable For You



UCP  
UNIVERSITY



FAST  
UNIVERSITY



COMSATS  
UNIVERSITY



**Address:** Avenue 1, Khayaban-E-Jinnah, Road, Johar Town, Lahore, Punjab

**Phone:** [042] 35880007

**Email:** Info@Ucp.Edu.Pk.

### Useful Links

- Home
- About
- Career
- Register

Subscribe



## 5. Test Specification and Results

### 5.1 Test Case Specification

**Table 6.1: TC-1**

<b>Identifier</b>	TC-1
<b>Related requirements(s)</b>	Security controls, authentication, session management
<b>Short description</b>	Test case for logging into the application
<b>Pre-condition(s)</b>	User already sign up
<b>Input data</b>	Username, Password
<b>Detailed steps</b>	<ol style="list-style-type: none"> <li>1. Open the system login page.</li> <li>2. Enter valid username and password.</li> <li>3. Click on the "Login" button.</li> </ol>
<b>Expected result(s)</b>	The system should authenticate the user and redirect them to the homepage.
<b>Post-condition(s)</b>	User is logged in and can access the system features
<b>Actual result(s)</b>	User is successfully redirected to the dashboard/homepage after entering valid credentials.
<b>Test Case Result</b>	Pass

<b>Identifier</b>	TC-2
<b>Related requirements(s)</b>	Customization and personalization, data privacy and security
<b>Short description</b>	Test case for evaluating the functionality of assisting with career path decisions.
<b>Pre-condition(s)</b>	The User is already logged in
<b>Input data</b>	Student's academic records, interests, and career goals.
<b>Detailed steps</b>	<ol style="list-style-type: none"> <li>1.Open the system login page.</li> <li>2.Log in with valid credentials or create a new account if necessary.</li> <li>3.Input academic records, including grades and courses completed.</li> <li>4.Input interests</li> <li>5.Specify career goals or areas of interest.</li> <li>6.Submit the input data</li> </ol>
<b>Expected result(s)</b>	<ul style="list-style-type: none"> <li>• The system generates personalized career suggestions based on the input data.</li> <li>• Relevant career options are displayed, along with recommended courses to pursue.</li> </ul>
<b>Post-condition(s)</b>	The user receives tailored career guidance and recommendations.
<b>Actual result(s)</b>	The system successfully generates personalized career suggestions, recommends relevant courses based on the input data.
<b>Test Case Result</b>	Pass

<b>Identifier</b>	TC-3
<b>Related requirements(s)</b>	Accuracy, reliability, performance
<b>Short description</b>	Test case for evaluating the functionality of determining university eligibility based on academic records and career goals.
<b>Pre-condition(s)</b>	User already sign up
<b>Input data</b>	Student's academic records, desired career path.
<b>Detailed steps</b>	<ol style="list-style-type: none"> <li>1.Open the system login page.</li> <li>2.Log in with valid credentials or create a new account if necessary.</li> <li>3.Navigate to the "University Eligibility" section.</li> </ol> <p>Input academic records, including grades and courses completed.</p> <ol style="list-style-type: none"> <li>4.Specify the desired career path or area of study.</li> <li>5.Submit the input data.</li> </ol>
<b>Expected result(s)</b>	<ul style="list-style-type: none"> <li>• The system evaluates the input academic records against admission criteria for relevant universities.</li> <li>• It generates a list of universities where the student meets the eligibility requirements.</li> </ul>
<b>Post-condition(s)</b>	The user receives a list of universities where they are eligible for admission based on their academic records and desired career path.
<b>Actual result(s)</b>	The system successfully evaluates the input academic records and generates a list of eligible universities based on the specified career path.
<b>Test Case Result</b>	Pass

<b>Identifier</b>	TC-4
<b>Related requirements(s)</b>	Customization and personalization, data privacy and security
<b>Short description</b>	Test case for evaluating the handling of invalid input data in the career guidance section
<b>Pre-condition(s)</b>	1.The system is accessible and properly configured. 2.User is logged in
<b>Input data</b>	Invalid academic records or incomplete input
<b>Detailed steps</b>	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
<b>Expected result(s)</b>	<ul style="list-style-type: none"> <li>• The system should detect the invalid input and display an error message indicating the issue.</li> <li>• It should not generate personalized career suggestions or recommendations.</li> </ul>
<b>Post-condition(s)</b>	The user is notified of the invalid input and prompted to correct it.
<b>Actual result(s)</b>	The system fails to detect invalid input and proceeds to generate career suggestions based on incomplete or incorrect data.
<b>Test Case Result</b>	Fail

<b>Identifier</b>	TC-5
<b>Related requirements(s)</b>	Accuracy, reliability, performance
<b>Short description</b>	Test case for evaluating the handling of unavailable university data in the "University Eligibility" section
<b>Pre-condition(s)</b>	1.The system is accessible and properly configured. 2.User already logged in
<b>Input data</b>	Academic records with unusual or non-standard grading systems.
<b>Detailed steps</b>	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. 4.Input academic records with a non-standard grading system that may not be recognized by the system. 5.Specify the desired career path or area of study. 6.Submit the input data.
<b>Expected result(s)</b>	<ul style="list-style-type: none"> <li>• The system should handle non-standard grading systems gracefully and provide appropriate feedback to the user.</li> <li>• If the system cannot determine eligibility due to unavailable university data, it should inform the user and suggest alternative actions.</li> </ul>
<b>Post-condition(s)</b>	The user is informed of the system's inability to determine university eligibility and provided with guidance on potential next steps.
<b>Actual result(s)</b>	The system fails to handle non-standard grading systems and does not provide clear feedback to the user regarding eligibility determination.
<b>Test Case Result</b>	Fail

## 5.2 Summary of Test Result

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, TC-5	1	0	1
Complete System	TC-1 to TC-5	2	0	2

### Defects Found:

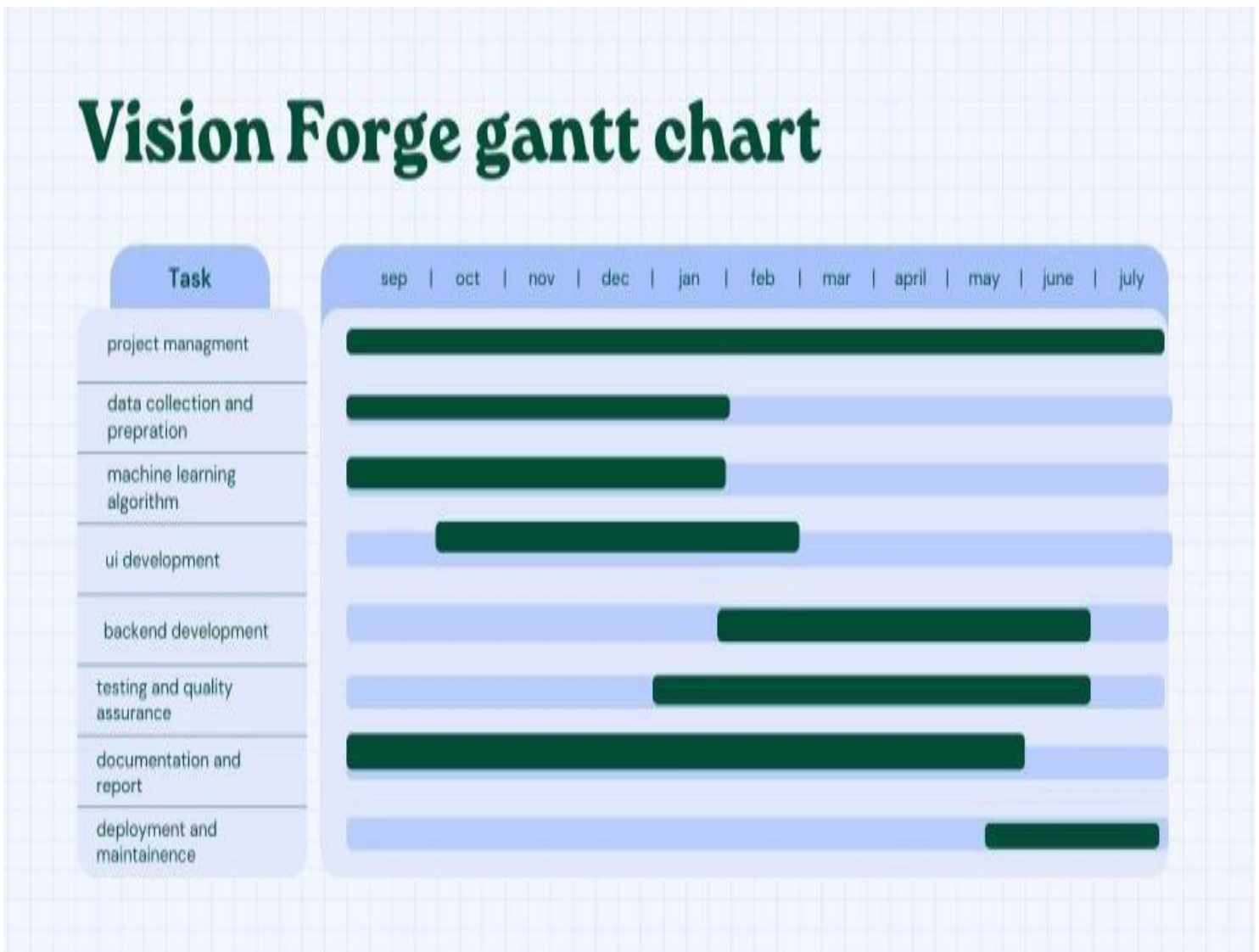
**TC-4:** The system fails to detect invalid input and proceeds to generate career suggestions based on incomplete or incorrect data.

**TC-5:** The system fails to handle non-standard grading systems and does not provide clear feedback to the user regarding eligibility determination.



## 6. Revised Project Plan

Module Name	Status
Front-end	Completed
Dataset Collection and Preparation	Completed
Model Training On dataset	Completed
Backend of system	Partially Implemented
API's for University Data	Not Implemented
Documentation	Completed
Login authentication and Data retrieval	Completed
Integration of System and Machine Learning Model	Partially Implemented
Complete System	Majorly Implemented



## 7. References

Gorad, R., & Zalte, S. (2021). Career Counselling Using Data Mining. *Journal Name, Volume(Issue), Page range. DOI or Retrieved from <https://www.semanticscholar.org/paper/Career-Counselling-Using-Data-Mining-Gorad-Zalte/8ff4c3420fce4e6e4915767207da2c52d0d6617f>*

Vaishnavi Patil. (2021). Career Guidance ML Project. Retrieved from <https://github.com/vaishnavipatil29/Career-Guidance-ML-Project>

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Figma. (2022). Collaborative interface design tool. Retrieved from <https://www.figma.com>

Patel, H., Sanghavi, J., Shah, S., Thacker, S., et al. (Year). Career Guidance System Using Machine Learning. *Career Guidance System using Machine Learning*, 9(5). Retrieved from <https://www.ijcrt.org/papers/IJCRT2105009.pdf>

## 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 1: List of non-trivial defects