TRIBHUVAN UNIVERSITY

FACULTY OF HUMANITIES AND SOCIAL SCIENCES
LALITPUR ENGINEERING COLLEGE

LABXPLORER: INTERACTIVE LEARNING ENVIRONMENT

BY

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A PROJECT PROPOSAL
SUBMITTED TO THE DEPARTMENT OF COMPUTER APPLICATION
IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR
THE DEGREE OF BACHELORS IN COMPUTER APPLICATION

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Submitted to

Department of Computer Application

Lalitpur Engineering College

In partial fulfillment of the requirement for the degree of Bachelors in Computer Application

Submitted by

Sushant Bramhacharya (LEC077BCA08)

JUNE, 2023

Under the Supervision of

Er. Bisikha Subedi

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DECLARATION

I declare that the work hereby submitted for Bachelors in Computer Application at the Department of Computer Application , Lalitpur Engineering College entitled "**LabXplorer: Interactive Learning Environment**" is my own work and has not been previously submitted by me at any university for any academic award. I authorize the Department of Computer Application , Lalitpur Engineering College to lend this project work to other institutions or individuals for the purpose of scholarly research.

 Sushant Bramhacharya (LEC077BCA08)

June, 2023

RECOMMENDATION

The undersigned certify that they have read and recommend to the Department of Computer Application for acceptance, a project work entitled "**LabXplorer: Interactive Learning Environment**", submitted by **Sushant Bramhacharya (LEC077BCA08) and Amit Maharjan (LEC077BCA01)** in partial fulfillment of the requirement for the award of the degree of "**Bachelors in Computer Application**".

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June, 2023

DEPARTMENTAL ACCEPTANCE

The project work entitled "**LabXplorer: Interactive Learning Environment**", submitted by **Sushant Bramhacharya (LEC077BCA08) and Amit Maharjan (LEC077BCA01)**in partial fulfillment of the requirement for the award of the degree of "**Bachelors of Computer Application**" has been accepted as a genuine record of work independently carried out by the student in the department.

_____

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June, 2023

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ABSTRACT

LabXplorer is an innovative web application developed using the PERN (PostgreSQL, Express.js, React, Node.js) stack and Phaser.js, designed to revolutionize science education by providing interactive virtual experiments. This platform offers a user-friendly interface where students can conduct various experiments, track their progress, and showcase their scientific achievements. By leveraging real-time, visually engaging simulations, LabXplorer enhances students' understanding of scientific concepts through hands-on learning. The platform also supports collaboration and knowledge sharing via integrated discussion forums and messaging systems, fostering a community of inquisitive learners. Comprehensive feasibility studies, addressing technical, operational, and economic aspects, along with detailed system design diagrams, ensure the platform's robustness and scalability. Utilizing the latest web development technologies, including HTML5, CSS3, JavaScript, AJAX, and JQuery, LabXplorer delivers a responsive and efficient user experience. Rigorous unit testing, particularly on the authentication module, ensures security and reliability, making LabXplorer a dynamic, effective, and engaging tool for modern science education.

Keywords: *Interactive, Collaboration, Simulation*

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LIST OF ABBREVIATIONS

ACID   Atomicity, Consistency, Isolation, Durability

BSD   Berkeley Software Distribution

CMS   Content Management System

CV   Curriculum Vitae

CSS   Cascading Style Sheets

DFD   Data Flow Diagram

DOM   Document Object Model

ER   Entity-Relationship

HTML   Hypertext Markup Language

IT   Information Technology

JS   JavaScript

MySQL   My Structured Query Language

OS   Operating System

PHP   Hypertext Preprocessor

SQL   Structured Query Language

UI   User Interface

UML   Unified Modeling Language

URL   Uniform Resource Locator

UX   User Experience

1 INTRODUCTION

1.1 Introduction

LabXplorer revolutionizes science education by providing an innovative virtual laboratory platform designed to transcend traditional learning methods. Tailored specifically for students and educators in STEM fields, LabXplorer aims to bridge gaps in practical science education by offering interactive simulations and experiments across diverse disciplines. This cutting-edge platform serves as a dedicated arena where learners can engage deeply with scientific concepts, conduct virtual experiments, visualize data, and collaborate seamlessly within their academic community.

1.2 Problem Statement

There are many general educational platforms available, but none are specifically designed to provide virtual laboratory experiences for science education. This means that students and educators often have to rely on traditional methods, which can be less effective for interactive learning and experimentation. Most general educational platforms do not have dedicated spaces for conducting virtual experiments. This makes it difficult for students to gain hands-on experience and apply theoretical knowledge in a practical setting. There are no specific tools available for creating and managing virtual lab simulations tailored to various scientific disciplines. This means that educators often have to use general-purpose simulation tools, which can be less effective for specific educational needs.

There is no specific platform that integrates various scientific disciplines into one comprehensive virtual laboratory environment. This means that students often have to use multiple platforms for different subjects, which can be cumbersome and disjointed. The lack of dedicated virtual lab platforms can make it difficult for students to engage deeply with the subject matter and for educators to track and assess practical skills development. These challenges can be even more pronounced for schools and institutions with limited access to physical laboratory resources, as they may not be able to provide adequate hands-on experiences for students.

1.3 Objectives

- Create a virtual laboratory platform that enhances science education through interactive simulations and experiments across various disciplines.

1.4 Scope

- The platform should provide a virtual space for students and educators to conduct interactive simulations and experiments across various scientific disciplines.

- LabXplorer should facilitate collaborative learning through discussion forums enabling students to share insights and ask questions.

- The platform should be user-friendly and accessible, making it easy for students of all levels to engage in virtual laboratory activities.

1.5 Report Organisation

The material in this project report is organised into seven chapters. After this introductory chapter introduces the problem topic this research tries to address, chapter 2 contains the literature review of vital and relevant publications, pointing toward a notable research gap. Chapter 3 describes the methodology for the implementation of this project. Chapter 4 provides an overview of what has been accomplished. Chapter 5 contains some crucial discussions on the used model and methods. Chapter 6 mentions pathways for future research direction for the same problem or in the same domain. Chapter 7 concludes the project shortly, mentioning the accomplishment and comparing it with the main objectives.

2 BACKGROUND AND LITERATURE REVIEW

2.1 Background Study

We are looking for designs that make out system visually appealing and at the same time have better performance. As this system is mainly for creatives who can share their journey, we need to implement a profile system that shows off their portfolio and resume. Showcasing their skills should be easy so this system mainly focuses on functionalities implementations. We are looking for different tools and techniques for achieving those goals. We are also studying papers, articles, and related books for our project. We are also learning about implementation about messaging system. The proposed project is to create an app for creative it professionals where they can share their discussions, projects, skills, and perform messaging functions. To develop this app, it is important to understand code collaboration, tools for code sharing, and messaging functions.

2.2 Limitation

- Graphics are planned to designed by myself can reduce in quality and become time consuming.

- We cannot message through our system directly.

2.3 Literature Review

Social networks are like groups of people who know each other and interact with each other. The technology helps us study how people are connected to each other and how they talk to each other online. It also helps us understand the things they say and the information they share.[1]

In today's competitive job market, organizations strive to identify and attract top talent, and this research investigates the influence of social media on the recruitment process. With the rapid growth of social media usage, it is crucial for organizations to understand effective strategies for attracting the best candidates. The study involved 12 recruiters from various industries, and the findings reveal heavy reliance

on platforms like LinkedIn for recruitment purposes. However, the use of Twitter and Facebook for recruitment is comparatively lower. Recruiters need a focused approach when utilizing social media to manage the potential overwhelming volume of work. It is evident that recruiters cannot effectively conduct recruitment activities without leveraging social media tools, but proper training in optimizing social media usage is essential. This study contributes to highlighting the significant impact of LinkedIn on recruitment processes, while also emphasizing that social media is not a one-size-fits-all solution for recruitment challenges.[2]

In Stack Overflow, A complete profile includes details such as a website URL, location, about me section, profile image, and age. Our analysis revealed that most users do not have a complete profile. However, users with complete profiles tend to have higher reputation scores and provide better quality question and answer posts compared to users with incomplete profiles. This suggests that having a complete profile is beneficial for contributing effectively to the network. Among the profile elements we examined, location and about me have a stronger relationship with user activity and contribution. This research helps us understand which profile elements are important in a Q and A social network and which ones should be prioritized for users to fill out regularly.[3]

We examine the characteristics of developers involved in Open Source software creation to understand what factors contribute to innovation within the Open Source community. The analysis reveals that having a higher reputation within the community increases the likelihood of attracting collaborators, although developers are also motivated by reciprocity, aligning with the principles of a gift economy. Additionally, we find a significant network effect resulting from standardization, indicating that developers who use popular programming languages in their projects are more likely to collaborate with others. Furthermore, providing additional information, such as a valid URL to the developer's homepage, increases the chances of finding coworkers. These findings can be applied to the broader population of experienced users on

platforms like GitHub.[4]

GitHub has recently introduced a new feature called Discussions, which serves as a platform for developers to ask questions and engage in broader discussions that go beyond specific Issues. Before its widespread availability in December 2020, Discussions underwent testing on selected open source software projects. In order to gain insights into developers' utilization of this innovative feature, their perceptions of it, and its impact on the software development process, we conducted a comprehensive mixed-methods study involving early adopters of GitHub discussions between January and July 2020.Developers perceive GitHub Discussions as a valuable tool; however, they encounter challenges related to topic duplication between Discussions and Issues. This issue poses a concern, as it leads to confusion and redundancy in communication.[5]

3 METHODOLOGY

3.1 System Development Approach

An incremental approach, also known as an iterative or step-by-step approach, is a development or problem-solving method that breaks down a larger task or project into smaller, manageable increments or steps. Rather than attempting to tackle the entire task at once, an incremental approach focuses on making incremental progress by completing and delivering smaller portions of work in a series of iterations.

- Initial Planning and Requirements Gathering

- Increment Planning and Design

- Development and Implementation

- Testing and Quality Assurance

- Evaluation and Feedback

- Iterative Development and Refinement

- Deployment and Release

- Repeat the Process for Subsequent Increments

3.2 Requirement Analysis

3.3 Feasibility Analysis

A feasibility study is a systematic and structured analysis conducted to determine the viability and practicality of a proposed project plan. It serves as an evaluation tool to assess whether the project can be successfully implemented and if it aligns with the organization's goals and objectives. It involves gathering and analyzing relevant information to determine if the project is technically feasible, operationally feasible, economically feasible, and scheduling feasible.

3.3.1 Economical Feasibility

Since the proposed system has a web application, we will be using free and open-source software development tools such as HTML,CSS,JS, PHP, MySQL and Figma.

We will only need some economy for server for hosting.

3.3.2 Operational Feasibility

Operational feasibility for the proposed system focuses ease of use. As the system is designed to be interactive, users do not require in-depth knowledge of the mobile app to navigate and utilize its features. The user interface (UI) is specifically designed to be user-friendly, ensuring a smooth and intuitive experience. This approach minimizes the need for extensive training and reduces potential resistance from users.

3.3.3 Technical Feasibility

There are several development technologies available. For frontend development, we have HTML,CSS,JS and React JS. For backend development, we have PHP along with the MySQL database. In our application, we have utilized HTML,CSS,JS, for the frontend and PHP with MySQL for the backend. Both HTML,CSS,JS, and PHP are open-source technologies and are supported by large companies with vibrant communities. This ensures that technical support and resources are readily available. Considering the chosen technologies and their strong community backing, the project is technically feasible.

3.4 System Design

3.4.1 Architecture Design

The following diagram shows diagram of our Architecture. Mainly shows what are the functions can be accessed after starting our application.
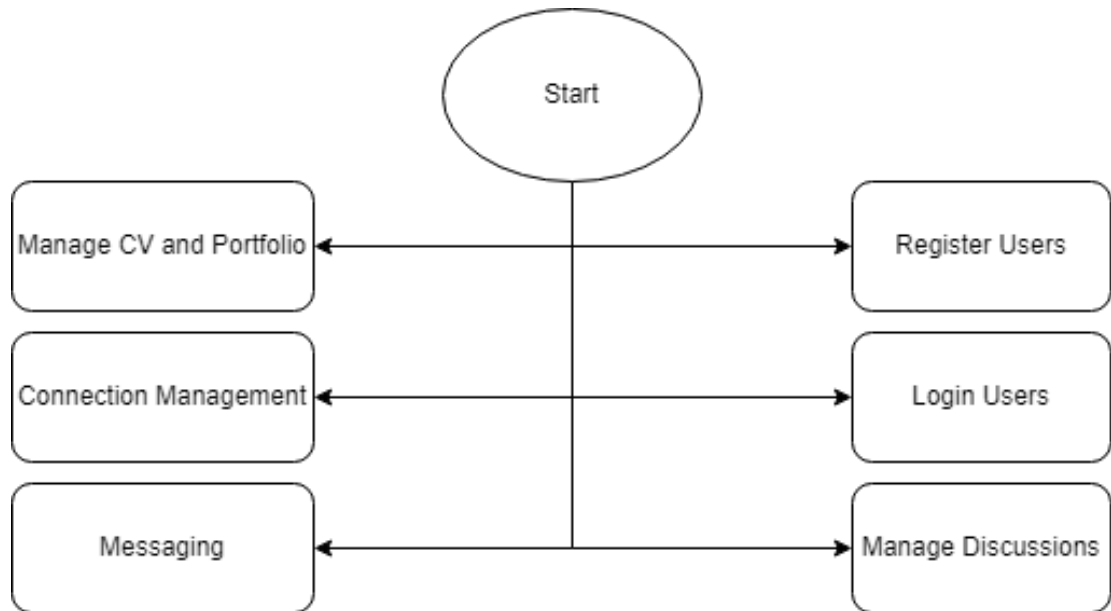

Figure 3.1: Main Architecture of System

3.4.2 Data Modelling(ER-Diagram)

ER Diagram is mainly used to design database schema. With the help of below er diagram we can easily design database in SQL.
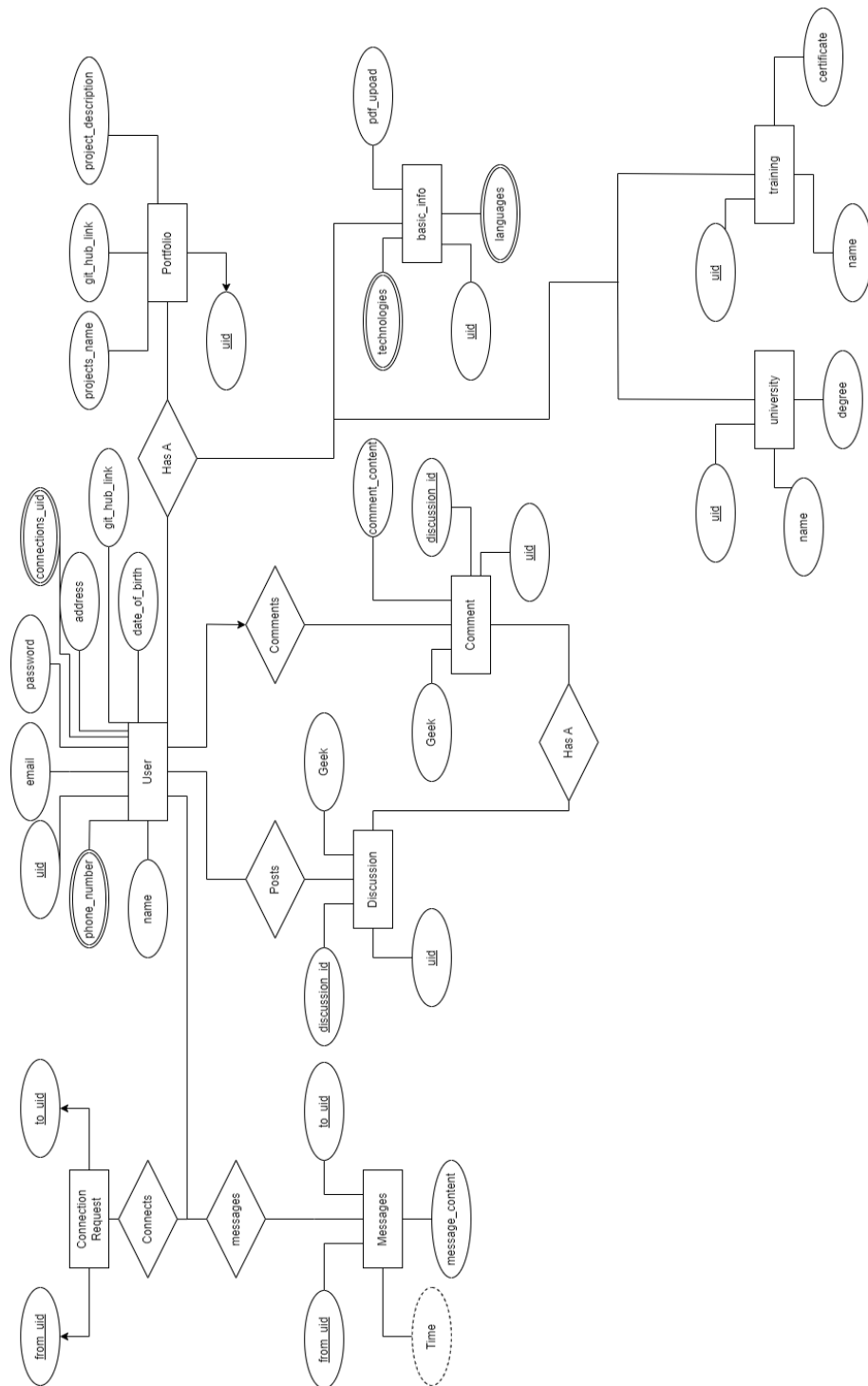

Figure 3.2: ER Diagram of System Data

3.4.3 Activity Diagram

An activity diagram visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram. This diagram showed how our program flow goes on.
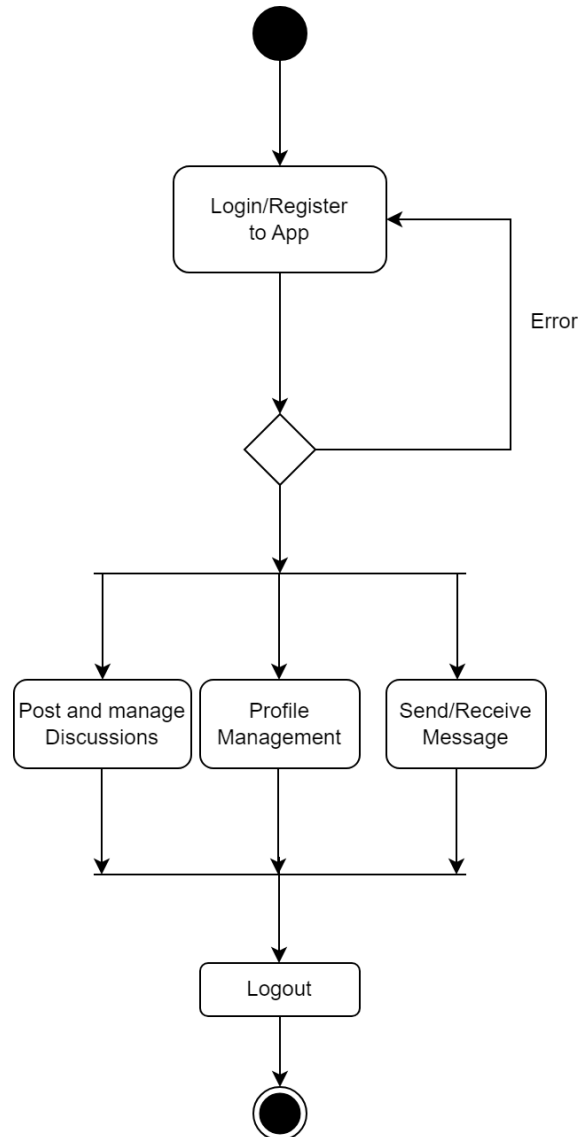

Figure 3.3: Activity Diagram

3.4.4 DFD

DFD or Data Flow Diagram is mainly used to show how data are being flowed in and out of our system. There are 3 levels of DFD i.e Context Level(Level 0),Level 1 and Level 2
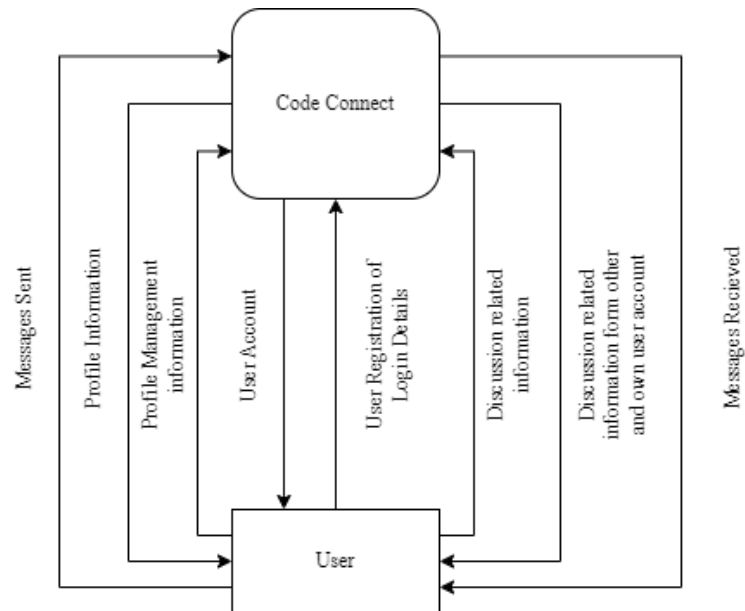

Figure 3.4: Data Flow Diagram (Context Level)

3.4.5 Use Case Diagram

A use case diagram, part of UML, visually represents interactions between actors and a system. Actors are external entities, while use cases depict specific functionalities. Relationships, such as association, generalization, include, and extend, illustrate connections between actors and use cases. The diagram helps in understanding system behavior, requirements, and scope.
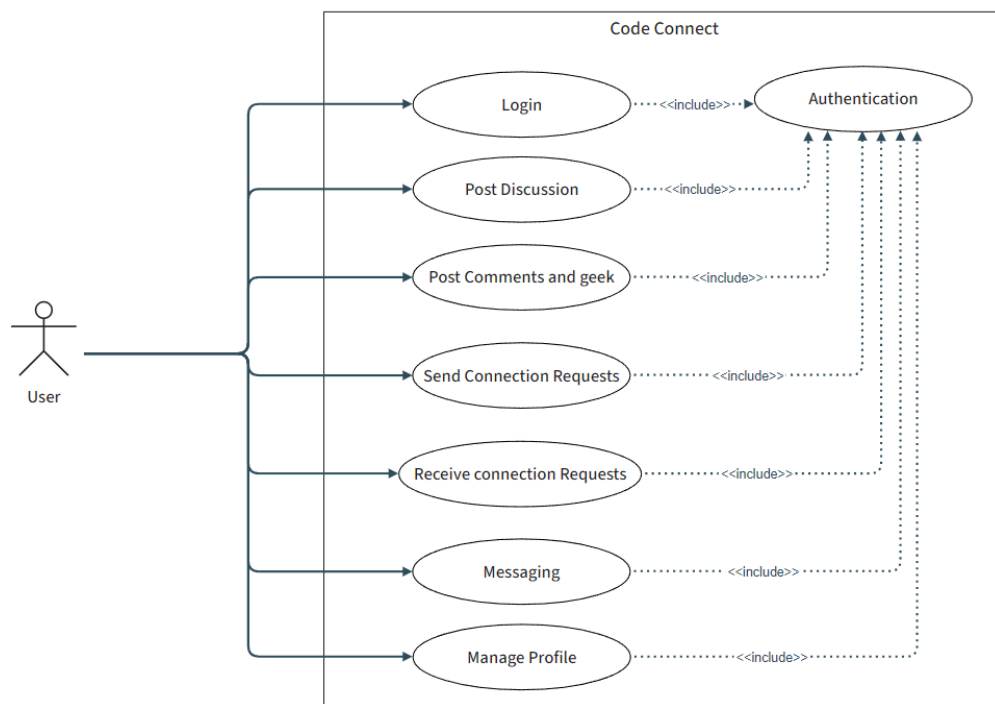

Figure 3.5: Use Case Diagram

4 IMPLEMENTATION

4.1 Tools Used

Figma

Figma is a cloud-based design and prototyping tool that empowers teams to collaborate on UI/UX design projects in real-time. It offers a user-friendly interface and powerful features that make it a popular choice among designers. With Figma, designers can create and share interactive prototypes, design components, and design systems. Its cloud-based nature allows for seamless collaboration, enabling multiple team members to work on the same design simultaneously. Figma supports version control, ensuring that design iterations can be easily tracked and managed.

HTML/CSS

HTML and CSS are two of the most important languages for creating web pages. HTML stands for HyperText Markup Language, and it is used to structure the content of a web page. CSS stands for Cascading Style Sheets, and it is used to control the appearance of a web page. HTML is a markup language, which means that it is used to mark up text with tags. These tags tell the web browser how to display the text. For example, the h1 tag tells the web browser to display the text as a heading, while the p tag tells the web browser to display the text as a paragraph. CSS is a style sheet language, which means that it is used to define styles for HTML elements. These styles can control the font, size, color, and other properties of HTML elements.

MySQL

MySQL is a robust relational database management system that offers a range of features for efficient data storage and retrieval. It supports transactions with ACID properties, ensuring Atomicity, Consistency, Isolation, and Durability. MySQL provides essential capabilities such as automatically updatable views, triggers, foreign keys, and stored procedures, allowing for complex data manipulation and logic implementation. It is compatible with various operating systems, including Windows, Linux, macOS, FreeBSD, and OpenBSD.

Git/Github

Git is a distributed version control system that is both free and open-source, designed

to handle projects of all sizes efficiently and swiftly. It simplifies collaboration by enabling multiple individuals to contribute changes that can be seamlessly merged into a single source. When using Git, the software runs locally on your computer, storing your files and their complete history. Alternatively, you can utilize online hosts like GitHub to store a copy of your files and their revision history. This central repository allows you to easily upload your changes and download updates from other developers, promoting seamless collaboration. Git facilitates automatic merging of changes, allowing multiple individuals to work on different sections of the same file and later merge their modifications without losing any work.

PHP

PHP is a server-side scripting language that is used to create dynamic and interactive web pages. It is a free and open-source language that is widely used by web developers. PHP can be used to process form data, generate dynamic content, and connect to databases. It is also used to create content management systems (CMS) and e-commerce platforms. PHP is a powerful and flexible language that is easy to learn and use. It is a great choice for web developers who want to create dynamic and interactive web pages.

JavaScript

JavaScript is a client-side scripting language that is used to create interactive web pages. It is a powerful and versatile language that can be used to do a wide variety of things, including adding animation and interactivity to web pages, validating form data, processing user input, making Ajax requests to the server, and creating games and other interactive applications.

React .js

React.js is a widely-used JavaScript library for creating efficient and reusable user interfaces. It offers a component-based architecture, virtual DOM for improved performance, and supports declarative programming. With a rich ecosystem of libraries and tools, React.js enables developers to build dynamic and responsive applications for both single-page and server-side rendering.

5 CONCLUSION AND EXPECTED OUTCOMES

5.1 Conclusion

Code Connect is a social networking web application designed specifically for creative it professionals. It should transform the way developers connect, collaborate, and learn from each other. The platform provides a range of features that allow creative it professionals to network, share knowledge, and enhance their skills. Code Connect also fosters a vibrant and inclusive resume and portfolio management system.

5.2 Expected Outcome

Code Connect is a platform that aims to create a thriving community of creative it professionals who can connect, collaborate, and learn from each other. The platform provides tailored features that facilitate meaningful interactions and knowledge exchange among its users. Through Code Connect, creative it professionals can expect to expand their professional network, gain insights from experienced peers, and receive support from the community. They can engage in discussions, seek advice, and offer assistance. Code Connect also aims to accelerate the professional growth of its users by providing access to valuable resources, tutorials, and learning opportunities. By connecting with like-minded individuals and staying up-to-date with the latest trends and technologies, creative it professionals can enhance their skills and advance their careers. The platform's expected outcome is to create a vibrant and supportive ecosystem that empowers creative it professionals and enriches their professional lives. In this complex world of technologies new peoples who are intrested in the field of technology face alot of difficulties. So they will also have exposure with the help of out technology.

APPENDIX A

A.1 Project Schedule

Below is the Gantt chart of our project Schedule. We have planned to perfrom these specific tasks between these time frames.

PROCESS	2023					
	April	May	June	July	August	September
Requirement Gathering	�					
Designing		▬				
Coding			▬▬▬			
Testing					▬	
Documentation						▬
Maintenance						▬

Figure A.1: Gantt Chart of Schedule

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