A Minor Project Proposal on

Presence: Automated Attendance System

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Abstract

The ”Presence” project is an innovative approach to attendance tracking in college classrooms. With the help of automation and data analysis, the system aims to provide a more efficient and accurate way of keeping track of student attendance while also providing valuable insights into student behavior and academic performance. The system uses cameras to detect when students enter and leave the classroom. The data collected is then analyzed to provide a real-time attendance report that instructors can access from their devices. This eliminates the need for manual attendance-taking and reduces the potential for errors or inaccuracies. In addition to real-time attendance tracking, the system also provides detailed reports on student attendance patterns, subject preferences, and behavior in class. By analyzing this data, instructors, and administrators can identify students who may be struggling with attendance or academic performance and take proactive steps to address these issues. They can also identify trends and patterns in attendance that can inform decisions about course scheduling and curriculum design.

The ”Presence” project is a valuable tool for both students and faculty. For students, it provides a streamlined attendance tracking process that eliminates the need for manual sign-ins and helps ensure that they are meeting attendance requirements. For faculty, it provides real-time insights into student attendance and behavior that can inform teaching strategies and improve academic outcomes.

Keywords– *automated attendance system, data analysis, college classrooms, attendance tracking, attendance report, academic performance, attendance patterns, subject preferences, student behavior, teaching strategies, curriculum design*

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1 Introduction

1.1 Motivation/Problem Statement

In today's technology-driven era, the trend is to switch from traditional systems to fast, smart, and interactive systems that can be linked to web applications, enabling users to access the system from anywhere at any time. In academic settings, regular attendance is crucial for students to acquire knowledge, participate in class discussions, and engage with their peers. However, traditional methods of taking attendance, such as calling out names or manually signing in, can be tedious, prone to errors, and inefficient.

The "Presence" project is being developed to address the challenges associated with manual attendance-taking in college classrooms. Traditional methods of attendance tracking, such as paper sign-ins or roll calls, are time-consuming, prone to errors, and may not provide accurate or timely data for instructors and administrators. Additionally, manual attendance-taking does not provide insights into student behavior or attendance patterns, which can be valuable for improving academic outcomes and making data-driven decisions.

1.2 Project Objectives

To address these challenges, we propose the design and implementation of a face detection and recognition system called "Presence." The "Presence" system is an automated attendance system that utilizes facial recognition technology to identify and mark the attendance of students attending a lecture in a classroom. By automating the attendance process, "Presence" aims to save time for instructors, reduce errors, and provide a more accurate and efficient way to monitor student attendance.

The proposed project has put forward the following objectives:

- To automate attendance system for college classrooms
- To provide insights into attendance patterns and behavior.
- To support data-driven decision-making for improved student success.

1.3 Significance of the study

The "Presence" project holds significant importance as it introduces an automated attendance system that addresses the limitations of manual methods. It streamlines attendance tracking, provides real-time reports, and offers insights into attendance patterns and student behavior. This empowers educators to make data-driven decisions, optimize instructional practices, and enhance student success in college classrooms.

2 Scope and Limitation

The scope of the ”Presence” project is wide-ranging and encompasses various aspects of attendance tracking and data analysis in college classrooms. It will be designed to accommodate multiple subjects and courses, providing flexibility for instructors and students. The system's scope also extends to generating comprehensive attendance reports and analysis, enabling instructors and administrators to gain valuable insights into attendance patterns, subject preferences, and student behavior. Additionally, the project has the potential for future expansion and integration with other educational technologies, further enhancing its scope and usability.

The following are the limitations of the project that are realized:

- The system may not work accurately in low lighting or poor camera quality environments.
- The system will have difficulty detecting faces if students are wearing masks or other facial coverings.
- Potential technical issues or errors with sensors and data analysis algorithms.
- Lack of consideration for the specific reasons behind student exits, such as temporary absences or emergencies.

3 Literature Review

This section consists description of the literature study performed during the development of this proposal.

3.1 Fareclock

Fareclock[1] is a web-based time clock software that offers features for employee time tracking, attendance management, and payroll processing. It provides businesses with tools to efficiently track employee work hours, monitor attendance, and generate accurate payroll reports. Fareclock allows employees to clock in and out using various methods such as biometric fingerprint scanning, web punch, mobile app, or phone call. The software also provides features like overtime tracking, PTO management, and shift scheduling. Fareclock aims to streamline the time management process and simplify payroll administration for businesses of all sizes.

3.2 Learning Management System (Moodle)

Moodle is a free and open-source learning management system. It has a variety of plugins to expand the features. There is a mod-attendance[2] plugin also called Attendance Activity[3] where the instructor clicks on the ”Update Attendance” button and is presented with a list of all the students in that course, along with configurable options and comments. The default options provided are Present, Absent, Late Excused. Instructors can download the attendance for their course in Excel format or text format. Sessions can also be configured to allow students to record their own attendance and a range of different reports are available.
Presence offers several advantages over the mod-attendance plugin in Moodle, making it a more beneficial solution for automated attendance tracking in college classrooms.

Firstly, Presence provides a seamless and automated attendance tracking process, eliminating the need for manual input by instructors. Unlike the mod-attendance plugin, which requires instructors to manually update attendance by selecting options for each student, Presence utilizes sensors or other automated methods to track student entry and exit from the classroom. This not only saves instructors significant time and effort but also ensures more accurate and reliable attendance data.

Secondly, Presence offers advanced data analysis and reporting capabilities. While the mod-attendance plugin in Moodle allows instructors to generate basic attendance reports, Presence takes data analysis to a higher level. It compiles and analyzes attendance data, providing valuable insights into attendance patterns, subject preferences, and even student behavior. This level of analysis can help instructors and administrators make informed decisions regarding teaching strategies, course planning, and student support, ultimately improving overall educational outcomes.

However, since Moodle is open-source we can use this technology and integrate it with Moodle.

3.3 Existing Similar Appilcations

While there may be similar plugins or programs available that offer alternative approaches to attendance tracking, ”Presence” stands out by providing a comprehensive solution. It not only detects student arrivals but also tracks their departures, allowing for a more thorough analysis of attendance patterns. This valuable data can then be utilized to design improved timetables and curricula, ensuring optimal scheduling and enhancing the overall learning experience. By offering this unique functionality, Presence sets itself apart as a powerful tool for attendance management and curriculum optimization.

4 Proposed Methodology

This section describes the methodology that is proposed to be followed during the development of the project.

4.1 Proposed Software Development Life Cycle

The project will be developed as per the waterfall model[4] of the software development life cycle as depicted in Figure 1. The reason for choosing this model is the lack of sufficient time duration for agile and iterative methods, as well as very low chances of changes of requirements in the process of development.

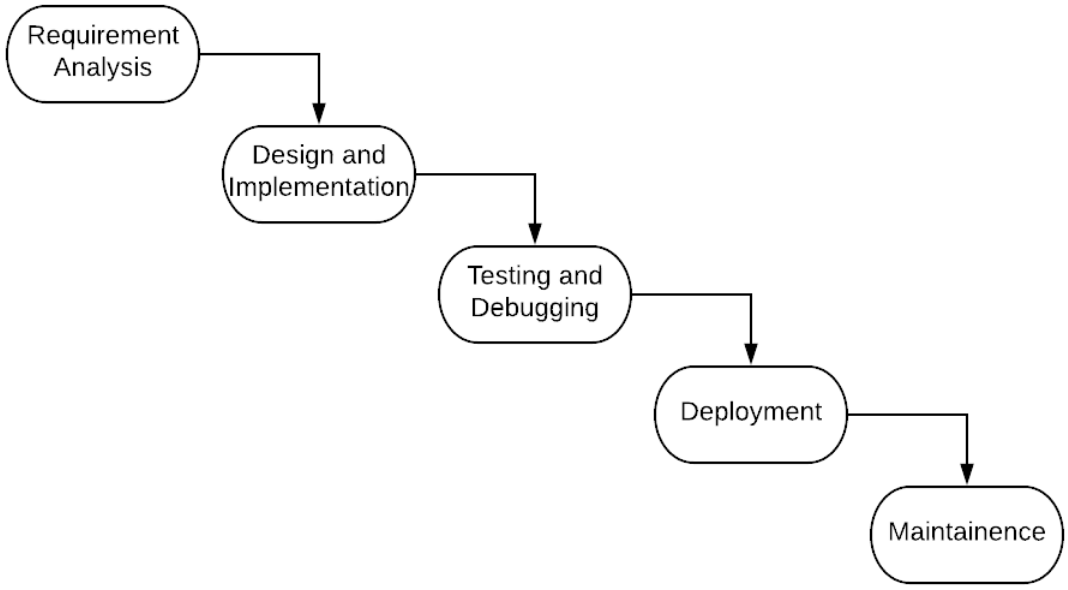

Figure 1: Proposed software development life cycle

The life cycle begins when the team collects and evaluates the requirements that will be expected from the application. The design and implementation phase will be to design and build both API services and client applications. By the end of this phase, a minimal viable product (MVP) will already have been constructed. In the testing and debugging phases, the quality control methods will be applied to both API and application. Finally, the application will be deployed to Docker containers at the end of the deployment phase. However, there might be slight modifications in the original waterfall model where the design and implementation may be changed slightly after the testing phase if seen as reasonable.

4.2 Technical Architecture

The application will be built upon the client-server web architecture, as illustrated in Figure 2.

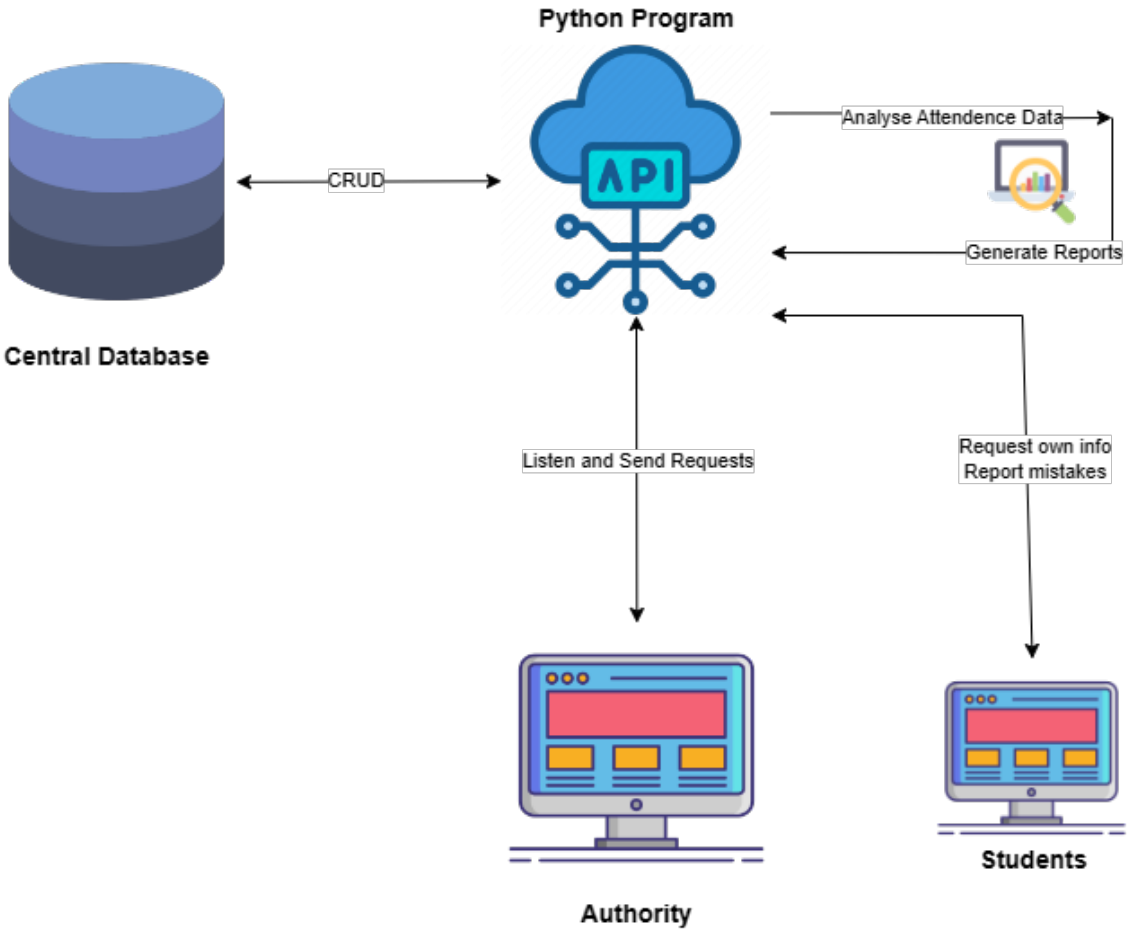

Figure 2: Proposed architecture of the application

The architecture consists of a database that handles data storage and management. Python is responsible for handling Create, Read, Update, and Delete (CRUD) operations on the database. It also provides WebSocket communication capabilities to the client application.

The client application allows students to access their personal attendance information securely. Only authorized personnel, such as administrators or instructors, can access the entire dataset via the client application using WebSocket communication.

Python program acts as the intermediary between the client application and is also responsible for generating reports based on the attendance data. This communication ensures seamless integration and efficient report generation.

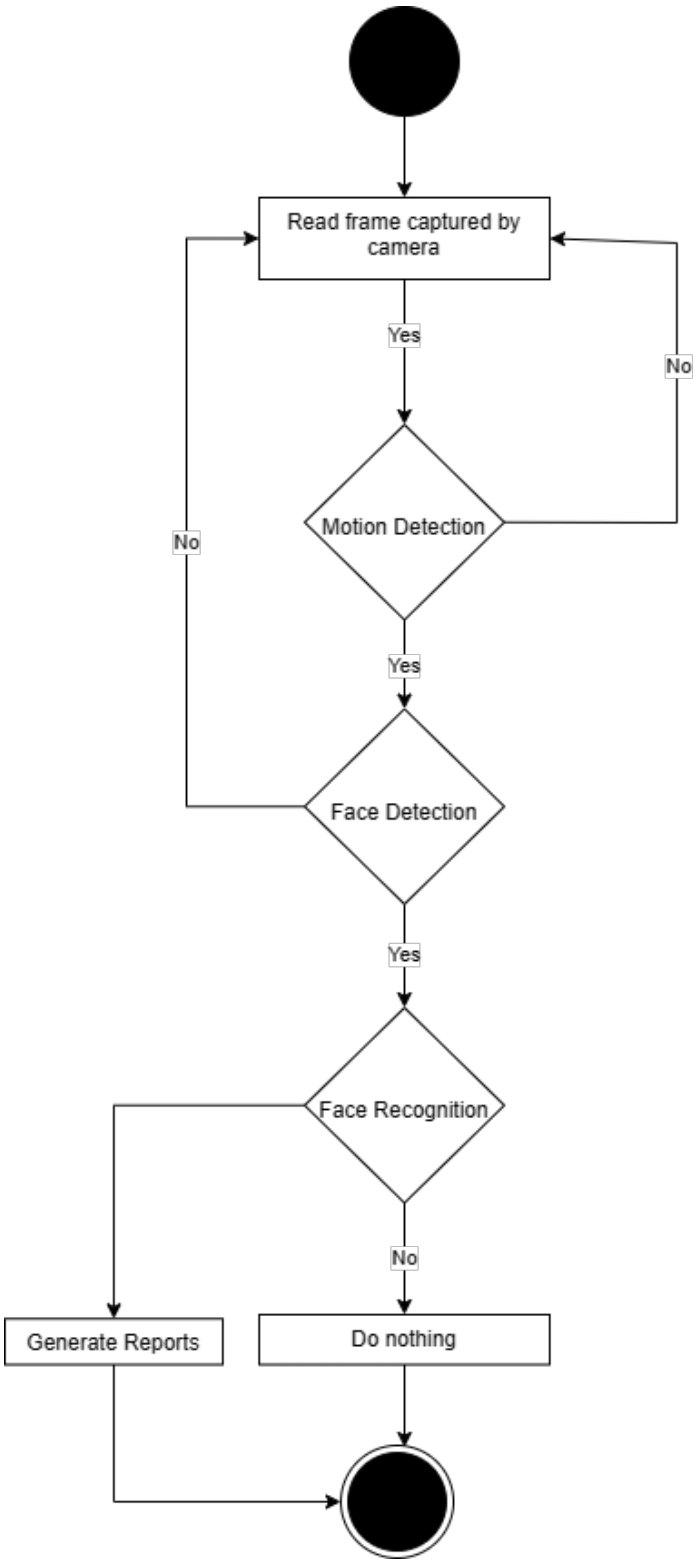

Figure 3: Activity Diagram[5] of the application

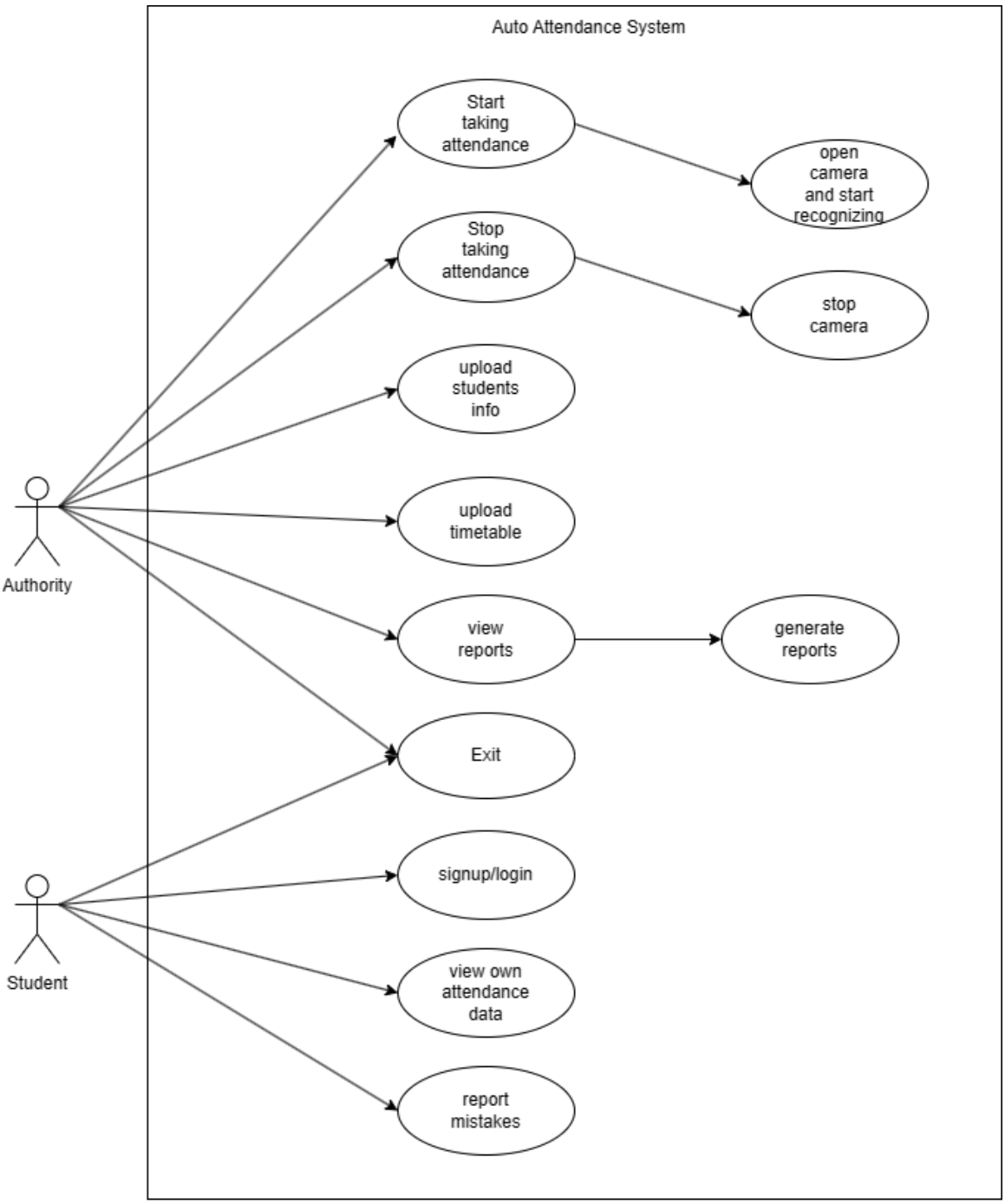

Figure 4: Use-case Diagram of the application

4.3 Proposed Technologies

Table 1 consists of the major technologies that are proposed to be used during the development and deployment of the application.

Subject	**Proposed Technology**
Backend Database	PostgreSQL
Backend Service	Python
API Communication	WebSocket
Frontend(Client)	Next.js(React), Typescript, TailwindCSS
Deployment	Docker Containers

Table 1: Technologies proposed to be used

5 Proposed Deliverable

The proposed deliverables for the Presence project align with the defined architecture and project objectives. These deliverables encompass various components and functionalities of the automated attendance system, ensuring a comprehensive solution for tracking and analyzing student attendance.

Database Design and Implementation

The first deliverable involves designing and implementing the database architecture that will serve as the backbone of the Presence system. This includes creating the necessary tables, relationships, and entities to store student information, attendance records, subject details, and other relevant data. The database design will prioritize efficiency, scalability, and data integrity.

Python Application

The Python application will form a crucial component of the Presence system. It will be the main backbone of our system that will recognize students and mark their attendance. It will also handle the communication between the database and the client application, enabling CRUD operations and WebSocket communication. The deliverable will include the development and deployment of the Python application, ensuring its stability, security, and seamless integration with other system components.

Client Application

The client application will provide a user-friendly interface for students to access their attendance information securely. It will be designed with intuitive navigation, responsive design, and robust authentication mechanisms. The deliverable will include the development of the client application, ensuring compatibility across different devices and browsers.

Authority Access and Reporting

The Presence system will offer authorized personnel, such as administrators or instructors, access to comprehensive attendance data and reporting functionalities. This deliverable involves developing a secure login system for authorities, granting them access to view and analyze attendance records, generate reports, and gain insights into attendance patterns and subject preferences. The reporting component will leverage Python programs to generate insightful reports based on the collected data. Also, students can view their own information with their login credentials and report if any mistakes happened.

6 Project Task and Time schedule

The working time period for the project is four months. The project will be completed by the end of the spring semester as per the requirements of the university. The major task division among the team members is mentioned in Table 2.

Team Member	**Assigned Task**
Rupesh Budhathoki	Project Management, Overall Coordination, Coding Support
Apsara Bishwokarma	Frontend Development
Sampada Kharel	AI Development
Sudarshan Kshettry	Backend Development and System Integration

Table 2: Division of tasks among project team members

The time schedule proposed for the development of the project is illustrated in the following Gantt chart

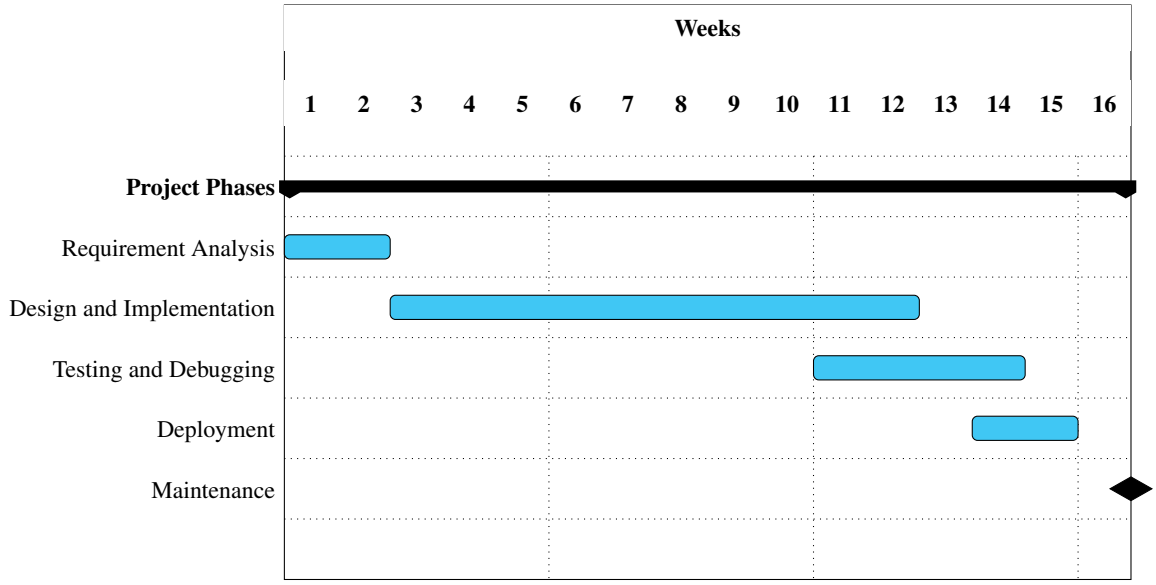

Table 3: Gantt Chart

7 References

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