MIT World Peace University
School of Computer Science and Engineering

Mini Project
Third Year B. Tech, Semester 6

Project Synopsis for
Attendence Assistant

Software Development, Machine Learning, AI

Prepared By

Batch A1
PA10. Krishnaraj Thadesar - 1032210888
PA07. Parth Zarekar - 1032210846
PA25. Sourab Karad - 1032211150
PA24. Saubhagya Singh - 1032211144
Cyber Security and Forensics

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1 Abstract

The "Attendance Assistant" presents a forward-thinking solution for revolutionizing conventional attendance tracking in educational settings. Integrating cloud services such as Amazon S3, Amazon EC2, and Amazon DynamoDB with the official Raspberry Pi High-Quality Camera, the project offers a sophisticated hybrid architecture for efficient and scalable face recognition capabilities.

In the cloud infrastructure, Amazon S3 acts as the secure repository for images captured by the Raspberry Pi High-Quality Camera, facilitating organized storage and seamless integration with other AWS services. Amazon EC2 instances play a crucial role in managing continuous processes, serving as the backbone for route management and backend operations. Amazon DynamoDB, a fully managed NoSQL database, anchors the system, efficiently handling dynamic client data and recognition results.

At the edge, the Raspberry Pi High-Quality Camera handles real-time image capture, working in tandem with the Raspberry Pi as the edge computing device. This dynamic combination ensures preliminary image processing tasks are executed seamlessly, allowing for real-time interaction with the local environment.

The "Attendance Assistant" represents a significant leap towards modernizing attendance tracking processes. By adopting a hybrid architecture that blends the strengths of cloud services with edge computing, the project offers flexibility and scalability, catering to the evolving demands of attendance management in educational institutions.

1.1 Facial Recognition and Machine Learning

The system leverages facial recognition technology powered by machine learning algorithms to accurately identify and track individuals.

1.2 Artificial Intelligence Integration

Artificial intelligence is embedded for intelligent decision-making and continuous improvement in attendance tracking processes.

1.3 Big Data Analysis and Attendance Tracking

Utilizing big data analysis techniques to process and analyze attendance data, ensuring accurate and insightful reporting.

1.4 Hybrid Architecture with Cloud Services

The system employs a hybrid architecture, seamlessly integrating both on-premise and cloud-based solutions for enhanced flexibility.

1.5 Cloud Services - AWS

Utilizing Amazon Web Services (AWS) for cloud functionalities, including Amazon S3 for efficient storage, Amazon EC2 for scalable computing, and Amazon DynamoDB as a NoSQL database.

1.6 Edge Computing with Raspberry Pi High-Quality Camera

Incorporating edge computing through Raspberry Pi with a high-quality camera for real-time image capture and processing at the device level.

1.7 Automated Attendance and Modernization

Implementing automated attendance processes to modernize and streamline the traditional manual tracking methods.

1.8 Educational Technology Integration

The system aligns with educational technology principles, providing a seamless and enhanced experience for both educators and students.

1.9 Scalability and Efficiency

Designed with scalability in mind, ensuring efficiency and performance as the system grows to accommodate larger educational settings.

1.10 Real-time Image Capture and Processing

Enabling real-time image capture and processing for instantaneous attendance updates and insights.

1.11 NoSQL Database for Data Management

Utilizing a NoSQL database, specifically Amazon DynamoDB, for efficient and scalable management of attendance data.

1.12 AWS Services Integration

Leveraging various AWS services to enhance functionality, security, and scalability in the overall system architecture.

2 Project Objectives

1. Develop an automated attendance tracking system using computer vision for MITWPU Campus.
2. Utilize cloud infrastructure for efficient storage and processing of attendance data.
3. Create a user-friendly application for both teachers and students to simplify attendance management.
4. Implement advanced data science techniques for processing large attendance datasets and performing analytics.
5. Significantly reduce per-class time spent on attendance tracking through automated processes, enhancing overall efficiency.
6. Mitigate the risk of malpractices in attendance tracking by implementing secure and tamper-resistant mechanisms.

3 Hardware and Software Requirements

3.1 Hardware Requirements

1. Raspberry Pi 4 Model B with 2GB RAM
2. Raspberry Pi High-Quality Camera
3. Raspberry Pi Camera Module 3
4. Micro SD Card
5. Power Supply
6. Internet Connection

Name	**Purpose**	**Cost**
Raspberry Pi Hi Quality Camera	Official camera from Raspberry Pi, more expensive for High resolution.	8000
Raspberry Pi Camera Module 3	Official camera from Raspberry Pi cheaper and highest resolution for cheapest cost.	3000
Raspberry PI 4 Model B with 2 GB RAM	To send image from camera to server.	5000

Table 1: Hardware Requirements

3.2 Software Requirements

3.2.1 Amazon S3 (Simple Storage Service):

Amazon S3 serves as the central cloud storage solution for our facial recognition project. Its secure, scalable, and organized storage infrastructure accommodates images captured by the Raspberry Pi High-Quality Camera connected to Raspberry Pi. S3's versatile bucket structure facilitates efficient organization of images and associated metadata, enabling seamless integration with other AWS services.

3.2.2 Amazon EC2 (Elastic Compute Cloud):

Amazon EC2 instances play a pivotal role in handling continuous, long-running processes essential for route management and backend operations. Offering a customizable and scalable computing environment, EC2 instances efficiently manage client routes, coordinate responses, and serve as the backbone for the facial recognition application.

3.2.3 Amazon DynamoDB:

Amazon DynamoDB, a fully managed NoSQL database, serves as the cornerstone for storing dynamic client data, images, and recognition results. Leveraging DynamoDB's scalability and low-latency access, the system efficiently manages diverse and dynamic data associated with facial recognition.

3.2.4 Raspberry Pi High-Quality Camera and Raspberry Pi:

The hardware components, Raspberry Pi High-Quality Camera, and Raspberry Pi form the edge computing segment of the project. The Raspberry Pi High-Quality Camera, equipped with a high-quality camera module, interfaces seamlessly with the Raspberry Pi to capture crisp facial images. The Raspberry Pi, acting as an edge computing device, executes preliminary image processing tasks and ensures real-time interaction with the local environment.

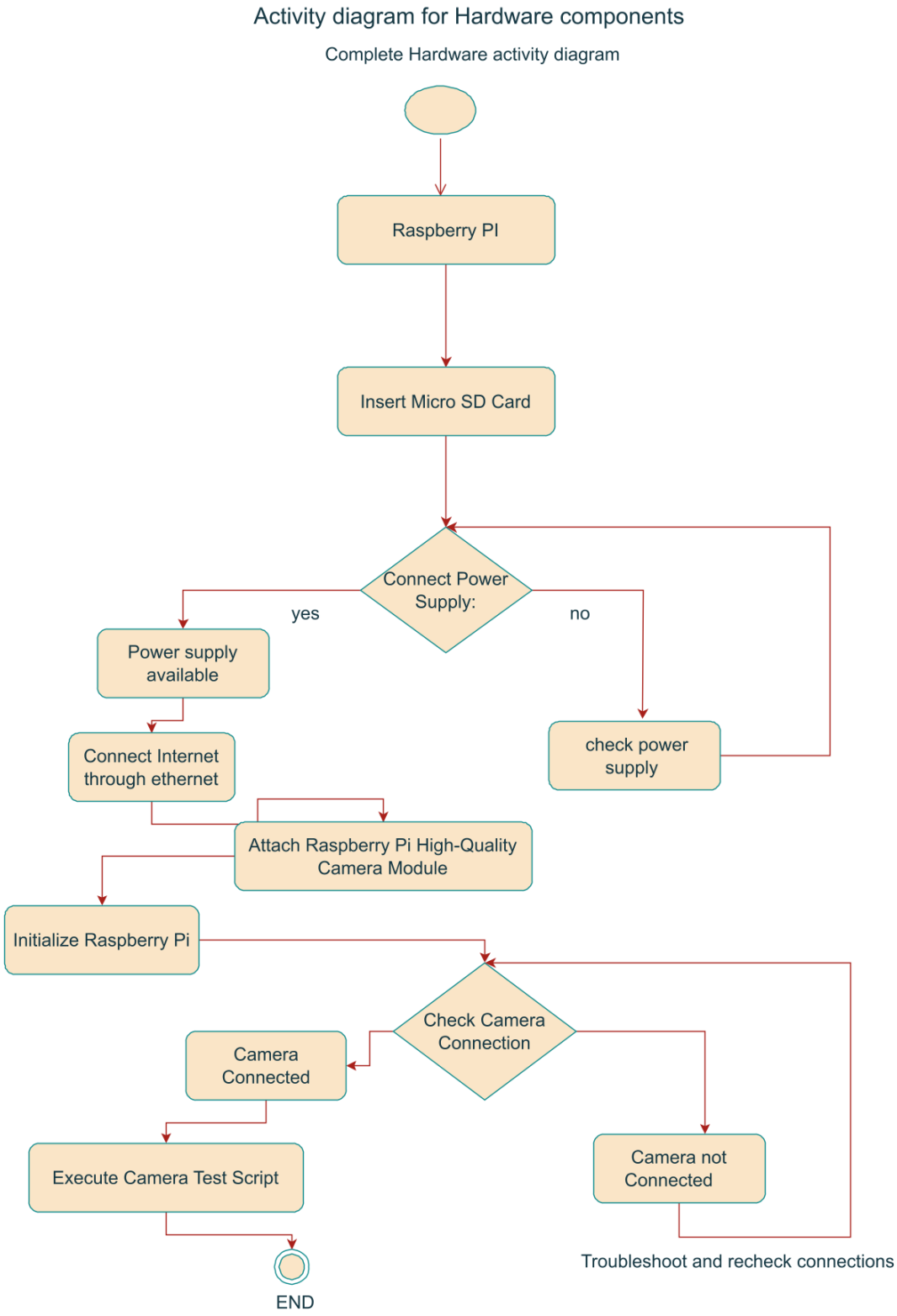
4 Cost Estimates from AWS

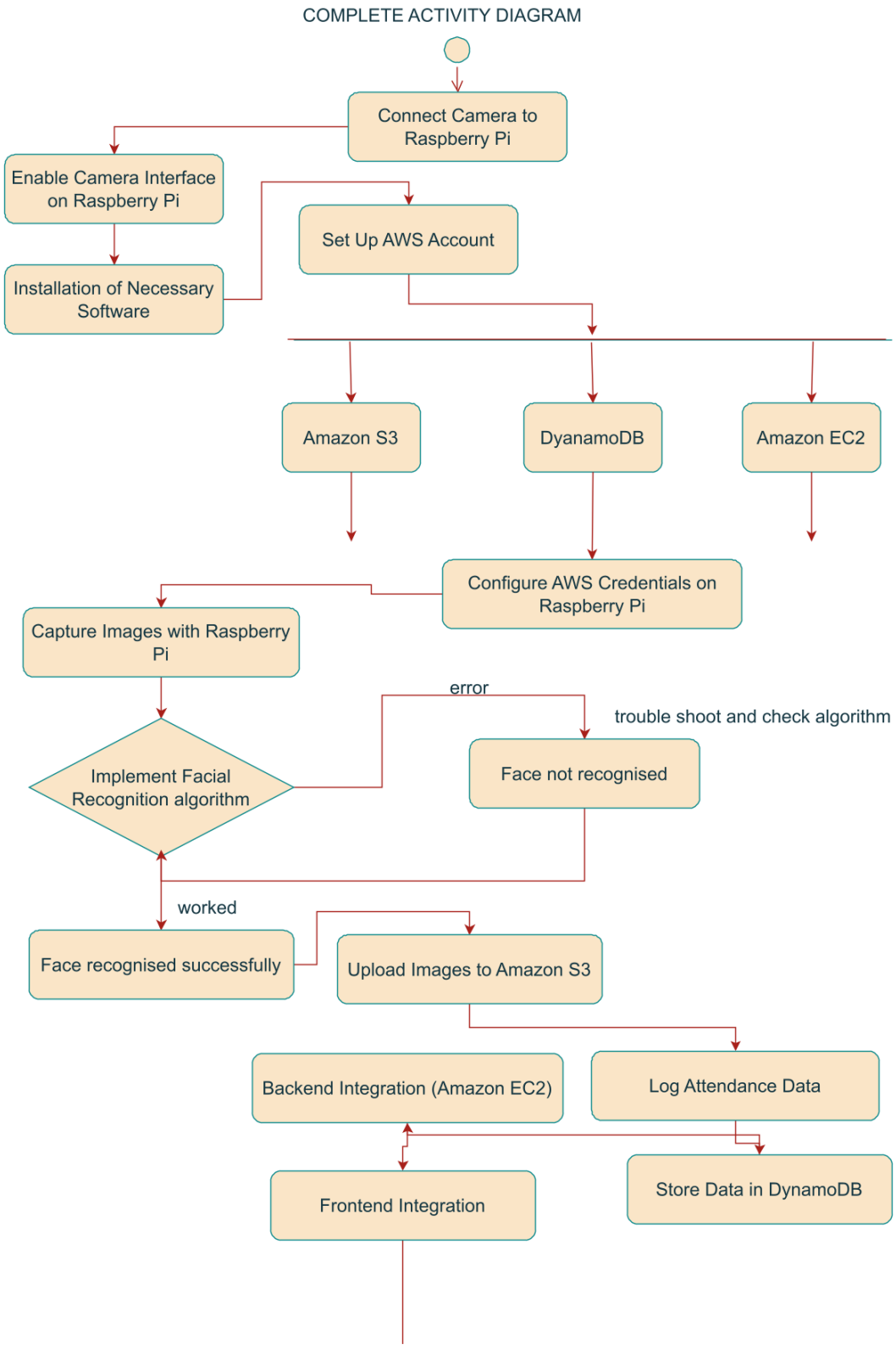
Detailed Estimate

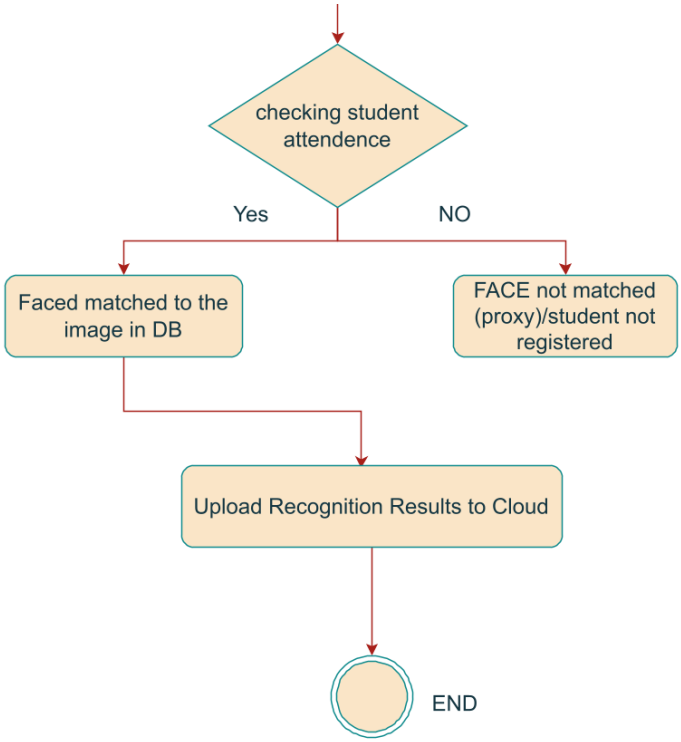
Name	Group	Region	Upfront cost	Monthly cost
Amazon DynamoDB	No group applied	Asia Pacific (Mumbai)	205.20 USD	34.39 USD
Status: - **Description:** **Config summary:** Table class (Standard), Average item size (all attributes) (1 KB), Write reserved capacity term (1 year), Read reserved capacity term (1 year), Data storage size (10 GB) On-demand backup data storage (15 GB)				
Amazon EC2	No group applied	Asia Pacific (Mumbai)	0.00 USD	78.40 USD
Status: - **Description:** **Config summary:** Tenancy (Shared Instances), Operating system (Linux), Workload (Consistent, Number of instances: 1), Advance EC2 instance (c6g.2xlarge), Pricing strategy (EC2 Instance Savings Plans 1yr No Upfront), Enable monitoring (disabled), DT Inbound: Not selected (0 TB per month), DT Outbound: Not selected (0 TB per month), DT Intra-Region: (0 TB per month)				
Amazon Simple Storage Service (S3)	No group applied	Asia Pacific (Mumbai)	0.00 USD	3.57 USD
Status: - **Description:** **Config summary:** S3 Standard storage (100 GB per month), PUT, COPY, POST, LIST requests to S3 Standard (150000), GET, SELECT, and all other requests from S3 Standard (150000), Data returned by S3 Select (10 GB per month), Data scanned by S3 Select (100 GB per month) DT Inbound: Internet (1 TB per month), DT Outbound: Not selected (0 TB per month)				

Figure 1: Estimate from AWS

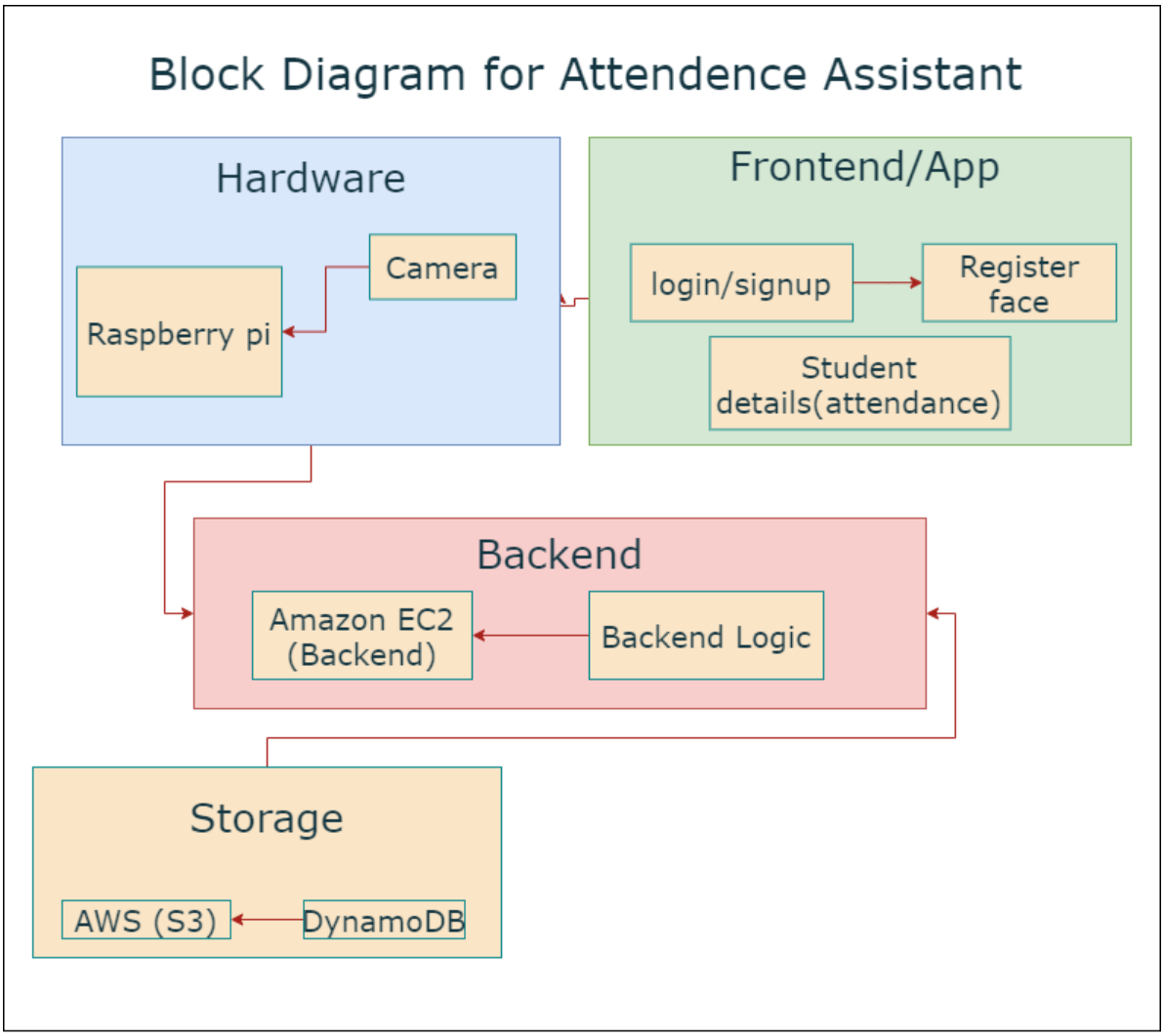
5 Activity Diagram




COMPLETE ACTIVITY DIAGRAM
Connect Camera to Raspberry Pi
Enable Camera Interface on Raspberry Pi
Installation of Necessary Software
Set Up AWS Account
Amazon S3
DyanamoDB
Amazon EC2
Configure AWS Credentials on Raspberry Pi
Capture Images with Raspberry Pi
Implement Facial Recognition algorithm
error
trouble shoot and check algorithm
Face not recognised
worked
Face recognised successfully
Upload Images to Amazon S3
Backend Integration (Amazon EC2)
Log Attendance Data
Frontend Integration
Store Data in DynamoDB


checking student attendence
Yes
NO
Faced matched to the image in DB
FACE not matched (proxy)/student not registered
Upload Recognition Results to Cloud
END

6 Block Diagram



Mini Project Guide / Mentor

Name

Signature

Member 1: PA10. Krishnaraj Thadesar

Member 2: PA07. Parth Zarekar

Member 3: PA25. Sourab Karad

Member 4: PA24. Saubhagya Singh