CLOUD BASED BIOMETRIC ATTENDANCE SYSTEM

Definition

The Cloud-Based Attendance System with Face Detection is an innovative solution that aims to automate the attendance management process using face recognition technology and store the attendance data securely in the cloud. The system will accurately identify employees by detecting their faces, eliminating the need for manual attendance marking and reducing the chances of errors and time theft.

Technologies

Face Detection and Recognition: OpenCV or similar computer vision libraries.

Cloud Storage: Amazon Web Services (AWS) or Google Cloud Platform (GCP).

Database: SQL or NoSQL databases for storing employee data and attendance records.

Web and Mobile Applications: HTML, CSS, JavaScript for web; frameworks such as Django or flutter.

Backend: Python, or other suitable server-side languages.

Data Security: Encryption algorithms, secure authentication methods, and access controls.

Requirements

Face Detection and recognition

- Physical devices for face detection.
- The system should accurately detect and recognize employees' faces in real-time.
- The face detection algorithm should work efficiently under varying lighting conditions and different facial appearances.
- The system should handle multiple faces in a single frame (group attendance).

Cloud Storage and Data Management

- Attendance data, including timestamps and employee identifiers, should be securely stored in the cloud.
- The system should support scalable storage to accommodate a growing number of employees and attendance records.
- Data should be accessible by authorized users through a web and mobile application.

Real-time Attendance Tracking

- Employees should be able to mark their attendance by facing the camera, and the data should be instantly recorded.
- The system should provide real-time notifications to employees after successful attendance marking.

Web and Mobile Applications

- The web application should provide an intuitive user interface for administrators and managers to manage attendance data.

- The mobile application should allow employees to view their attendance history and receive notifications.
- Login or sign-in page to view attendance records or to make new records.

Security and Privacy

- Employee facial data should be securely stored and encrypted to protect privacy.
- Access to sensitive data should be restricted based on user roles and proper authentication mechanisms.
- The system should comply with data protection laws and regulations.

Efficient Salary Calculation:

- Program for calculate the total working hours of employees per day.
- Salary calculation program that calculates the employee's salary based on their monthly attendance.

Software Requirements Specification

1. Introduction

1.1 Purpose

The Cloud-Based Attendance System with Face Detection will revolutionize attendance management by providing a secure, efficient, and user-friendly solution for organizations of all sizes. The system's ability to automate attendance tracking and integrate with existing HR systems will save time, reduce administrative burden, and enhance overall workforce management.

1.2 Scope

The system will enable employees to mark their attendance by facing the camera at designated entry points. Attendance data will be securely stored in the cloud, accessible to employees and administrators through web and mobile applications.
There are systems for calculating the employee’s salary based on their monthly attendance and for calculating the total working hours of employees per day. System will provide punctuality bonus also.

1.3 Environmental Characteristic

1.3.1 Lighting Conditions

The system's face detection and recognition capabilities may be influenced by varying lighting conditions, such as bright sunlight, low light, or artificial lighting.

1.3.2 Camera Quality

The performance of face detection relies heavily on the quality of the cameras used in the face detection devices

1.3.3 Internet Connectivity

As the system relies on cloud storage and real-time communication, a stable and reliable internet connection is essential.

1.3.4 Operational Hours

The system should be designed to accommodate 24/7 operation if required, especially in organizations with employees working in shifts or around the clock.

2. Overall Documentation

2.1 Product Perspective

The system will function as a standalone attendance management application integrated with face detection devices and cloud storage. It may also integrate with existing HR systems for employee data synchronization.

2.2 Product Features

- Real-time face detection and recognition for attendance marking.
- Cloud-based storage for attendance data.
- Web and mobile applications for employee acess.
- Admin dashboard for configuration and reporting

2.3 User Classes and Characteristics

2.3.1 Employees:

Will use the system to mark attendance and access records.

2.3.2 Administrators

Will manage the system settings, employee data, and attendance reports.

2.3.3 Managers/Supervisor

Managers or supervisors may have limited administrative privileges, allowing them to view attendance reports the their respective teams. This enables them to track their team members' attendance and identify any potential issues related to punctuality**.**

2.3.4 Security Team

The security team will oversee the implementation of data security.

2.4 Operating Environment

- Supported Web Browsers: Chrome, Firefox, Safari, Edge ○ Supported Mobile Platforms: Android, iOS
- Cloud Service Provider: AWS, GCP

2.5 Design and Implementation Constraints

- Face detection accuracy and speed must meet system requirements.
- Compliance with data privacy and security regulations.
- Integration with existing HR systems should follow their APIs and protocols.

2.6 User Documentation

- Comprehensive user documentation will be provided for employees, administrators, and IT personnel covering system usage, troubleshooting, and FAQs.

3. External Interface of Requirement

3.1 User Interfaces

Employee Web Application

This interface will allow employees to login or sign in and access the system through a web browser. Employees can view their attendance history, receive notifications, and mark attendance using face detection devices.

Mobile Application

The mobile application will provide similar functionalities as the web application, allowing employees to access the system from their smartphones or tablets.

3.2 Software Interfaces

Cloud Storage

The system will interface with the cloud storage infrastructure, where attendance data will be securely stored. The cloud storage provider (e.g., AWS, Azure, GCP) will handle data management and scalability.

Web Browser

The system's web application will interact with web browsers, such as Chrome, Firefox, Safari, and Edge, for employees and administrators to access the system.

Internet Connectivity

The system requires a stable internet connection to enable real-time communication with the face detection devices, cloud storage, and remote access to the web and mobile applications.

Security and Encryption Interfaces

The system will implement security protocols and encryption interfaces to protect employee data, access controls, and secure communication between different components.

3.3 Hardware Interfaces

Power Supply

- Face Detection Devices: The devices need a stable power supply to operate continuously. They may be power supply through direct electrical connection or battery-powered with charging capabilities.
- Servers/Cloud Infrastructure: Adequate power supply and backup mechanisms are necessary to ensure uninterrupted operation of the cloud infrastructure.

Face Detection Devices

- Cameras: The face detection devices will be equipped with high-quality cameras capable of capturing clear images of employees' faces for accurate recognition.
- Facial Recognition Sensors: The devices will have facial recognition sensors or software algorithms capable of detecting and identifying facial features for attendance marking.

4. Functional Requirements

4.1 User Authentication and Registration

Input: User enters registration details (name, email, etc.) and sets up a password.

Output: User account is created, and authentication is required for subsequent access.

4.2 Face Detection and Recognition

Input: Real-time images from cameras.

Output: Detected faces are highlighted and recognized against existing face templates.

4.3 Attendance Marking

Input: Recognized face.

Output: Attendance is marked for the identified user.

4.4 Cloud Storage and Scalability

Input: Data (user information, attendance records) is stored in a cloud-based database.
Output: The system can efficiently handle a large number of users and attendance records.

4.5 Access Control

Input: User login credentials and role-based access levels.
Output: Users and administrators have appropriate access privileges.

4.6 Notifications

Input: Triggers for notification events (e.g., successful attendance marking).
Output: Automatic notifications sent to users and administrators.

4.7 Salary Calculation

Input: Employee attendance record for the month.
Output: calculate the monthly salary.

4.8 Punctuality bonus

Input: Attendance data to track punctuality, such as time-in and time-out records.

Output: Calculate punctuality bonuses for employees who consistently arrive on time and maintain good attendance throughout the month.

4.9 Mobile Support

Input: User access through mobile apps.
Output: Mobile app interface for attendance information and marking.

4.10 Reliability and Error Handling

Input: Error and exception handling mechanisms.

Output: The system remains robust and continues functioning during errors.

5. Non-Functional Requirements

5.1 Security and Privacy

- Employee facial data should be securely stored and encrypted to protect privacy.
- Access to sensitive data should be restricted based on user roles and proper authentication mechanisms.
- The system should comply with data protection laws and regulations.

5.2 Performance

- The face detection process should be fast and responsive, ensuring minimal delay in attendance marking.
- The system should handle simultaneous attendance marking from multiple employees without performance degradation.

5.3 Scalability

- The system should scale seamlessly to accommodate an increasing number of employees and devices.
- Cloud infrastructure should be capable of handling peak loads during high attendance marking times.

5.4 Reliability and Availability

- The system should have high uptime and availability to ensure continuous attendance tracking.
- Regular backups of attendance data should be maintained to prevent data loss.

5.5 Usability

- The user interfaces should be intuitive and easy to navigate for all types of users.
- Onboarding new employees and administrators should be a straightforward process.

5.6 Compatibility

- The face detection devices should be compatible with various camera types and models.
- The web and mobile applications should be compatible with popular browsers and operating systems.

5.7 Maintenance and Support

- The system should be designed for ease of maintenance and troubleshooting.
- Adequate documentation and training materials should be provided for system users and administrators.

6. Cost Estimation

Cloud Infrastructure:

Cloud service provider costs (e.g., AWS, Azure, Google Cloud) for storage, compute, and data transfer.

Software Development:

Development team salaries or hourly rates (based on their roles and experience).

Cost of any third-party software or APIs used for face detection and recognition.

Hardware:

Cost of cameras and other necessary hardware for face detection.

User Interface and Experience:

UI/UX design and development costs.

Testing and Quality Assurance:

Testers' salaries or testing services costs.

Deployment and Integration:

Implementation and integration costs.

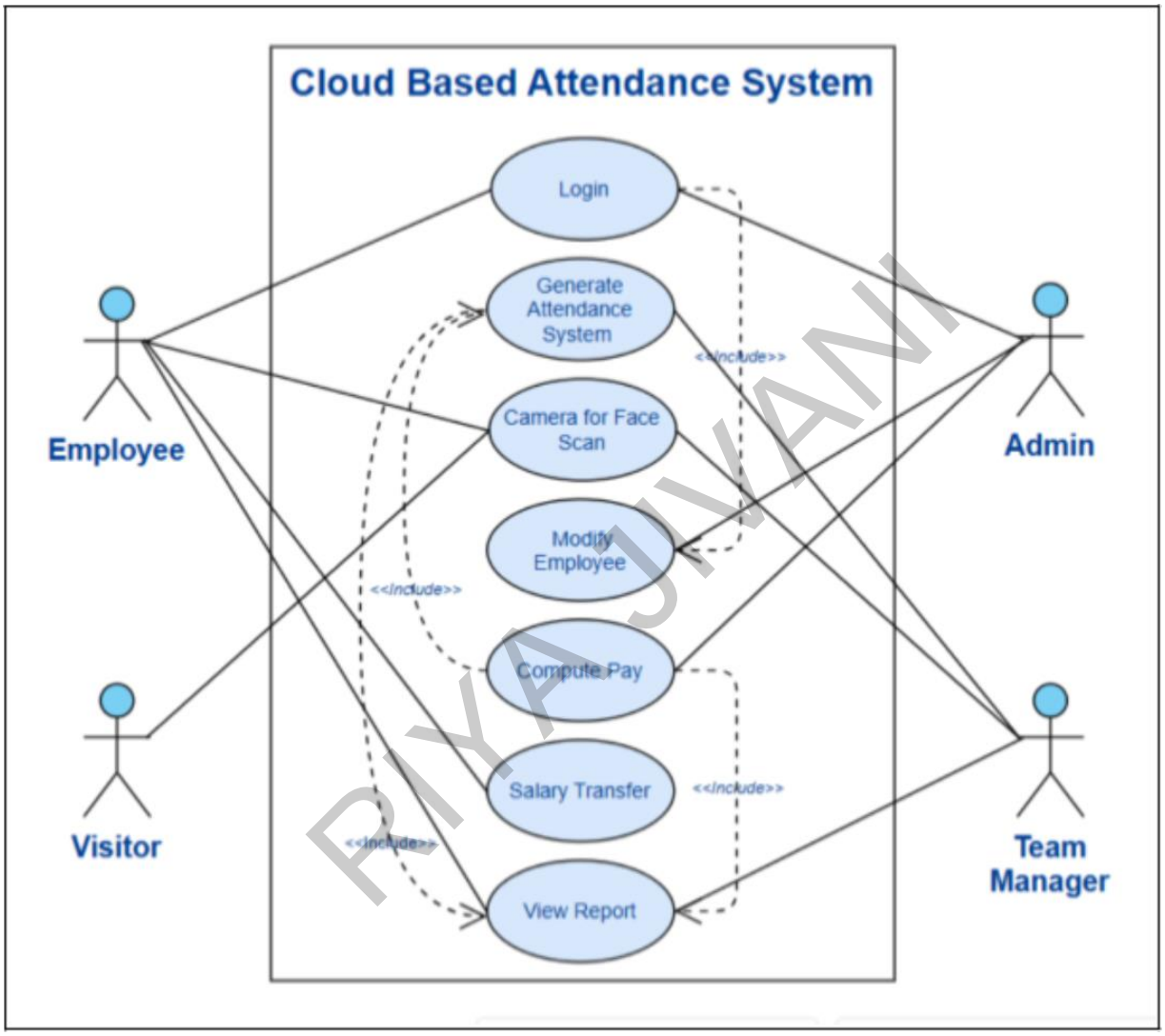
Maintenance and Support:

Ongoing maintenance and support expenses.

Contingency:

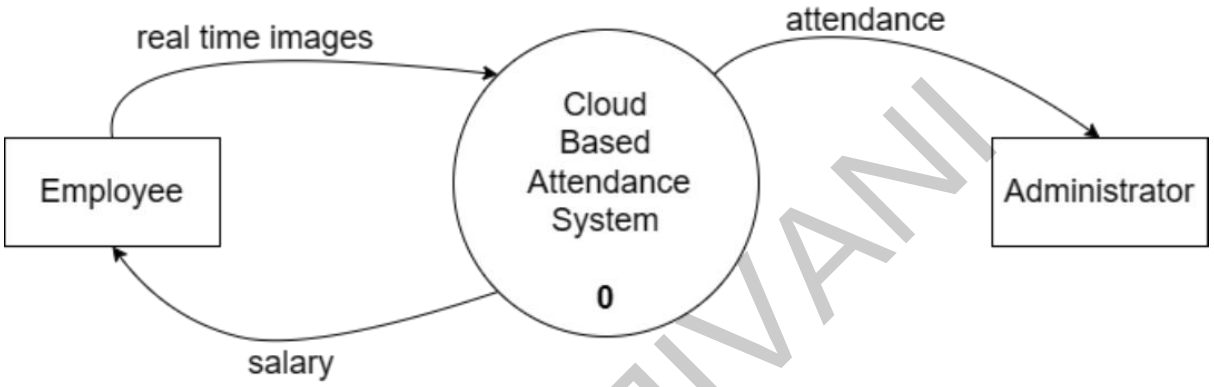
Set aside a portion of the budget for unexpected costs or scope changes.

USE-CASE DIAGRAM



Data Flow Diagram

level 0:



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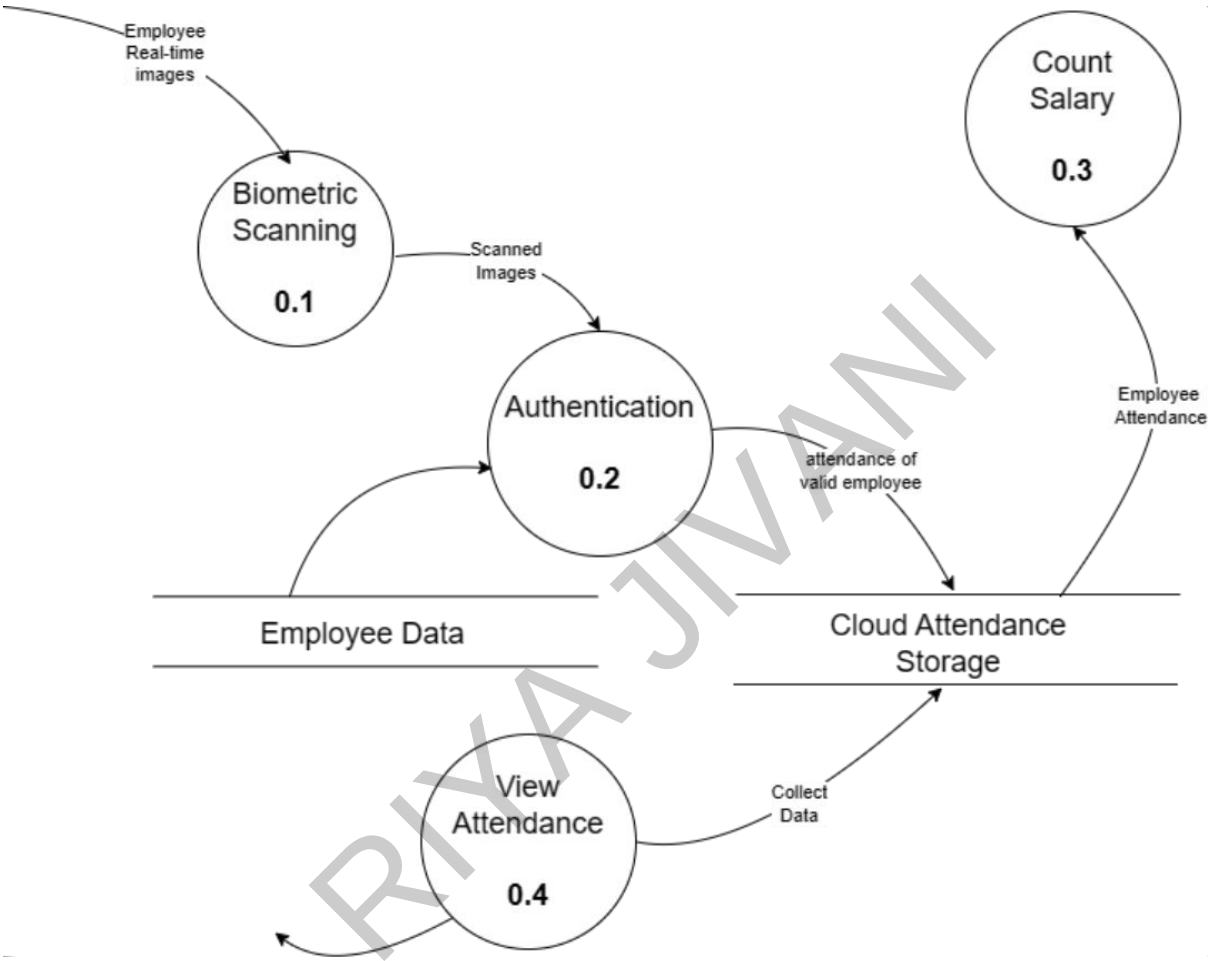

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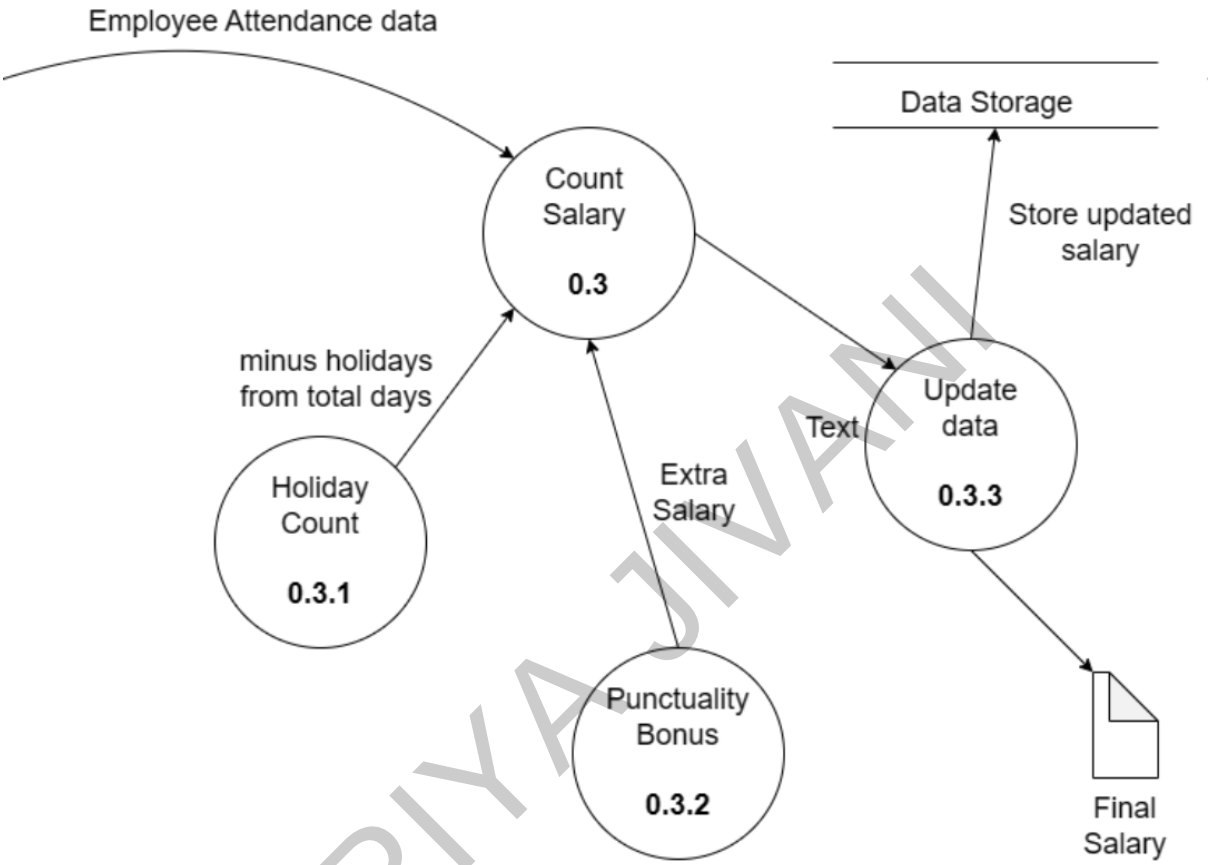
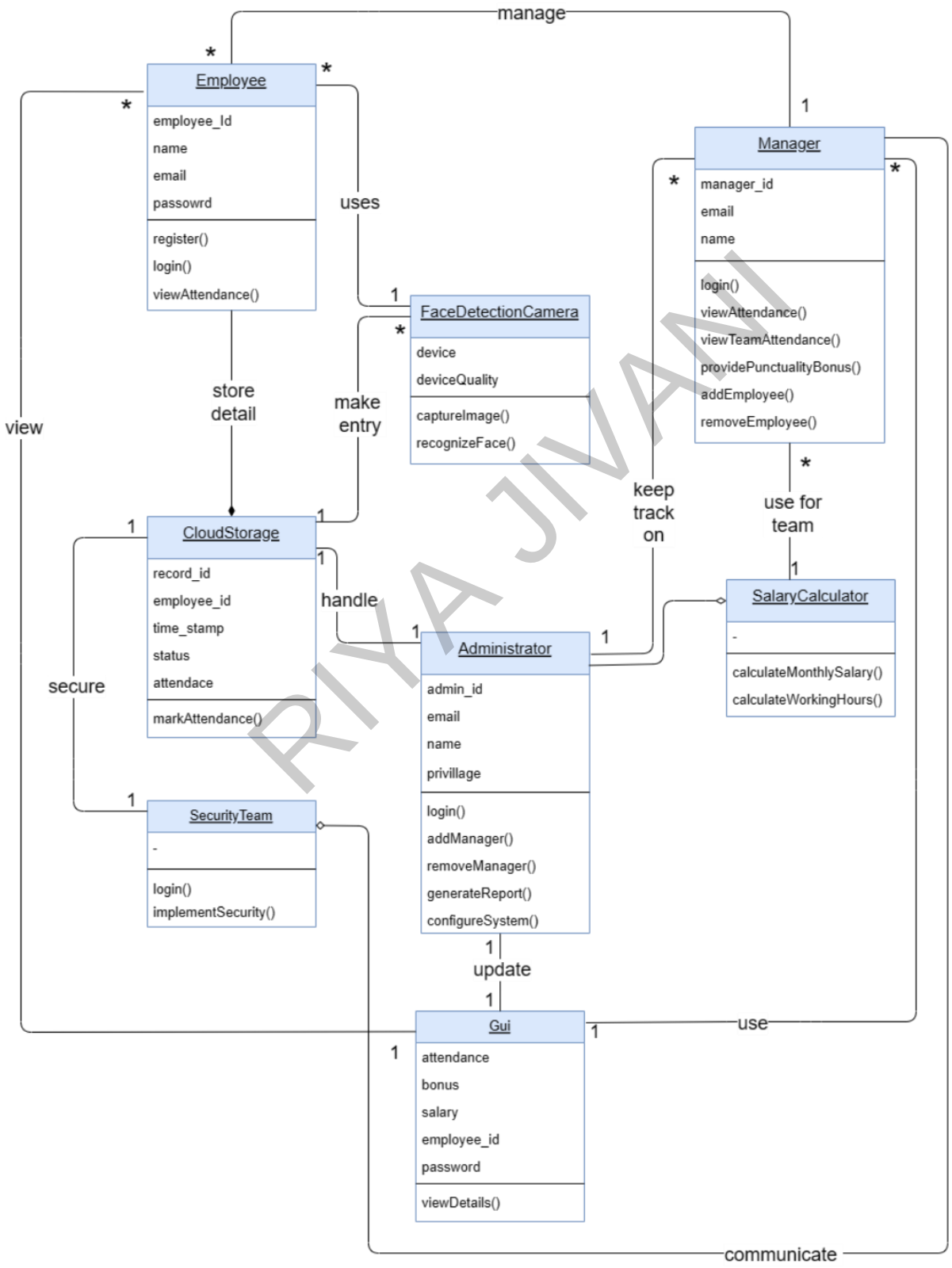
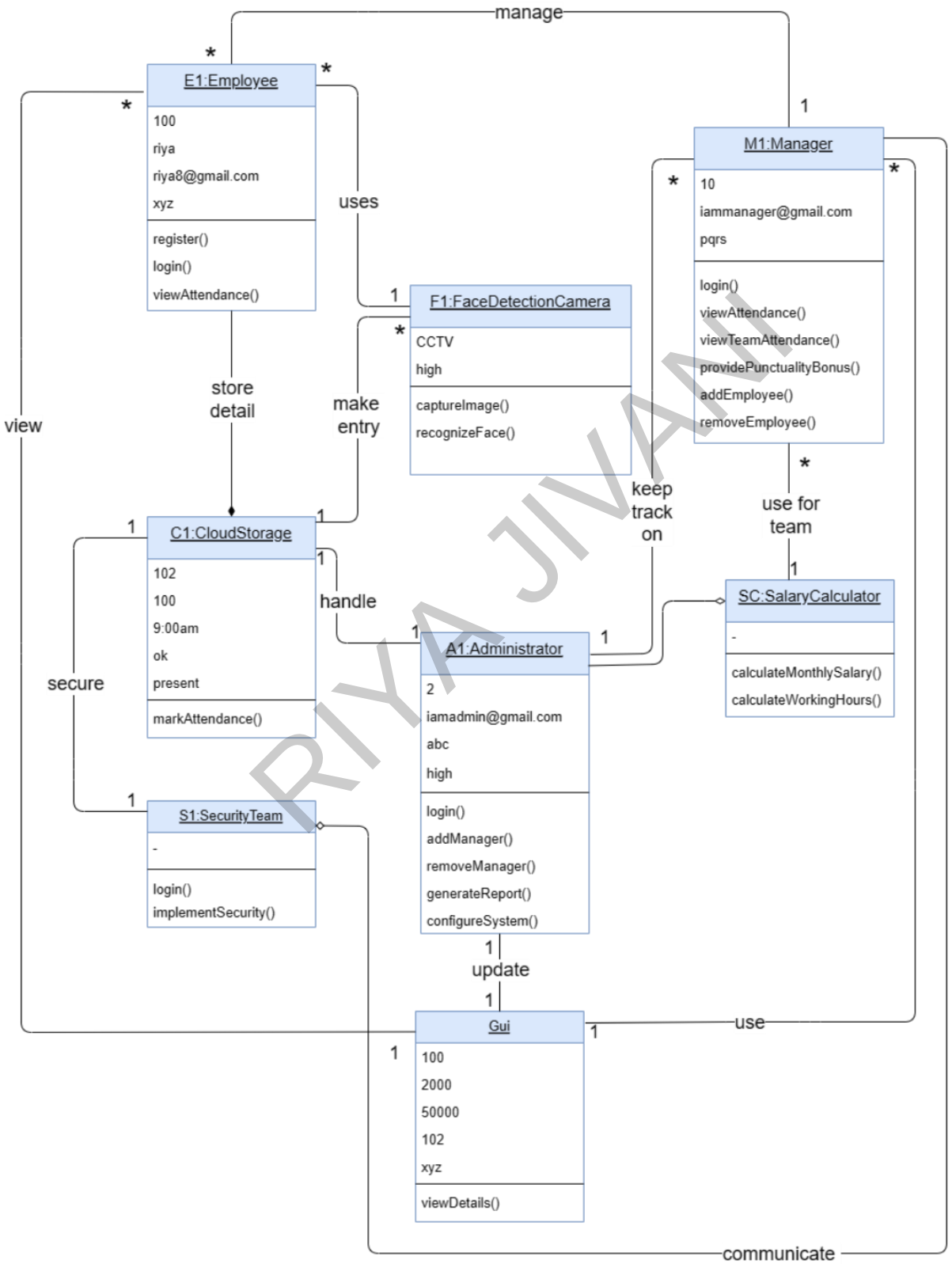


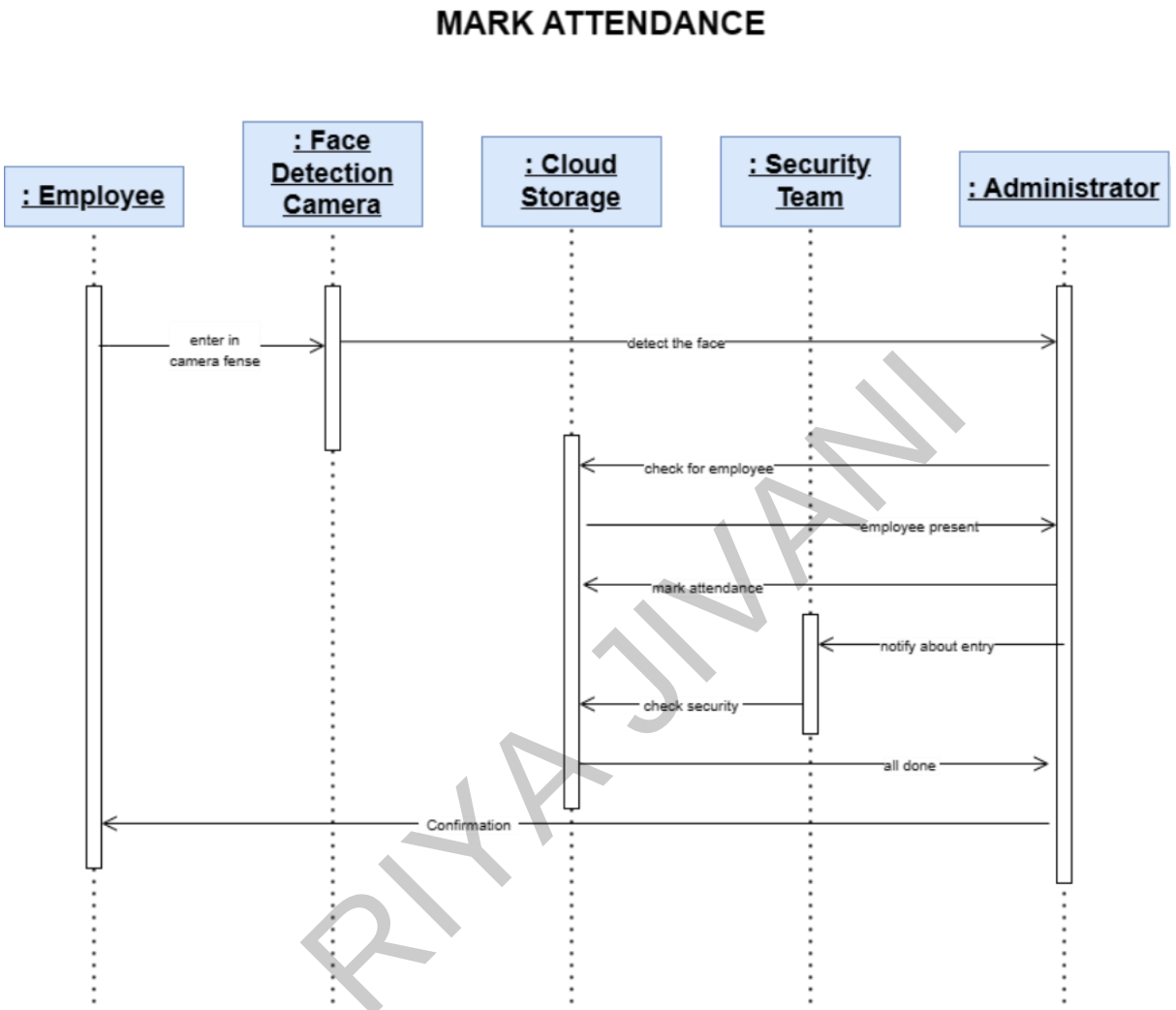
Class Diagram



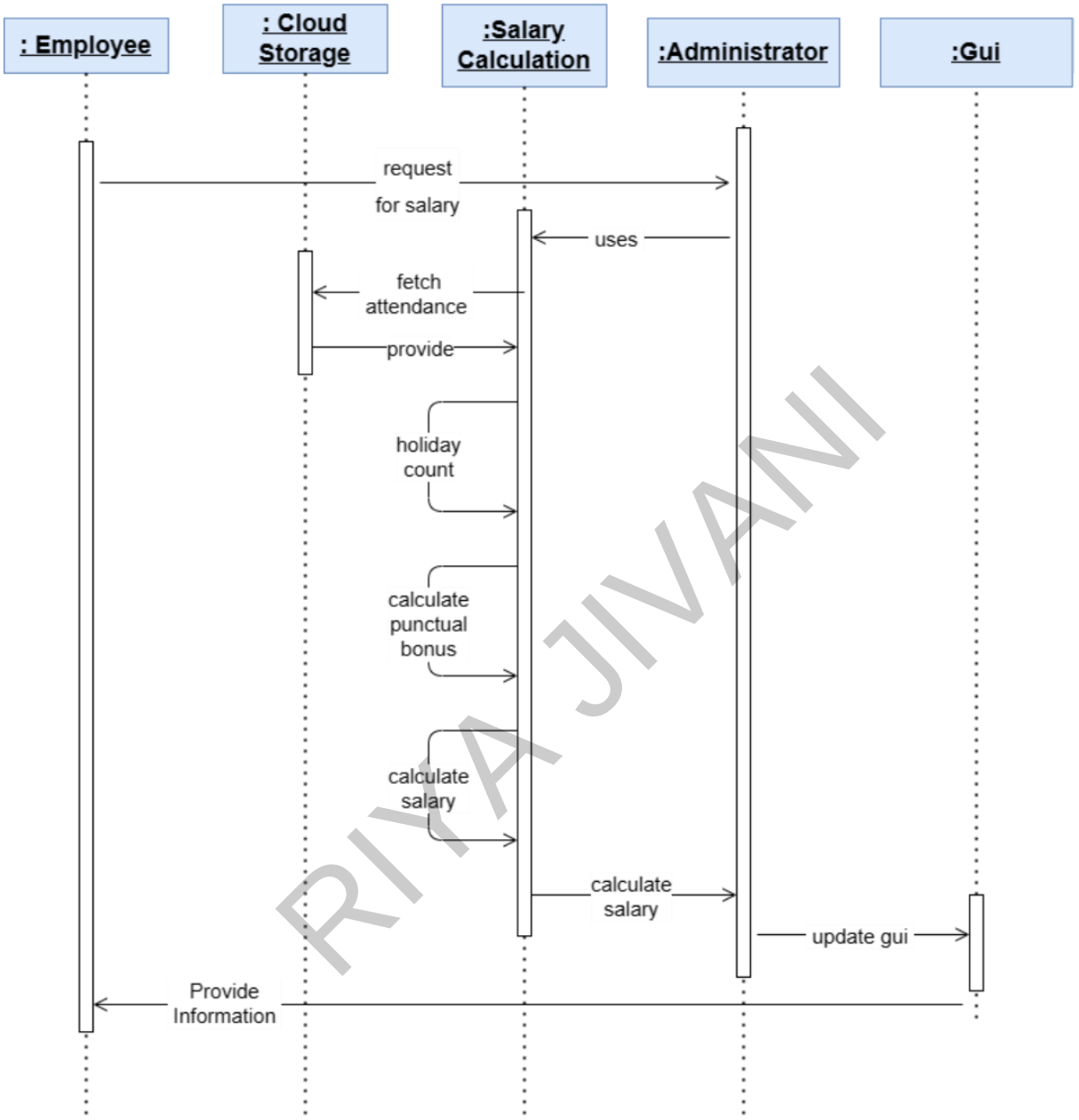
Object Diagram



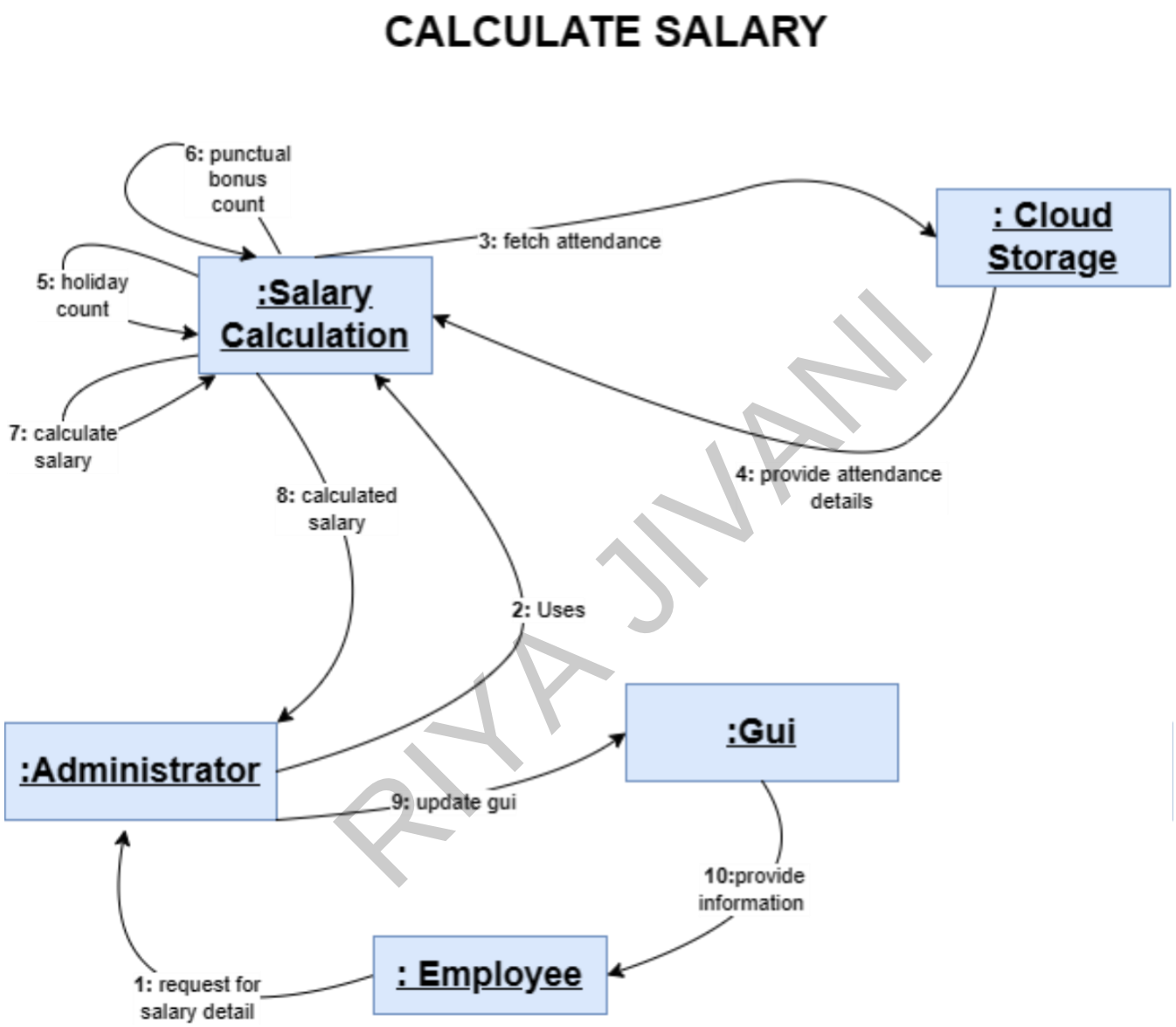
Sequence Diagram



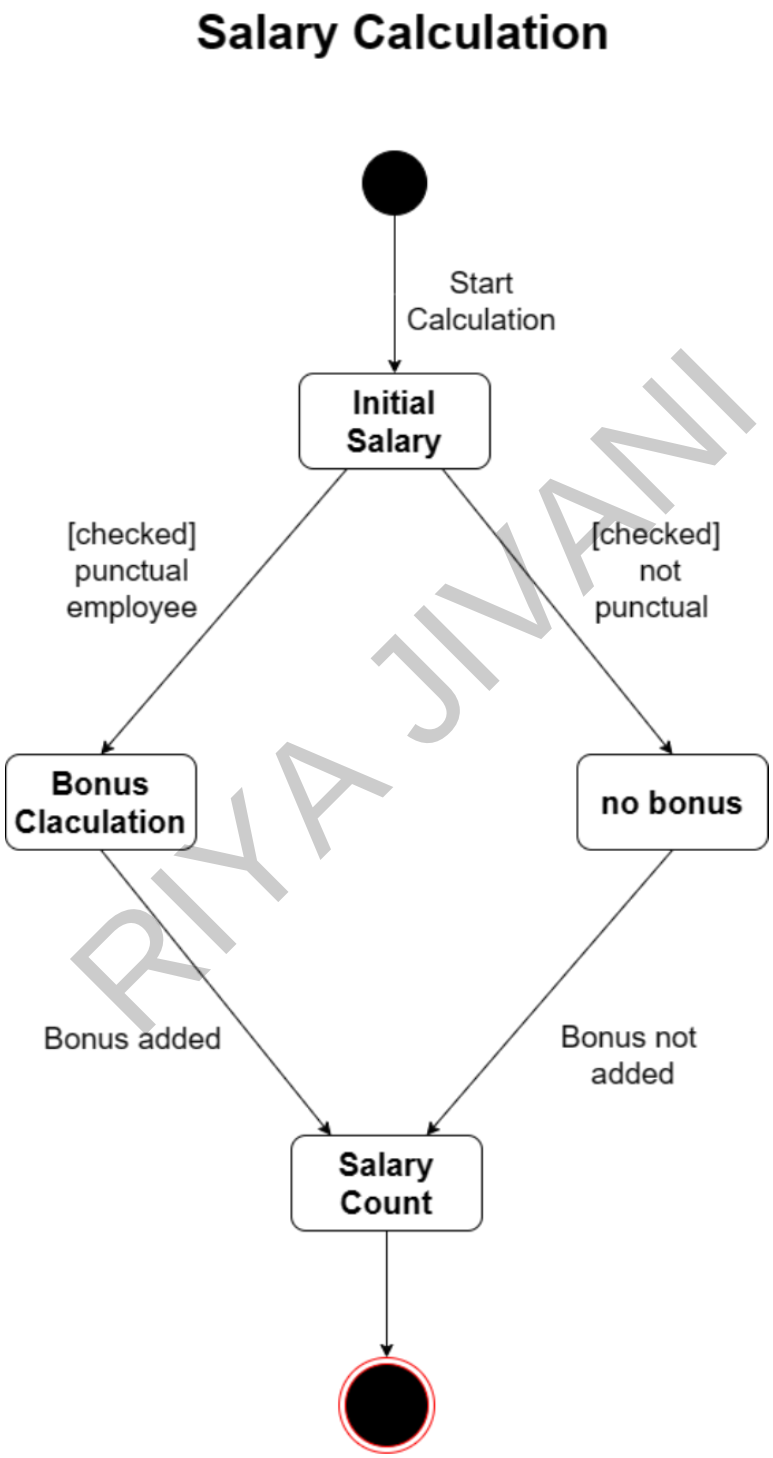
CALCULATE SALARY



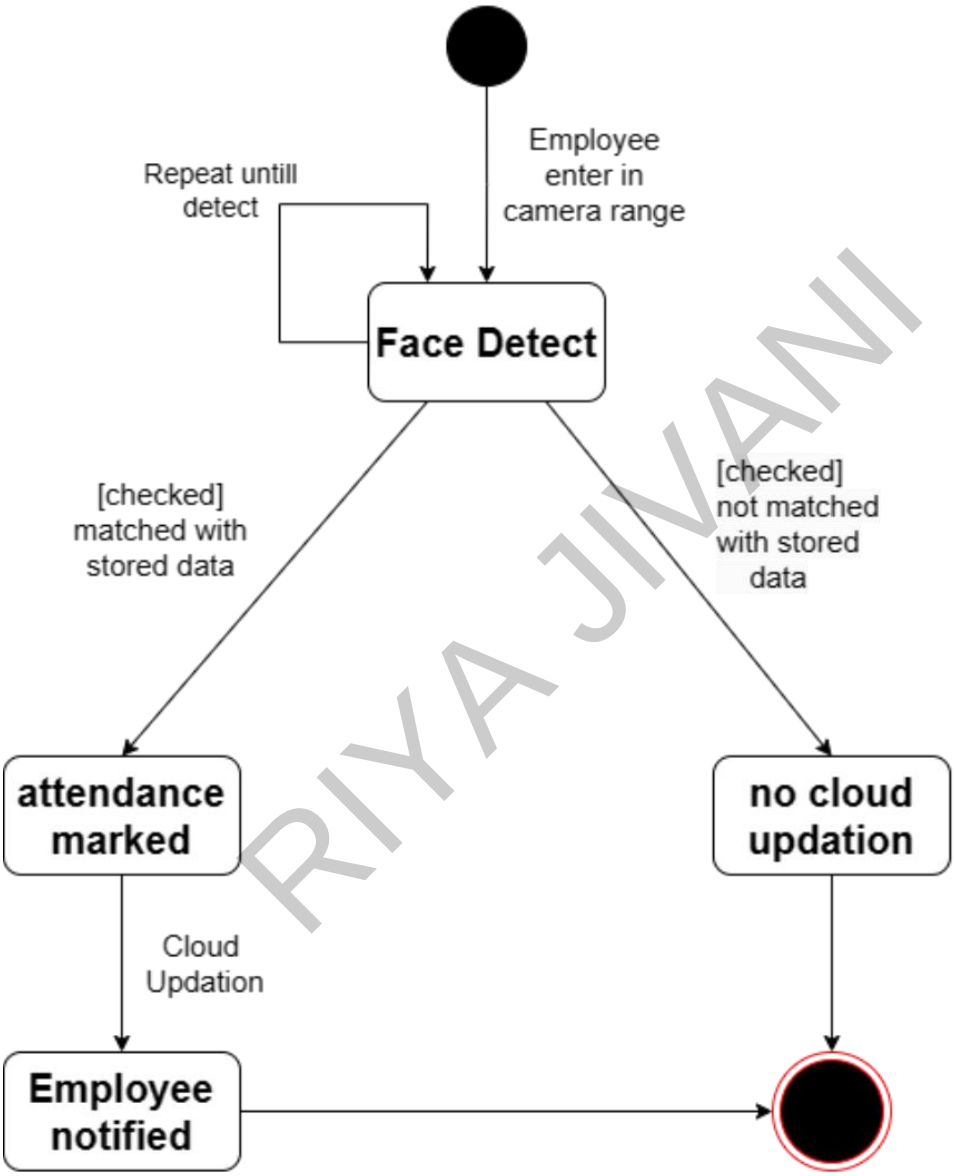
Collaboration Diagram



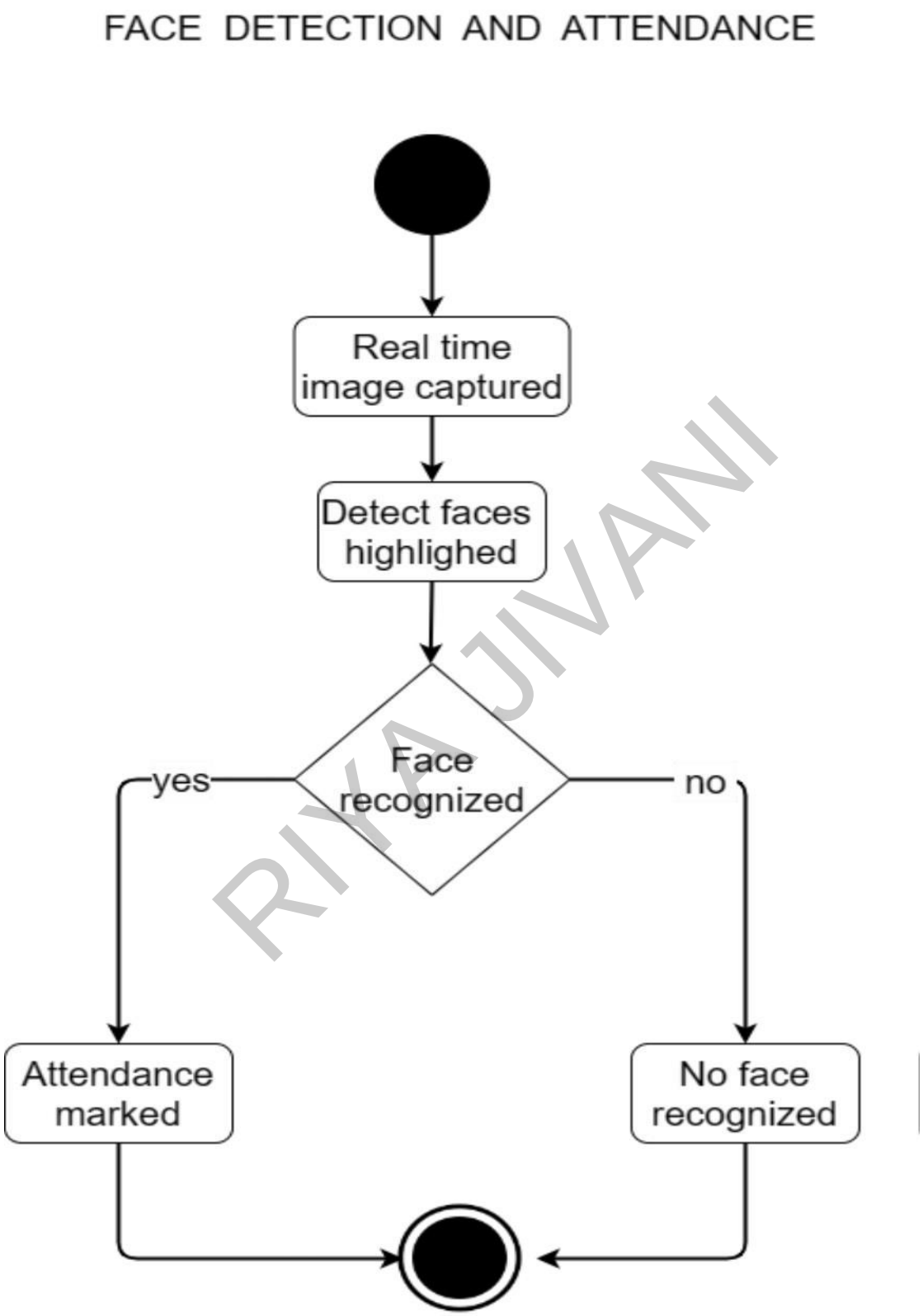
State chart diagram



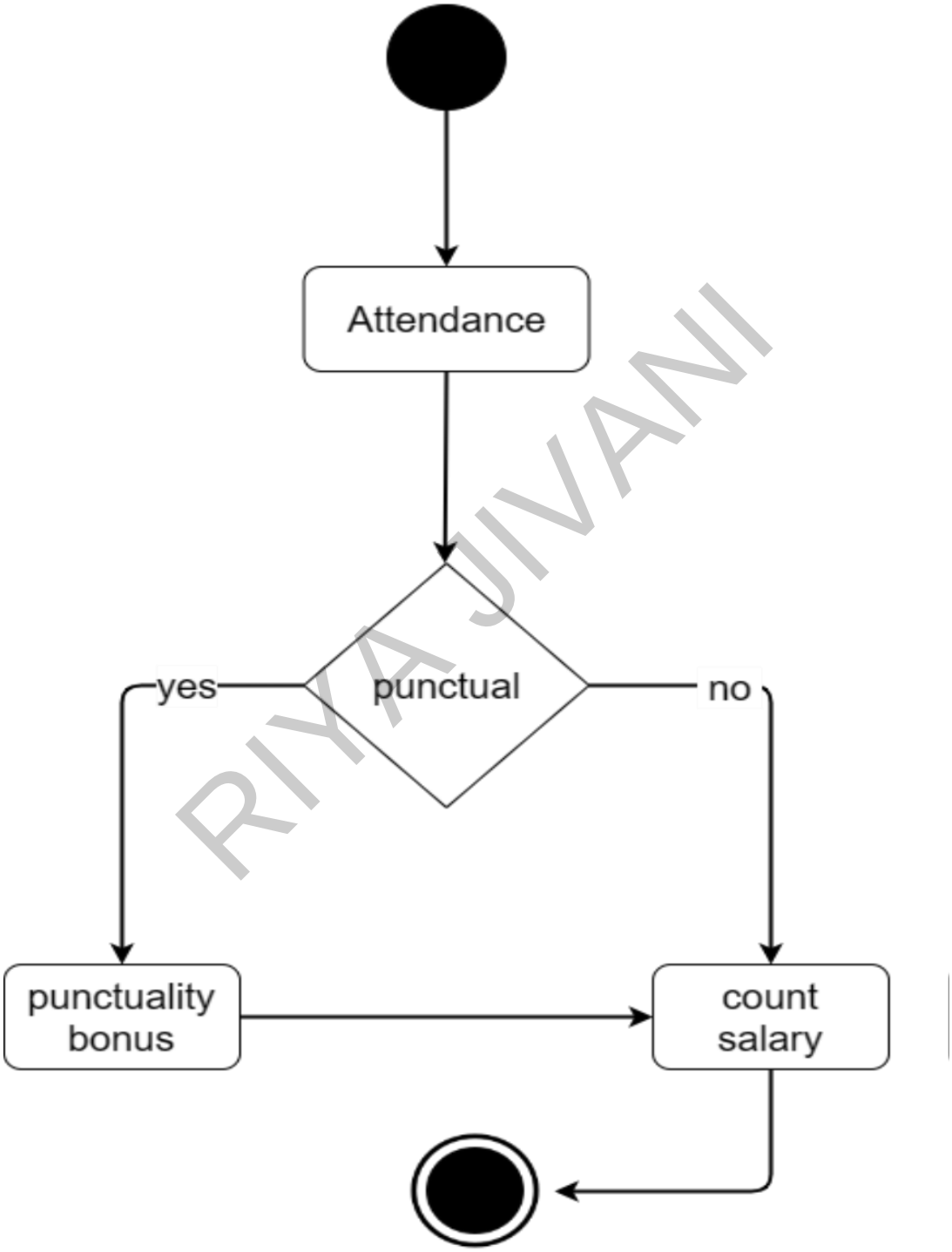
Face Detection



activity diagram



SALARY CALCULATION



USER AUTHENTICATION AND REGISTRATION