AI ATTENDANCE PLATFORM

Project Report

Team Number 27

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Github : https://github.com/danish241194/AI_BASED_ATTENDENCE_PLATFORM

Introduction

Project Introduction

Replacing manual tasking of attendance taking with a comprehensive application can save a lot of precious teaching time . Our AI powered face recognition solution which uses Computer Vision and Machine Learning algorithms to mark the attendance of the employees or students of the organisation. This platform is a really convenient choice to quickly and easily track students/employees attendance or their participation in any given event , program and class.
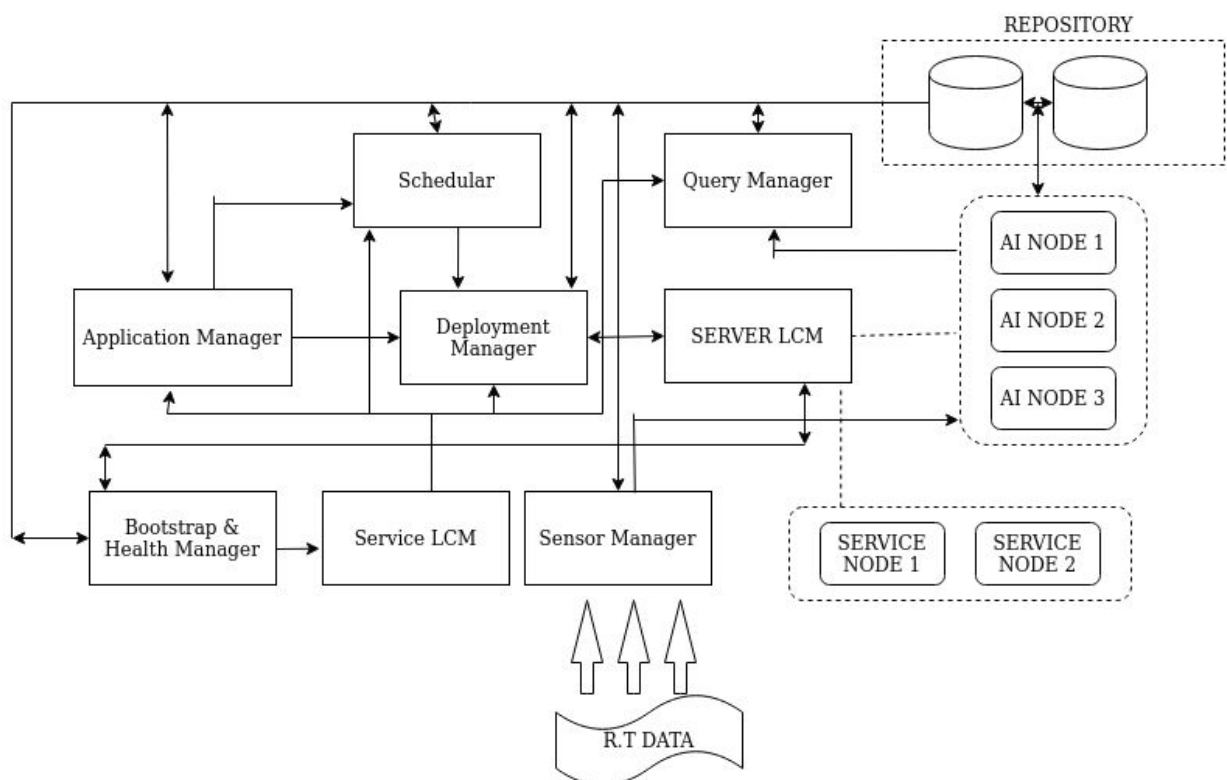
Why to use

- This provides a solution to RFID cards and biometric devices used in organizations which costs organization in terms of manpower and cost.
- During the current state of the world due to **COVID19**, hygiene issues regarding traditional biometric devices have come to surface. This platform will ensure a contactless attendance system.

Platform Entities

This platform can be used by the two entities detailed below.

Educational Institute

- Upload Photos : Institute will be given functionality to upload pictures of students whose attendance needs to be taken .
- Add course : Institute will be given functionality to add courses for which institute wants to use the platform for attendance.
- Drop course : Institute can drop courses for which the institute doesn't want to use the platform for attendance.
- Automatic attendance : In Automatic attendance mode, the platform will have access to cameras installed in the class and it will record a video automatically at a predefined time during the time slot of the class.
- Retrieve attendance : Institute can retrieve attendance of a course at any time.

Corporate organisations

- Add Employee : Organisations will be given functionality to upload pictures of the employees whose attendance needs to be taken .
- Drop Employee : Organisations will be given functionality to remove the employees whose attendance need not be taken further.
- Automatic attendance : In Automatic attendance mode, the platform will have access to cameras installed at the entry and exit of the organisation. Camera will provide the photo frame at every instance when a person enters or leaves the organisation.
- Retrieve attendance : Organisation can retrieve attendance of the employees.
- Working hours : Some organisations that want their employees to have at least certain working hours per week can retrieve whether that employee was present in the organisation for required working hours or not.

Architecture

Bootstrap

- Responsible to initialize all the available platform modules like   Repository, Scheduler,Deployment manager,Sensor Manager etc.

Application Manager

- Dashboard : User Interface through which institutes and the corporate organization can interact with our platform services
- This module will serve all requests like Login and works as a redirector i.e redirects the user request to the appropriate services.

Server Life Cycle Manager(Load Balancer)

- Server Life cycle will accept request from service life cycle manager and provide a running machine with all dependency installed in it required for a service to run.
- Server Life Cycle will be responsible to add machines to the platform at run time to balance the load of running services

Service Life Cycle Manager

- Responsible to Start and Stop attendance marking service,training on photos service,querying service request given by Platform User.
- Responsible to store all important details of a given service in registry, information like service (mentioned in above point) running on which machine, its start and end time.

Scheduler

- This module is responsible to run the face recognition attendance model at the scheduled time as given by the institute/corporate organization on the configuration file.

Deployment Manager:

- This module is responsible to setup an environment for the service to run e.g for the attendance marking service , it will copy the weights of institutes face recognition model to the machine decided by load balancer.

Query Manager :

- Service responsible to to resolve queries given by user (institute or organisation) related to attendance

Run Time Server:

- Responsible for initiating node instances as requested by deployment manager.
- Run time server will support multiple containers service to run.

  AI NODES :

  Nodes to run ML algorithms for training and face recognition

  SERVICE NODES:

  Nodes to run platform services like scheduler,deployment manager etc

Sensor Manager

- Binds the running stream of frames coming from the camera to the face marking service

Sensor Registration

- Sensor Registration will help to initially setup cameras in platform and will store relevant information in run time registry.

Health manager

- Health Manager keeps track of the services and if any service is down it is responsible to make it live again with collaboration with service life cycle manager

Technologies/Environment to be used

Flask

Flask is a micro web framework written in Python, python based framework will be used for UI based interfaces and servers.

KAFKA - Messaging Queue

Kafka is used for real-time streams of data, to collect big data, or to do real time analysis (or both). Kafka is used with in-memory micro services to provide durability. Since Kafka is a fast, scalable, durable, and fault-tolerant publish-subscribe messaging system.

Platform - User Servies

Face Training Service:

This service is responsible to train the face recognition model for the students and employees of the particular institute and corporate company respectively. After training on the the faces will save the weights on the repository.

The photos are uploaded by the admins of the institutes or the company in the following format:

- Photos
  - student_id_1/employee_id_1
    - Photo1.png
    - Photo2.png
    - Photo3.png
  - student_id_2/employee_id_2
    - Photo1.png
    - Photo2.png
    - Photo3.png

Attendance Marking Service

Educational Institutes

For the institutes ,this service can be called either by the request manager or the scheduler.This service will load the weights of the model for the particular institute and run the model on the frames which it will be getting until the scheduler calls for stopping. On

every frame it will get the faces appearing on the frame and mark attendance of the students and hence in the end of attendance will store the attendance in the database.

Corporate Organizations

Here the frame can appear from two kinds of cameras one for in and other from out. Hence will mark the entry for both the employees who are coming in and the employees who are coming out. Which can later also be used to find the effective time the employee has been inside the company.

Querying Service

Our platform will be supporting various kinds of queries on the attendance marked by our service.The following kind of queries we will support :

Educational Institutes

- Get attendance of [students list or all students] for [list of courses or all courses] on [list of dates or list of months or list of semesters]
- Get all students having attendance [less than or greater than K] for [list of courses]

Corporate organisation:

- Get attendance of [employee list or all students] for [list of dates]
- Get all employees having attendance [less than or greater than K] from [date1] to [date2]
- Get all employees having effective time [less than or greater than K] from [date1] to [date2]