**Smart Vision: CNN-based attendance marking system**

**Objective:**

The project's goal is to create an automated attendance system that uses a CCTV camera to make it easier for businesses, schools, and other groups to track attendance. The main goals are:

1. **Automate Attendance Marking** – Use real-time facial recognition from CCTV footage to do away with manual attendance procedures.
2. **Enhance Accuracy & Security** – Reduce mistakes and unapproved proxy attendance by using facial recognition powered by AI.
3. **Improve Efficiency** – Reduce the amount of time and money spent on human assistance while keeping track of attendance.
4. **Seamless Integration** – Create a system that works with the current attendance management software and CCTV equipment.
5. **Data Analytics & Insights** – Using analytics, generate reports on working hours, absenteeism, and attendance trends.

**Methodology:**

To guarantee accuracy and efficiency, the system is created in a highly methodical manner. The following are the main elements of the methodology:

1. **Gathering and Preparing Data**

* A CCTV camera is used to take pictures of every employee or student.
* Each person has about 500 photos saved in a structured directory.
* To improve model training, pre-processing methods such as resizing, grayscale conversion, and image augmentation method from TensorFlow e.g., rotation, zoom shear, etc.

1. **Training of Models**

* A Convolutional Neural Network (CNN) with a deep learning foundation is used for facial recognition.
* For classification, a pre-trained model such as VGGNet-16 and then we will refine according to our preference.
* We will employ dropout methods and L2 regularization to prevent overfitting in our train model.
* For effective learning, the Adam optimizer is utilized in conjunction with a categorical cross-entropy loss function.
* For later inference, the trained model is stored in.h5 format.

1. **Face Recognition and Detection**

we will use Three methods of detections:

* Haar Cascade (this is quick but imprecise)
* Deep Neural Network (DNN) (this is in between of high accuracy and high computation cost and have a stronger range)
* Multi-task Cascaded Convolutional Networks (MTCNN): a computationally costly but highly accurate method.

To classify the detected face's identity, the trained CNN model is employed.By comparing the retrieved features with the registered faces, the model determines the identity; if the face is in the database, the name appears; if not, it displays unknown.

1. **Data storage and attendance marking**

* Attendance is automatically recorded if a match is discovered
* sqlite will be used to store the attendance records as this will store the attendance with name confidence and the time of marking.
* For scalability, a database integration option (such as SQLite or PostgreSQL) is taken into consideration.
* Data visualization and real-time monitoring are made possible by a web-based dashboard.

**Reference:**

1. Implementing CCTV-Based Attendance Taking Support System Using Deep Face Recognition: Case Study at FPT Polytechnic College *(Received: 24 January 2020; Accepted: 17 February 2020; Published: 21 February 2020)* Ngo Tung Son 1, Bui Ngoc Anh1, Tran Quy Ban1, Le Phuong Chi1, Bui Dinh Chien1
2. Integration of FaceNet and DeepFace Algorithms for Optimized Attendance Management in Educational Systems *(Received: 21 october2023; Accepted: 19 october 2023; Published: 22 november2023)*  Bhamidi Sri Bhargava 1, Kusam Uday Tej Reddy 2, Vithalapuram Srihari3 , K. Venkatesh Sharma4

**Team:**

1. VANSH BUDHIRAJA - E22CSEU0177
2. PRATHAM PAHWA - E22CSEU0164
3. DEEPANSHU KASANA - E22CSEU0156