SYNOPSIS REPORT

Project Insight: Real-Time Infrastructure & Behavioral Monitoring

Bachelor of Technology (CSE - AIML) PARUL UNIVERSITY

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1. Introduction

In modern educational and corporate environments, traditional methods of monitoring attendance and engagement are often inefficient and prone to manual error. Most institutions face challenges regarding the real-time tracking of student behavior and the actual performance of employees.

The proposed system, Project Insight, is an AI-powered infrastructure monitoring platform. It utilizes computer vision and facial analytics to automate administrative tasks and provide deep insights into classroom efficiency and campus security. Unlike manual evaluation, this system provides instantaneous, unbiased data to help organizations optimize their time and resources.

2. Core Features & Functionality

The system is built around three primary pillars of automation and analysis:

- Automated Attendance & Space Management: The system uses camera-based facial recognition to identify students/employees and mark attendance automatically in a central dashboard. Furthermore, it monitors "empty class presence" to identify available rooms for extra lectures or administrative adjustments across the campus.
- Sentiment & Efficiency Analysis: To measure faculty feedback and student interest, the AI analyzes facial movements and eye curvature. For example, if a significant portion of the class shows "drowsy eyes" or signs of disinterest (yawning), the system flags this in the dashboard as a drop in "current period student efficiency."
- Security & Behavioral Monitoring: The system is trained to detect suspicious activities or physical altercations (fights) within the classroom or infrastructure, providing real-time alerts to the administration.

3. Methodology

The development of the system follows a structured AI pipeline:

1. Requirement Identification: Defining parameters for posture detection, facial landmarks (eye curvature, yawning), and activity recognition (fights/suspicious movement).
2. Dataset Collection: Utilizing video feeds and image datasets for facial recognition and human activity recognition (HAR).
3. Data Preprocessing: Cleaning and normalizing video frames, handling lighting variations, and balancing datasets for different ethnicities and environments.
4. Model Development: * Classification: For attendance and suspicious activity detection.
    - Emotion/Sentiment Analysis: Using facial landmark detection to determine engagement levels.
5. Dashboard Integration: Developing a real-time interface (Flask/Django) to reflect attendance, efficiency scores, and security alerts

Technical Methodology: Real-Time Infrastructure Monitoring

The core of the system relies on specialized Computer Vision (CV) pipelines to process live video feeds from campus cameras.

1. Eye-Tracking & Sentiment Analysis (MediaPipe)

- ➢ Facial Landmark Detection
- ➢ Eye Aspect Ratio (EAR)
- ➢ Drowsiness Logic
- ➢ Class Efficiency Score

2. Suspicious Activity & Fight Detection (YOLO / HAR)

- ➢ Object Detection (YOLOv8/v10)
- ➢ Human Activity Recognition (HAR)
- ➢ Real-Time Alerts

3. Automatic Attendance & Infrastructure Mapping

- ➢ Facial Recognition
- ➢ Spatial Analysis

Software & Hardware Requirements

Requirement Type	Specification
Development IDE	VS Code (preferred for AI + web development) , Jupyter Notebook
Key Libraries	**OpenCV** (Video processing) , **MediaPipe** (Landmarking), **PyTorch/TensorFlow** (YOLO/ML)
Backend/UI	Flask or Django for the administrative dashboard
GPU (Recommended)	NVIDIA RTX Series (3060+) for real-time video inference and low latency
Processor	Intel i7 / AMD Ryzen 7 for faster model training
Memory	16 GB or more for large-scale video data processing