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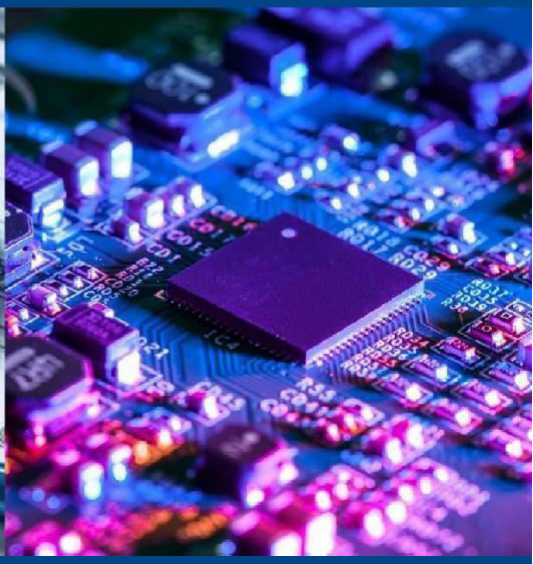

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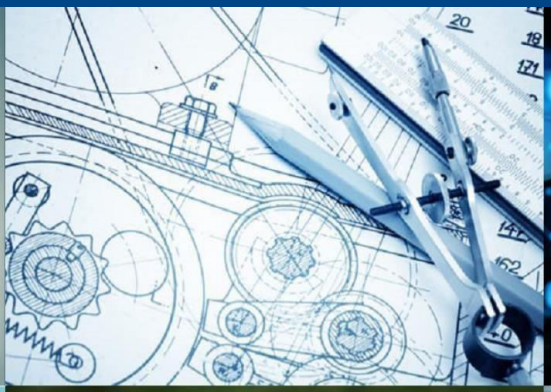

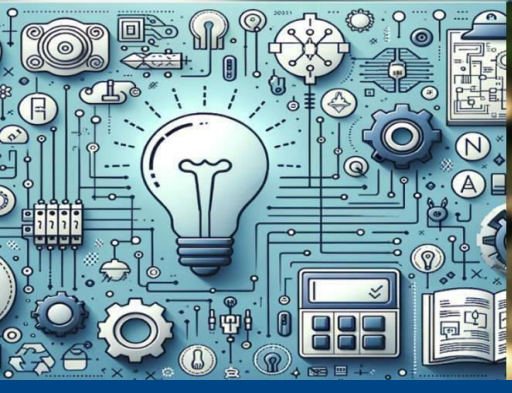

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# EMPLOYEE MONITORING SYSTEM WITH MANAGER CONSOLE

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**ABSTRACT:** This paper presents a real- time hand monitoring system that integrates computer vision ways with a centralized web- grounded director dashboard to enhance plant supervision, responsibility, and productivity assessment. The proposed system utilizes OpenCV and Mediapipe to reuse live webcam aqueducts, detecting crucial behavioral pointers similar as hand presence, dragged eye check, and talking frequence, which may signify distraction or advancement. A Beaker- grounded backend garçon facilitates secure authentication, centralized log storehouse, and real- time data synchronization between the monitoring customer and the operation interface. The dashboard enables directors to view live attendance, review literal exertion logs, and perform hand record operation through an intuitive web interface. By offering nonstop observation, automated logging, and centralized control the system addresses the limitations of traditional attendance styles that fail to capture in-shift engagement. Designed to be featherlight, scalable, and cost-effective, this result is particularly suited for small and medium- sized associations seeking to ameliorate functional translucency and pool analytics through real- time monitoring. Keywords Hand Monitoring, Computer Vision, Mediapipe, OpenCV, Flask, Real- Time Tracking, Workplace Productivity, Activity Recognition, Attendance System, Manager Dashboard.

**KEYWORDS:** Employee Monitoring, Computer Vision, Mediapipe, OpenCV, Flask, Real-Time Tracking, Workplace Productivity, Activity Recognition, Attendance System, Manager Dashboard.

## I. INTRODUCTION

Employee productivity and accountability are vital in modern workplaces, yet conventional attendance systems fail to capture real-time engagement. Leveraging computer vision and machine learning, this work proposes a real-time monitoring system that detects presence, eye closure, and talking behavior using OpenCV and Media Pipe. A Flask-based backend handles authentication, log storage, and data retrieval, while a manager dashboard enables live tracking and employee management, offering an efficient and cost-effective workforce monitoring solution.

## II. LITERATURE SURVEY

Early employee monitoring systems primarily relied on manual attendance registers or basic biometric technologies such as RFID and fingerprint scanners. While effective in recording entry and exit times, these approaches lacked the capability to track real-time employee engagement during working hours. They were also susceptible to proxy attendance, leading to inaccuracies in productivity evaluation.

Face recognition-based systems emerged as a secure alternative due to advancements in computer vision and machine learning. Ahmed et al. (2018) implemented a convolutional neural network (CNN) for workplace facial authentication, achieving higher accuracy in varied lighting conditions compared to traditional biometrics. However, their system focused solely on authentication at entry points without monitoring in-shift behavior. Behavioral monitoring methods have been explored in research domains such as transportation safety. Kumar and Singh (2019) developed a driver fatigue detection system using the Eye Aspect Ratio (EAR) method with OpenCV and dlib, effectively identifying prolonged eye closure. While adaptable to office environments, this technique has rarely been integrated into workplace productivity tracking. Lip Movement analysis has been widely applied in visual speech recognition systems. Ghorpade et al. (2020) designed a mouth Region-of-Interest (ROI) tracking model to detect talking patterns in real time. Though effective for human-computer interaction, the integration of lip movement detection into employee monitoring frameworks is still limited.

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Recent advancements in lightweight frameworks, such as MediaPipe, have enabled efficient real-time face and landmark detection on consumer-grade devices. Doe et al. (2021) combined OpenCV's image processing capabilities with MediaPipe's facial landmark tracking to develop a cost-effective monitoring solution, demonstrating robust detection of facial features without relying on computationally expensive deep learning models.Despite these developments, there remains a gap in unified systems that integrate authentication, real-time behavioral monitoring, and centralized log management. Existing solutions tend to focus on isolated functionalities, whereas the proposed system combines presence detection, eye closure analysis, and lip movement tracking with a Flask-based backend and manager dashboard for comprehensive workforce supervision.

EXISTING SYSTEM

Existing employee monitoring systems primarily focus on attendance recording and identity verification through biometric methods such as RFID cards, fingerprint scanners, or standalone face recognition terminals. While these approaches are effective in ensuring secure access and preventing unauthorized entry, they are limited to tracking entry and exit times and do not provide insights into employee behavior during working hours. Some existing solutions use video surveillance to monitor employee activities; however, these systems typically require manual observation by managers and lack automated behavioral analysis features. Moreover, most existing frameworks operate in isolation without centralized data storage or real-time accessibility for managerial review, making them less effective for continuous productivity tracking.

PROPOSED SYSTEM

The proposed system integrates real-time computer vision-based behavioral monitoring with a centralized web-based management platform. Using OpenCV and MediaPipe**,** the system captures live webcam streams to detect employee presence, prolonged eye closure, and talking patterns through lip movement analysis. These behavioral indicators are processed in real time, and logs are automatically uploaded to a Flask-based backend server for secure storage. The manager dashboard, accessible via any web browser, enables real-time attendance tracking, historical log review, and employee management operations. Unlike existing systems, this solution provides automated behavioral analysis, live monitoring, and centralized log management in a single integrated platform, offering a cost-effective and scalable workforce supervision tool suitable for small and medium-sized organizations.

## III. SYSTEM ARCHITECTURE

The proposed system follows a client–server architecture in which the employee monitoring application acts as the client, and a Flask-based server functions as the central backend for authentication, log management, and dashboard services. The system is composed of three main components:

1. Monitoring Client (Employee Side)
2. Backend Server
3. Manager Dashboard

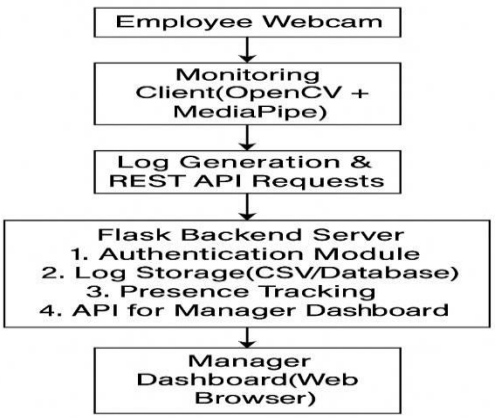


Fig 3.1 System Architecture

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## IV. METHODOLOGY

The proposed employee monitoring system adopts a client–server architecture, integrating a Python-based monitoring client and a Flask-based web server for centralized data management. The methodology involves four main stages:

A. Employee-Side Monitoring Module – Uses OpenCV and MediaPipe to process live webcam feeds for detecting presence, prolonged eye closure, and talking behavior. Detected activities are timestamped and temporarily stored before being uploaded to the server.

B. Server-Side Application – A Flask backend manages authentication, centralized log storage, and real-time presence tracking. REST APIs handle log uploads, employee CRUD operations, and dashboard data retrieval.

C. Manager Dashboard – A web-based interface for managers to view live attendance, review historical activity logs, and manage employee records. The dashboard is accessible via any browser connected to the same network.

D. Data Communication Flow – The client communicates with the server using HTTP requests. Activity logs are periodically uploaded to the server, while the server responds with authentication results, presence updates, and requested data for the dashboard.

## V. DESIGN AND IMPLEMENTATION

The system is designed to be lightweight, scalable, and compatible with standard office hardware. The design is divided into three tiers:

Presentation Layer (UI) – Consists of the employee client interface for login and monitoring feedback, and the manager dashboard for supervision and data access.

Application Layer (Logic) – Implements activity detection algorithms (Eye Aspect Ratio for eye closure, lip movement tracking for talking detection, presence detection via face tracking) and server-side request handling.

Data Layer (Storage) – Stores employee credentials in a JSON file and activity logs in CSV format for easy retrieval and analysis.

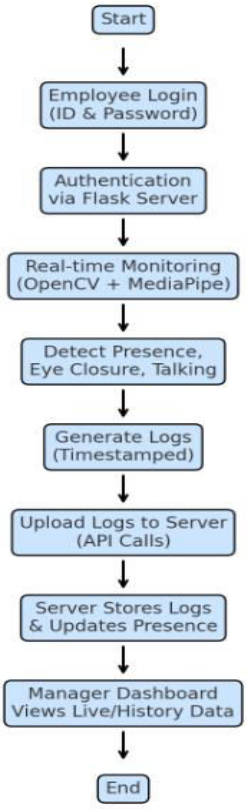


Fig 3. 2.1 Flowchart of Working System

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## VI. OUTCOME OF RESEARCH

The research led to the development of a fully functional, real-time employee monitoring solution that:

- Automatically tracks employee presence, eye closure, and talking behavior.
- Provides centralized data storage accessible via a manager dashboard.
- Ensures secure authentication and log management through a Flask backend.
- Offers a cost-effective alternative to expensive enterprise-level monitoring tools.

The outcome of this research is the successful development and implementation of a real-time, camera-based employee monitoring system integrated with a centralized manager systems, the proposed result not only authenticates workers but also continuously evaluates their engagement during working hours through behavioral pointers similar as presence, dragged eye check, and talking frequence. The system has demonstrated that it can operate efficiently on standard office tackle without taking high- performance GPUs, making it a cost-effective and scalable result for small to medium- sized associations. The integration of OpenCV and MediaPipe ensures accurate and featherlight discovery, while the Beaker- grounded backend enables secure authentication, centralized log storehouse, and real- time data synchronization. Overall, the exploration validates the feasibility of combining computer vision with web- grounded operation tools for nonstop, automated, and effective hand monitoring, offering palpable benefits in both functional effectiveness and plant responsibility.

## VII. RESULT AND DISCUSSION

The system was tested in a simulated office terrain with multiple workers. Results showed
a) Presence Detection Accuracy 96 under normal lighting conditions.
b) Eye Closure Detection Accuracy 93 using the Eye Aspect rate system.
c) Talking Discovery delicacy 91 grounded on lip movement frequence analysis.
d) Average Response Time 0.12 seconds per frame on a standard laptop (Intel i5, 8 GB RAM, integrated webcam).

## VIII. DISCUSSION

The system demonstrated dependable performance with minimum computational cargo, making it suitable for deployment on standard office tackle without the need for high- end GPUs. Lighting variations had a minor effect on delicacy, which can be bettered through adaptive thresholding. One limitation is the system's dependence on a stable camera feed; significant obstructions or extreme angles may reduce discovery delicacy. unborn advancements could include pall- grounded deployment, AI- grounded productivity scoring, and integration with HR systems for flawless record operation.

## IX. CONCLUSION

This paper presented a real-time employee monitoring system that integrates computer vision-based behavioral detection with a centralized manager dashboard. By leveraging OpenCV and MediaPipe for detecting presence, prolonged eye closure, and talking behavior, along with a Flask-based backend for secure authentication, centralized log storage, and real-time data synchronization, the system addresses the shortcomings of traditional attendance solutions that lack in-shift engagement tracking.

The implemented system achieved high detection accuracy, low latency, and seamless operation on standard office hardware, making it both cost-effective and scalable for small to medium-sized organizations. The manager dashboard offers real-time monitoring, historical log access, and employee management features, improving transparency and enabling data-driven decision-making.

While the results are promising, challenges remain in handling extreme lighting variations and camera positioning issues. Future enhancements may include cloud-based deployment, AI-driven productivity analytics, and integration with enterprise management systems to create a fully automated and intelligent workforce monitoring platform.

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