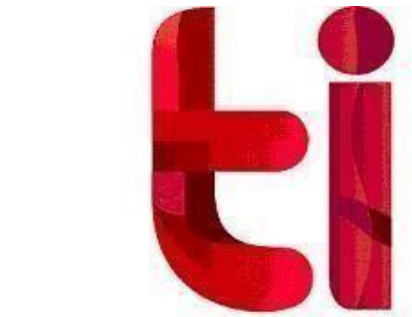
ELC ACTIVITY

PROJECT REPORT

REAL TIME APPLICATION BASED ON COMPUTER VISION

StudyBuzz - Real-Time Drowsiness and Yawning Detection System

Submitted To:



THAPAR INSTITUTE
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INTRODUCTION –

The modern digital learning environment often causes students to sit for prolonged periods, increasing the likelihood of fatigue, eye strain, and reduced alertness. "StudyBuzz" is a real-time computer vision-based application designed to detect signs of sleepiness and yawning during study sessions and provide instant voice alerts to help users stay alert.

OBJECTIVE –

The goal of this project is to build an assistive tool using computer vision that can:

- Detect drowsiness through prolonged eye closure.
- Detect yawning through mouth openness.
- Use real-time voice alerts to bring the students attention back.

TOOLS AND TECHNOLOGIES USED –

- **Language:** Python 3.7+
- **Libraries:** OpenCV, MediaPipe, pyttsx3, math, threading, time
- **Models:** MediaPipe FaceMesh for facial landmark detection
- **Audio:** pyttsx3 for offline text-to-speech

DATASET–

This project does not use an external dataset. It works on real-time webcam input using MediaPipe FaceMesh which is pretrained for facial landmark detection.

METHODOLOGY–

- **Facial Landmark Detection:** MediaPipe FaceMesh is used to detect facial features in real-time from webcam input.
- **Eye Aspect Ratio (EAR):** Measures the vertical and horizontal eye dimensions to detect prolonged closure.
- **Mouth Aspect Ratio (MAR):** Measures the vertical mouth distance to detect yawns.
- **Text-to-Speech:** pyttsx3 is used to generate alerts like "Eyes closed! Wake up!" and "You are yawning. Stay awake!".
- **Cooldown Timer:** To prevent repeated messages, a time buffer ensures each alert is not repeated within 5 seconds.

SYSTEM REQUIREMENTS–

- Python 3.7 or higher
- Webcam
- Windows/Linux/macOS with audio output
- Internet is NOT required as pyttsx3 is offline

EVALUATION CRITERIA–

- **Precision**: Eye and mouth landmark calculations are accurate under good lighting conditions.
- **Responsiveness:** Alerts are real-time with <1 second delay.
- **Usability:** Minimal interface, voice alerts help without breaking study flow.

RESULTS & OUTPUT–

- On prolonged eye closure (EAR < 0.25 for 2 seconds), alert is triggered.
- On wide mouth opening (MAR > 0.03), a yawn alert is given.
- Alerts spoken only once every 5 seconds to avoid repetition.

APPLICATIONS & IMPACT–

- Prevents students from dozing off during late-night study
- Useful for focused sessions or online self-learning
- Could be extended for drivers or professionals in critical attention roles

FUTURE SCOPE & ENHANCEMENTS–

1. Session Logging & Analytics
   - Track how often the user yawns or closes their eyes
   - Export data as a .csv or view daily reports
   - Useful for habit tracking or productivity analysis

2. User Calibration / Personalization
   - Calibrate EAR/MAR thresholds based on individual face structure
   - Could improve accuracy and reduce false alerts
   - Store user profiles with personalized sensitivity levels

3. Multimodal Alerts
   - Add vibration feedback (for mobile use)
   - Show visual pop-ups or animated characters
   - Combine voice with screen-based alerts for more impact

4. Mobile Version / App Integration
   - Port the system to Android using MediaPipe + Kivy or Flutter + ML Kit
   - Useful for studying on tablets or phones
   - Background monitoring while using other apps (e.g., PDFs)

5. Break Reminder System
   - Notify users to take a break if studying for too long without movement
   - Encourage healthy study habits and reduce fatigue

6. Emotion Detection Integration
   - Detect emotions (sad, bored, frustrated) using facial expression analysis
   - Give motivational alerts or recommend breaks

7. Zoom/Google Meet Integration
   - Real-time focus detection during online lectures
   - Could notify user if they're disengaged or not looking at screen

8. Privacy-Aware Design
   - Run completely offline (already does) and optionally blur/display only key features
   - Add privacy mode where only EAR/MAR is shown — not full face feed

CONCLUSION–

StudyBuzz is a practical, lightweight, and helpful application that uses the power of computer vision and speech synthesis to keep students attentive. It serves as a real-time digital guardian during long or intense study hours.