

AI-Driven System for Optimizing Student Engagement by Automated Attendance and Real-Time Concentration Detection Using Deep Learning in Physical Classrooms

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The aim of this research is to develop an AI-based Student Engagement Optimization System that utilizes Computer Vision and Deep Learning. The entire system consists of two key components: face recognition for automated attendance and behavior/emotion detection to analyze students' concentration levels. Each component will include data collection and analysis approaches that will provide educators great insights into student attendance and attention while allowing data-driven decision making. The main focus of this research is on developing a more accurate and efficient mechanism for student performance and engagement monitoring in the classroom. To take attendance, it uses OpenCV and dlib for precise face recognition and eye gaze tracking to measure student focus levels. DeepFace, dlib, and MediaPipe employ to identify students' emotional states and behaviors. Convolutional Neural Networks (CNN) are used to build a precise model for assessing students' concentration levels. By basically automating attendance along with behavior detection and emotions, it is possible to quickly identify those students who would need extra care or intervention measures. This system could also make interpretations about the appropriateness of the teaching method or content.

Keywords: *Automated Attendance, Concentration Level, Emotion Detection, Facial Recognition, , Head-pose Detection*