AI-Based System for Analyzing and Supporting Student Engagement in the Classroom

Al Zarouni, Ibrahim (School: Saad Bin Abi Waqqas School)
Al Balushi, Abdul Rahman (School: Saad Bin Abi Waqqas School)

Student engagement, including attention, focus, and emotional involvement, is essential for academic success. However, traditional observation methods are limited in precision and may not capture engagement consistently across all students. This project investigated whether an AI-based classroom monitoring system could provide more detailed engagement data and support teaching interventions aimed at improving student engagement. The study involved 127 students from four classes in two secondary schools in Shinas, Oman. Across six classroom sessions, student engagement, attention, focus, and emotional state were assessed by both an AI system and independent human observers. The system used a camera connected to a computer, with OpenCV for video capture and MediaPipe and Dlib for face detection, recognition, registration, and analysis. The first three sessions served as the baseline phase, while in the following three sessions, teachers applied interventions informed by AI-based monitoring reports. The AI system detected more engagement events than human observers, with a mean difference of 49%. However, no statistically significant differences were found between AI-based and human-observer engagement scores, indicating that the AI system provided a comparable and reliable measure of student engagement. After the intervention, attention showed a modest but non-significant increase ($p = 0.34$), while focus, emotional state, and confidence remained stable. These findings suggest that AI can support classroom monitoring by detecting engagement in greater detail while maintaining accuracy comparable to human observation, reinforcing its role as a tool to assist rather than replace teachers.

Awards Won:
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