

Sistem Pendeteksi Engagement Siswa dalam Lingkungan E-Learning dengan Teknologi OpenCV berbasis CNN = Student Engagement Detection System in E-Learning Environment using OpenCV and CNN

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Abstrak

Dalam era digital ini, pembelajaran dengan metode e-learning menjadi solusi yang umum diimplementasikan pada pendidikan jarak jauh. Kekurangan dari metode e-learning ini yaitu minimnya informasi pengajar mengenai antusiasme dan tingkat partisipasi siswa dalam pembelajaran. Masalah tersebut dapat diselesaikan dengan sistem yang mampu mendeteksi engagement siswa. Tingkat engagement siswa pada e-learning dapat ditentukan dari pandangan siswa dan ekspresi wajah siswa dalam pembelajaran. Sistem pendeteksi engagement siswa bekerja dengan cara mendeteksi arah mata siswa dan ekspresi wajah siswa menggunakan teknologi OpenCV dengan metode CNN (convolutional neural network) pada input file berupa video atau webcam secara real-time. Sistem akan memberikan output berupa nilai engagement siswa “engaged” berdasarkan durasi mata siswa menatap layar dan ekspresi wajah siswa berupa ekspresi netral atau positif. Sistem akan memberikan output berupa nilai kehadiran siswa “disengaged” berdasarkan durasi mata siswa tidak menatap layar dan ekspresi wajah siswa menunjukkan ekspresi negatif. Sistem menganalisis reaksi emosi siswa yang direpresentasikan dalam parameter nilai persentase reaksi netral, positif, dan negatif menggunakan dataset FER-2013. Sistem pendeteksi engagement siswa dapat mengukur presensi, status attendance siswa memperhatikan layar, emosi, impresi dan status engagement siswa dengan tingkat akurasi sebesar 83,33%, presisi sebesar 100%, recall sebesar 66,67% dan f1 score sebesar 80,00%.

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In this digital era, the e-learning method is a common solution implemented on distance learning. The disadvantage of the e-learning process is the facilitator has no idea about students' enthusiasm and participation rate during a lecture. This problem could be solved by a student engagement detection system. Student engagement can be determined by capturing the student's eye-gazing focus rate and student's facial expression during an online lecture. The student engagement detection system works by detecting student eye gaze and facial expression using OpenCV technology and CNN (convolutional neural network) method, receiving input through video file input or real-time webcam feed. The system will report on the student engagement level “engaged” if the student's eyes are staring at the screen and student facial expression showing a neutral or positive impression. The system will report on the student engagement level “disengaged” if the student's eye gaze were away from the screen and student facial expression showing a negative impression. This system will analyze student's emotional reactions which represented by neutral, positive, or negative reaction percentage value using the FER-2013 dataset. Student Engagement Detection System could calculate student presence, attendance rate calculated through eye gaze focus rate, emotional reaction, impression and engagement status with an accuracy of 83,33%, a precision of 100%, recall of 66,67%, and f1 score 80,00%.