Student Attendance and Engagement Tracking

The system is designed for real-time student attendance and engagement tracking. It uses eigenface and PCA techniques for face recognition and a trained engagement model to determine the level of engagement of students during lectures.

Matt Lewis

Arjun Nair

Methodology

1. Data collection: 10 photos of each student were taken before a webcam was brought up to create a database of faces.
2. Face detection: OpenCV's face detection algorithms detect faces in real-time.
3. Face recognition: Eigenface method computes eigenvectors from the face database to recognize faces in real-time.
4. Attendance tracking: The model marks the attendance of each recognized student in real-time.
5. Student engagement tracking: OpenCV's facial expression recognition algorithms track student engagement by analyzing emotions.
6. Testing: Model's accuracy and effectiveness were evaluated through testing in a classroom setting.

Results/Findings

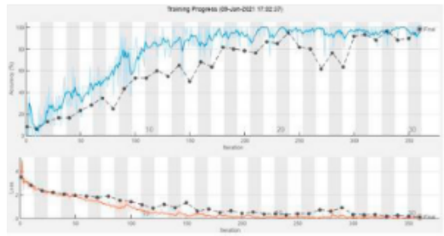
While the model achieves high accuracy with facial recognition using eigenface and PCA techniques, the accuracy of student engagement tracking may suffer due to the limited datasets available for training. The engagement model is trained on a set of labeled data, which may not be representative of all possible scenarios in the classroom. This can lead to the model not being able to accurately classify students' engagement levels, resulting in false positives or negatives.

Conclusion

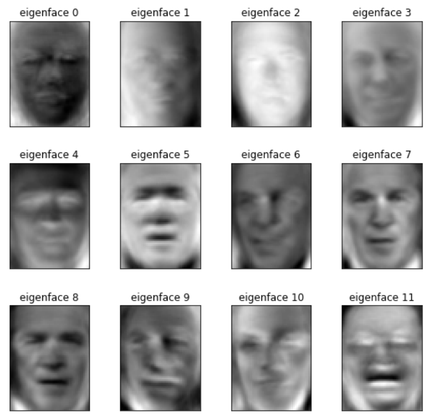
To address this issue, additional data can be collected to improve the training dataset for the engagement model. This can include collecting data from a larger number of classrooms or collecting data over a longer period of time to capture a wider range of engagement levels. Another approach could be to explore alternative methods for tracking student engagement, such as audio-based methods or eye-tracking technology.
Despite the limitations of the engagement tracking, the model still provides valuable insights into student attendance and engagement in real-time. This can be particularly useful for educators to identify patterns and trends in student behavior and adjust their teaching strategies accordingly. Additionally, the model can help reduce manual effort in taking attendance and tracking engagement, allowing teachers to focus more on teaching and interacting with students.

Approach

- The model will use the eigenface approach for facial recognition, which involves creating a low-dimensional representation of facial images using principal component analysis.
- The model uses an Eigenface approach by taking the grayscale of the input video frames and using the eigenface method to extract facial features represented as vectors
- PCA then extracts the most important features from this mathematical representation to identify faces
- Extract features from data images using convolutional neural networks (CNNs)
  - Used to predict the emotional state and engagement level of each student.
- Output a holistic analysis of attendance and student reception for an active participation report



Performance of engagement detection model



Using an Eigenface approach and PCA to recognize faces

Increase student attendance, Achieve student engagement goals, Improve active student participation