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Class attendance system on smartphone using face recognition

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Abstract

This research aims to develop a system to check class attendance by using a mobile application with face recognition. Face recognition has applied FaceNet in the feature extraction process. FaceNet creates features from keys areas of the face, including eyes, nose, and mouth, into 128-dimensional vector data. To select a classifier in our model, we consider among three classifiers: K-Nearest Neighbors, Multi-layer Perceptron, and Support Vector Machine. We found that K-Nearest Neighbors was the best classifier with an accuracy of 97.8% and the mean of probability at 85.0%. Therefore, we applied K-Nearest Neighbors to our proposed model to the attendance check-in system. We also use the flutter framework for developing our mobile applications, which support running on both Android and iOS platforms. The attendance checking system is divided into two parts. The first part is the class attendance checking process which consists of the enrollment course of the student. The part runs on a smartphone. The second part is the face recognition process which uses our proposed face recognition model and the class attendance database, which runs on the webserver. After selecting a class to attend, the student has to take his/her picture and upload it to the face classifying model on the webserver. After that, our model will predict the received image and send a message confirming the face prediction result. Finally, the application will record the user's class attendance information into the database.

Literature Reviews

Face recognition[1]

Face recognition is a method that identifies or verifies the identity of an individual using their face. Face recognition systems can identify people in photos, video, or in real-time.

Multi-task Cascaded Convolutional Networks[2]

Multi-task Cascaded Convolutional Networks (MTCNN) is a framework developed as a solution for both face detection and face alignment. The process consists of three stages of convolutional networks that are able to recognize faces and landmark location such as eyes, nose, and mouth.

Facenet[3]

FaceNet provides a unified embedding for face recognition, verification, and clustering tasks. It maps each face image into a euclidean space such that the distances in that space correspond to face similarity. For example, an image of person A will be placed closer to all the other images of person A as compared to images of any other person present in the dataset.

Support Vector Machine(SVM)[4]

The objective of the support vector machine algorithm is to find a hyperplane in an N-dimensional space(N – the number of features) that distinctly classifies the data points.

K-Nearest Neighbor (K-NN)[5]

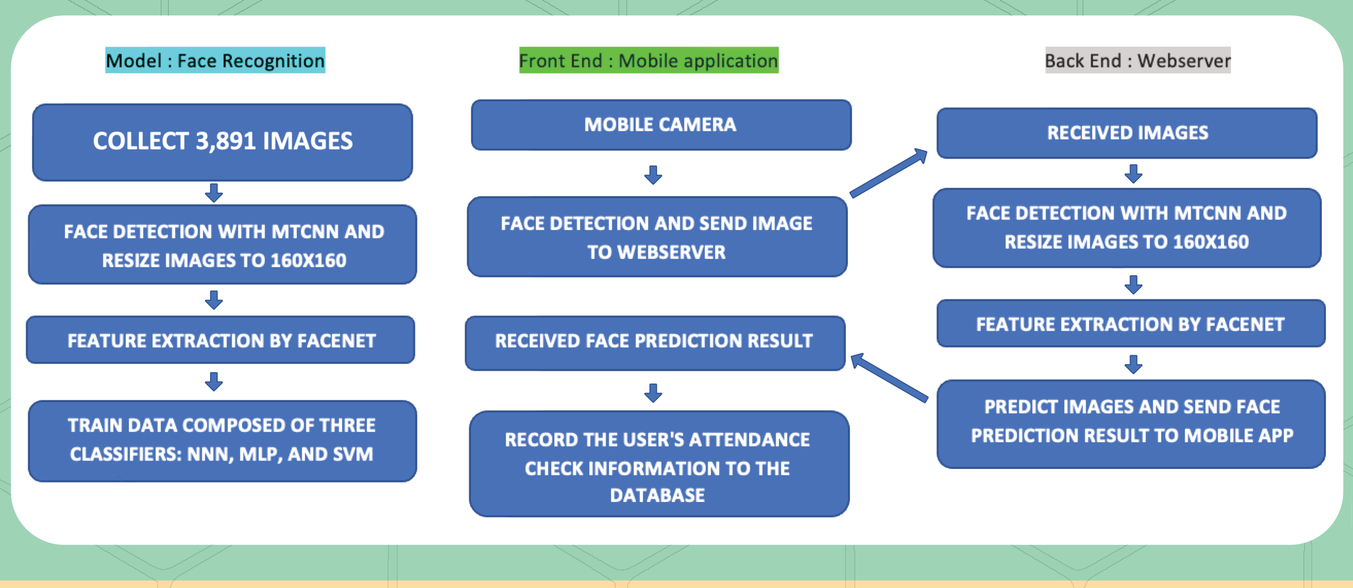
KNN is done by searching for the group of K objects in the closest training data (similar) to objects in new data or data testing [2]. Generally, the Euclidean distance formula is used to define the distance between two training objects and testing

Multilayer Perceptron (MLP)[6]

Multilayer perceptron (MLP) is a class of feedforward artificial neural network. A MLP consists of at least three layers of nodes: an input layer, a hidden layer and an output layer. Except for the input nodes, each node is a neuron that uses a nonlinear activation function. MLP utilizes a supervised learning technique called backpropagation for training. Its multiple layers and non-linear activation distinguish MLP from a linear perceptron. It can distinguish data that is not linearly separable.



EXPERIMENTATION AND METHODOLOGY



EXPERIMENTAL RESULTS

Face Recognition

Classifier	Accuracy of Train	Accuracy of Test	Mean of Probability
K-Nearest Neighbors	99.6%	97.8%	85.0%
Multi-layer Perceptron	99.4%	95.5%	80.8%
Support Vector Machine	99.8%	98.1%	49.5%

From the experiment results, we found Support Vector Machine reach the highest accuracy at 98.1% of face prediction process. However, when choosing a model to analyze the face, the classifier that pass our probability confidential threshold was the K-Nearest Neighbors with highest mean probability at 85%.

Mobile Application and Webserver

In the application part, we have developed a mobile application, which connects to the phpMyAdmin database to show details of the various user interfaces. The application will retrieve student enrollment information and display it on the student's course list. After selecting a course, the student can view the details of their class attendance.The server-side consists of a class attendance database and the model that runs on the Webserver to predict student's faces and return predictions result to the client's application.

CONCLUSIONS

We develop a class attendance system on smartphone using face recognition. From the experiment's results, our proposed model able to classify student's faces correctly. The best probability value is K-Nearest Neighbors with the mean probability at 85%. The application can record the user's attendance information into the database by verifying the face image send from the student's smartphone to analyze on the webserver.

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