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Facial recognition using transfer learning

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Bachelor of Science Programs in Computer Science

01 Abstract

This research aims to develop a face recognition system from pre-trained models and compare the accuracy of models in the face recognition application. The system is used to identify people entering the system. The system operates on an image or person entering the system. The system detects the face of a person and creates frames around the face before sending it to face recognition. The accuracy of the system depends on the model, which should be trained with large datasets to achieve good performance for our dataset and face recognition system of this research. The models used in this research are three pre-training models: VGG16, MobileNet, ResNet50. The results from the evaluation are compared to select the best model that is suitable for the dataset and face recognition system. This research uses 2,923 images of 106 people from two datasets: 2,292 images of 57 people from the Labelled Faces in the Wild (LFW) dataset and 631 images of Computer Science 49 students. The dataset is divided as a training set of 2,045 images and as a test set of 878 images. The best recognition result obtained from the experiment achieves with 95% in accuracy.

02 Knowledge Rework

Face Recognition

Facial recognition is a way of identifying or confirming an individual's identity using their face.

Convolutional Neural Network (CNN)

Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm that can take in an input image, assign importance to various aspects/objects in the image and be able to differentiate one from the other.

Transfer Learning

Transfer learning is related to problems such as multi-task learning and concept drift and is not exclusively an area of study for deep learning.

Pre-trained Model

MobileNet is a class of CNN that was open-sourced by Google.

VGG16 is a convolutional neural network model.

ResNet-50 is a convolutional neural network that is 50 layers deep.

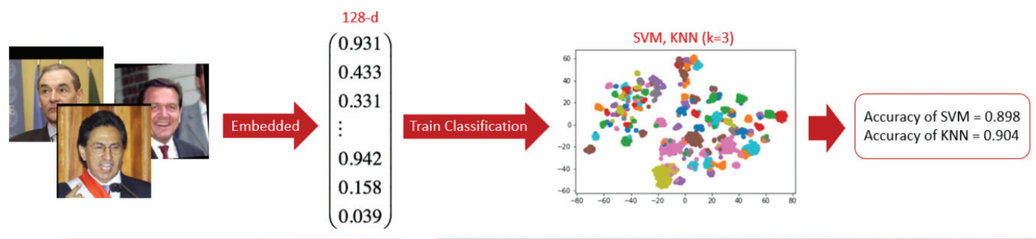
Classification

SVM is a supervised machine learning algorithm that can be used for both classification or regression challenges.

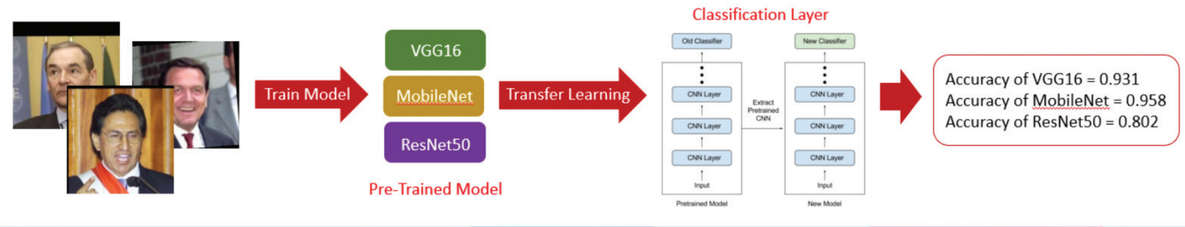
KNN is a model that classifies data points based on the points that are most similar to it.

03 Methodology

Face Recognition



Classification Layer



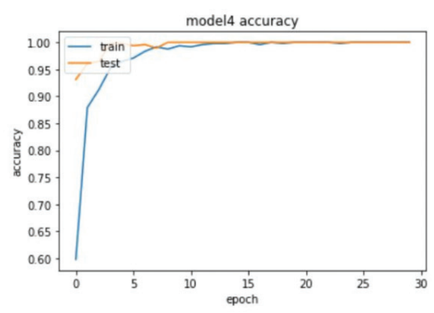
04 Results

From the implementation of the research, By comparing the Pre-trained model from the Classification layer by adjusting the parameter and the Weight of the Pre-trained model used to get the Class of the data set. And get the accuracy value as shown in the table below.

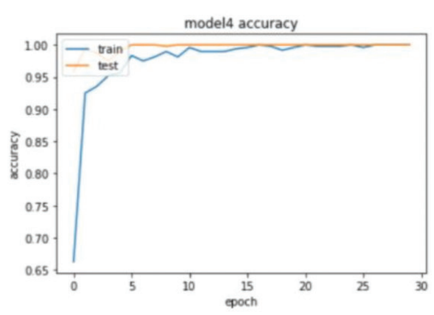
Model	Accuracy	Parameters
VGG16	0.9312	14,714,688
Mobilenet	0.9583	3,228,864
ResNet50	0.8021	23,587,712

Examples of Model accuracy graphs for comparing the performance of trained models.

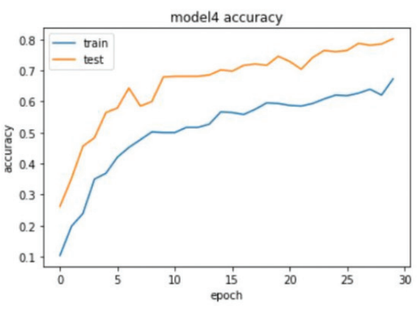
VGG16



MobileNet



Resnet50



05 Conclusion

From the implementation of the research to compare the validity and efficiency of various models That are adopted for the selected Pre-trained model face recognition system. Accuracy values are obtained as follows: VGG16 has an accuracy value of 0.9312, MobileNet has an accuracy value of 0.9583, ResNet50 has an accuracy value of 0.8021. Therefore, we can be concluded that MobileNet has the highest accuracy. The three selected models studied, gave a good accuracy for the datasets used in the face recognition system.

06 Reference

[1] S. SHARMA, "Activation Functions in Neural Networks," 2017. https://towardsdatascience.com/activation-functions-neural-networks-1cbd9f8d91d6 (accessed May 15, 2020).

[2] Angeliki Fydanaki & Zeno Geradts, "Evaluating OpenFace: an open-source auton facial comparison algorithm for forensics," 2018. http://www.tandfonline.comm/loi/tfsr20 (accessed Nov. 3, 2020)