ECE-GY 6123
INTRODUCTION TO MACHINE LEARNING
PROJECT PROPOSAL
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Group Members

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Project Title

Hand Gesture Classifier using Convolution Neural Network and Transfer Learning

Project Description

Hand gestures are a fun and sometimes essential way to communicate our feelings and messages to others. This project proposes to develop a hand gesture classifier on still 28x28 greyscale images using the Convolution Neural Network (CNN). Altogether, the project will be able to detect and classify seven classes as shown in Table I. Initially, we aim to train a CNN model on Fashion MNIST training data using Keras API on TensorFlow, consisting of a training set of 60,000 examples and a test set of 10,000 examples with ten classes for different wearable items. A few samples from the training set are shown in Figure 1. Once our model achieves satisfactory training and test accuracy, we utilize transfer learning and custom images to re-train our model for hand gesture recognition. We will closely monitor the effect of new training samples on the accuracy and training time of the re-trained model. Whereafter we plan to contrast the results of the transfer learning-based CNN model with the scenario when we train the model from the scratch on the available hand-gesture images.

Project Objectives

1- Train CNN model on fashion MNIST data to get more than 95% accuracy on the test set
2- Acquire custom hand gesture images and label them according to Table I
3- Pre-process the images (resize, greyscale, normalise) to be able to feed into the CNN classifier trained on fashion MNIST
4- Use transfer learning while retraining the existing CNN classifier on a new data set of acquired and processed hand gesture images
5- Fine-tune model hyperparameters to achieve high test accuracy and a balanced bias and variance
6- Compare the results with a case when transfer learning is not used (training from the scratch)
7- Report and analyse the results and discuss the possible trade-offs between accuracy and training time

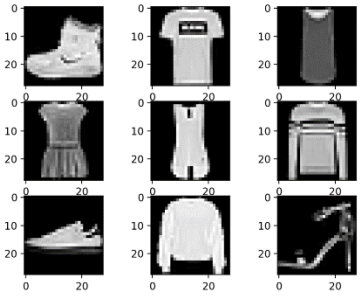
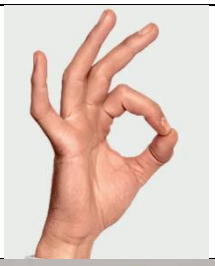
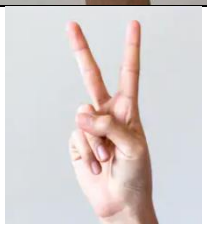


Figure 1. Nine sample images from fashion MNIST Data Set [1]

Table I. Hand Gestures and Corresponding Labels

#	Gesture	Label
1		Thumbs Up
2		Thumbs Down
3		Hi-five
4		Fantastic
5		YOLO
6		Victory
7		Strength
8	Otherwise	Not identified

[1] "Fashion MNIST | Kaggle." [Online]. Available: https://www.kaggle.com/zalando-research/fashionmnist. [Accessed: 31-Oct-2020].