Assignment 1.1 Exercises

Image Processing and Neural Networks

The goal of this assignment is to work on Neural Network Design, preprocessing images using Tensorflow and OpenCV.

Part 1 NN Model

1. Read the Fashion-MNIST dataset into Python.

- Draw the first 16 data (images) from the training data while showing the name of each image (label of it) under the image.
- Normalize the data (both train and test).
- Create the model here. It should be an NN model with one hidden layer (128 nodes) and Relu activation function. What should be the output activation function?
- Start training the model. We have 20% for validation, 20 epochs, and batch sizes are 128.
- Draw the learning curves and write down your understanding from the graphs. What is your suggestion to resolve the issue that you see?

Part 2 TensorFlow

2. There is a set of flower images stored in the TensorFlow repository. We start with transferring the data to our VM on Colab.

a) Let's start with counting the total number of images in this dataset. There are 5 subfolders in this dataset each containing different types of flowers.

b) You can look into any of the subfolders to see images stored over there. You can look into the folder using: `data_dir.glob('tulips/*')`

For this part use Pillow (PIL) to show at least one flower from each subfolder.

c) One issue that we often have with images is that the images in a folder may have different dimensions and this affects the Model that we use later on for classification. To address this issue, we are going to use Keras to load the data and apply preprocessing techniques.

Now, convert the validation data into 180 x 180. Note the message that you receive from Python identifying the number of classes.

d) You can use the `train_ds.class_names` command to get the list of labels. Write a code to randomly show 9 images from training data while printing their label on top of the image.
Please carefully review the images. What are some barriers that you can see in the images for having a proper classification?

e) Now, we want to use a preprocessing package in Keras to apply different filters to the image. Apply the following procedures to image data:

- Rescale the image by dividing by 255
- Shear the image 20%
- Zoom the image 20%
- Horizontally flip the images

Part 3 Open CV

3. Now use OpenCV for preprocessing.

a) Show the first 9 images in the dataset using OpenCV. Before showing each image, resize the images to 180 x 180.

b) Note that images are not in normal color. Convert images into colorful ones with normal coloring.