Project: Classification with Deep Convolutional Neural Networks

In this project you will work with a provided python notebook on Google Colab, using Tensorflow, to implement Convolutional Deep Neural Networks (CNNs) for image classification. The CNN models should be trained on a version of the Fashion-MNIST dataset (dataset is provided for you).

The following are the four parts of the project:

Part 1: This part involves developing the base model and examines the effect of number of filters on network performance. The model used for Part1B will have more filters than Part1A. The rest of the models will vary the architecture used in Part1B.

Part 2: Use dropout layers for improving generalizability.

Part 3: Use batch normalization for improving the convergence rate and generalizability.

Part 4: Add more layers to improve accuracy and generalizability.

1 Implementation and experimentation

The majority of the code is provided. Guidance on how to work with the code will be provided in a Google Colab notebook, as well as link to relevant Tensorflow documentation. Your will need to implement variations of CNN architectures, including different layer types and sizes, and examine how the variations affect network performance, training time, etc.

To work with the code, follow this link. When working in the Colab notebook, change your runtime to GPU, otherwise training will take prohibitively long. Instructions on how to do this are included in the Colab document. For more information on using Google Colab, refer to the welcome page when you start Colab. Here is a short video as an introduction as well: video

2 Report

Write a 2-3 page report, including plots and tables to highlight the performance of each of the CNN models you are required to train on both datasets. There is also guidance in the Colab notebook on specific results that you should take note of and include in your report.

Grade allocation: Each of the 5 models you are required to train (two for Part 1 and one each for Parts 2-4) carries 20% of the project grade. This includes implementation, experimentation, and writing of the report for those parts.