Assignment #7

Training Neural Networks

Submit By: 11:59pm November 17th, 2024
revised October 31, 2024

1 Overview

In this assignment you will be training two neural networks on the MNIST dataset using Keras. One model should be a Fully Connected Neural Network(FCNN) while the second model should be a Convolutional Neural Network(CNN).

2 Instructions

1. Obtain the Fashion-MNIST Dataset(tensorflow) or from zalandoresearch on Github.
2. Train a FCNN on the fashion MNIST dataset using Keras.
   - You may want to use: NN Example Using Fashion MNIST Dataset
   - Feel free to directly use source code from above(or other sources) but cite it if you do.
   - Note that with the FCNN you may need to reshape input data.
3. Train a CNN on the fashion MNIST dataset using Keras.
4. Compare and contrast the final model accuracy between the two models.
   - For each model, plot the performance metrics on a graph. See directions below.
   - Each graph should plot performance curves (accuracy & loss on Y-axis) against number of epochs trained(X-axis). Include performance curves for both training & validation sets.
   - You may graph these curves on separate charts or combine them, whatever you prefer as long as they are clearly labeled.
5. You may not use transfer learning! No YOLOv#whatever.

6. Write-up:
    - Summarize your methods, results, and discuss the performance graphs you constructed from your experiments.

3 Resources

1. Google Colab is a good resource if you want easy access to a system that can run the Keras library code.
2. Tensorman uses docker containers to manage toolchains for ML on Debian linux distros. Highly recommend as the easiest way to start using a GPU for ML.
3. Conda – not the best solution for all use cases, but maybe the only easy one if you are on Windows. Also works with Linux. Be warned though, it uses some strange python package management strategies that you may not appreciate later.
4. TensorBoard offers a TensorFlow visualization library for tracking model performance as your model is training and comparing performance between test iterations while hyperparameter tuning. Probably overkill for this scale of project, but a potentially useful tool for larger projects requiring a more systematic approach.

4 Requirements

Make sure your zipped submission contains:

1. Source code `.py` files *with your name at the top.*
2. Performance graphs: you can include these in your PDF write-up if you wish, or as individual files.
3. Your write-up as a PDF.
    - ***Note:*** *If you are looking for an easy way to convert your write-up from something like Markdown to PDF, you might be interested in pandoc.*

5 Submission Instructions

Submit via Canvas or to my email (grwells@uidaho.edu). Most assignments require a write-up and source code, both submitted in a compressed/zipped folder containing all files required to run. Write-ups must be submitted in PDF format. When submitting an assignment via email, please put the course number and the assignment name in the subject line. Submission requirements may be amended in assignment instructions.