Assignment 2019 - Street View House Numbers Dataset

For your major code assignment you are required to implement a Deep Neural Network model to perform classification on the Street View House Numbers (SVHN) dataset. The SVHN dataset may be downloaded from the following site:

http://ufldl.stanford.edu/housenumbers/ (http://ufldl.stanford.edu/housenumbers/)

As a starting point for your investigation it is suggested that you first study and implement the CIFAR-10 tutorial for TensorFlow that can be found here:

https://www.tensorflow.org/tutorials/images/deep_cnn (https://www.tensorflow.org/tutorials/images/deep_cnn)

The CIFAR-10 and Street View House Numbers Dataset are very similar in that they are both image classification tasks on relatively low-resolution images. Both also have a small number of target classes.

Your implementation should be made in TensorFlow and you cannot use any alternative data set. Keras or non-Keras implementations are both equally acceptable.

There are a number of papers, essays, and other works describing approaches to using ConvNets to implement a solution for the SVHN dataset online. Your work should aim to build on these existing materials rather than just replicate them. It is suggested that you work with a ConvNet architecture, but you are open to express your more creative side if that is what you want to do.

In order to pass the assignment, a basic implementation that can be well defended need only be provided. In other words if you can take someone else's code and get it running and write a document clearly outlining in your own words the architecture, the methods employed, and be prepared to answer questions on it, then you get a pass (see rubric for details).

To achieve a greater mark, and specifically a 1.1, you need to in some way improve on the baseline code as provided by others. Marks greater than 80% are available for people who demonstrate an improvement which is worthy of submission for publication.

Submission Details

This assignment is due for submission at 10pm on Monday 27th May. Extensions will not be granted except in the case of documented and approved personal circumstances. Late submissions will be deducted 2 percent per day for each of the first two days late, and then 1 percent per day for each day thereafter until submissions can no longer be

accepted (ie. until two days before boards are held). The assignment report and a document containing a link to a downloadable code/model archive should be submitted through Webcourses through Assignment 1.

All students should be available to answer questions on their assignment on Thursday 30th and Friday 31st of May. Some students will be selected randomly for questions while others might be called to answer questions if they have a boundary grade. Most students will not be called -- but you could be! Details on who is beign called will be released in and around Wednesday 29th.

The assignment submission has two components:

(a) a zip file containing a working code repository **and model**. Your main python file should be called svhn.py and contain at least two functions. The first of these two functions is:

test(FileName)

which takes the name of a JPEG or PNG file that is assumed to be the same dimensions as the standard SVHN test data and return an integer that corresponds to the most likely house number seen in the supplied image. This result should be produced according to a tensorflow model that you have pre-trained and included in the archive.

The second function should be called

traintest()

This function when called should (a) download the training and test data, (b) train the model from scratch; and (c) perform analysis against test data. The final output of this function should be a production of average F1 scores across each class in your testset.

TensorFlow versioning can be problematic. Therefore in order to make reviewing easier, but also to make discussions about coding easier can you please run and save your models with TensorFlow version 1.13.

(b) a paper summarizing your work. The paper should be formatted in IEEE Conference style as described here:
https://www.ieee.org/conferences_events/conferences/publishing/templates.html
(https://www.ieee.org/conferences_events/conferences/publishing/templates.html) Your paper should be between 3 and 4 pages excluding any references and figures. Your paper should focus on describing your methods, results, and conclusions. As such there is no need to provide an Introduction or Background Information -- there is no point in writing another introduction to TensorFlow.

Section 1 - Model Design

Section 2 - Results

Marking Rubric

0 - 19: The student failed to provide a working implementation of code for training and testing the Street View House Numbers dataset based on TensorFlow.

20 - 39: The student provided a working implementation of a Street View House Numbers dataset solution based on tensorflow, but the documentation or interview failed to show the student had a clear understanding of the methods employed.

39 - 60: The student provided a working implementation of a Street View House Numbers dataset solution based on TensorFlow, and the documentation or interview showed that the student had a clear understanding of the methods employed.

60 - 80: The student provided a working implementation of a Street View House Numbers solution with TensorFlow that went beyond what was available in pre-existing tutorials / online sources in a substantive way. This was clearly demonstrated through documentation.

80 - 100: The student provided a working implementation of a Street View House Numbers solution that had features or results that are original and beyond the current state of the art. The documentation is worthy of submission to a conference.

All students should be able to defend / explain their submission orally **if** requested to do so. Any failure to do so will be judged as a failure in the documentation to show the student had a clear understanding of the methods employed.

Unfair practice of any type is not accepted. Do not copy text into your report without appropriate citations. No copying blocks of code into your code without appropriate acknowledgement. Unfair practice of this type will be subject to a grade of 0 on the assignment. If you are in doubt - ask me.

Team Submissions

A team submission is allowed - but subject to:

1. A team handicap of 5% per person
2. The use of a peer evaluation form which will result in a factor for group mark adjustment to result in an individual mark
3. The requirement that all team members be equally capable of defending and describing the work.