COLLEGE OF ENGINEERING

UNIVERSITY OF NOTRE DAME

2021 CSE 60625 Final Project Status Report II

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1 PROJECT GOAL AND MILESTONE

1.1 BRIEF EXPLANATION OF MY PROJECT

I wish to evaluate as to how far a GPU like NVIDIA GeForce RTX 3070 can be trusted to run deep learning algorithms on it and whether NVIDIA has been successful in fulfilling its promise of bringing cuDNN powered and GPU accelerated deep learning to the machine learning scientists, especially to those who cannot afford to spend a fortune behind setting up multiple GPUs with the limited budget they generally have. In brief, I want to carry out a study related to benchmark of NVIDIA GeForce RTX 3070 laptop GPU with state-of-the-art image classification models such as DenseNet121, InceptionV3, MobileNetV2 and ResNet50.

1.2 MY MILESTONES

The following are my milestones for the final project:

- I plan to train 70% of all categories of images on DenseNet121, InceptionV3, MobileNetV2 and ResNet50 by using the newly-released Python library ImageAI
- I plan to evaluate the accuracy of these models on the validation dataset (30% of all the categories of images)
- I plan to plot the losses and accuracy scores of the training and validation datasets against the number of iterations (epochs)
- I plan to compare the accuracy scores of the manually-trained models against those of a pre-trained model like ResNet50 from Keras
- I plan to report the best model for each of the image classification models
- I plan to evaluate and report the prediction probabilities for each of the models for each of the categories of images

2 TASKS COMPLETED SO FAR

2.1 COMPLETED TASKS

The following tasks have been completed so far:

- 70% of all categories of images have been trained on DenseNet121, InceptionV3, MobileNetV2 and ResNet50 by using ImageAI Python library

- The accuracy of these models on the validation dataset (30% of all the categories of images) have been evaluated
- Plots of the losses and accuracy scores of the training and validation datasets against the number of iterations (epochs) have been completed
- Transfer learning with ResNet50 from Keras completed; its training and validation accuracy have been recorded and compared with that of the manually-trained ResNet50 model from ImageAI
- Best models (.h5 files) from each of the 4 manually-trained image classification models have been finalized and are being reported
- Prediction probabilities for each of the models for each of the categories of images have been evaluated

2.2 ALIGNMENT OF MY PROGRESS

My progress so far is well aligned with the milestones I have set for my project. I wanted to try out transfer learning with Densenet121, InceptionV3 and MobileNetV2 from Keras, but I had to stop at ResNet50 because of the following reasons:

- Each of the aforementioned 3 models would take approximately 12 hours for re-training with the given dataset
- The training as well as the validation accuracy scores were not improving even after 3 epochs for any of them
- Since accuracy scores were not improving, coupled with longer re-training time, it was futile to continue further
- Longer re-training time might have caused severe, irreversible damage to NVIDIA GeForce RTX 3070 GPU

At this point, I am done with almost 90% of the things I planned to do for the final project. I am just left with writing the Final Report where I plan to further explain the results I have obtained.

3 TYPO

3.1 TYPO IN STATUS REPORT I

I made a blunder in the Status Report I where I referred to "image classification models" as "object detection systems" entirely by mistake.

It so happened that, even before I had started polishing the Status Report I for submission purposes, I had planned to go for object detection systems. However, upon finding out that my NVIDIA GeForce RTX 3070 GPU is not capable of handling any manual training of any object detection system, I changed the plan to try out the image classification models ever since. It is just that I forgot to change the words "object detection systems" to "image classification models" in my Status Report I. Similarly, I also forgot to change "IoU" to "prediction probabilities" in Status Report I.

Sincere apologies for the same.