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CSC 180.02 - Intelligent System

Project 3 : Computer vision using GPU and transfer learning

Due Date: October 28

Problem Statement

In this project, we aim to practice classification using Google GPU and transfer learning. Training and testing a CNN model on GPU with and without transfer learning.

Methodology

We would train and test the CNN model on GPU with and without transfer learning. Transfer learning is a machine learning technique that uses pre-trained models as a starting point for computer vision and the natural language processing tasks. It is an optimization that allows rapid growth or improves performance when modeling the second task. We also work with the CIFAR-10 dataset which is preinstalled with tensorflow. The dataset consists of 32x32 color images in 10 classes, containing 6000 images per class. There are about 50000 images for training and 10000 testing images. Since the pretrained data was intended for images greater than 42x42, we had to resize the images to 64x64 to use them in the transferred learning model.

Tools: pandas, numpy, sci-learn, tensorflow, Jupyter notebook, google colab

Experimental Results and Analysis

Convolutional Neural model

Accuracy: 0.6838

Averaged F1: 0.6856155052971215

	precision	recall	f1-score	support
0	0.73	0.73	0.73	1000
1	0.84	0.75	0.79	1000
2	0.55	0.58	0.56	1000
3	0.47	0.56	0.51	1000
4	0.69	0.57	0.62	1000
5	0.60	0.56	0.58	1000
6	0.78	0.73	0.75	1000
7	0.68	0.79	0.73	1000
8	0.82	0.79	0.80	1000
9	0.77	0.77	0.77	1000
accuracy			0.68	10000
macro avg	0.69	0.68	0.69	10000
weighted avg	0.69	0.68	0.69	10000

Transfer Learning

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Accuracy: 0.6873
Averaged F1: 0.688547789385149
      precision    recall  f1-score   support

0         0.78        0.73        0.75        1000
1         0.80        0.79        0.79        1000
2         0.59        0.65        0.62        1000
3         0.48        0.53        0.50        1000
4         0.59        0.69        0.64        1000
5         0.62        0.50        0.56        1000
6         0.70        0.71        0.71        1000
7         0.77        0.71        0.74        1000
8         0.82        0.79        0.80        1000
9         0.77        0.77        0.77        1000

 accuracy                   0.69        10000
 macro avg                 0.69        0.69        0.69        10000
 weighted avg              0.69        0.69        0.69        10000

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The difference between the 2 model's accuracy and f1-score was negligible, which shows that transfer learning is a great way to apply the learning from one set of data to a completely different set of similar data, since image recognition portion was not retrained in our model.

Task Division and Project Reflection

(Brian) Was in charge of building the first section and helping with the second section.

(Kevin) Was in charge of Building the second section.

(Cody) Was in charge of code review and writing the report.

As it turned out the project was quite small and easy, since our team was already use to using Google Colab, and Brian was able to get a headstart on the project while Kevin was working on a project for another class and Cody was in the hospital, so Brian was able to complete the first section with little time and no help. He was then able to start on to the second section, while Kevin was getting up to speed. Then they pair coded to get the base of the second section done, after which Kevin put in the final touch.

Cody had things go wrong at the hospital, and ended up being late getting home by more than a day, so he went over the code to get caught up and learn what he had missed, while making sure that nothing was incorrect or left out. Then once caught up, he wrote the report, and made sure to clarify any questions he had with Brian and Kevin.

There was not much we could do to have made our team work on the project go more smoothly, since it was a scheduling conflict, and the project was so small. Thanks to our work on previous projects, we all had a strong grasp on what to do in this project, and it was only a matter of time before one of us

would be able to take out a bulk of the work in one sitting, however we did make strides to relieve one another of duty, so the person working on the project prior to our arrivals would be able to rest and charge up, and our communication has made sure that none of use get left behind in our understanding.