Progress Report 2

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Problem Description

Neural network framework selection is an important design decision in the grand scheme of this project. It can be equally as important as sufficient training data or any optimization. A poor choice in framework can only be optimized so much, where a well selected network framework can be tuned to near perfection. This problem can be addressed through research and comparison of various state-of-the-art frameworks through their success in results, but also in the documentation, because in order to fine tune a network it is important to know how to manipulate it.

Problem Approach

The initial approach was to tackle academic papers on famous, widely used networks such as ResNet. It is a popular concept taken to new heights (or depths) in a variety of different ways because the residual network concept has been shown to be effective for work with images. DenseNet was my other candidate for comparison because it is a newer variation using a number of fundamentals from ResNet. The differences between these networks is the basis from which I made my comparison, with the reasons behind their effectiveness in image classification having a vote in the winning framework. The overall results had a significant weight, however so did factors such as memory utilization, training time, information flow, adaptability, simplicity, and popularity. Researching other opinions whose knowledge extends beyond mine is a beneficial resource outside of individual understanding of both papers.

Solution

DenseNet significant advantages over ResNet and therefore it will be the initial framework. Among others covered in my comparison report, DenseNet feature reuse makes it easier to train because of its parameter efficiency and therefore narrower layers. This is important because the network will eventually be utilized for multiple stages of training including both classification and regression algorithms. The disadvantage of DenseNet is that it is more memory hungry than ResNet, however this shouldn't be too much of an issue when run with a GPU on a designated server. Overall it exhibited various qualities that lead it to be more appealing of an option for this particular problem over ResNet.

Challenges Faced

Interpreting academic papers was the first speed bump crossed, as I was under-exposed to this type of writing. The technical writing began my struggle in this comparison, however more experience reading other papers as well as re-reading the originals overcame this reading comprehension challenge.

Results

DenseNet has proven to be a good choice so far. The initial results using extremely low optimized hyperparameters was better than expected, and the documentation and simplicity help in analyzing both problems and further performance.

Future Work

There is much room for further research in framework, as DenseNet is only an implementation rather than some complete module. The design can be easily changed and improvements can be made when new information arises. The optimal design for an orientation estimation network is most likely not the default DenseNet design, and therefore this will be a great starting point when time comes to tune the network for increasingly reliable results.