Individual Final Report
Cristina Giraldo

Introduction. An overview of the project and an outline of the shared work.

The main objective of our project was to correctly classify the presence of brain hemorrhages and their sub-types in brain scans. Our dataset was obtained from the Kaggle Competition RSNA Intracranial Hemorrhage Detection.

Description of your individual work. Provide some background information on the development of the algorithm and include necessary equations and figures.

Shared Worked

Both Taisha and I worked on researching the topic, downloading the data, and formatting the data.

Individual Work

Once we agreed on the project problem, we decided to work on testing different models individually. I tested transfer learning by using VGG16 and Densenet, while Taisha was working in different CNN architectures from scratch. We also each worked on combining our 3 different models ensembling methods.

After we created our different model architecture, we combined the code from one of the CNN models created from scratch and two of my pre-trained models.

Then we finally joined our models to create an averaging ensemble model.

After modeling, I primarily worked on the presentation and organizing our code for submission.

Results. Describe the results of your experiments, using figures and tables wherever possible. Include all results (including all figures and tables) in the main body of the report, not in appendices. Provide an explanation of each figure and table that you include.Your discussions in this section will be the most important part of the report.

After I did some research and read some papers, I wanted to try transfer learning. Transfer learning is being mentioned in several research papers in which they claim the good results of this technique used in medical images.

In my experiments, I used transfer learning - weight initialization from Densenet 121 and VGG16. Although I got an accuracy of 95% on the training set and 94% on the validation loss, the predictions were not quite precise.

To improve these predictions, I decided to apply what I learned from exam 2. Therefore, I created an ensemble model to averaging these 2 models (figure1. Shows the architecture that I used for this purpose). However, I got similar results (see figure 2). Which it makes sense given that the individual models gave similar results in accuracy and loss previously.

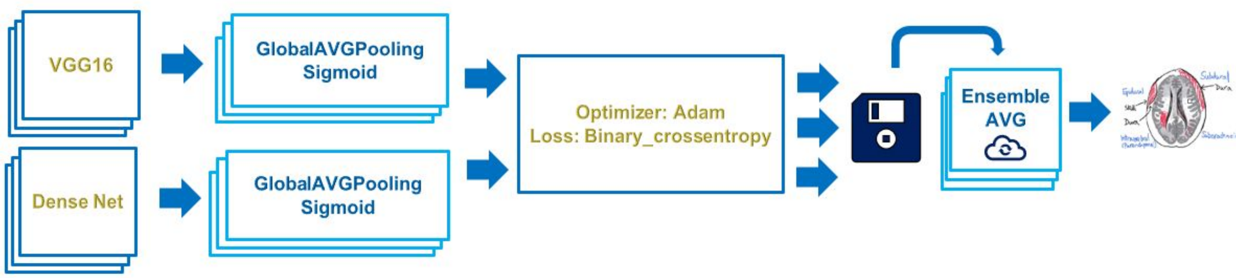

Figure1. Ensemble model with VGG16 and Dense Net 121

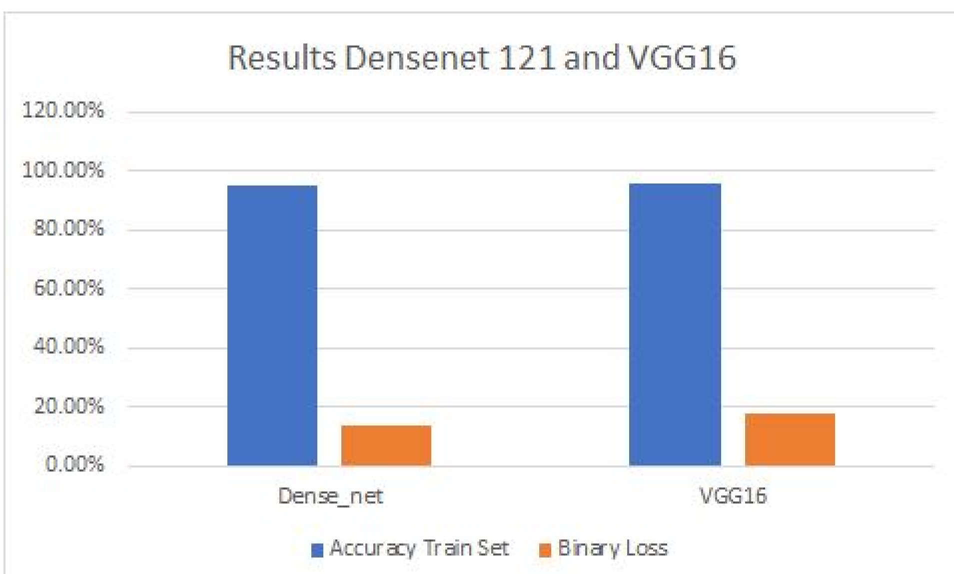

Figure2. Results Training set Densenet 121 and VGG16

After our individual attempts to create a good model and improve our predictions, Taisha and I consolidated our codes and created two models:

1. Custom CNN + VGG16 + Densenet 121
2. Custom CNN + Densenet 121

For the first model we could train our model for one epoch. However, for the second model we could train our model for five epochs. This last model showed better results.

I did several attempts to train my models with 300 but it would take 20 days to perform the training. Then I tried 100 epochs and that one would take several days as well. Due to time constraints, we could not train our model much longer than 5 epochs.

Summary and conclusions. Summarize the results you obtained, explain what you have learned, and suggest improvements that could be made in the future.

In this project, I made a lot of mistakes. However, these failures have enabled me to better understand the different approaches to deep learning.

In this particular project, my transfer model and ensemble model finally worked unlike my exam 2. Even when I used different Frameworks for this implementation, now I have a better understanding of how to tackle these types of problems.

Also, in my readings, I found out that models that have been trained on ImageNet will not necessarily be useful for medical images due to their nature. Instead, it is recommended to use Nifty Net for medical images and the other models for images that attempt to classify people, objects or places. The general recommendation is to choose a pre-trained model that is similar in structure to the problem.

By the time that I read this information, I was already out of time. However, it is something that I would like to try to prove the theory and choose better pretrained models to save time and get better performance.

Another method that I would like to try in the future is feature extraction in medical images and other ensembling methods such as stacking and voting to improve the prediction on the images.

Calculate the percentage of the code that you found or copied from the internet. For example, if you used 50 lines of code from the internet and then you modified 10 of lines and added another 15 lines of your own code, the percentage will be 50−1050+15×100

Fifty percent (50%) of the code used in our paper was referenced from the internet. We used code from public Kaggle notebooks to assist mostly with downloading and formatting the files and also formatting files for submission. The majority of our time was spent on researching different network architectures and applying it to our model. Also, we spent a lot of our time working out the code for ensembling.

REFERENCES

Brownlee, J. (2019, September 2). Transfer Learning in Keras with Computer Vision Models. Retrieved from https://machinelearningmastery.com/how-to-use-transfer-learning-when-developing-convolutional-neural-network-models/.