Pneumonia Detection

Using Neural Networks

Introduction

- The stakeholder for this project will be County Government of Nairobi Department of Health who would like to leverage technology to screen patients for Pneumonia care in their day to day process.

- This technology has the opportunity to be used as a screening measure to help doctors become more efficient in helping patients who have pneumonia by identifying cases and bringing them in to ensure proper care.

Data Preparation

- The information provided in this notebook was provided by kaggle at https://www.kaggle.com/datasets/paultimothymooney/chest-xray-pneumonia.
- This was a less intensive version of the data from https://data.mendeley.com/datasets/rscbjbr9sj/2. The information came with a train, validation and test set, each with a folder labeled "NORMAL" and "PNEUMONIA".
- The validation set vastly lacked information, therefore, information from the train set was moved into the validation set before any processing or modeling preparations.

Modelling

- Iterative adjustments were made to the models during the modelling phase of this notebook to determine how they would impact the performance in producing a meaningful model.

- Nodes, optimizers, dropout, and learning rates all saw changes. Additionally, adjustments were made to fit variables like epochs and validation stages.

- A very simple neural network comprising an input layer, hidden layer, and output layer served as the foundation of the procedure.

- The neural network's many parameters were tested using an HParams search to see which would perform the best before being gradually adjusted.

Conclusion

- Model 10, was the most effective model on the test set. It had the highest overall score, correctly predicting pneumonia 98.2% of the time for pneumonia X-rays and normal 1.8% of the time. It also had the easiest time predicting pneumonia in instances that were considered to be normal. Additionally, this model received the highest test evaluation score (85.4).

- Model 7 was 99.5% accurate in identifying Pneumonia cases, however it misclassifies normal cases at a substantially higher rate than Model 10. The test evaluation score for this model, which was 74%, was the lowest of the three models.

- Models 9 and 10 were relatively similar, however model 10 was more balanced than model 9 and could predict instances of pneumonia by 1.3% more accurately. Test evaluation for this model was 82.7%.

Recommendations

This analysis leads to theses recommendation on what the county Government of Nairobi, Department of Health should do when it comes to Pneumonia care in the county hospitals:

- Include more X-rays of the stages of Pneumonia in which patients can have.

- Permit the use of demographic data to see if demographic plays a role in likelihood of Pneumonia.

Thank You.

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