Phase 4: Pneumonia Prediction Project

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Overview

- The goal of this project was to build a machine learning model to classify a dataset for chest x-ray images, screening them for pneumonia.

- To achieve this goal, I built a convolutional neural network to classify images as either pneumonia or non-pneumonia.

- The Paul Mooney dataset was used, found on Kaggle. It contains 5,683 images separated into two categories: “Normal” and “Pneumonia”

Preprocessing and Metric Determination

Preprocessing:

- The images in the Mooney dataset have the three layers of a colored photograph.
- Keras' ImageDataGenerator was used to resize the images' pixels to 224 x 224 px.

Metrics Used:

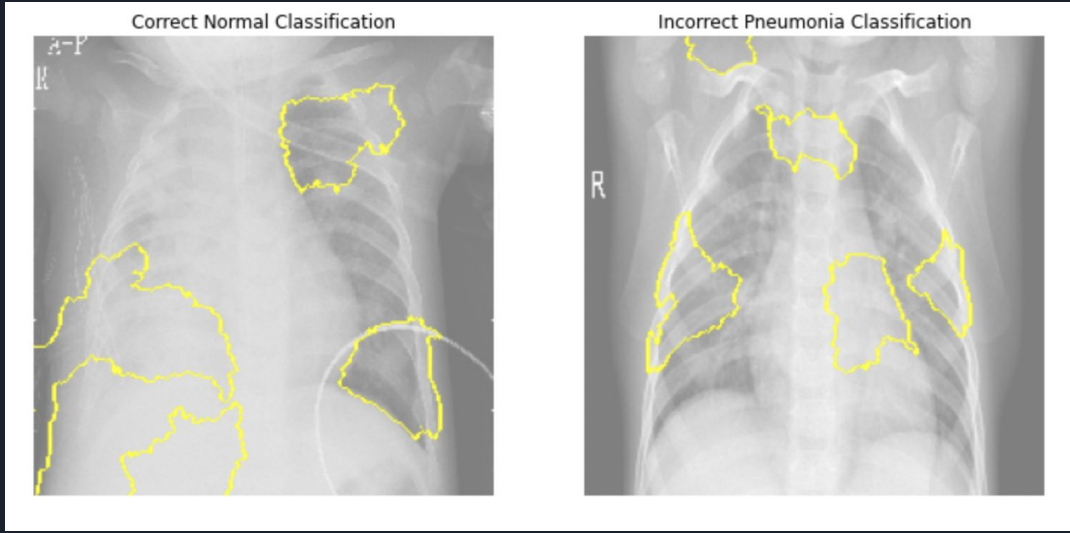
- The best practice for diagnosing pneumonia is to reduce the number of false negatives (pneumonia images misclassified as “normal”).

- It is assumed that each X-ray image will be looked over by human eyes-in addition to being trained on the machine-learning model. Therefore, the overall accuracy of the model should be high to make this process the most efficient for the technician or doctor reviewing the x-ray.

Feature Importances

The python LIME package was used to depict the features (edges) in the image that the model found most important in making its prediction.

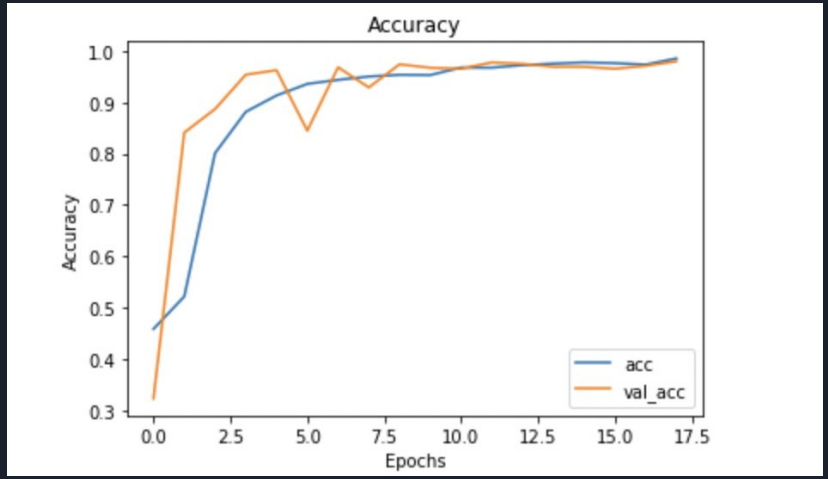
The diaphragm of each image may be adding “noise” and reducing accuracy.



Final Model Validation

5 iterations of the model were trained before selecting the final model.

The final model has an accuracy score of 75%. It also predicts *less false negatives* (pneumonia misclassified as normal) and *less false positives* (normal misclassified as pneumonia) than the other models.




```
20/20 [==============================] - 0s 11ms/step - loss: 4.1887 - acc: 0.7532
Test Loss: 4.188652515411377
Test Acc: 0.7532051205635071
```

Model Conclusion and Recommendations

The model is imperfect; further tuning could be done to improve its accuracy score.

However, it can still be a useful tool for efficiency.

Recommendations:

- Each image should be reviewed by human eyes (tech and/or doctor) in addition to being trained on the model.
- Each image should be saved as 224 x 224 px before being trained on the model
- High-intensity pixel from the diaphragm may be adding noise to the model. The tech should crop out the diaphragm on each image to improve accuracy.

What’s Next?

To further improve this model, I would:

- Explore methods to remove the diaphragm from each image to remove “noise” and improve accuracy
- Retrain the model using smaller images (ex: 32 x 32 px) see if image features are more accurately highlighted
- Research other methods to tune CNNs

Thank You