Image Classification

Pneumonia detection on chest X-ray

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Summary

- Background in Aviation (aeronautics)
- Birdstop - Autonomous data collection start up
- Use all my knowledge to help create the data analytics/ML division

Business Problem

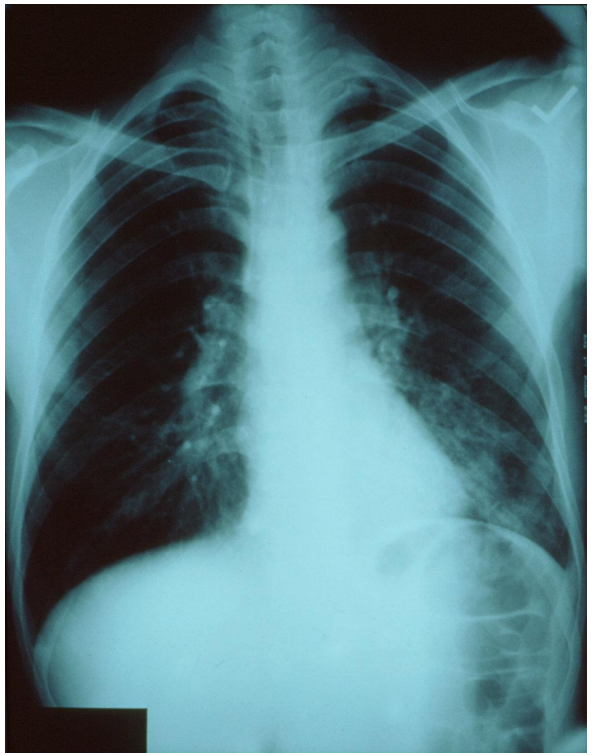
Using Neural Networks, to what degree of accuracy can we detect Pneumonia in chest X-rays?

Using these models and learnings to later be implemented in future image classification problems.

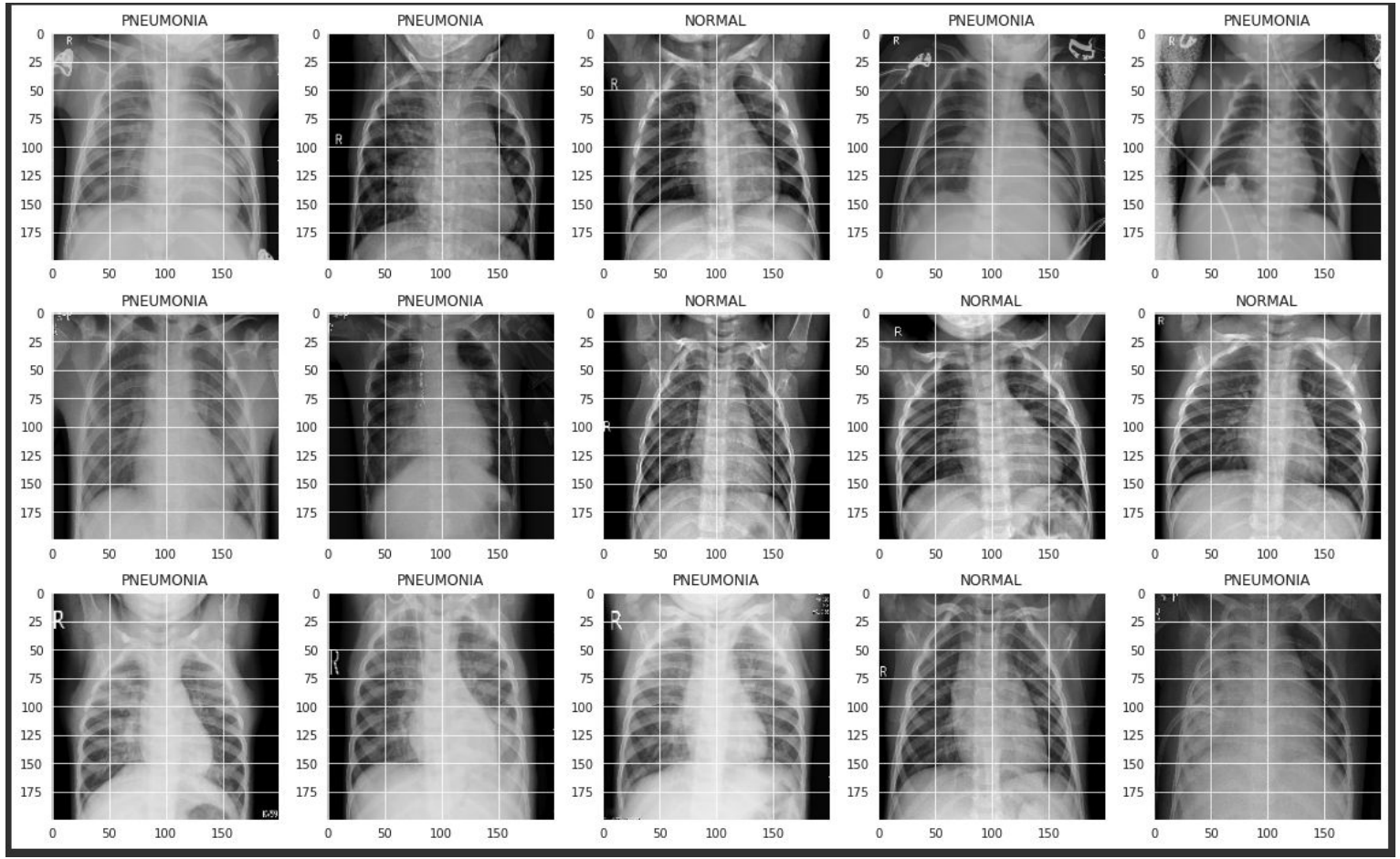
Outline

1. Business Problem
2. Data
3. Results
4. Conclusions

Data



- Pulled from Kaggle
- The dataset contains 5,863 x-rays (JPEG) divided into two categories (pneumonia / normal).
- The dataset contains 3 subsets: train, val, test.
- We will train the model only on the training set.
- Chest X-ray images (anterior-posterior)


PNEUMONIA
PNEUMONIA
NORMAL
PNEUMONIA
PNEUMONIA
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NORMAL
NORMAL
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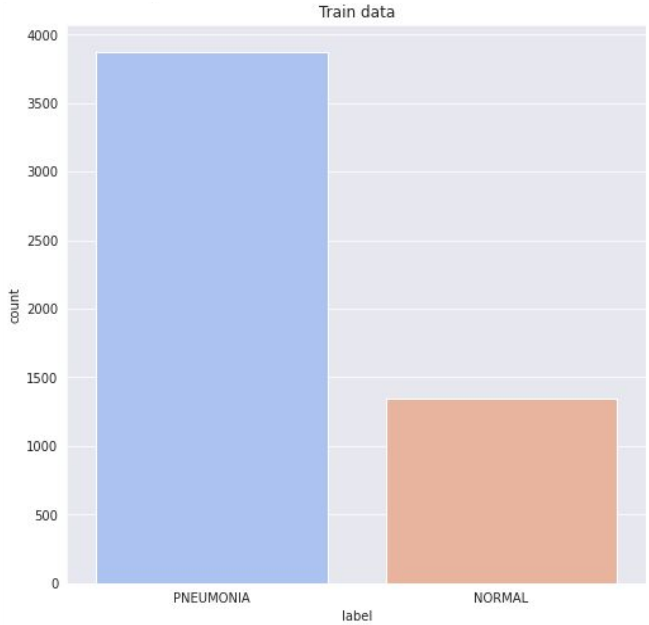
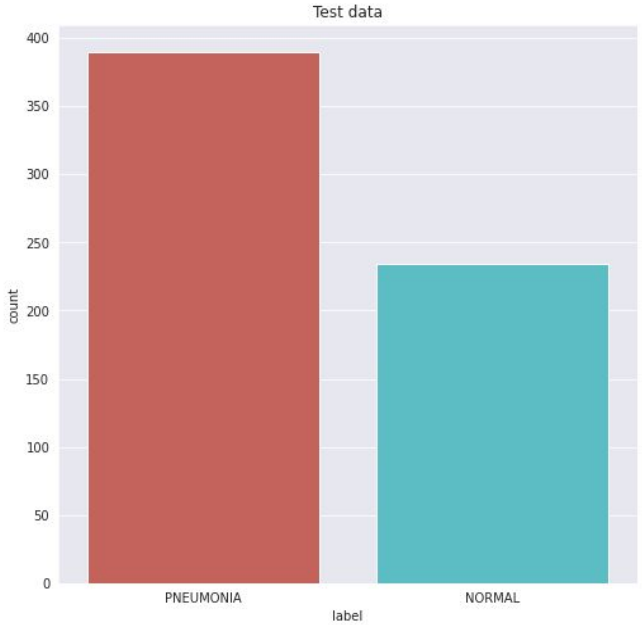
NORMAL
PNEUMONIA





Distribution of Images:

```
[ ] train_df.shape
    (5216, 2)
[ ] test_df.shape
    (624, 2)
```

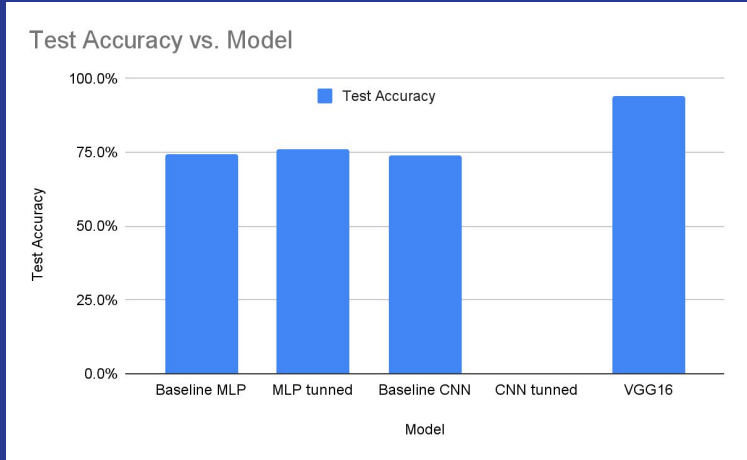
Normal X-rays = 0

Pneumonia X-rays = 1

- Both data sets are imbalanced
    - Favoring Pneumonia in both cases

Initial Results

Model	Test Accuracy	Test Loss	MLP Error	Batch Size	Epochs	Verbose	Run Time
Baseline MLP	74.5%	101.4%	25.5%	64	40	2	18:22:00
MLP tunned	76.0%	64.9%	24.0%	64	100	1	38:07:00
Baseline CNN	74.0%	374.7%	26.0%	64	100	1	12:26:48
CNN tunned				30	100	0	
VGG16	94.00%	0.12%		32	5	5	5:08:30



Conclusions

1. Ran deep learning models to classify pneumonia in chest X-rays.

2. My best model was the pretrained VGG16 model

3. Pre-trained Model was the best model

    a. Transfer learning generally refers to a process where a model trained on one problem is used in some way on a second related problem.

    b. VGG-16 is a dataset of over 14 million images belonging to 1000 classes

    c. One or more layers from the trained model are then used in a new model trained on the pneumonia images.

Next Steps

1. Try different activation functions
2. Re-run tuned CNN
3. Try to use Grad-CAM class activation visualization

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Thank You!