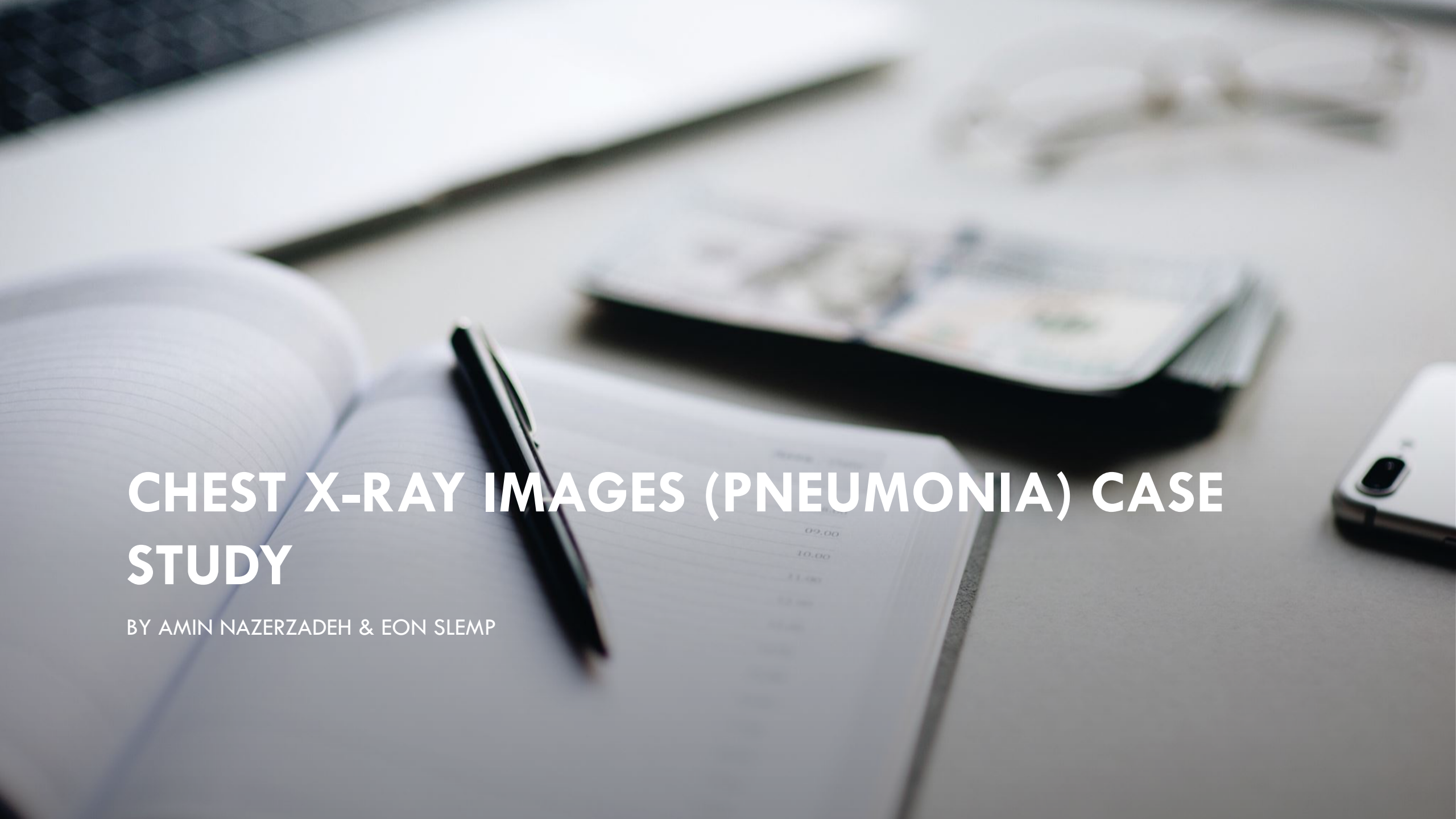


CHEST X-RAY IMAGES (PNEUMONIA) CASE STUDY

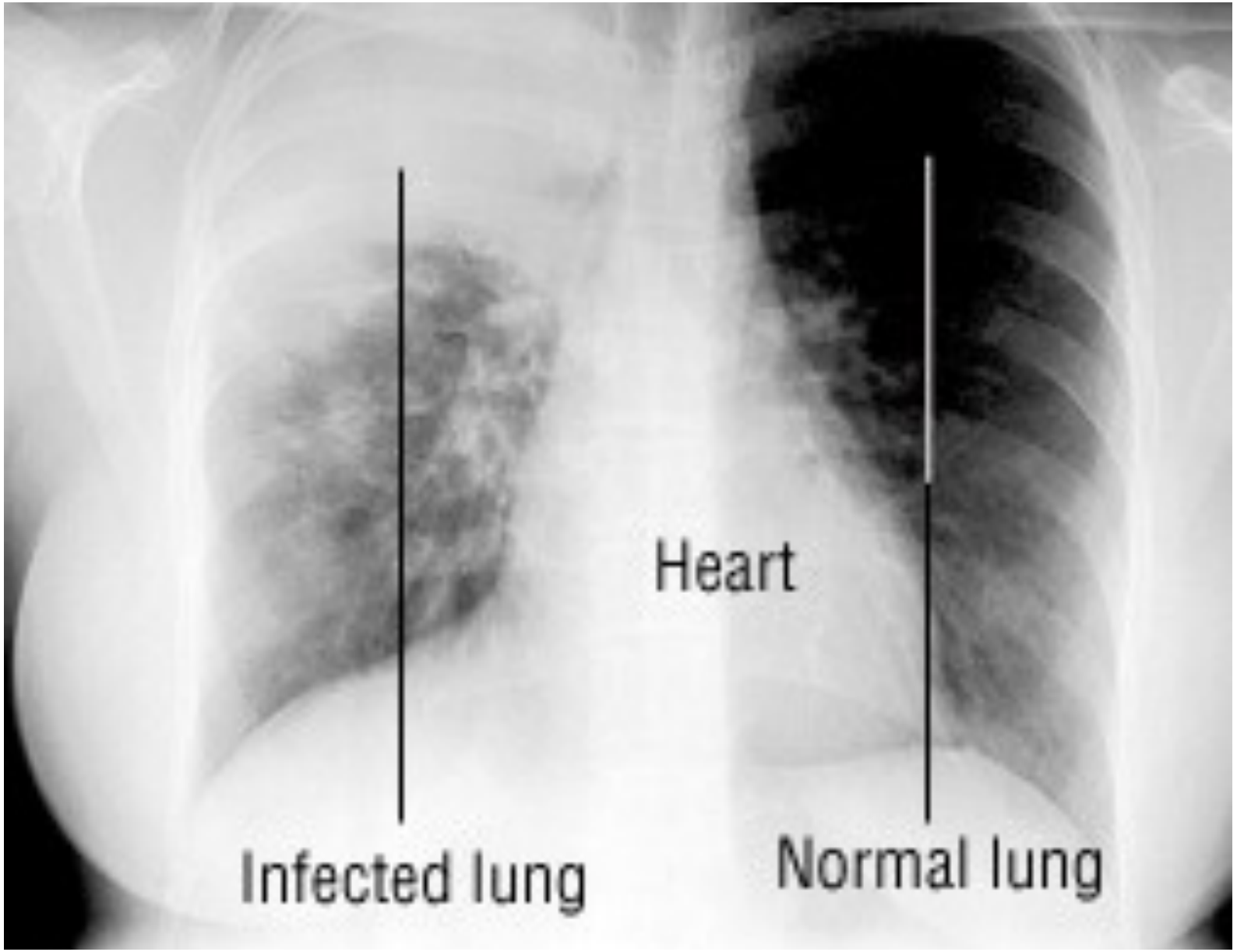
BY AMIN NAZERZADEH & EON SLEMP

DATA

- The dataset comes from Kermany et al. on Mendeley
- Kagel website (https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia)
- There are 5,863 X-Ray images (JPEG) and 2 categories (Pneumonia/Normal).
- All chest X-ray imaging was performed as part of patients' routine clinical care.
- All chest radiographs were initially screened for quality control by removing all low quality or unreadable scans
- The diagnoses for the images were then graded by two expert physicians before being cleared for training the AI system

WHAT IS PNEUMONIA

- Pneumonia is the filling of air vesicles in the lung with an inflamed fluid.
- Viruses, bacteria, and rarely fungal infections cause it.
- Pneumonia can be diagnosed by examining the X-Ray chest radiography by doctors.
- We will build a model that will do this instead of doctors



BUSINESS GOAL

Finding	Finding the best model that can predict if someone has Pneumonia or not
Leverage	Leverage deep learning to expand access to timely diagnosis.

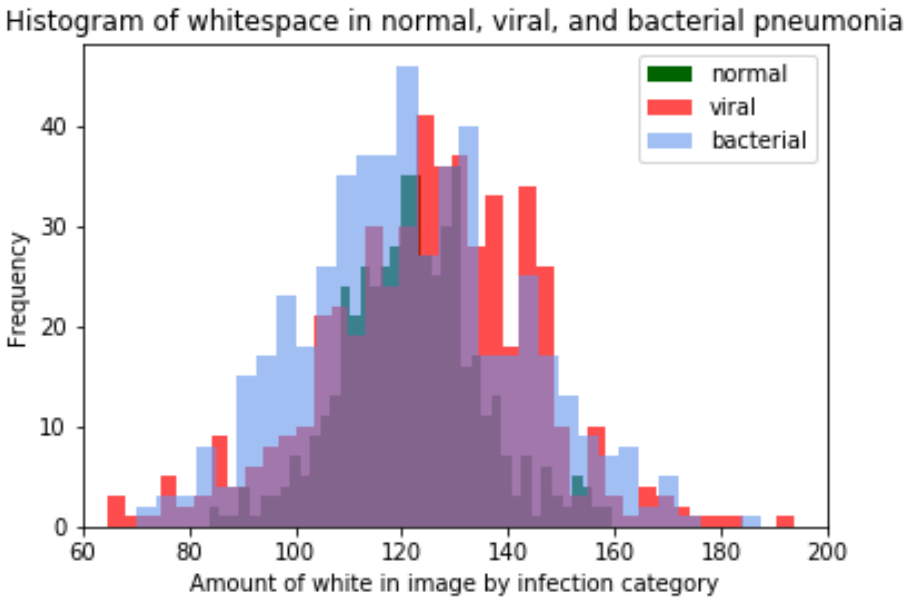
Normal

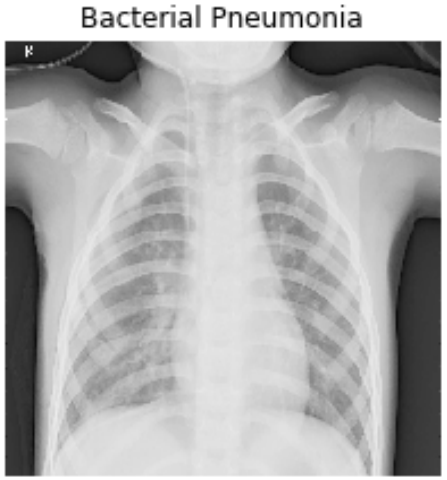
Bacterial Pneumonia

Viral Pneumonia

INITIAL EXPLORATION

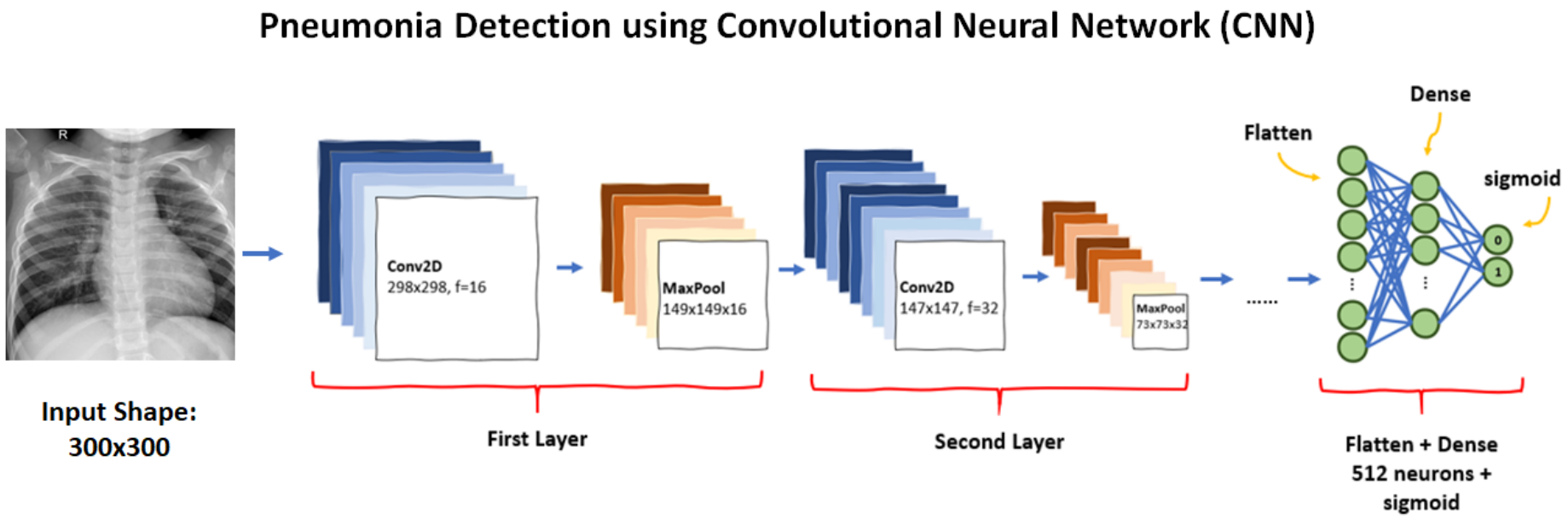
- Black in the image corresponds to open space.
- White in the image equals mass





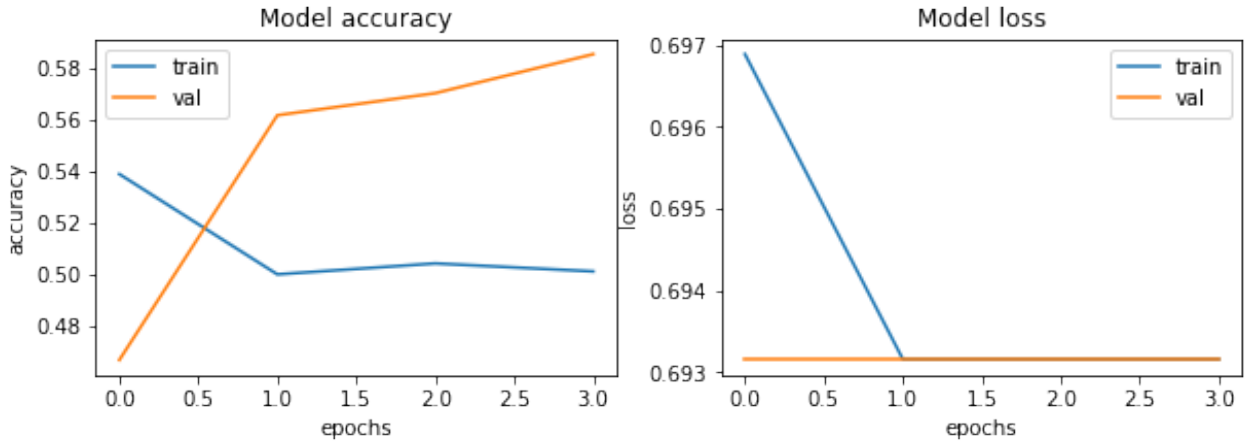
MODEL STRUCTURES

- Structure of CNN model will be like (Conv2D->relu -> MaxPool2D -> Dropout)x2 -> Flatten -> Dense -> Dropout -> Out
- I used five convolutional blocks comprised of convolutional layer and max-pooling.
- I have used dropouts to reduce over-fitting on the third Model.
- Activation function was Relu throughout except for the last layer where it was Sigmoid as this is a binary classification problem.
- I have used Adam as the optimizer
- I have also used EarlyStopping to prevent overfitting



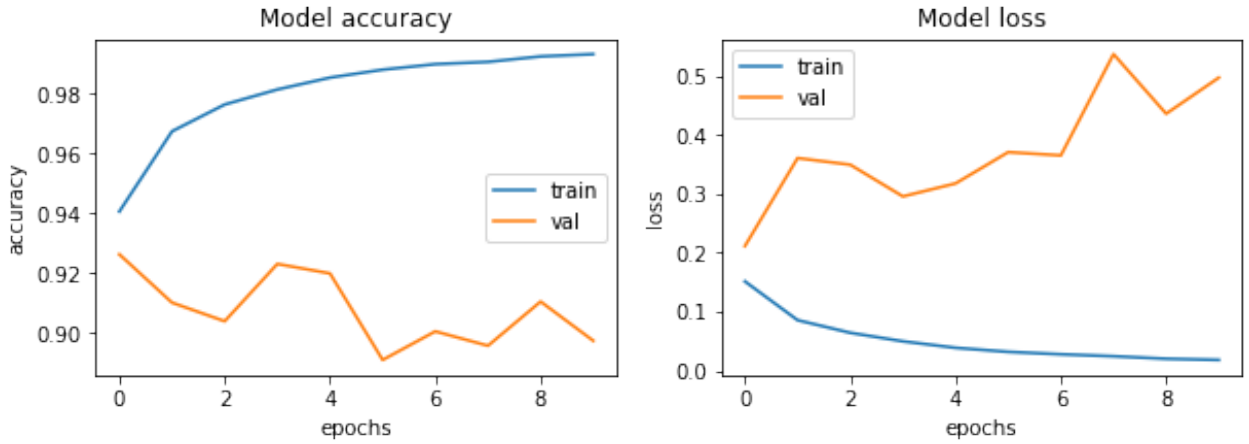
MODEL 1

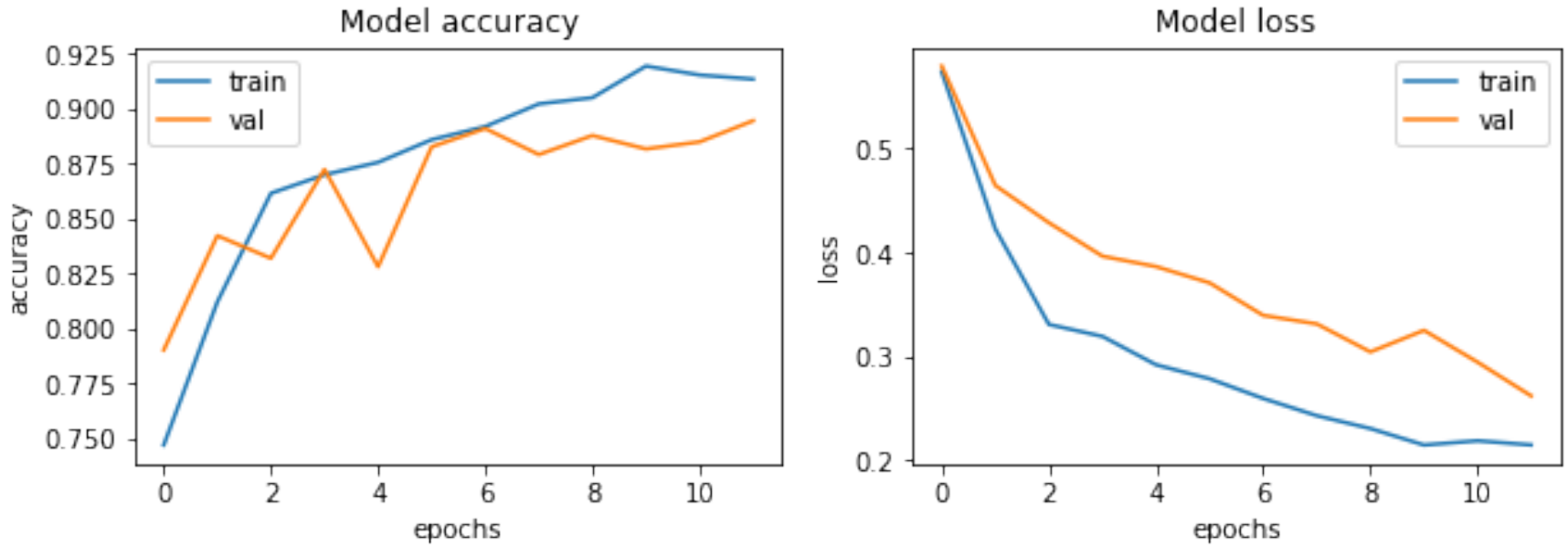
- After running our first model we got an accuracy score of: 0.5011 and al_accuracy: 0.5855
- Unfortunately, our model has low accuracy scores
- Based on the graph was unable to learn the training dataset



MODEL 2

- After running our second model we got an accuracy score of: 0.9933 and val_accuracy: 0.8974 which is better than the last Model
- You can clearly see from the preceding outputs that we still end up overfitting the model
- After the the 3 epochs





MODEL 3

- After running our third model we got an accuracy score of: 0.9131 and val_accuracy: 0.8942
- As we can see we lost accuracy a the val_accuracy is almost close to Model 2
- We reduced the overfitting significantly by adding dropout and validation steps
- The train and validation accuracy are quite close to each other, indicating that the model is not overfitting

FURTHER ANALYSIS & CONCLUSION

Adding more chest x ray images to the dataset is likely to help

Adding more layers to improve our model accuracy and reduce overfitting

It would be nice to see how our model perform by comparison with doctors

Can our model do a better classification than the doctors?