

Identifying Pneumonia in Chest X-rays

Deep Learning Module Project

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Introduction

- **QUESTION:** Can deep learning be used to identify pneumonia in chest x-rays?
- **OBJECTIVE:** To build a classification model to identify chest x-ray images with pneumonia that will help doctors to quickly confirm suspected cases of pneumonia.



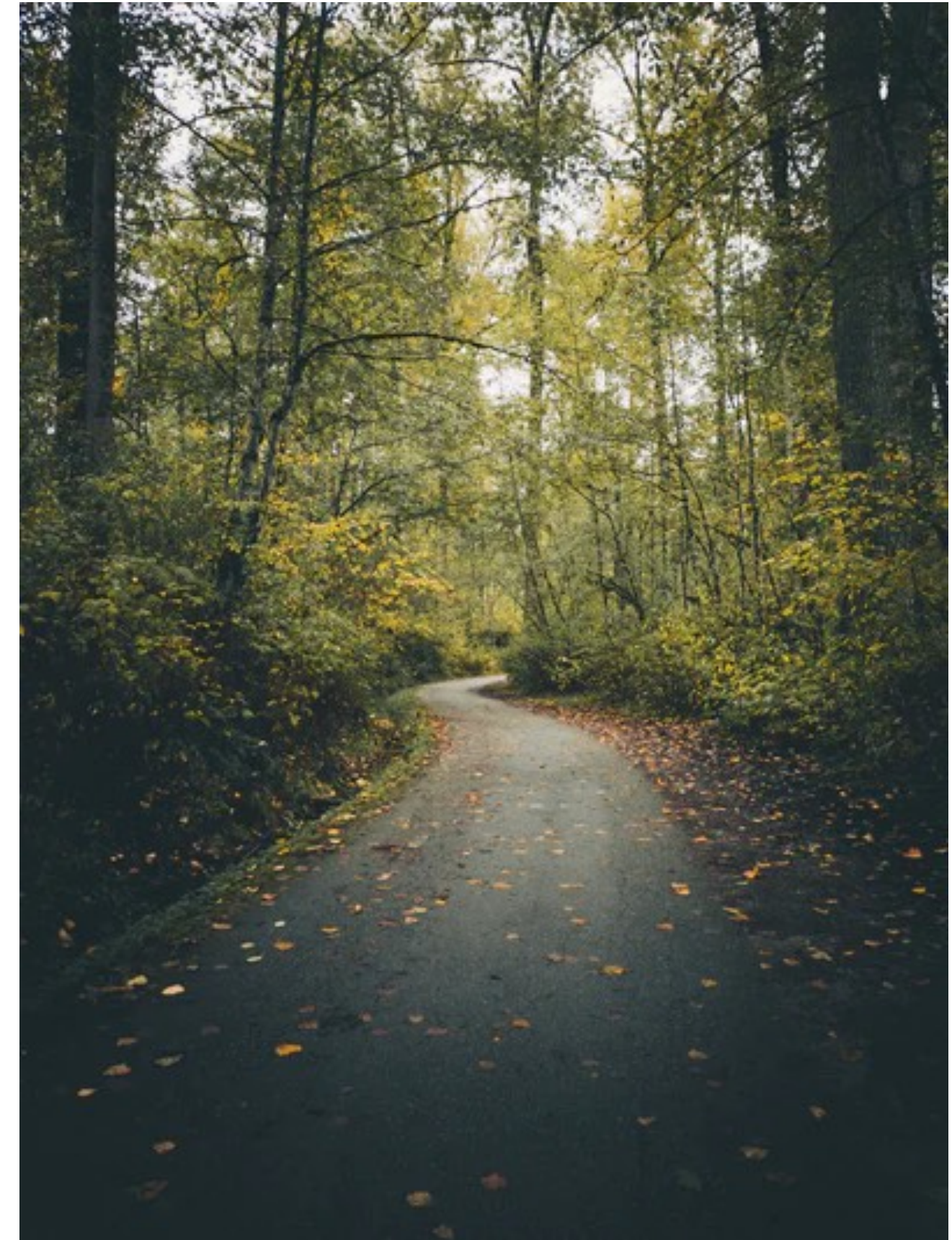
Data

- Kaggle dataset with over **5,000 unique images** of patients with and without pneumonia. The grayscale JPEG images were resized to a resolution of 256 x 256 before modeling.



Algorithms

- **Data** consisted of a training set, validation set, and test set.
- **Python Libraries**
 - Tensorflow
 - Keras
 - Scikit-learn
 - Mathplotlib
 - Seaborn



Results

- **Recall** was used to rate models with a high **true positive** and low **false negative** rate for both classes.
- **CNN** model was the best performing and selected for tuning.

	Logistic Regression	Simple NN	CNN
Normal	0.36	0.46	0.46
Pneumonia	0.99	0.98	0.99

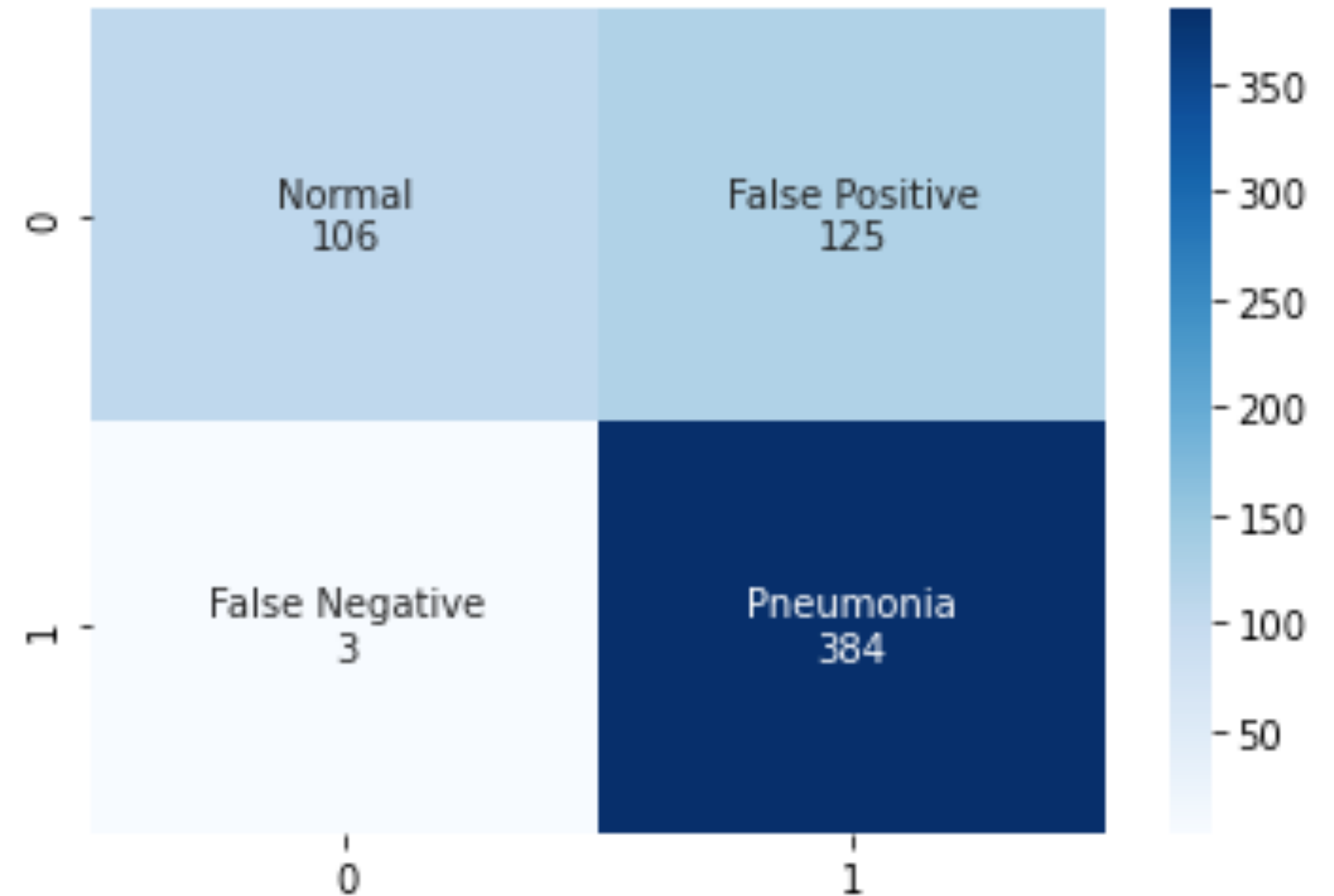
Results

- **Dropout** layers with values of 0.05 were added between the top section layers. The **recall** of normal class increased significantly (~40%).
- **Epochs:** higher epochs increased accuracy of model but did not improve **recall**. The epoch was decreased from 20 to 15 in the final model.

	CNN	Tuned CNN
Normal	0.46	0.65
Pneumonia	0.99	0.96

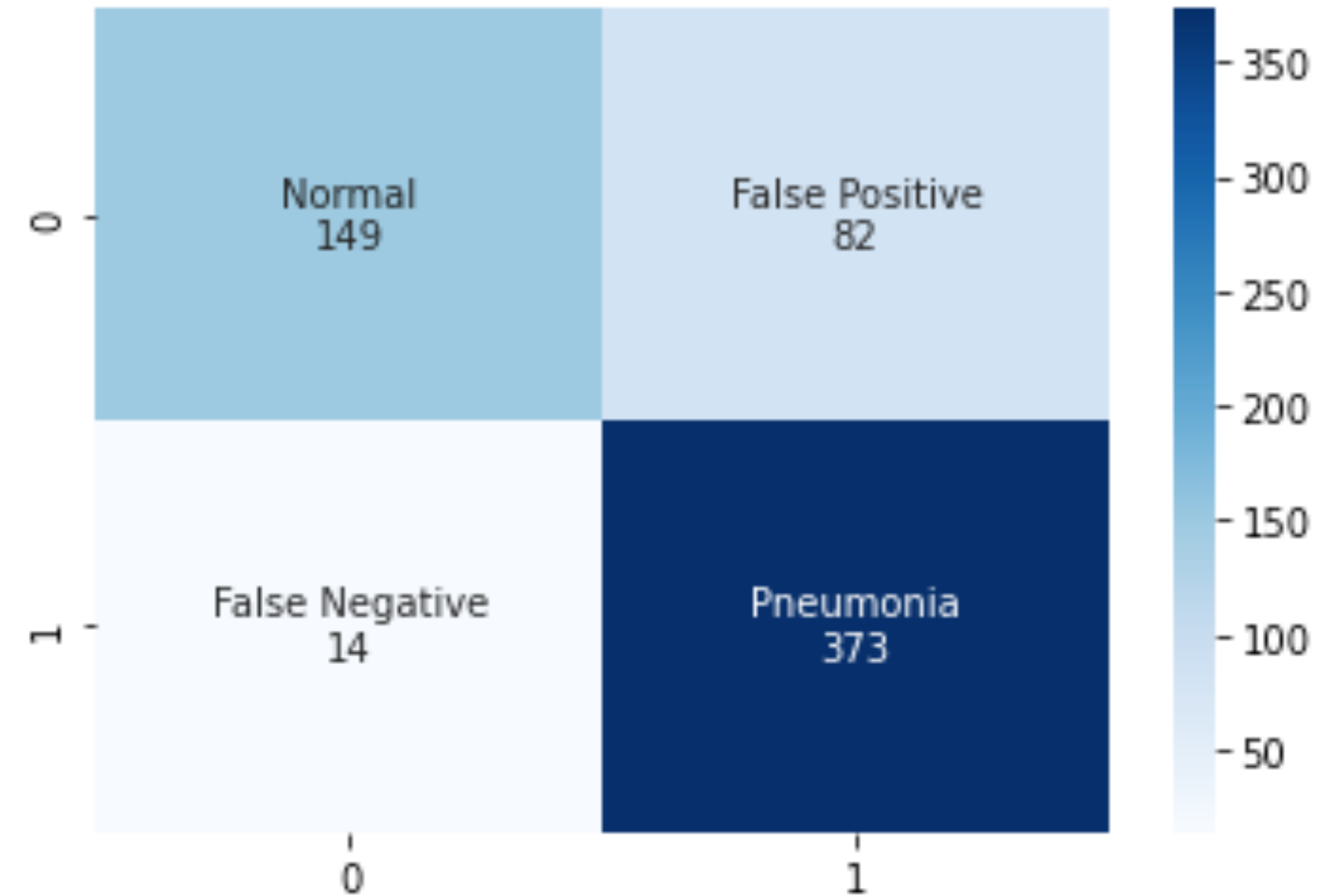
Results - CNN

- The **CNN** model has a recall score of **0.99** for the pneumonia class, and an overall test accuracy of 0.79.



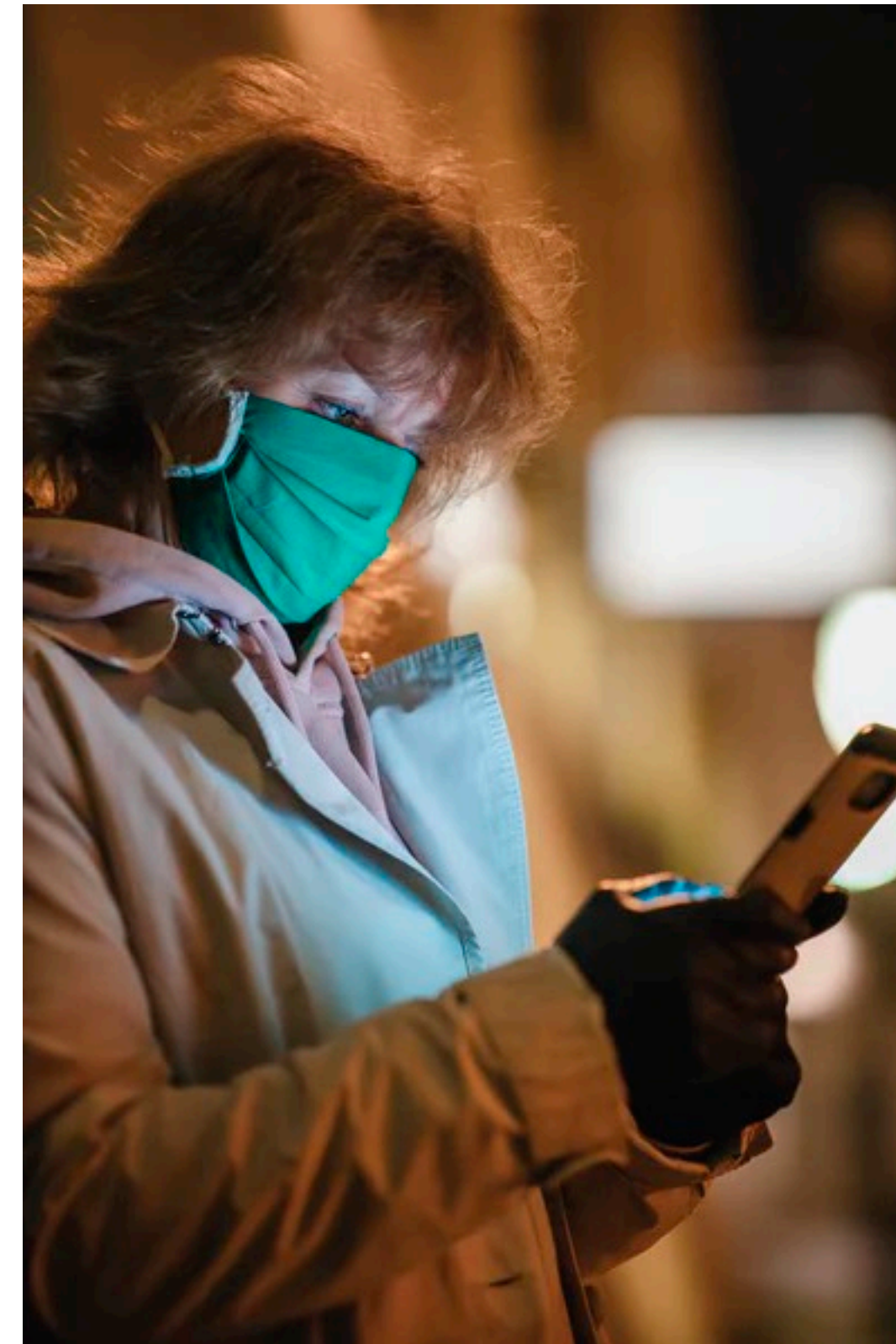
Results - Tuned CNN

- The **tuned CNN** model has a recall score of 0.96 for the pneumonia class, and an overall test accuracy of **0.85**.



Conclusions

- A **CNN** model can be used to confirm suspected cases of pneumonia.
- The **tuned CNN** model will need a doctor to root out false positives (patients without pneumonia).



Future Work

- Expanding the **tuned CNN** model to extract more features in the convolutional layers.
- Exploring different pre-processing techniques to improve resolution of images and to focus on the main of area of pneumonia diagnosis in chest x-rays.



Appendix

- Slideshow pictures from <https://unsplash.com>