Pneumonia Classification

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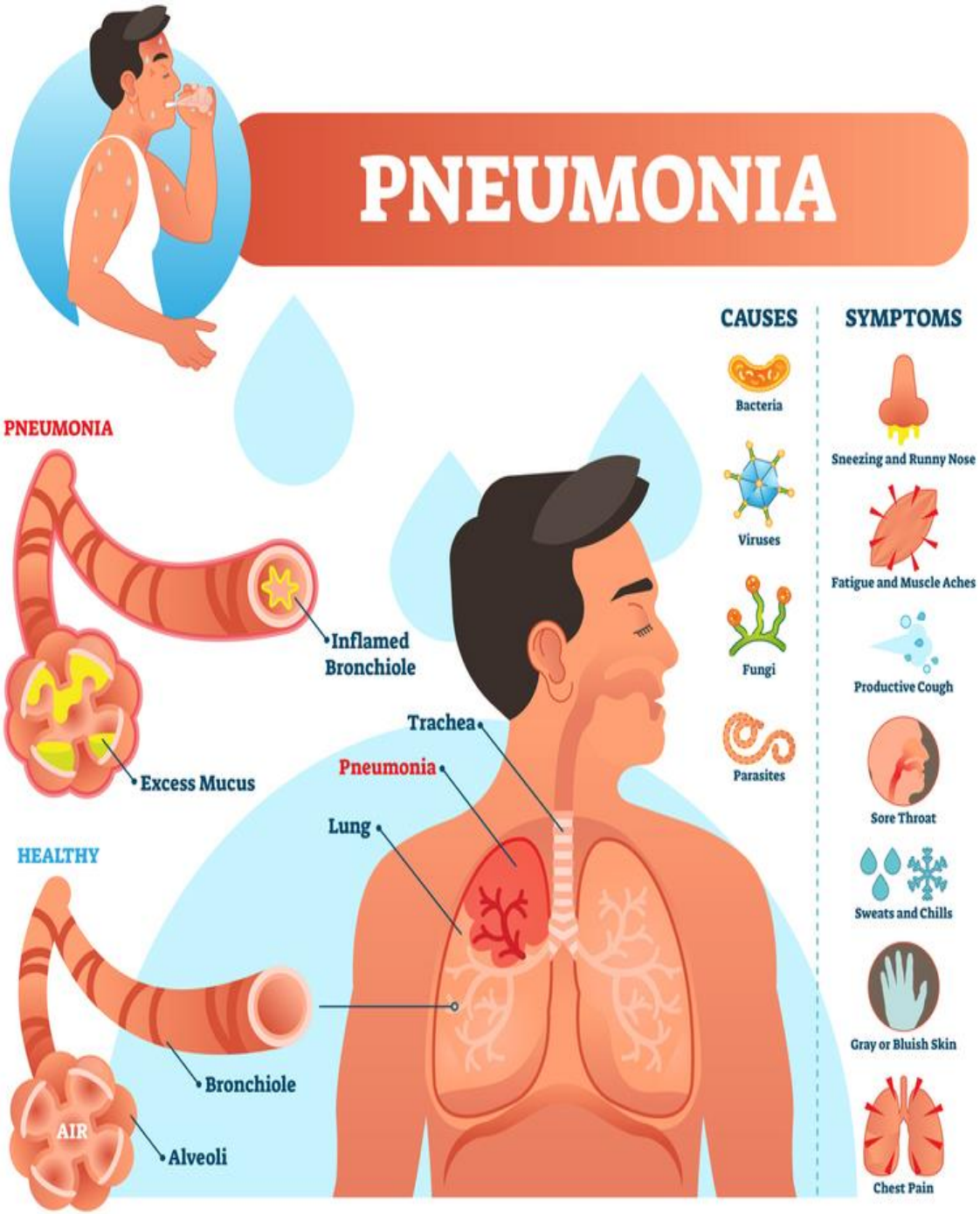
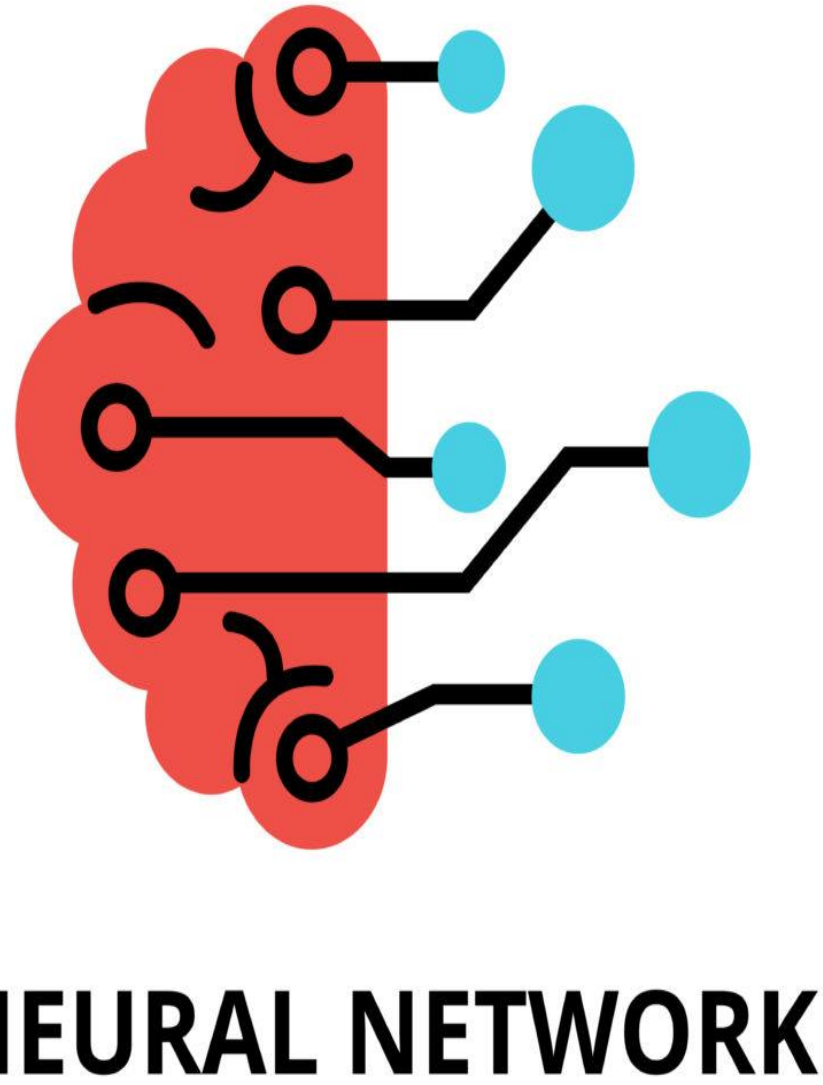
Business Goal

- Pnemonia is common cause of hospitalization
- 1 million people in US affected a year
- Infection of lungs
- Requires chest x-ray, then interpretation by doctor
- Hospital wants to minimize time spent analyzing x-rays



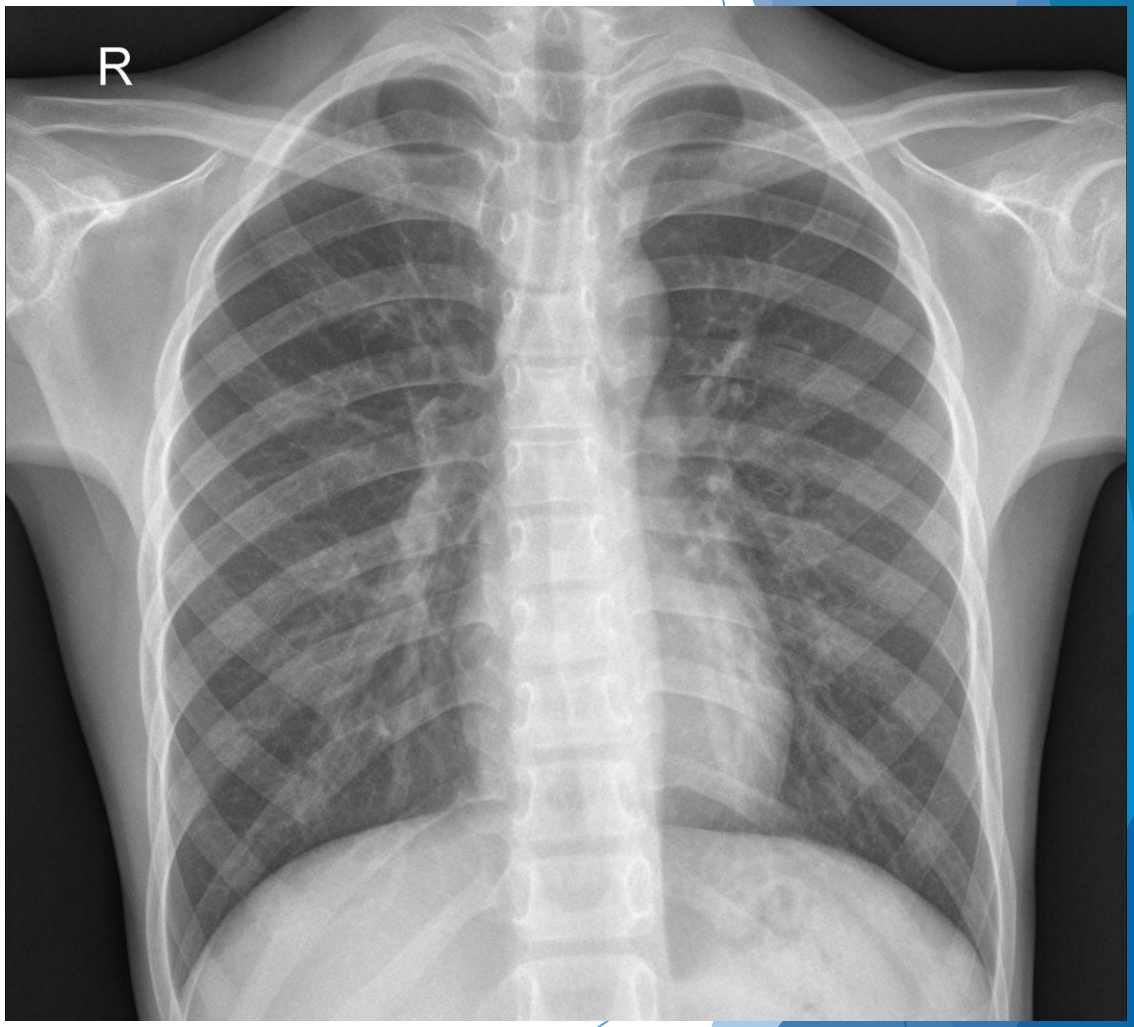
Method

- Use of Image Classification through Neural Network models
- Deep Neural Network and Convolutional Neural Network(CNN)
- Pick the best one
- Accurately classify x-ray image



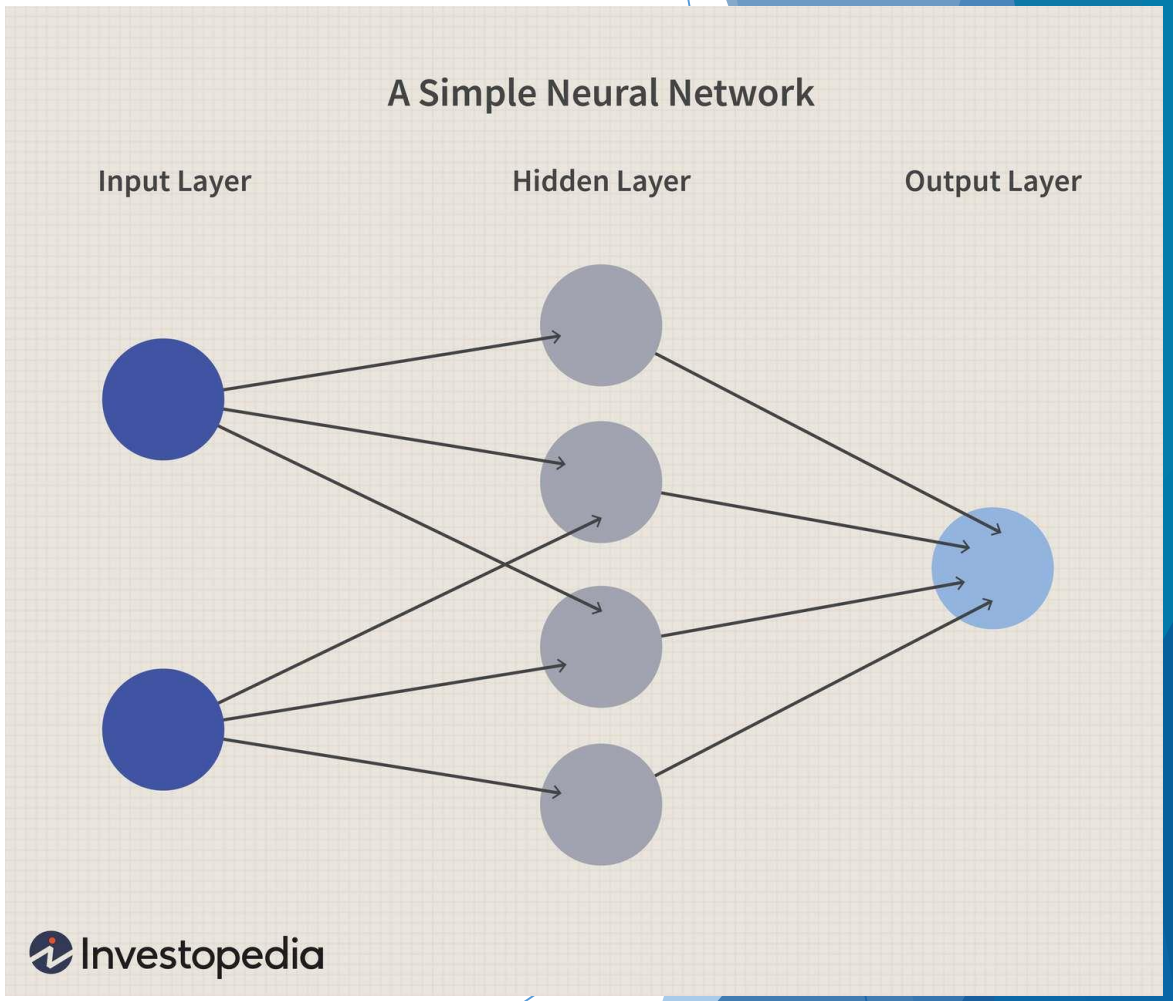
Data

- Kaggle dataset of chest X-ray images
- 5,856 images
- 4,273 pneumonia images and 1,583 normal images
- What are DNN and CNN?



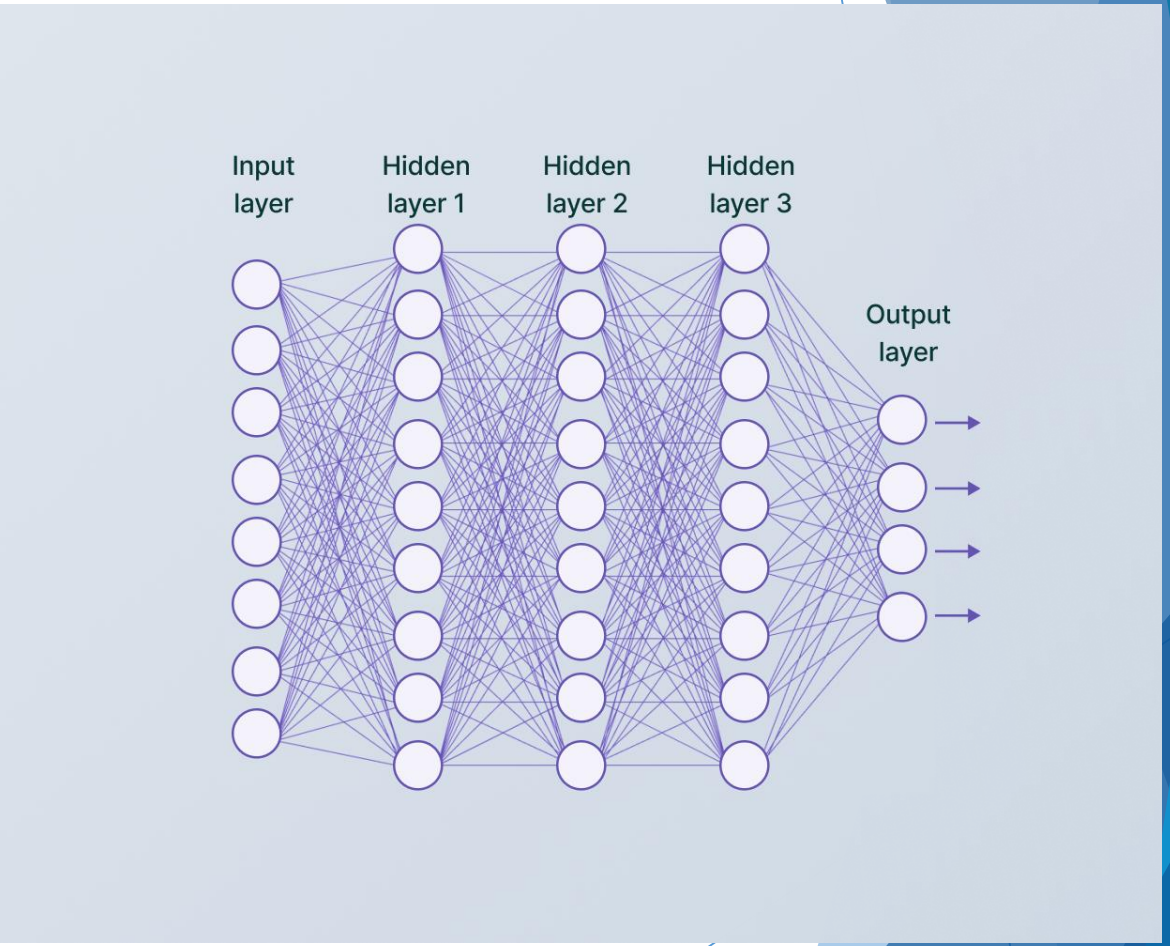
A Simple Neural Network

- Series of nodes (processing units) comprised into layers
- Input layer, 1 hidden layer, and output layer
- Model takes some input (Images in our case)
- Processes data in hidden layer
- Output layer produces some output (image classification)



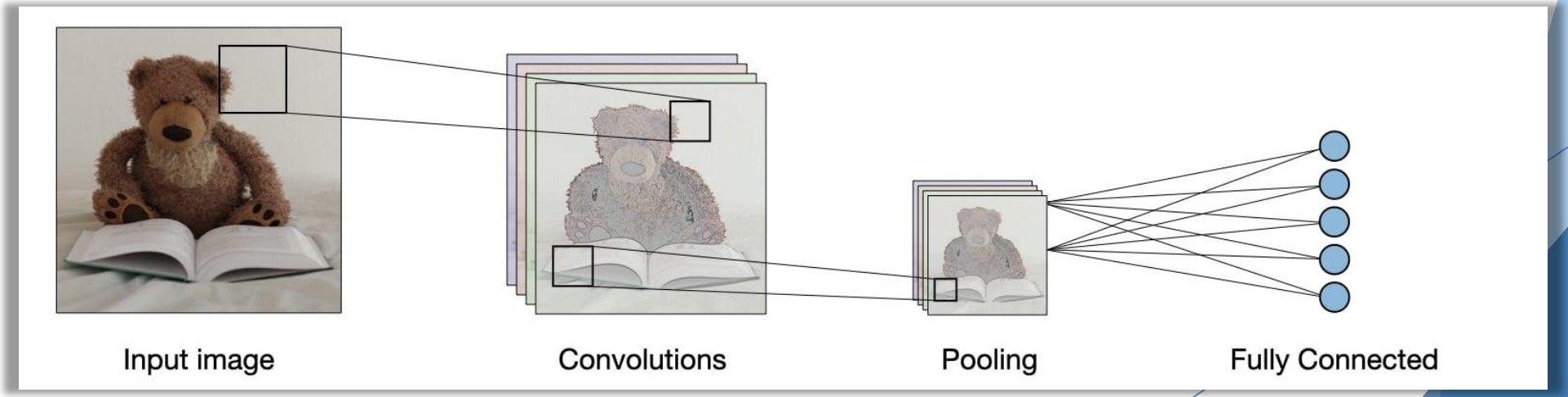
Deep Neural Network

- Similar to simple Neural Network
- More hidden layers, therefore more processing
- Detection of more complex features of an image, and groups parts together to classify image



Convolutional Neural Network

- Detects complex features better than a DNN
- Applies filters to image
- Filter moves across image from top to bottom
- Looks for edges or patterns
- Features mapped out and new smaller images created
- Images condensed and classification decision is made



Best Model

- Compared DNN and CNN, tuned in different ways
- CNN had better accuracy
- Look at our results

Training

- Different accuracy types
- Need to train model before anything
- Accuracy of model on classifying data it trained on
- Our training accuracy was 90%
- Comparing to DNN results, 51% improvement

Testing

- After training
- Accuracy of model on classifying unseen data images
- Test accuracy was 91%
- Compared to DNN results, 57% improvement
- Overfitting decreased compared to DNN
- Can lead to model not performing well on new data

Validation

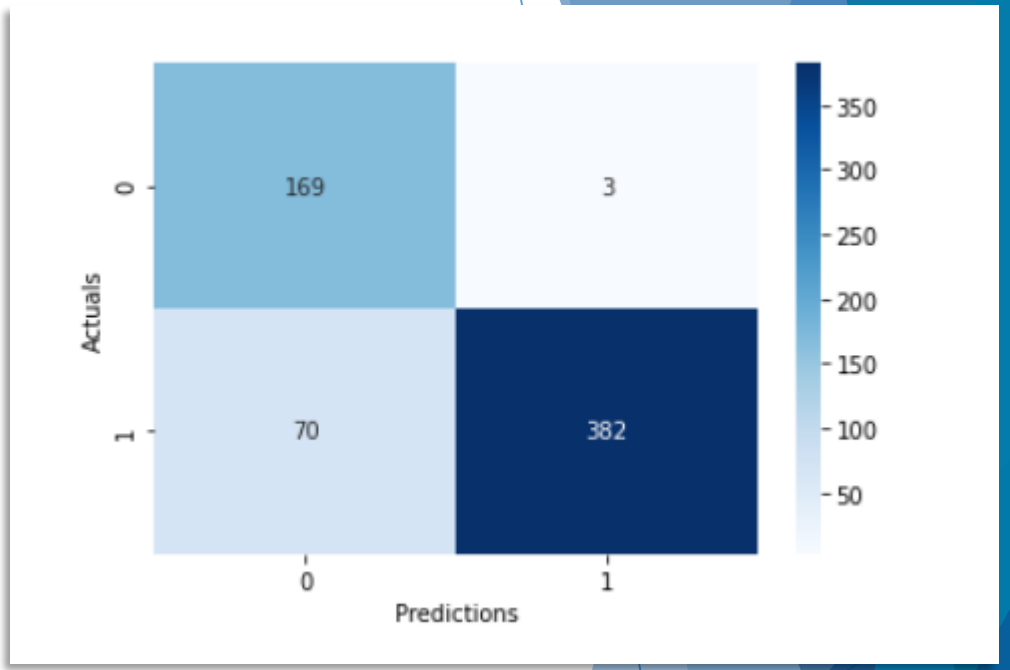
- Validation accuracy evaluates overall model performance
- Validation accuracy was at 81%
- 19% improvement compared to DNN results

Recall

- What percentage of all x-rays that were actually Pneumonia x-rays were classified correctly?
- Good metric to use besides accuracy
- Recall value of 85%

Confusion Matrix

- 169 x-rays were correctly classified as being normal x-rays
- 70 x-rays were wrongly classified as not being Pneumonia x-rays
- 3 x-rays were wrongly classified as being Pneumonia x-rays
- 382 x-rays were correctly classified as being Pneumonia x-rays



Recommendations

- Recommendations for coding model
- Larger difference between our training and test accuracy to reduce overfitting
- Higher testing accuracy
- See a higher validation accuracy (81%)
- Reduce the instances of false negatives
- Address by adding more images to our datasets
- Experiment with more tuning/ combination of tuning to models

Recommendations (Continued)

- Recommendations for hospital setting
- Implement model in same setting where x-rays taken
- X-ray can immediately be analyzed by model
- Use different x-ray image sizes
- Can affect speed and efficiency of analysis

Next Steps

- Our model shows promising results
- Increase the accuracy of model even more
- Reduce time doctor spends on evaluating x-ray
- Start off with diagnosing pneumonia
- Can lead to diagnosing broken bones, bone cancer, even breast cancer

Questions and Contact Info

- Questions?
- Any additional inquiries can be directed to linkedin:
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