Chest X-Ray Image Pneumonia Classification

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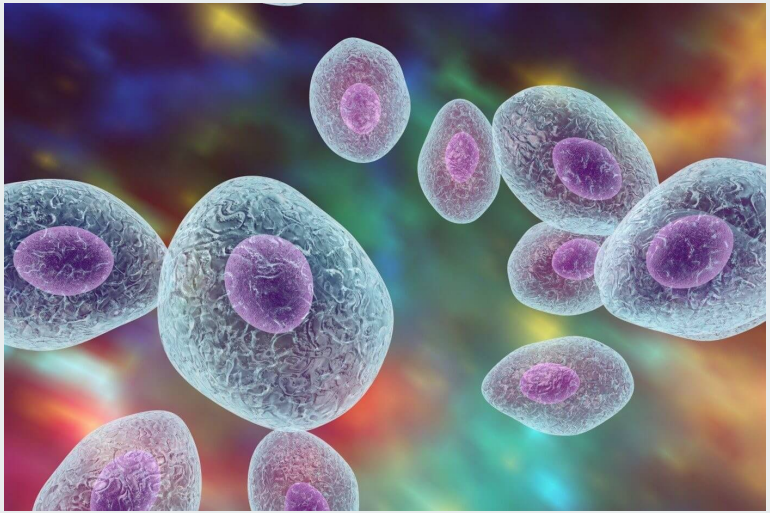
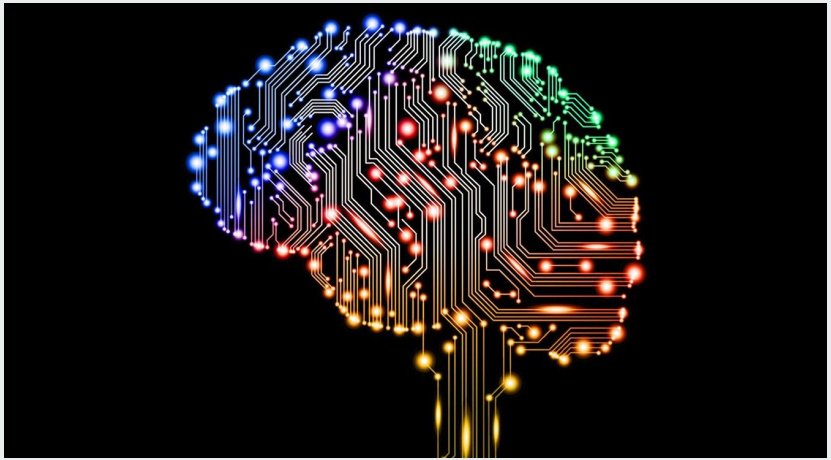
Project Overview



- We trained a Convolutional Neural Network to help detect pneumonia in chest x-ray images.
- Pneumonia is a contagious lung infection that disproportionately affects the elderly and young and is the leading cause of death among children under 5 years old.[1]
- Pneumonia is also one of the most expensive conditions seen during hospitalizations in the U.S.[2]

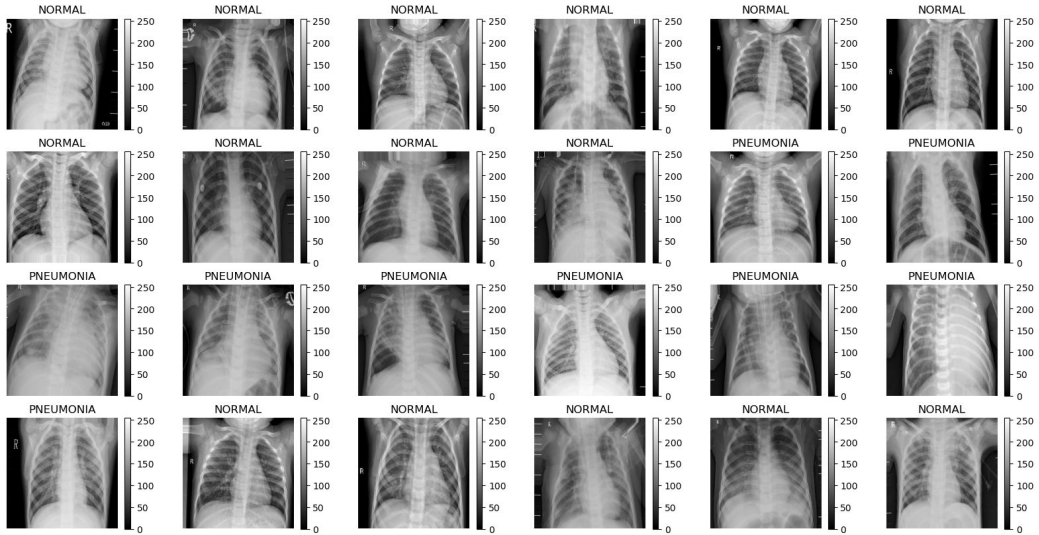
Business Problem

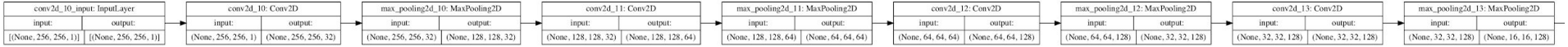


- Detecting pneumonia solely from x-rays is a difficult task for the human eye, so we sought to train a Convolutional Neural Network to recognize pneumonia in x-ray images to help speed the process of pneumonia detection and help prevent cases from going undetected.

Data Source

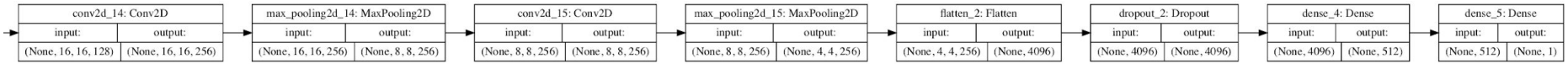
- Kaggle's Chest X-Ray Images (Pneumonia)[3]
- Over 5.5 thousand jpeg images split into train, test, and validation folders
- Each folder consisted of a “Pneumonia” and “Normal” folder
- 16 images in original validation set
    - Training: 4616 images
    - Testing: 640 images
    - Validation: 600 images





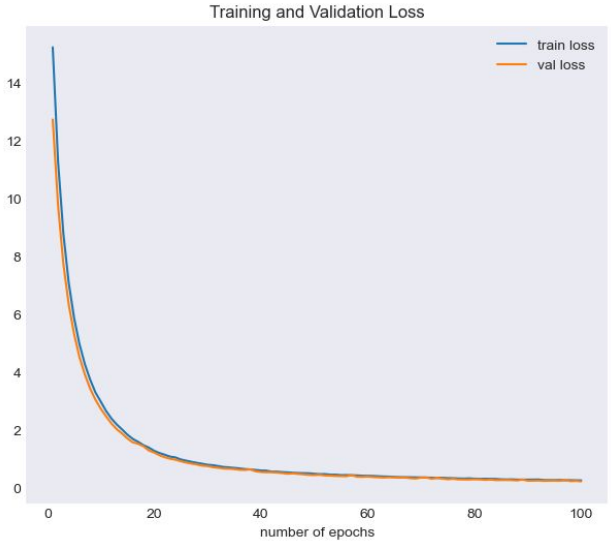
Approach

- Keras package, prediction model was built iteratively and updated using metric optimization.
- Training set had a class imbalance— class weights were implemented
- Data augmentation of the training set to account for class imbalance
- Final model consists of over 3 million parameters



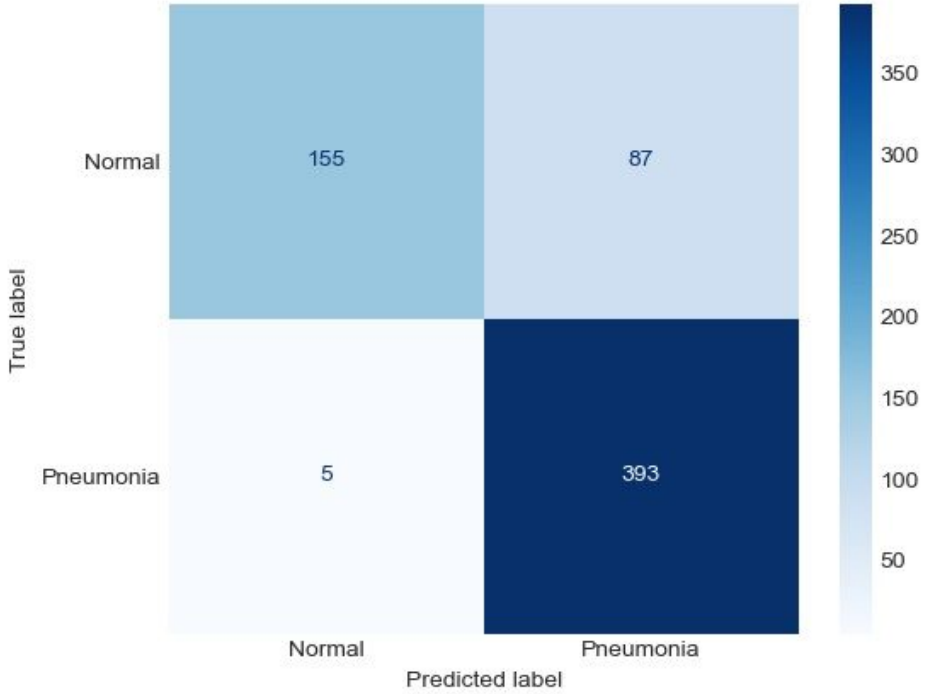
Results

- On our validation set, our model achieved 99% accuracy, 99% recall, and 98% percent precision.
- When tested on unseen data, our model received 86% accuracy, 99% recall, and 82% precision.



Conclusions and Recommendations

- The majority of the positive pneumonia cases were accurately detected from our model
- We recommend that the doctor should do additional testing to detect false positive cases



Next Steps

- Pre-trained Models/ other modeling architectures
- Principal Component Analysis (PCA)
- Different Image Augmentation
- Additional methods to address class imbalance
- Train using a variety of other parameters
- Separating pneumonia cases into viral and bacterial
- Test classifier on other medical images

Questions?

Sources

1. http://54.209.11.195/patients/patient-resources/resources/top-pneumonia-facts.pdf
2. Ibid., http://54.209.11.195/patients/patient-resources/resources/top-pneumonia-facts.pdf
3. https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia