RSNA Pneumonia Detection

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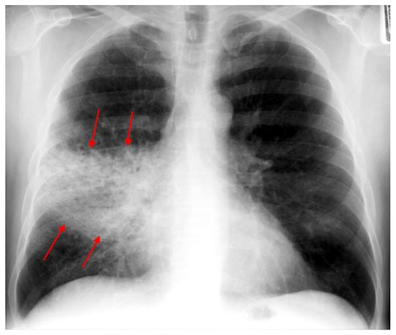
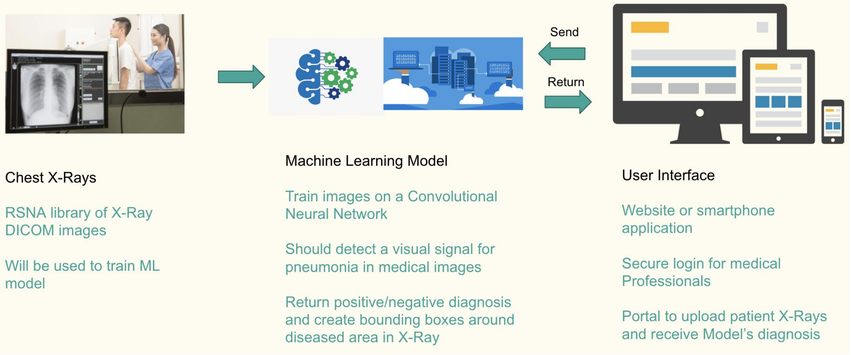
Introduction



- Pneumonia is the leading cause of infection-related deaths in the U.S, which 200 million cases per year
- Only 29% of patients were accurately diagnosed by a physician prior to chest x-rays
- Internationally responsible for 15% of all deaths in children under 5 years old

Objectives

- Build an algorithm to detect detect a visual signal for pneumonia in medical images
- Locate and draw bounding boxes around lung opacities on chest radiographs
- Build an application implementing the algorithm



RSNA Dataset

- The RSNA training dataset is made up of 26684 chest radiographs
- 68% pneumonia negative and 32% pneumonia negative
- We split the whole training dataset to 80% for training and 20% for testing

```
patientId    00436515-870c-4b36-a041-de91049b9ab4
x                                            264
y                                            152
width                                        213
height                                       379
Target                                         1
Name: 4, dtype: object
```

Positive label

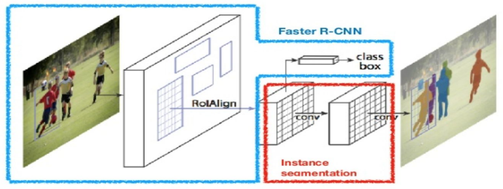
```
patientId    0004cfab-14fd-4e49-80ba-63a80b6bddd6
x                                            NaN
y                                            NaN
width                                        NaN
height                                       NaN
Target                                         0
Name: 0, dtype: object
```

Negative label

Deep Learning Architectures

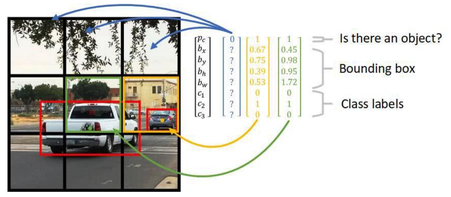
Mask-RCNN

- Mask-RCNN is an advanced deep neural network used for image segmentation
- We utilized Matterport's implementation of Mask R-CNN for opacity detection and pixelwise disease segmentation



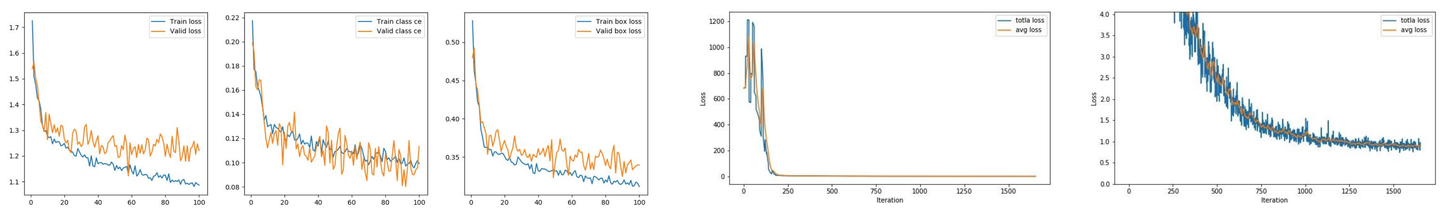
YOLO v3

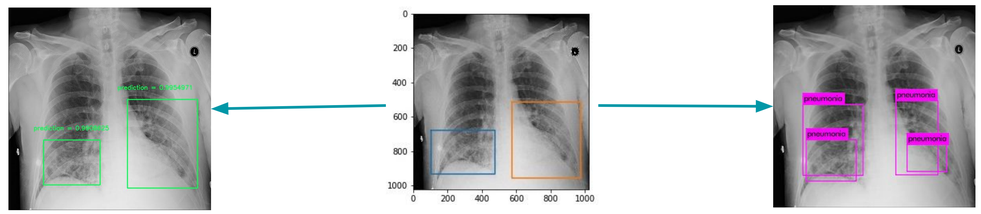
- You only look once, or YOLO is a state-of-the-art, real-time object detection system
- We trained our model using YOLO v3 algorithm based on the RSNA dataset with customized configuration



Results

- The Mask-RCNN was trained using the Boston University shared computing cluster(SCC)
- Epochs = 100 Loss = 1.08 Kaggle Score = .13906



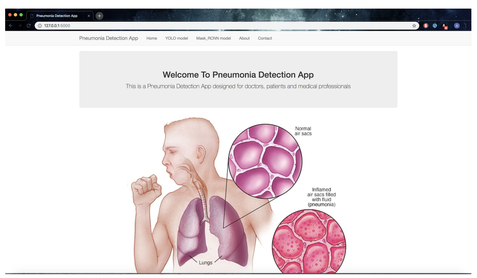


Mask-RCNN Prediction | Ground Truth | YOLO Prediction

- The YOLO model training loss
- Iteration = 1600 Loss = 0.85

Application

- The web application was built using Flask, a micro web framework written in python
- It implements both the Mask RCNN and YOLO v3 algorithms
- Users can upload chest radiographs in either png or jpeg formats and receive a pneumonia prediction



Github: https://github.com/minzhou1003/ec601-project
Trello: https://trello.com/b/tm5CsmTN/sprint-1