RSNA Pneumonia Detection

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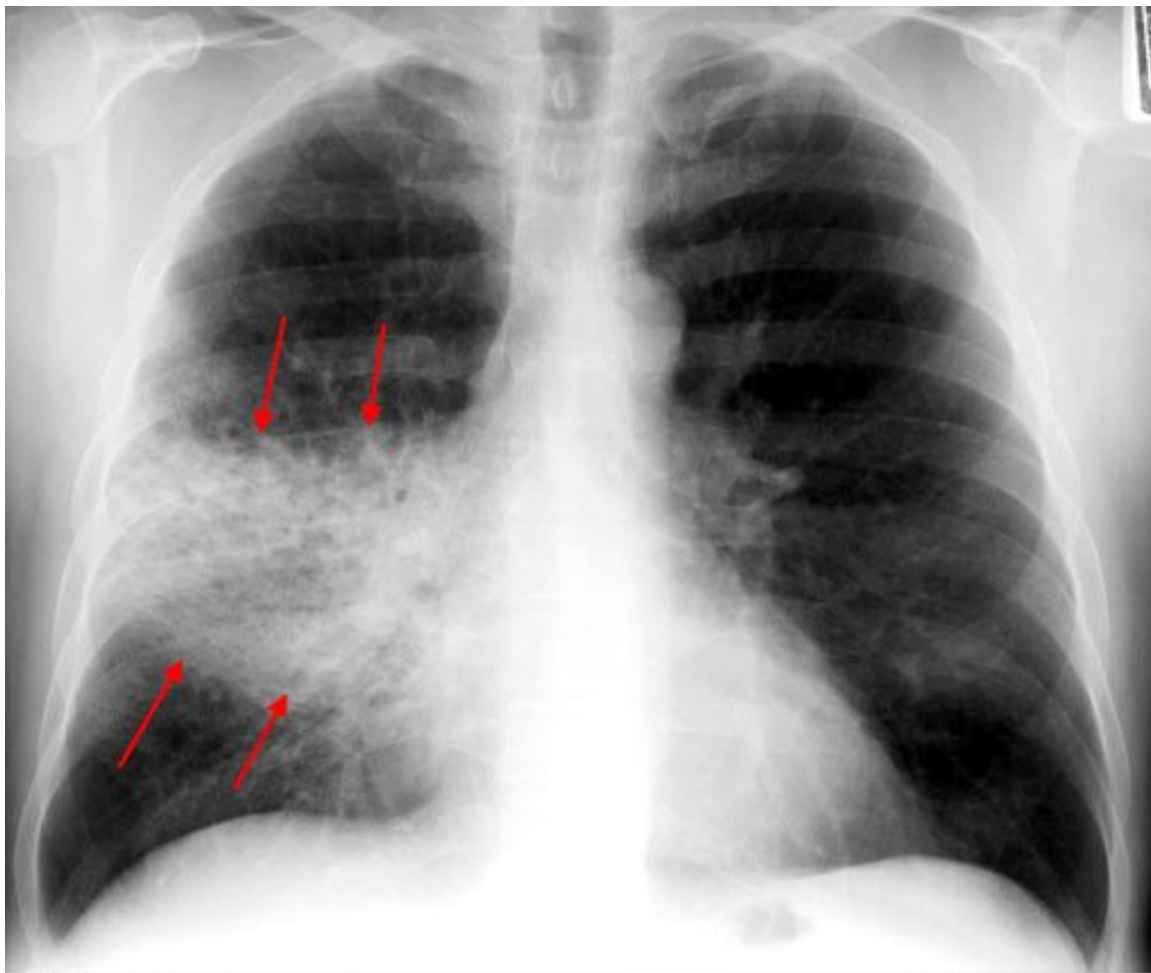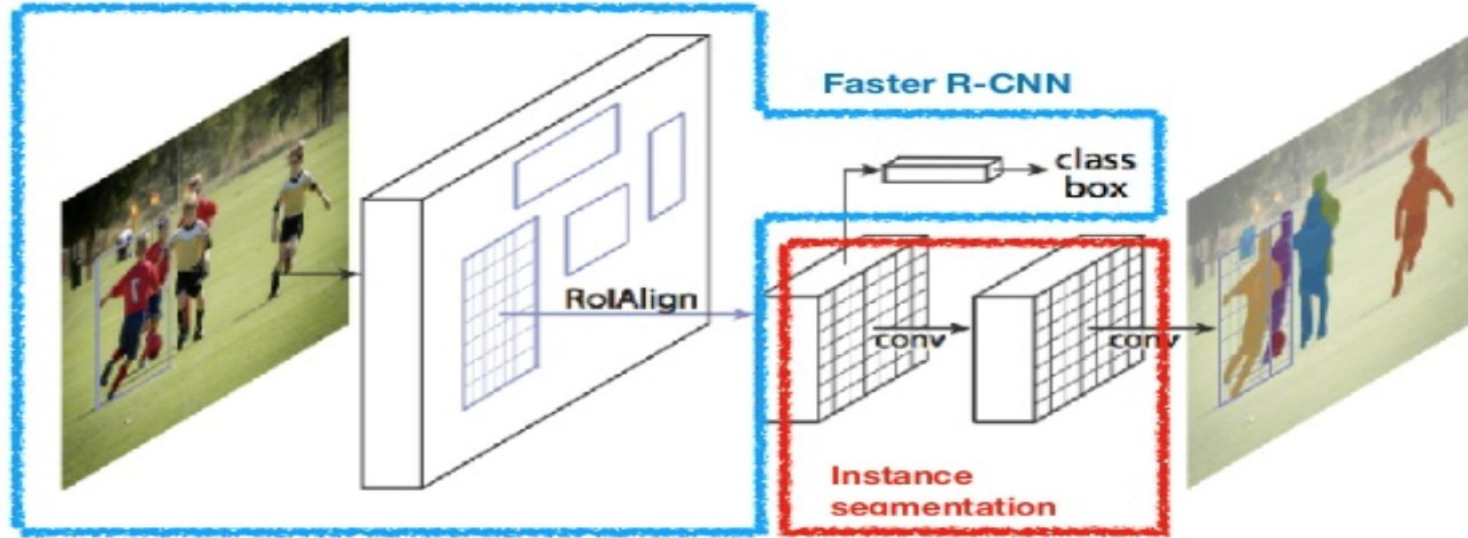**RSNA** Radiological Society of North America

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

Chest X-Rays

RSNA library of X-Ray DICOM images

Will be used to train ML model

Machine Learning Model

Train images on a Convolutional Neural Network

Should detect a visual signal for pneumonia in medical images

Return positive/negative diagnosis and create bounding boxes around diseased area in X-Ray

User Interface

Website or smartphone application

Secure login for medical Professionals

Portal to upload patient X-Rays and receive Model's diagnosis

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

Positive label

Negative label

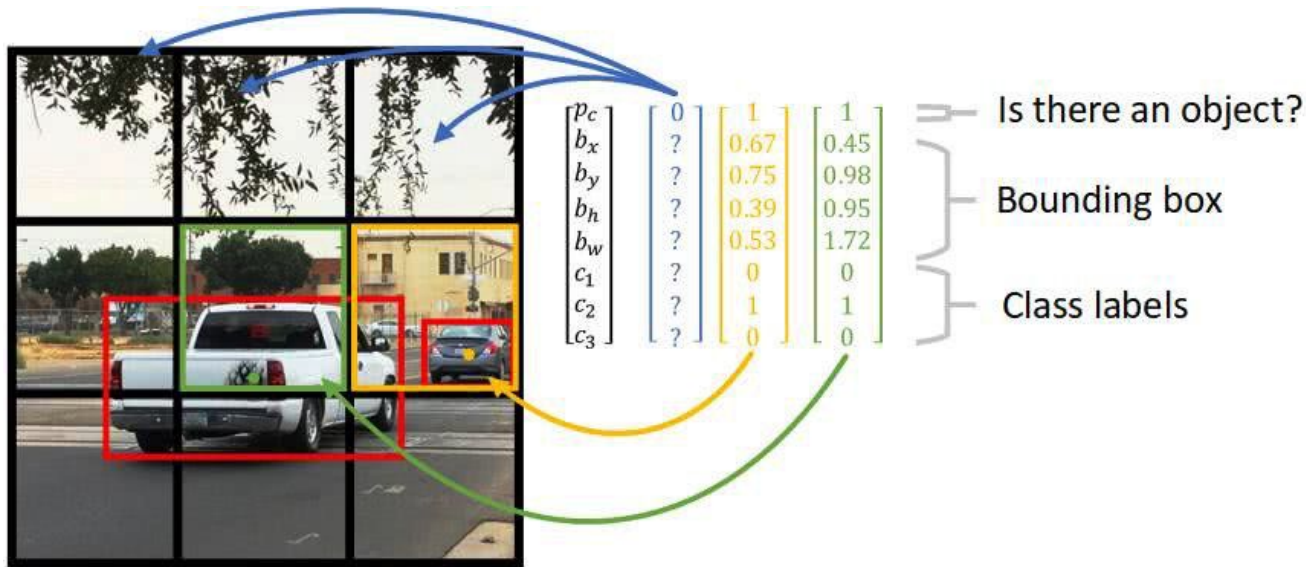## Deep Learning Architectures

Mask R-CNN

- 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
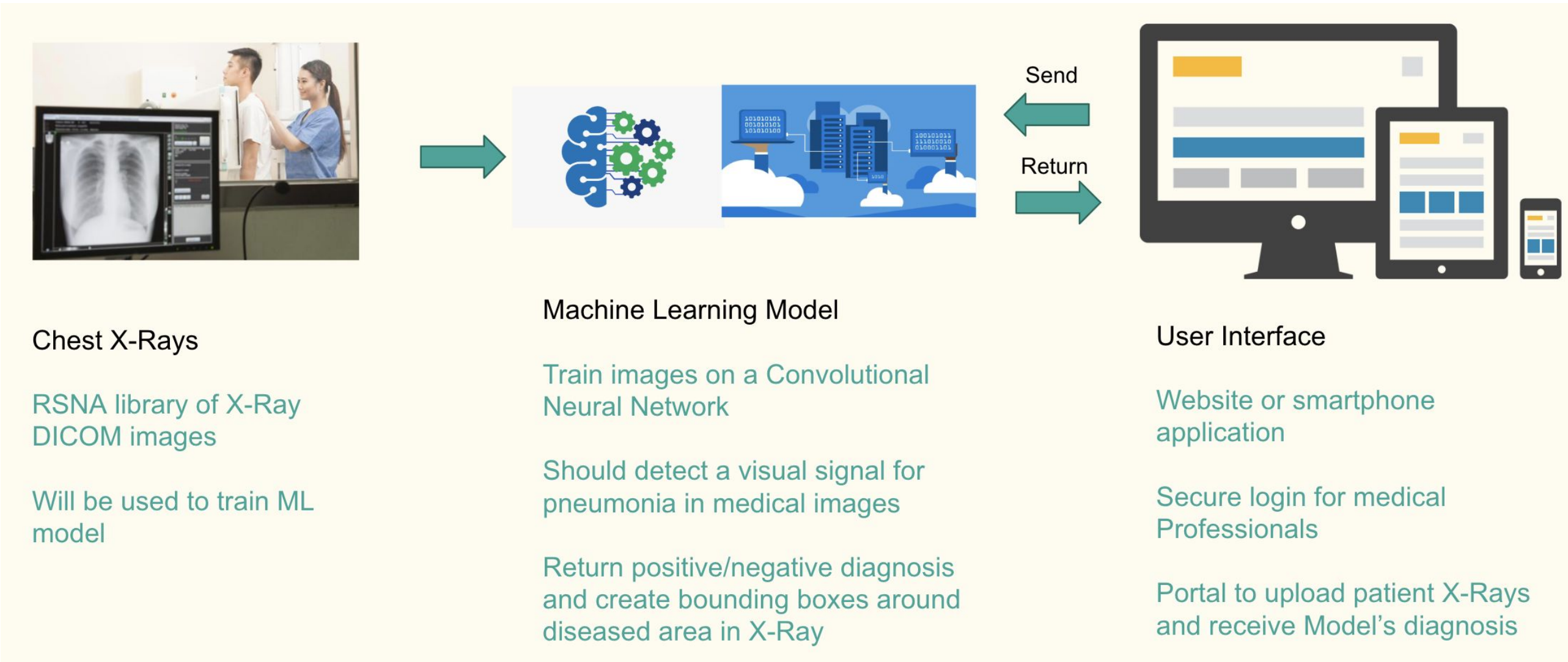

YOLOv3

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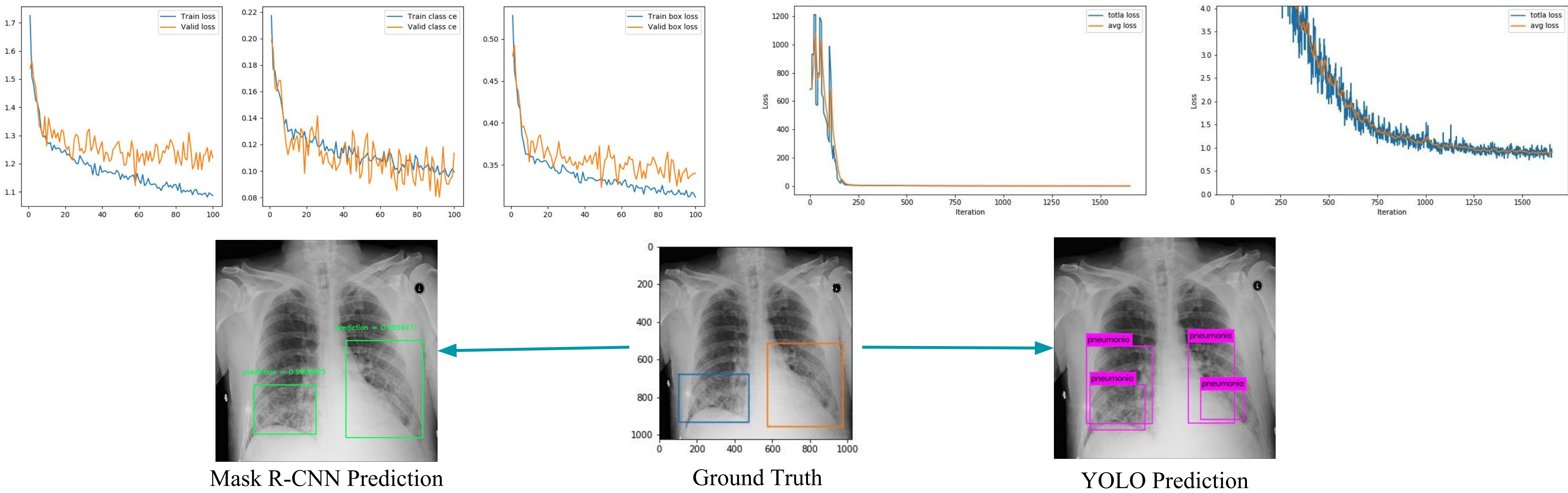- We trained our model using YOLO v3 algorithm based on the RSNA dataset with customized configuration

Results

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

- The YOLOv3 model training loss
- Iteration = 1600 Loss = 0.85

Mask R-CNN Prediction

Ground Truth

YOLO Prediction

Application

- The web application was built using Flask, a micro web framework written in python
- It implements both the Mask R-CNN and YOLOv3 algorithms
- Users can upload chest radiographs in either png or jpeg formats and receive a pneumonia prediction

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