Final Presentation

Lung Nodule Detection

Group 3
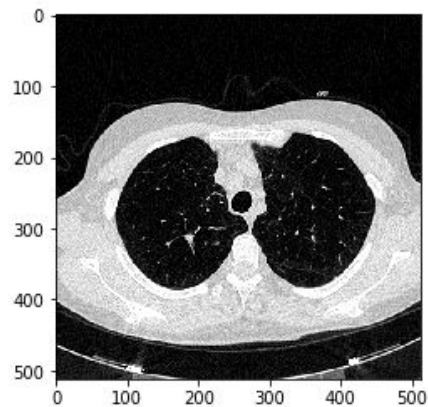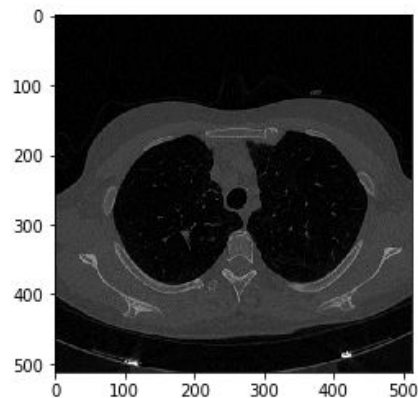### Alice, Karen, Justine, and Anh

Preprocessing

- Upload case volumes and the ground truth node locations

- Convert nodes from world to index coordinates

- Collect slices containing nodes

- Normalize the image - enhance contrast

- Save the image as a jpg file

Case Volume -> Slice -> Enhance -> {Training Set}

Detectron 2 -the framework

Facebook AI Research's next generation software system that implements state-of-the-art object detection algorithms

- Pre trained

- Model Zoo : COCO Object Detection Baseline Model
  - **Faster R-CNN**
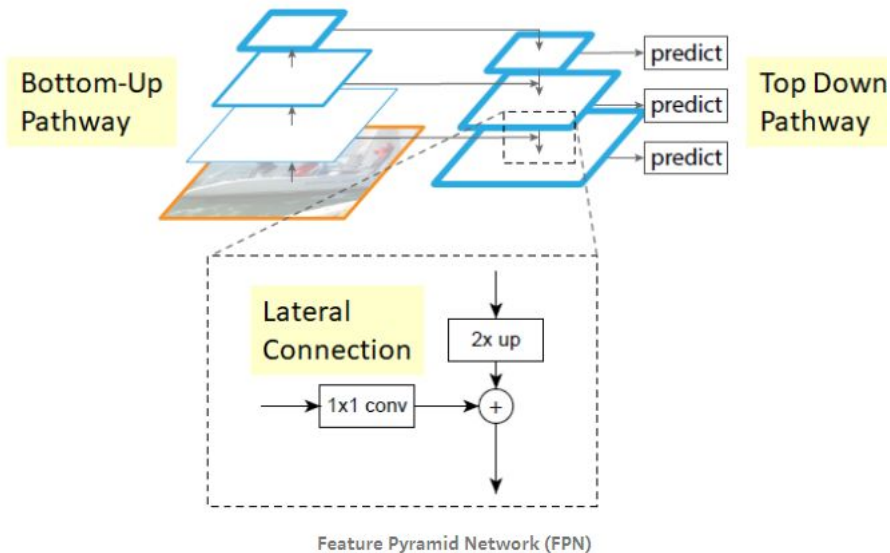 - Region based convolutional neural network
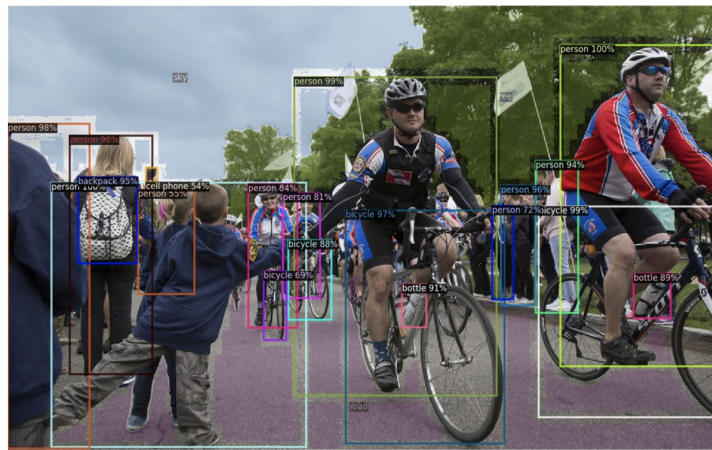
https://github.com/facebookresearch/detectron2

Architecture

- **ResNet + FPN backbone**
  - FC heads for box prediction
  - Achieves the best speed/accuracy trade off

- Lateral connection merges (element wise addition) feature maps of the same spatial si from the bottom-up and top-down pathways
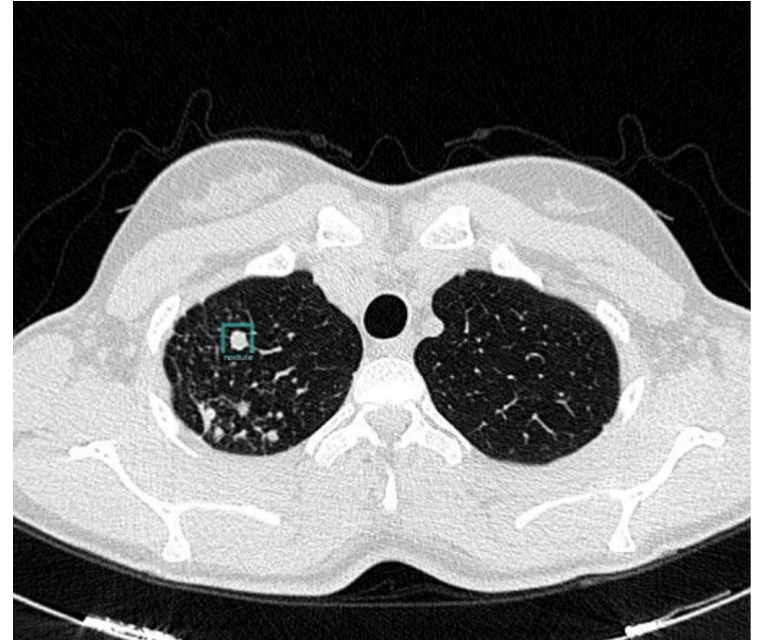

Feature Pyramid Network (FPN)

Training

Labels : Set up corresponding dataset to create detection boxes surrounding nodules

**Training Set :** Set of 1219 jpg images containing a ground truth nodules - one nodule per image

Training hyper parameters: [800 epochs] , [learning rate of 0.008] ,

Post-processing & Evaluation

Created a csv of the predictions (as per challenge requirements)

- Checked the predicted coordinates against the ground-truth values
  - Used the volume of the true nodule to determine its diameter*
  - Compared the distance between the two center-points against the diameter
- Determined False-Positive, False-Negative, True-Positive and True-Negative values when comparing predicted coordinates using *many* nested if statements
  - Non-nodules provided an extra level of conditionals
- Converted the xyz coordinates from image to world coordinates
  - Using the spacing and transformation matrix extracted from the MHD file
- Calculated confidence values for the predictions
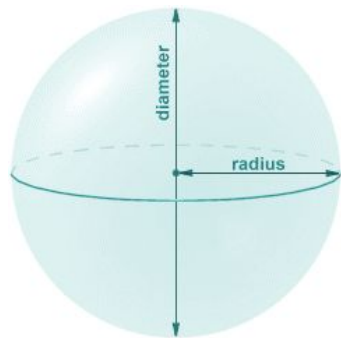
Evaluation

- Sensitivity at each agreement level:

  $S = TPs / (TPs + FNs)$

  ```
  ⮑  Agreement Level:  1  ---  Sensitivity:  47.0 %
     Agreement Level:  2  ---  Sensitivity:  71.0 %
     Agreement Level:  3  ---  Sensitivity:  80.0 %
  ```

- Overall sensitivity:

  $Smean = TPsSum / (TPsSum + FNsSum)$

  ```
  ⮑  Overall sensitivity:  54.0 %
  ```

- Overall accuracy:

  $A = (TPsSum + TNsSum) / (Ps + Ns)$

  ```
  ⮑  Overall accuracy:  42.0 %
  ```

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