
Machine Learning Final Project: Medical Image Detection

MLTAs
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Outline

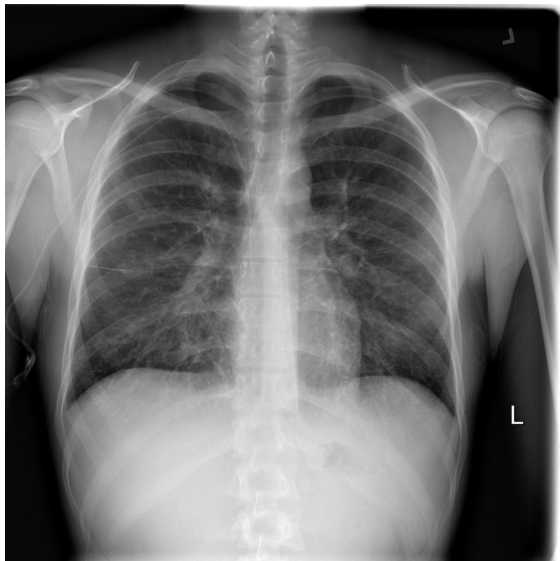
- Task Description - Medical Image Detection
- Data Format
- Kaggle
- Requirements
- FAQ

Outline

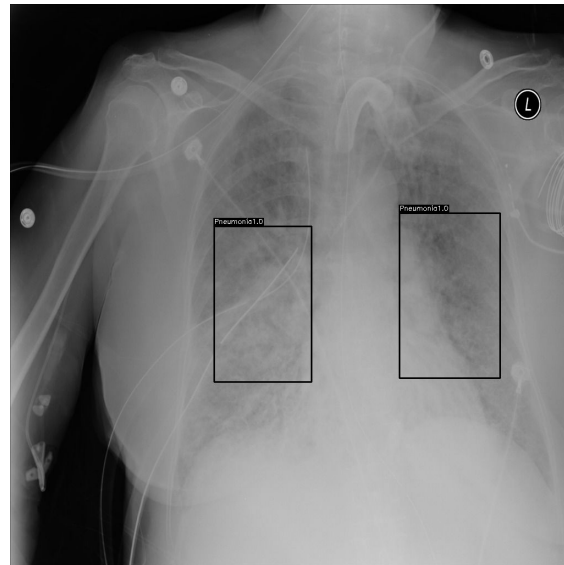
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Task Description

- Lung disease detection



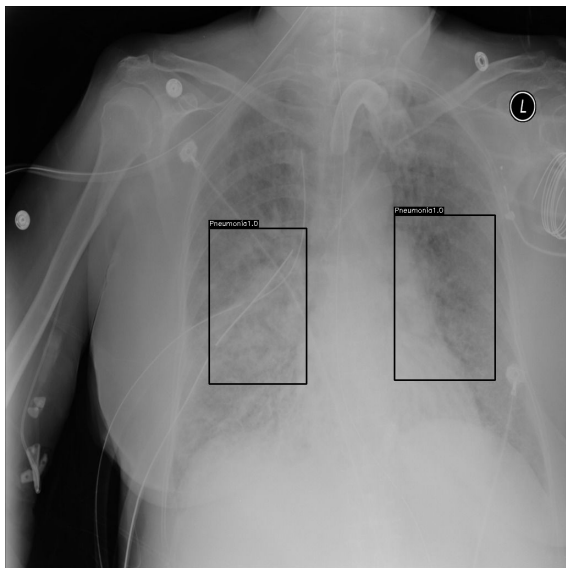
Normal



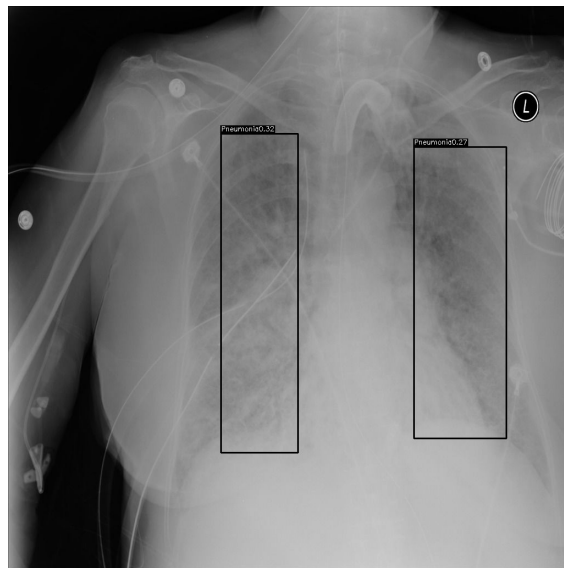
Diseased

Task Description

- Lung disease detection



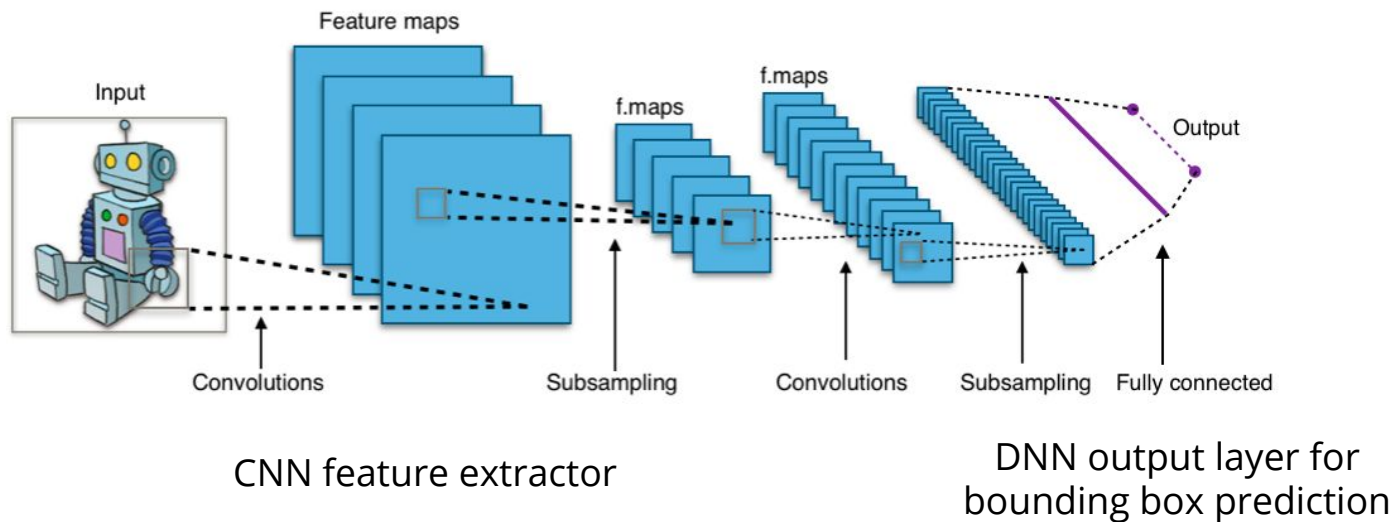
Ground truth



Predicted

Task Description

- How to?



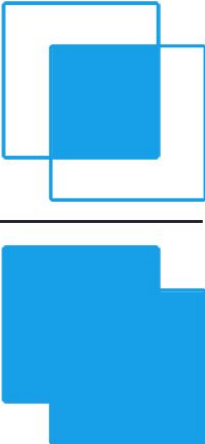
- Hint: pretrained CNN may help!!

Task Description

- Procedure
 - Resize pictures to the same size
 - Normalize the ground truth bbox with respect to the width/height of each picture
 - Train the network
 - Predict normalized bbox and un-normalize it
- Loss
 - Binary classification: normal/diseased
 - Position of the bbox

Task Description: Evaluation Metrics

- Intersection over union score
 - A metrics for image segmentation
 - Treat the detection problem as a segmentation problem by simply labeling the pixels within the bbox as 1, out of the bbox as 0

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$


Task Description: You may be interested

- YOLO

- https://medium.com/@jonathan_hui/real-time-object-detection-with-yolo-yolov2-28b1b93e2088
- <https://github.com/xiongzihua/pytorch-YOLO-v1>
- <https://github.com/vietnguyen91/Yolo-v2-pytorch>
- <https://github.com/ayooashkathuria/pytorch-yolo-v3>

Task Description: You may be interested

- RCNN
 - <https://towardsdatascience.com/r-cnn-fast-r-cnn-faster-r-cnn-yolo-object-detection-algorithms-36d53571365e>
 - <https://github.com/multimodallearning/pytorch-mask-rcnn>
 - <https://github.com/jwyang/faster-rcnn.pytorch>
- RetinaNet
 - <https://towardsdatascience.com/review-retinanet-focal-loss-object-detection-38fba6afabe4>
 - <https://github.com/yhenon/pytorch-retinanet>
 - <https://github.com/kuangliu/pytorch-retinanet>

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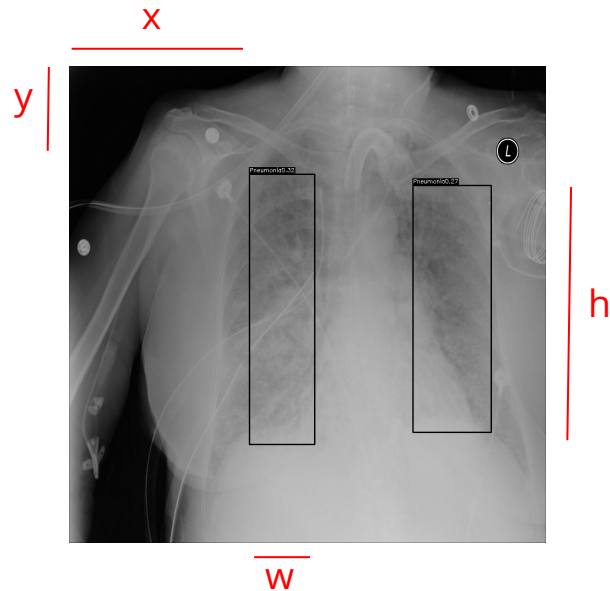
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Data Format

- File layout
 - Data/ --- train_labels.csv
 - | --train_images/
 - | --test_images/
- Link: <https://www.kaggle.com/t/19d6f65872cd4f5498244b822cebae1f>
- Dataset credit to <https://www.kaggle.com/c/rsna-pneumonia-detection-challenge/overview>

Data Format

- Train_labels.csv
 - Each line stand for one bbox, instead of one picture!!!
 - **PatientId**: filename for the picture
 - **x, y**: the up-left corner of the bbox
 - **width, height**: the width and height of the bbox, measured in pixels
 - **Target**: 1 for diseased, 0 for healthy



Data Format

- Train_labels.csv

```
patientId,x,y,width,height,Target
train-00000.png,,,,,0
train-00001.png,,,,,0
train-00002.png,316.0,318.0,170.0,478.0,1
train-00002.png,660.0,375.0,146.0,402.0,1
train-00003.png,570.0,282.0,269.0,409.0,1
train-00003.png,83.0,227.0,296.0,438.0,1
train-00004.png,552.0,164.0,376.0,676.0,1
train-00004.png,66.0,160.0,373.0,608.0,1
train-00005.png,,,,,0
```

healthy, thus no bbox

multiple bboxes for
train-00003.png

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Kaggle

- Link: <https://www.kaggle.com/t/19d6f65872cd4f5498244b822cebae1f>
- Max daily submissions: 10
- Scoring based on private dataset
- Kaggle score * 0.7 for wrong name

Kaggle

- Submission format: run-length encoding for pixel-wise segmentation masks

```
patientId,EncodedPixels
test-00000.png,0 0
test-00001.png,547526 96 548550 96 549574 96 550598 96
766 96 558790 96 559814 96 560838 96 561862 96 562886 96
70054 96 571078 96 572102 96 573126 96 574150 96 575174
582342 96 583366 96 584390 96 585414 96 586438 96 587462
96 594630 96 595654 96 596678 96 597702 96 598726 96 599750
4 96 606918 96 607942 96 608966 96 609990 96 611014 96
test-00002.png,0 0
```

Kaggle

- Label the pixels in the bboxes as 1, others as 0
- Run-length encoding of the 1-pixels
 - The competition format requires a space delimited list of pairs
 - For example, '1 3 10 5' implies pixels 1,2,3,10,11,12,13,14 are to be included in the mask
 - The metric checks that the pairs are sorted, positive, and the decoded pixel values are not duplicated
 - The pixels are numbered from left to right, then top to bottom(e.g.1 is pixel (1,1), 2 is pixel (1,2), etc.)
- Don't worry, TA provides the code to transform the train_labels.csv format into the kaggle submission format!

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Requirements

- Any method is allowed, **excluding...**
- Use your classmate's code
- Use the labels of the test data directly or indirectly. (Do not try to find them.)
- Train your model on any other dataset (but pretrained CNN is allowed)
- Pretrain your CNN on dataset other than NIH-Chest X-ray dataset and ImageNet dataset
- Submit prediction with more than one Kaggle account
- Give/get model prediction to/from others
- Give/get trained model to/from others
- Publish your code before deadline

Outline

- Task Description - Malicious Comments Identification
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FAQ

- 若有其他問題，請寄信至助教信箱，**請勿直接私訊助教**。
- 有問題建議可以在 FB Group 裡面留言發問，可能很多人都有一樣的問題
- 不足之處請參照deepQ提供的投影片，關於kaggle以及競賽方面規定若有衝突以deepQ的投影片為主
- 助教信箱: ntumlta2019@gmail.com
- Useful Website: [link](#)