Deep Learning Project Presentaion on CS 732

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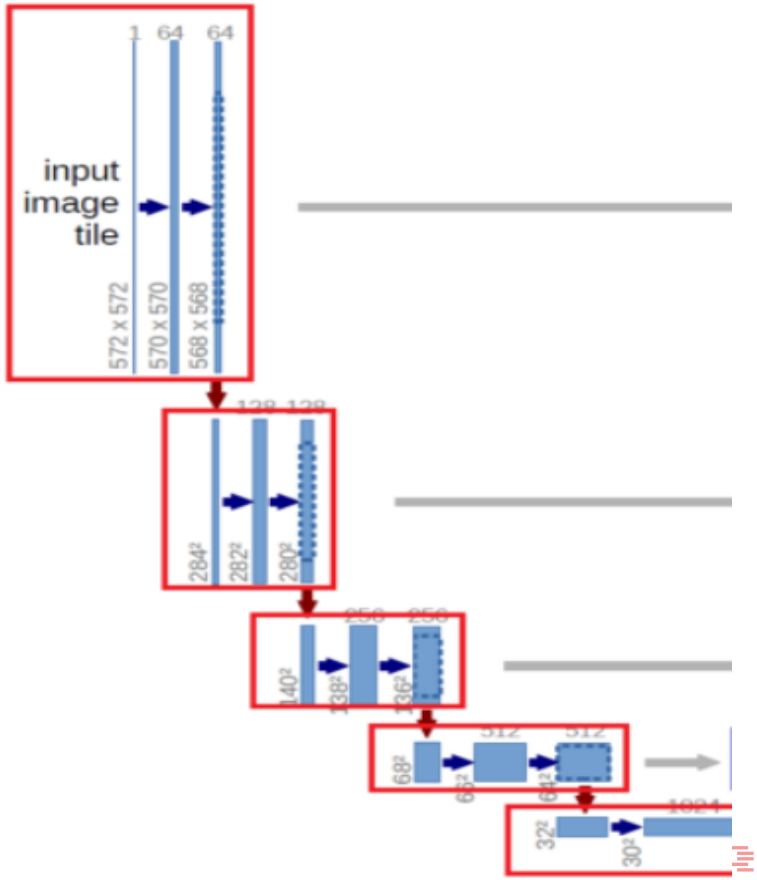
Introduction

- Deep Learning Architecture:
  Unet (for segmentation)
  CheXnet (for detection and classification).
- Data set:
  Ultrasound image of the neck (from Kaggle) for Unet
  ChestXray-14(from NIH) for Chexnet
- Result

1. Unet (Reproduced)

Layers of left side for downsampling:

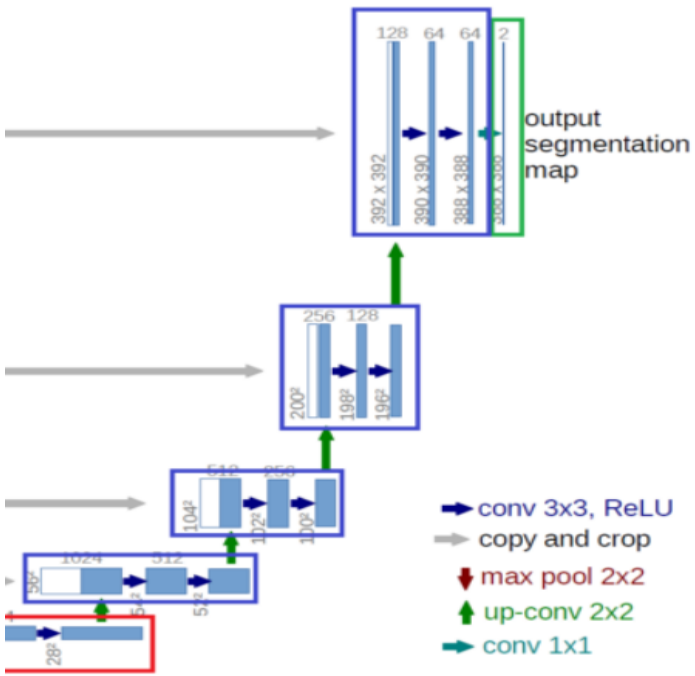
- l11=conv(3,1,3)
  l12=conv(3,3,3)
  l13=conv(3,3,3)
- l21=conv(3,3,6)
  l22=conv(3,6,6)
  l23=conv(3,6,6)
- l31=conv(3,6,12)
  l32=conv(3,12,12)
  l33=conv(3,12,12)
- l41=conv(3,12,24)
  l42=conv(3,24,24)
  l43=conv(3,24,24)
- l51=conv(3,24,48)
  l52=conv(3,48,48)
  l53=conv(3,48,24)



1. Unet (Reproduced)

Layers of right side for upsampling:

- r11=conv(3,24,48)
  r12=conv(3,24,24),(left l42)
  r13=conv(3,24,12)
- r21=conv(3,12,24)
  r22=conv(3,24,24),(left l32)
  r23=conv(3,12,6)
- r31=conv(3,6,12)
  r32=conv(3,6,6),(left l22)
  r33=conv(3,6,3)
- r41=conv(3,3,6)
  r42=conv(3,3,3),(left l12)
  r43=conv(3,3,3)
- finalOutput=conv(3,3,1)



2. Implementation

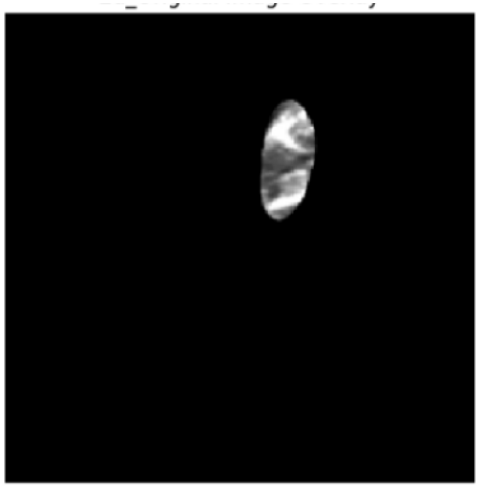
- This is a 2D CNN implementation
- Smaller feature map size: 1,3,6,12,24,48.
  Adv: more quickly to get output;
  Limitation: accuracy
- Train model using default dice loss, but only 5 epoch

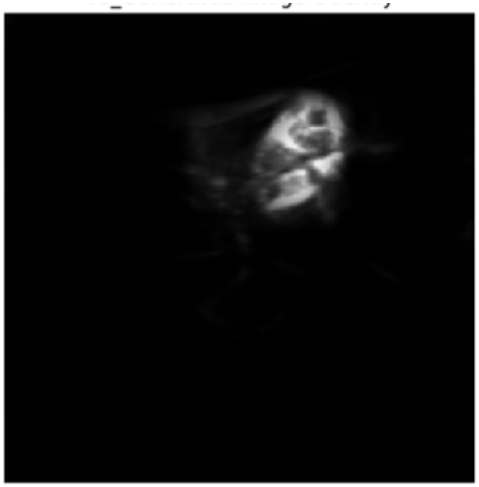
3. data set

- Original set: utralsound of the neck, from kaggle.com
  Train Set: 5,653 images from 47 patients
- What I use: 200 for training, 100 for testing

4. result

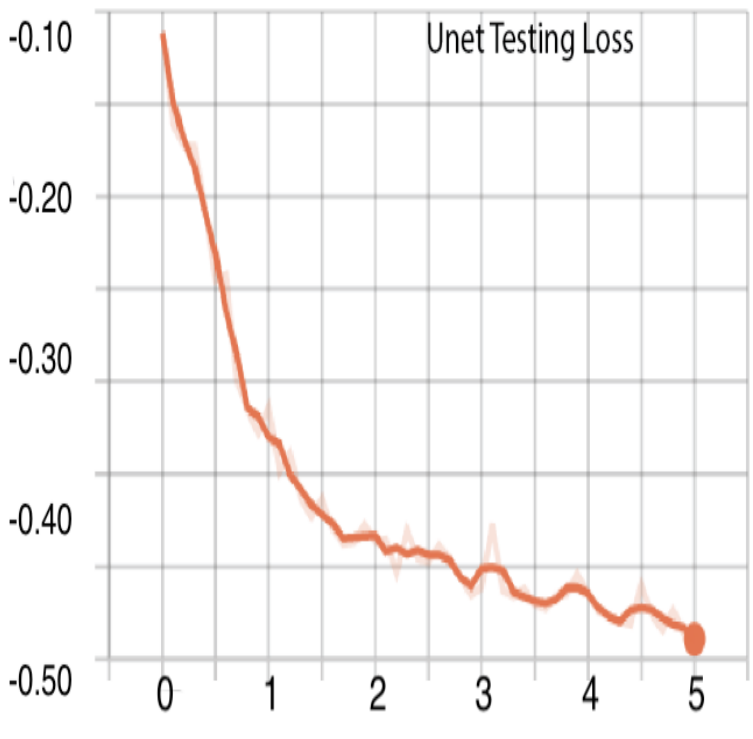
- Compared with ground truth binary mask, the network seem to correctly segment the area around it





4. result


Unet Training Loss
-0.10
-0.20
-0.30
-0.40
-0.50
0
1
2
3
4
5


Unet Testing Loss
-0.10
-0.20
-0.30
-0.40
-0.50
0
1
2
3
4
5

5. Future work

- 1. More data.
- 2. Have implemented Unet3D, still waiting for setting environment on my gup-station (continue on summer).

1.ChexNet Network

- Based on original paper: 121 layers DesnseNetï$\frac{1}{4}$ default model by keras
- With the loss function: the sum of unweighted binary cross entropy losses

$$L(X, y) = \sum_{c=1}^{14} [-y_c \log p(Y_c = 1|X) - (1 - y_c) \log p(Y_c = 0|X)]$$

2. some initial value

- 1. pretrained model weights file is from DenseNet-Keras. epoch=100, batch size=32, learning rate= .001
- 2. Add 50% horizaontal flip augmentation

3. Data set : Chest X-ray 14

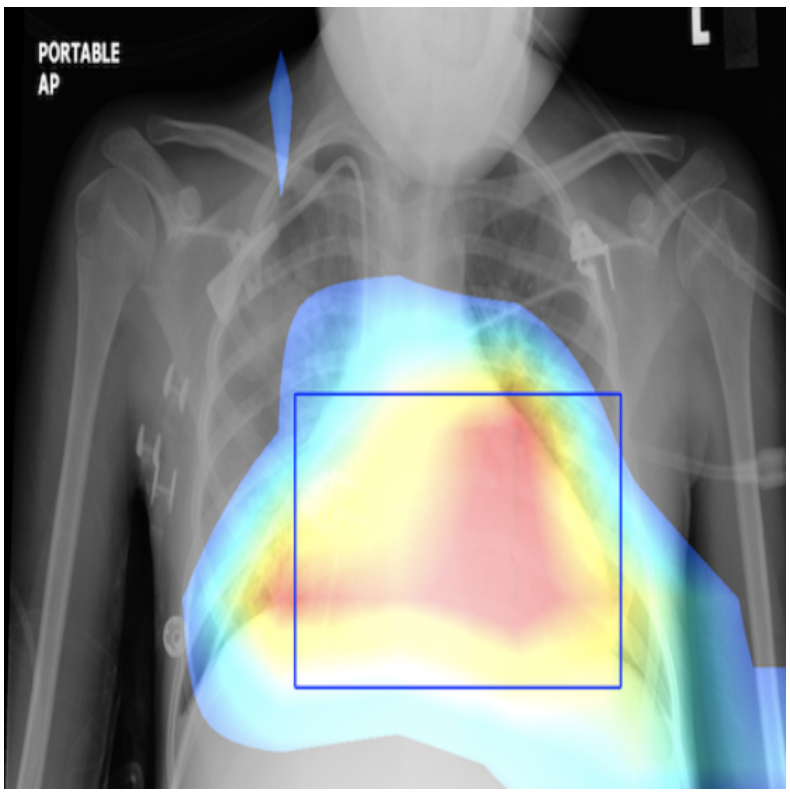
- 1. ChestX-ray14 dataset released by Wang et al. (2017) which contains 112,120 frontal-view X-ray images of 30,805 unique patients. // From NIH dropbox
- 2. 14 different thoracic pathology have been labeled
- 3. .csv files of default spilit can be download on github.com/brucechou1983/CheXNet-Keras/tree/master/data/defaultsplit.

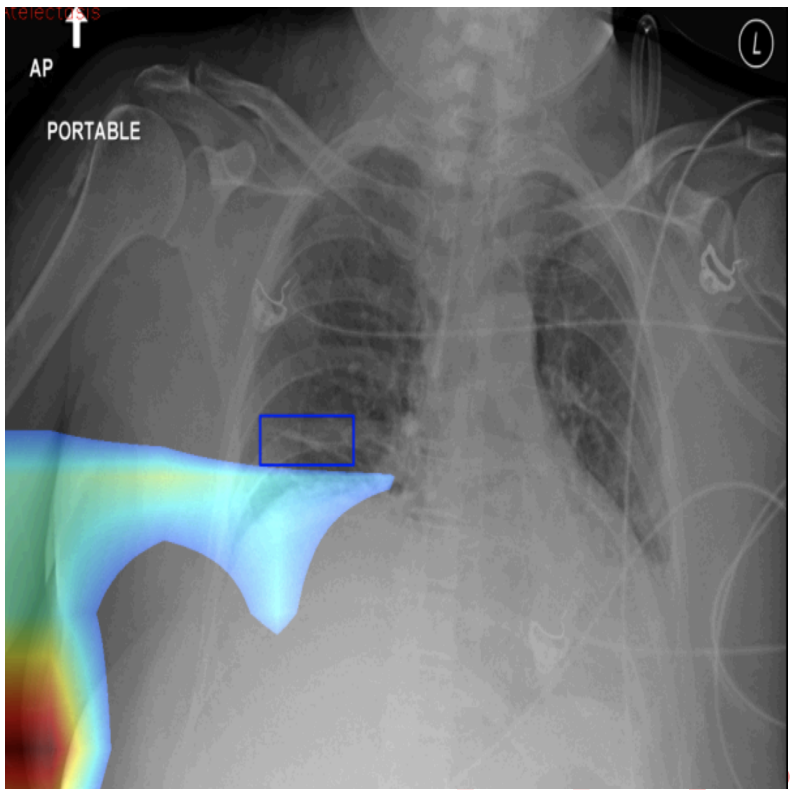
4 Experiments

- Randomly pick up the small zise dataset
  training (40 images),
  validation (20 images),
  test (20 images)
- Change epoch = 6(init epoch take too long)
- Downscale the images to 96*96(224 is too large for my gpu)

4. result

some can get similar bounding box(left one), but some not(right one)





5.future work

- 1.since no soucrcode can be found, I will try to using initial weights and input next phases to see if there's still generate wrong boundary box
- 2.Train and test on the original data set(ChestXray-14). Due to the work station I used need to reset environment these days, to be continued
- 3.No comparison and AUROC/Loss curve analysis

References

- 1. https://lukeoakdenrayner.wordpress.com/2017/12/18/the-chestxray14-dataset-problems/
- 2. https://github.com/zhixuhao/unet
- 3. https://medium.com/coinmonks/learn-how-to-train-u-net-on-your-dataset-8e3f89fbd623
- 4. https://stanfordmlgroup.github.io/
- 5. https://medium.com/@BalintBotz/a-few-thoughts-about-chexnet-and-the-way-human-performance-should-and-should-not-be-measured-68031dca7bf

Thank You