

# AlexNet CNN Lung Detection

- Brief: Directory involve *CT Lung Nodule Detection Scripts*, testing accuracy of LUNG NODULE DETECTION using AlexNet convolutional neural network.
- Requirements:
  - Python3.6,Python2.7(execute caffe pyscript)
  - caffe-windows
  - Win10

## 1. Preparation

### i. Data collection

- download LIDC-IDRI Dataset from: <https://wiki.cancerimagingarchive.net/display/Public/LIDC-IDRI#dbf22419dbb1415080c3adfd39cdc651>
- place the dataset in directory `./LIDC-IDRI`

Data Type	Download all or Query/Filter	
Images (DICOM, 125GB)*	<a href="#">Download</a>	<a href="#">Search</a>
DICOM Metadata Digest (CSV)	<a href="#">Download</a>	
Radiologist Annotations/Segmentations (XML format) (Note: see <a href="#">pylidc</a> for assistance using these data)	<a href="#">Download</a>	
Nodule Size List (web)	<a href="#">Search</a>	
Nodule Counts by Patient (XLS)	<a href="#">Download</a>	
Patient Diagnoses (XLS)	<a href="#">Download</a>	

### ii. Python configuration

- make sure python 3.6 is available
- packages : `pip install pydicom opencv-python sci-kit-image`

### iii. Caffe installation

- git clone to `.\microsoft-caffe\caffe` from : <https://github.com/happynear/caffe-windows>

- install and compile Caffe on windows, following steps from `caffe-windows` *Windows Setup* carefully <https://github.com/happynear/caffe-windows/blob/ms/README.md> (This step will take a long time)
- make sure the files in this project under `. \microsoft-caffe\caffe` still exist after install Caffe successfully (**important**)

## 2. Generate Training Set

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### i. Before images preprocess

- generate a pickle pointer-file with python3.7: `python . \pyprocessing\loadpath.py`
- make sure the existence of `\TCIA_METADATA\tci-a-diagnosis-data-2012-04-20.csv`

### ii. Parenchymal templates generation&candidate nodules cropping

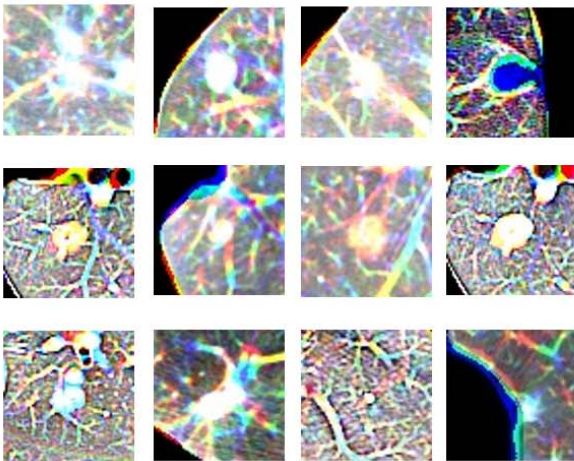
- `python . \pyprocessing\start.py`

(This process will take a long time)

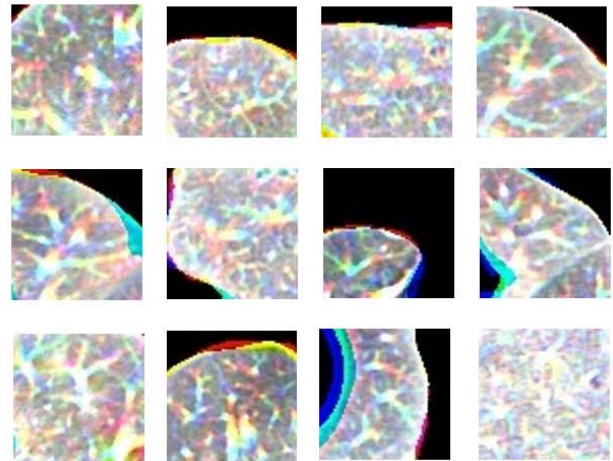
### iii. Results

- candidate lung nodules and healthy tissues will categorized under `. \TrainingSet`
- process files & images will saved under `. \pyprocessing\imageBasket\LPT`

#### Nodules



#### Healthy Tissue



## 3. AlexNet CNN Training

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### i. Generate category texts

- execute `python . \pyprocessing\label_generate.py`  
(`test.txt` `train.txt` `val.txt` will be created for Caffe training)
- copy images training set to caffe : `xcopy . \TrainingSet . \microsoft-caffe\caffe\data\nodulesdetect /e /q`

- copy 3 text files `test.txt`, `train.txt`, `val.txt` under `.\pyprocessing` to `.\microsoft-caffe\caffe\data\noduledetect\`

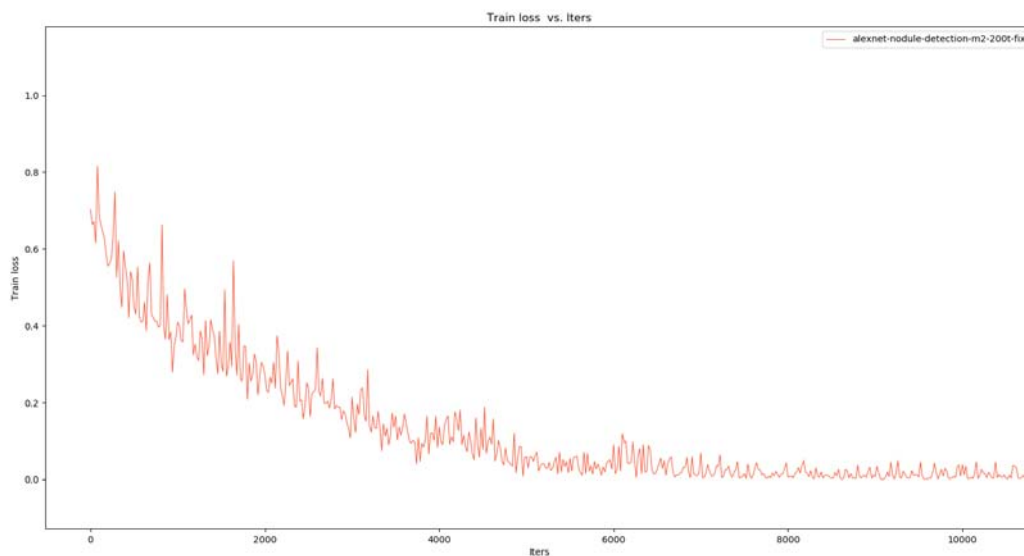
## ii. Generate Lmdb & mean files (Caffe)

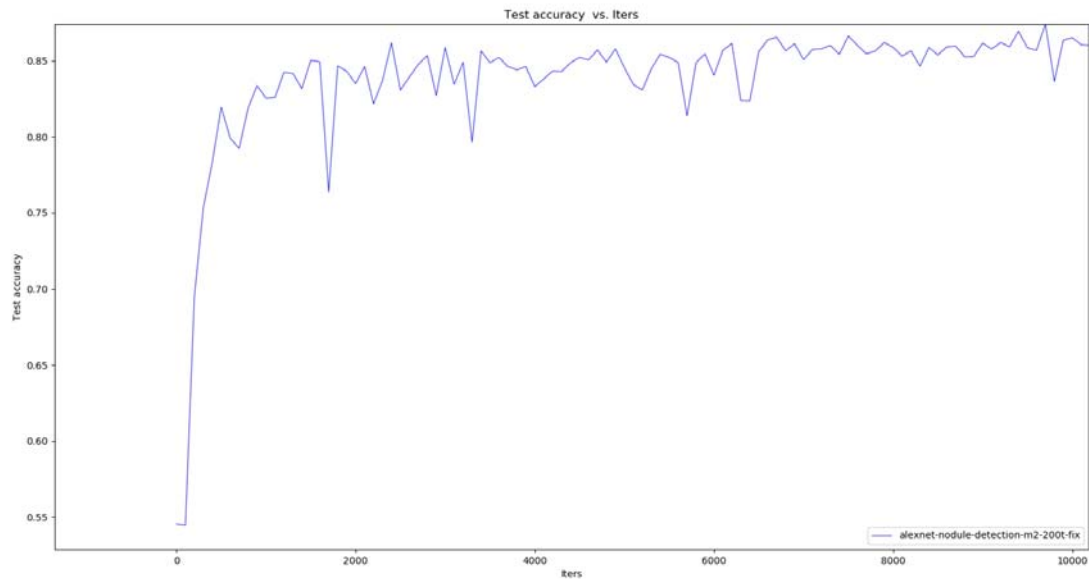
- go to the directory of Caffe, such as `cd .\microsoft-caffe\caffe\`
- Lmdb validation set : `Bui I d\x64\Release\convert_imageset.exe --shuffle --resize_height=64 --resize_width=64 data\noduledetect\ data\noduledetect\val.txt data\noduledetect\val_lmdb`
- Lmdb training set : `Bui I d\x64\Release\convert_imageset.exe --shuffle --resize_height=64 --resize_width=64 data\noduledetect\ data\noduledetect\train.txt data\noduledetect\train_lmdb`
- mean binary file : `Bui I d\x64\Release\compute_image_mean.exe data\noduledetect\train_lmdb data\noduledetect\mean.binaryproto`

## iii. Training

- adjust model parameters under `.\microsoft-caffe\caffe\model\s\noduledetectmt2` (**important**)
- start training : `Bui I d\x64\Release\caffe.exe train --solver=model\s\noduledetectmt2\solver.prototxt >log\alexnet_noduledetecti on_round1.log 2>&1`

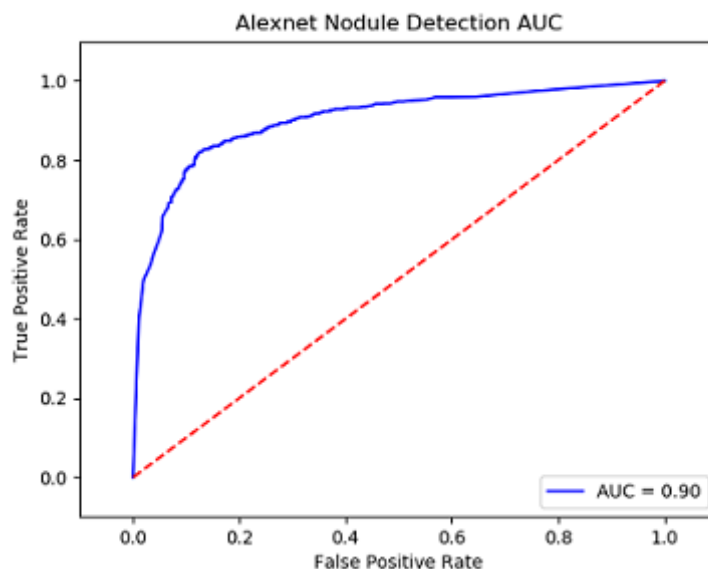
*(This step will take a long time)*





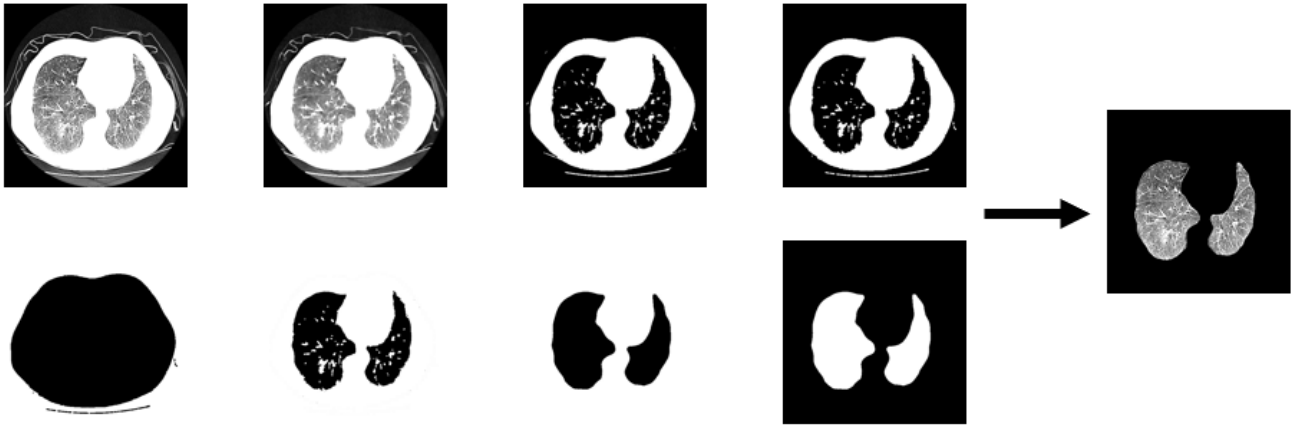
## 4. Testing

- make sure the existence of `.\microsoft-caffe\caffe\data\noduledetect\labels.txt`
- set using of python 2.7
- start testing : Under directory `.\microsoft-caffe\caffe\` and execute `python testresult.py`
- check result under `.\microsoft-caffe\caffe\data\noduledetect\test_re.npy`
- analysis : function `drawroc()` in `testresult.py`



## 5. Other

### i. Process of lung parenchyma segmentation



## ii. RGB 3 channels Stacking

