

How to Use AIS Training Codeset

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github.com/tkshirakawa/AIS_Training_Codeset

Author’s Miniconda* List

*Conda: docs.conda.io/en/latest/miniconda.html

Name	Version	Name	Version	Name	Version	Name	Version
tfflow_select	2.1.0	keras	2.2.4	pip	19.3.1	tensorflow-gpu	1.15.0
absl-py	0.8.1	keras-applications	1.0.8	protobuf	3.11.2	termcolor	1.1.0
astor	0.8.0	keras-base	2.2.4	py-opencv	3.4.2	tornado	6.0.3
blas	1.0	keras-preprocessing	1.1.0	pydot	1.4.1	vc	14.1
ca-certificates	2019.11.27	kiwisolver	1.1.0	pyparsing	2.4.6	vs2015_runtime	14.16.27012
certifi	2019.11.28	libopencv	3.4.2	pyqt	5.9.2	werkzeug	0.16.0
cuda-toolkit	10.0.130	libpng	1.6.37	python	3.7.6	wheel	0.33.6
cuda-nn	7.6.5	libprotobuf	3.11.2	python-dateutil	2.8.1	wincertstore	0.2
cycler	0.10.0	libtiff	4.1.0	pytz	2019.3	wrapt	1.11.2
freetype	2.9.1	markdown	3.1.1	pyyaml	5.2	xz	5.2.4
gast	0.2.2	matplotlib	3.1.1	qt	5.9.7	yaml	0.1.7
google-pasta	0.1.8	mkl	2019.4	scipy	1.3.2	zlib	1.2.11
graphviz	2.38	mkl-service	2.3.0	setuptools	44.0.0	zstd	1.3.7
grpcio	1.16.1	mkl_fft	1.0.15	sip	4.19.8		
h5py	2.8.0	mkl_random	1.1.0	six	1.13.0		
hdf5	1.8.20	numpy	1.18.1	sqlite	3.30.1		
icc_rt	2019.0.0	numpy-base	1.18.1	tensorboard	2.0.0		
icu	58.2	opencv	3.4.2	tensorflow	1.15.0		
intel-openmp	2019.4	openssl	1.1.1d	tensorflow-base	1.15.0		
jpeg	9b	opt_einsum	3.1.0	tensorflow-estimator	1.15.1		

Rules for Dataset

In your dataset folder:

Level	Name Rules
Cases	The folder name must include the word case : e.g. case01, case-XYZ or case_from_XX
Raw image	The folder name must be x . Each image must be named with four digits : e.g. 0001.png, 0016.png or 0003.jpeg, ...
Groundtruth	The folder name must be y . Each image must be named with four digits : e.g. 0001.png, 0016.png or 0003.jpeg, ...



❑ Images

Images must be 200 x 200 pixel, 8-bit grayscale w/o alpha channel.
‘Dataset’ means pairs of raw images and corresponding groundtruth masks.

❑

Dataset structure sample
Here, case01 has L slices,
case02_temp has M slices,
case03 ...

Your_Dataset_Folder

```
case01
  x
    0001.png
    0002.png
    0003.png
    ...
    000L.png
  y
    0001.png
    0002.png
    0003.png
    ...
    000L.png
case02_temp
  x
    0001.png
    ...
    000M.png
  y
    0001.png
    ...
    000M.png
case03
  x
    ...
  y
    ...
```

Data Augmentation

All the codes show helps with ‘-h’ option.

Stretched, twisted, flipped, rotated and/or cropped images will be recognized as different images (= new datasets) by neural network during its training. CLAHE filter is applied to change image contrast as well.

Code	Description
GenerateDeformedImageFromDir.py GenerateDeformedImage.py	CLAHE filter Vertical and horizontal deformation Trapezoid deformation Parallelogram deformation Clockwise and anti-clockwise rotation *See the code for details.

CSV Lists of Training and Validation Datasets

Make a csv file of all the datasets at first, then separate the list into training and validation list, which keeps locations of raw images and groundtruth masks. Otherwise, you can put both training dataset and validation dataset in different locations, then make csv files for each dataset separately.

Code	Description
MakeCSVList.py	The code generates a list file in .csv format, ‘x’ column for paths of raw images and ‘y’ column groundtruth masks, from .png or .jpeg files in case folders. *See the code for details.

Convert CSV Lists into HDF5 [optional]

HDF5 (.h5 format) enables high-speed data loading during training.

Code	Description
CreateHDF5.py	The code generates two .h5 files for training dataset and validation dataset from each csv list. *See the code for details.

Training by Keras

Training parameters are defined in Train.py and each neural network model’s code.

Code	Description
Train.py	The code manages a whole training sequence.
Models: CV_net_Synapse.py [not yet] CV_net_2.py CV_net.py Deeplab_v3_plus.py *1 U_net.py *2	Codes for the model, image loading, custom losses, metrics and layers are required for training. <u>Those additional codes will be copied into the working folder for the next conversion step for a Core ML model.</u> *1 github.com/bonlime/keras-deeplab-v3-plus *2 github.com/chuckeye/cardiac-segmentation

Convert Trained Keras Model to Core ML Model

NOTE: The code dose **NOT** run with TensorFlow 2. Use this code in **macOS Terminal.app** with **coremltools** by Apple installed.

coremltools: github.com/apple/coremltools

Code	Description
Keras_to_CoreML.py	The code converts a Keras model (.h5 format) to a Core ML model (.mlmodel format). This converter allows custom objects (custom losses, metrics and layers) used in a Keras model. <u>The additional codes copied in the training step above is required for conversion process.</u> The following custom layers are implemented in A.I.Segmentation plugin. <ul style="list-style-type: none">SynapticTransmissionRegulatorGELUSwishSqaureSQRT *See the code for details.