Model building: Brain MRI Segmentation

In our basic building stage we will use **U-Net** model for the semantic segmentation for the medical pre-ops.

Here we basically focus on U-Net only to use different different variation of U-Net for example - Inner skip connects, ect

as instead of creating architecture for all and train from scratch which is too much time consuming

we will use instead of **Keras** backend.

For the contest - transfer learning (i.e.) a concept where previously trained model is reused to solve the similar type of problem. Here we introduce to **Keras** backend for U-Net model and use it for our problem.

so there is little "experimentation" which provides multiple pretrained model with different's variation of U-Net, and we will use one of them for our problem.

these are multiple backbone/encoders and with some models we have trained on ImageNet as follows which we train on:

- 'vgg16', 'vgg19', 'resnet34', 'resnet50',
- 'resnet101', 'resnet152', 'densenet121',
- 'densenet169', 'densenet201',
- 'inceptionv3', 'inceptionresnetv2',
- 'mobilenet', 'mobilenetv2'

apart from using pretrained model, we will also train some model from scratch so that we can compare and do different among them (and ensembling ofcourse)

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1. Dependencies

In [1]:
```
# !pip install -q
!pip install -q -U
!pip install -q segmentation-models
!pip install -q albumentations
!pip install -q opencv-python
!pip install -q -U tensorflow-addons
!pip install -q -U keras
!pip install -q -U keras-tuner
!pip install -q -U imgaug
!pip install -q -U tensorflow-gpu
!pip install -q -U scikit-learn
!pip install -q -U scikit-image
!pip install -q -U pydicom
!pip install -q -U scikit-image[data]

import numpy as np
import pandas as pd
import os
import glob
import shutil
import sys
import random
import warnings
import tqdm
import tqdm.keras
from sklearn.model_selection import train_test_split
from keras.utils.vis_utils import plot_model
from keras.models import *
from keras.layers import *
from keras.optimizers import Nadam
from keras.callbacks import ReduceLROnPlateau,EarlyStopping,ModelCheckpoint
from keras.utils.vis_utils import plot_model

# import pydicom
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import matplotlib.gridspec as gridspec
import seaborn as sns
import PIL
from PIL import Image, ImageOps, ImageStat, ImageEnhance
import cv2
import numpy as np
import tqdm
from tqdm import tqdm,tqdm_notebook
import os.path
import os
import glob
from glob import glob
import shutil
import sys
import random
import warnings
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from matplotlib import cm
import seaborn as sns
```

```
Epoch 1/20
1/1 [==============================] - ETA: 0ms/step - loss: 0.2000 - val_loss: 0.0000 - val_loss_mae:
Epoch 2/20
1/1 [==============================] - ETA: 0ms/step - loss: 0.2000 - val_loss: 0.0000 - val_loss_mae:
Epoch 3/20
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Epoch 4/20
1/1 [==============================] - ETA: 0ms/step - loss: 0.2000 - val_loss: 0.0000 - val_loss_mae:
Epoch 5/20
1/1 [==============================] - ETA: 0ms/step - loss: 0.2000 - val_loss: 0.0000 - val_loss_mae:
Epoch 6/20
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Epoch 7/20
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Epoch 9/20
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Epoch 11/20
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Epoch 12/20
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Epoch 13/20
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Epoch 20/20
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In [ ]:
```
history = model.fit(train_dataset, validation_data=(val_dataset[0],val_dataset[1]), epochs=20, validation_data=test_dataset[0], vali
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Epoch 20/20
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```

In [ ]:
```
model.save_weights("model_save_2.h5")
```

In [ ]:
```
history = model.fit(train_dataset, validation_data=(val_dataset[0],val_dataset[1]), epochs=20, validation_data=test_dataset[0], vali
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```

hyperparameter tuning

For hyperparameter tuning we have choosen 100 image only as that can better analyze which loss, mae, optimizer is better

In [ ]:
```
!pip install keras-tuner kaggle import keras_tuner

!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/
!ls ~/.kaggle
!chmod 600 /root/.kaggle/kaggle.json
!kaggle competitions download -c 'dogs-vs-cats' -p /content/ -unzip
!unzip -q -o train.zip extract_dogs_cats.zip
!find train -type f -delete

keras.utils.image_dataset_from_directory(
    'train',
    labels='inferred',
    label_mode='binary',
    image_size=(150,150),
    batch_size=100,
    shuffle=True,
    seed=None,
    validation_split=None,
    subset=None,
    interpolation='bilinear',
    follow_links=False,
    crop_to_aspect_ratio=False
)
```

```
Collecting keras-tuner
  Downloading keras_tuner-1.4.7-py3-none-any.whl (19 kB)
Requirement already satisfied: keras-core in /usr/local/lib/python3.10/dist-packages (0.1.7)
Requirement already satisfied: keras-nlp in /usr/local/lib/python3.10/dist-packages (0.6.4)
Requirement already satisfied: keras-cv in /usr/local/lib/python3.10/dist-packages (0.6.4)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (23.2)
Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (2.31.0)
Requirement already satisfied: kaggle in /usr/local/lib/python3.10/dist-packages (1.5.16)
Requirement already satisfied: tensorflow-cpu-aws>=2.16.1rc0 in /usr/local/lib/python3.10/dist-packages (2.16.1rc0)
Requirement already satisfied: absl-py in /usr/local/lib/python3.10/dist-packages (1.4.0)
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Requirement already satisfied: namex in /usr/local/lib/python3.10/dist-packages (0.0.8)
Requirement already satisfied: optree in /usr/local/lib/python3.10/dist-packages (0.11.0)
Requirement already satisfied: dm-tree in /usr/local/lib/python3.10/dist-packages (0.1.8)
Requirement already satisfied: keras-hub==0.6.4 in /usr/local/lib/python3.10/dist-packages (0.6.4)
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Requirement already satisfied: tensorflow-text==2.16.1 in /usr/local/lib/python3.10/dist-packages (2.16.1)
Requirement already satisfied: tensorflow-datasets==4.9.4 in /usr/local/lib/python3.10/dist-packages (4.9.4)
Requirement already satisfied: tensorflow-metadata==1.14.0 in /usr/local/lib/python3.10/dist-packages (1.14.0)
Requirement already satisfied: protobuf==3.20.3 in /usr/local/lib/python3.10/dist-packages (3.20.3)
Requirement already satisfied: tensorflow==2.16.1 in /usr/local/lib/python3.10/dist-packages (2.16.1)
Requirement already satisfied: keras==3.2.1 in /usr/local/lib/python3.10/dist-packages (3.2.1)
Requirement already satisfied: tensorboard==2.16.2 in /usr/local/lib/python3.10/dist-packages (2.16.2)
Requirement already satisfied: tensorflow-hub==0.16.1 in /usr/local/lib/python3.10/dist-packages (0.16.1)
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Requirement already satisfied: nvidia-cufft-cu12==11.3.3.41 in /usr/local/lib/python3.10/dist-packages (11.3.3.41)
Requirement already satisfied: nvidia-curand-cu12==10.3.9.55 in /usr/local/lib/python3.10/dist-packages (10.3.9.55)
Requirement already satisfied: nvidia-cusolver-cu12==11.7.2.55 in /usr/local/lib/python3.10/dist-packages (11.7.2.55)
Requirement already satisfied: nvidia-cusparse-cu12==12.5.7.53 in /usr/local/lib/python3.10/dist-packages (12.5.7.53)
Requirement already satisfied: nvidia-nccl-cu12==2.23.4 in /usr/local/lib/python3.10/dist-packages (2.23.4)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.8.61 in /usr/local/lib/python3.10/dist-packages (12.8.61)
Requirement already satisfied: nvidia-nvtx-cu12==12.8.55 in /usr/local/lib/python3.10/dist-packages (12.8.55)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.9.41 in /usr/local/lib/python3.10/dist-packages (12.9.41)
Requirement already satisfied: nvidia-cublas-cu12==12.9.1.4 in /usr/local/lib/python3.10/dist-packages (12.9.1.4)
Requirement already satisfied: nvidia-cuda-cupti-cu12==12.9.79 in /usr/local/lib/python3.10/dist-packages (12.9.79)
Requirement already satisfied: nvidia-cuda-nvcc-cu12==12.9.41 in /usr/local/lib/python3.10/dist-packages (12.9.41)
Requirement already satisfied: nvidia-cuda-nvrtc-cu12==12.9.41 in /usr/local/lib/python3.10/dist-packages (12.9.41)
Requirement already satisfied: nvidia-cuda-runtime-cu12==12.9.37 in /usr/local/lib/python3.10/dist-packages (12.9.37)
Requirement already satisfied: nvidia-cudnn-cu12==9.10.2.21 in /usr/local/lib/python3.10/dist-packages (9.10.2.21)
Requirement already satisfied: nvidia-cufft-cu12==11.4.1.4 in /usr/local/lib/python3.10/dist-packages (11.4.1.4)
Requirement already satisfied: nvidia-curand-cu12==10.3.10.19 in /usr/local/lib/python3.10/dist-packages (10.3.10.19)
Requirement already satisfied: nvidia-cusolver-cu12==11.7.5.82 in /usr/local/lib/python3.10/dist-packages (11.7.5.82)
Requirement already satisfied: nvidia-cusparse-cu12==12.5.8.93 in /usr/local/lib/python3.10/dist-packages (12.5.8.93)
Requirement already satisfied: nvidia-nccl-cu12==2.27.3 in /usr/local/lib/python3.10/dist-packages (2.27.3)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.9.86 in /usr/local/lib/python3.10/dist-packages (12.9.86)
Requirement already satisfied: nvidia-nvtx-cu12==12.9.79 in /usr/local/lib/python3.10/dist-packages (12.9.79)
Requirement already satisfied: nvidia-nvjitlink-cu12==13.0.39 in /usr/local/lib/python3.10/dist-packages (13.0.39)
Requirement already satisfied: nvidia-cublas-cu12==13.0.0.19 in /usr/local/lib/python3.10/dist-packages (13.0.0.19)
Requirement already satisfied: nvidia-cuda-cupti-cu12==13.0.48 in /usr/local/lib/python3.10/dist-packages (13.0.48)
Requirement already satisfied: nvidia-cuda-nvcc-cu12==13.0.48 in /usr/local/lib/python3.10/dist-packages (13.0.48)
Requirement already satisfied: nvidia-cuda-nvrtc-cu12==13.0.48 in /usr/local/lib/python3.10/dist-packages (13.0.48)
Requirement already satisfied: nvidia-cuda-runtime-cu12==13.0.48 in /usr/local/lib/python3.10/dist-packages (13.0.48)
Requirement already satisfied: nvidia-cudnn-cu12==9.12.0.46 in /usr/local/lib/python3.10/dist-packages (9.12.0.46)
Requirement already satisfied: nvidia-cufft-cu12==11.0.2.54 in /usr/local/lib/python3.10/dist-packages (11.0.2.54)
Requirement already satisfied: nvidia-curand-cu12==10.3.7.77 in /usr/local/lib/python3.10/dist-packages (10.3.7.77)
Requirement already satisfied: nvidia-cusolver-cu12==11.4.5.107 in /usr/local/lib/python3.10/dist-packages (11.4.5.107)
Requirement already satisfied: nvidia-cusparse-cu12==12.5.4.2 in /usr/local/lib/python3.10/dist-packages (12.5.4.2)
Requirement already satisfied: nvidia-nccl-cu12==2.27.7 in /usr/local/lib/python3.10/dist-packages (2.27.7)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.8.93 in /usr/local/lib/python3.10/dist-packages (12.8.93)
Requirement already satisfied: nvidia-nvtx-cu12==12.8.90 in /usr/local/lib/python3.10/dist-packages (12.8.90)
Requirement already satisfied: nvidia-nvjitlink-cu12==12.9.79 in /usr/local/lib/python3.10/dist-packages (12.9.79
```

In [ ]:
```
# A tree trained on original tra_score
clf.fit(X_train, y_train)
clf.score(X_train, y_train)
clf.score(X_test, y_test)
clf.predict(X_train[0:1])
clf.predict_proba(X_train[0:1])
clf.predict(X_test[0:1])
clf.predict_proba(X_test[0:1])
clf.n_features_in_
clf.feature_names_in_
clf.max_features_
clf.classes_
clf.n_classes_
clf.n_outputs_
clf.tree_.max_depth
clf.tree_.node_count
clf.tree_.capacity
clf.tree_.n_leaves
clf.tree_.n_features
clf.tree_.n_classes[0]
clf.tree_.n_outputs
clf.tree_.max_depth
clf.tree_.impurity[:10]
clf.tree_.threshold[:10]
clf.tree_.children_left[:10]
clf.tree_.children_right[:10]
```

Out[ ]:
```
1.0
0.7
array([1])
array([[0.0, 1.0]])
array([1])
array([[0.0, 1.0]])
20
['tra_score']
None
2
1
1
3
5
2
3
[0.2499 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999]
[0.7499 0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    ]
[ 1 -1 -1 -1 -1 -1 -1 -1 -1 -1]
[ 2 -1 -1 -1 -1 -1 -1 -1 -1 -1]
```

In [ ]:
```
# Training Accuracy
clf.score(X_train, y_train)
```

Out[ ]:
```
1.0
```

Training Tensorflow-2 on gpu RAM 12G 8Gb, started 2:00:00 Ago (Sep 7th) 2021 PT to 6:21 Pc.

Lifetime zero-drawup, reversal report

1.4. utf8/utf8/utf8_cond

In [ ]:
```
# Loading and make utf8 Sentence - reversal
!wget -c -nc data/utf8/utf8/utf8_reversal_weights/*reversal*.*;
!mkdir -p data/utf8/utf8/utf8_reversal_weights; mv -nv *reversal*.* data/utf8/utf8/utf8_reversal_weights
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet121_weights_tf_dim_ordering_tf_kernels_notop.h5
```
8192000/8192000 [==============================] - 0s 0us/step
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/
```

In [ ]:
```
# A tree trained on original tra_score
clf.fit(X_train, y_train)
clf.score(X_train, y_train)
clf.score(X_test, y_test)
clf.predict(X_train[0:1])
clf.predict_proba(X_train[0:1])
clf.predict(X_test[0:1])
clf.predict_proba(X_test[0:1])
clf.n_features_in_
clf.feature_names_in_
clf.max_features_
clf.classes_
clf.n_classes_
clf.n_outputs_
clf.tree_.max_depth
clf.tree_.node_count
clf.tree_.capacity
clf.tree_.n_leaves
clf.tree_.n_features
clf.tree_.n_classes[0]
clf.tree_.n_outputs
clf.tree_.max_depth
clf.tree_.impurity[:10]
clf.tree_.threshold[:10]
clf.tree_.children_left[:10]
clf.tree_.children_right[:10]
```

Out[ ]:
```
1.0
0.7
array([1])
array([[0.0, 1.0]])
array([1])
array([[0.0, 1.0]])
20
['tra_score']
None
2
1
1
3
5
2
3
[0.2499 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999]
[0.7499 0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    ]
[ 1 -1 -1 -1 -1 -1 -1 -1 -1 -1]
[ 2 -1 -1 -1 -1 -1 -1 -1 -1 -1]
```


In [ ]:
```
# Training Accuracy
clf.score(X_train, y_train)
```

Out[ ]:
```
1.0
```

Training Tensorflow-2 on gpu RAM 12G 8Gb, started 2:00:00 Ago (Sep 7th) 2021 PT to 6:21 Pc.

Lifetime zero-drawup, reversal report

1.4. utf8/utf8/utf8_cond

In [ ]:
```
# Loading and make utf8 Sentence - reversal
!wget -c -nc data/utf8/utf8/utf8_reversal_weights/*reversal*.*;
!mkdir -p data/utf8/utf8/utf8_reversal_weights; mv -nv *reversal*.* data/utf8/utf8/utf8_reversal_weights
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet121_weights_tf_dim_ordering_tf_kernels_notop.h5
```
8192000/8192000 [==============================] - 0s 0us/step
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/checkpoint_weights_1.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_1/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/checkpoint_weights_2.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_2/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/checkpoint_weights_3.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_3/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/checkpoint_weights_4.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_4/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/checkpoint_weights_5.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_5/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/checkpoint_weights_6.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_6/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/checkpoint_weights_7.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_7/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/checkpoint_weights_8.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_8/
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/checkpoint_weights_9.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_9/
```

In [ ]:
```
# A tree trained on original tra_score
clf.fit(X_train, y_train)
clf.score(X_train, y_train)
clf.score(X_test, y_test)
clf.predict(X_train[0:1])
clf.predict_proba(X_train[0:1])
clf.predict(X_test[0:1])
clf.predict_proba(X_test[0:1])
clf.n_features_in_
clf.feature_names_in_
clf.max_features_
clf.classes_
clf.n_classes_
clf.n_outputs_
clf.tree_.max_depth
clf.tree_.node_count
clf.tree_.capacity
clf.tree_.n_leaves
clf.tree_.n_features
clf.tree_.n_classes[0]
clf.tree_.n_outputs
clf.tree_.max_depth
clf.tree_.impurity[:10]
clf.tree_.threshold[:10]
clf.tree_.children_left[:10]
clf.tree_.children_right[:10]
```

Out[ ]:
```
1.0
0.7
array([1])
array([[0.0, 1.0]])
array([1])
array([[0.0, 1.0]])
20
['tra_score']
None
2
1
1
3
5
2
3
[0.2499 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999 0.4999]
[0.7499 0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    0.5    ]
[ 1 -1 -1 -1 -1 -1 -1 -1 -1 -1]
[ 2 -1 -1 -1 -1 -1 -1 -1 -1 -1]
```


In [ ]:
```
# Training Accuracy
clf.score(X_train, y_train)
```

Out[ ]:
```
1.0
```

Training Tensorflow-2 on gpu RAM 12G 8Gb, started 2:00:00 Ago (Sep 7th) 2021 PT to 6:21 Pc.

Lifetime zero-drawup, reversal report

1.4. utf8/utf8/utf8_cond

In [ ]:
```
# Loading and make utf8 Sentence - reversal
!wget -c -nc data/utf8/utf8/utf8_reversal_weights/*reversal*.*;
!mkdir -p data/utf8/utf8/utf8_reversal_weights; mv -nv *reversal*.* data/utf8/utf8/utf8_reversal_weights
```

Downloading data from https://storage.googleapis.com/tensorflow/keras-applications/densenet/densenet121_weights_tf_dim_ordering_tf_kernels_notop.h5
```
8192000/8192000 [==============================] - 0s 0us/step
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights
```

In [ ]:
```
# Checkpoint
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/*.*;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/
```

In [ ]:
```
# utf8/utf8_lstm = create_utf8/utf8_lstm(num_lstm=256,
# optim='Adam',loss='mse',
# metrics=['mae','mse','cosine_sim'])
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.h5;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.pkl;
!wget -c -nc data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/checkpoint_weights_0.csv;
!mkdir -p data/utf8/utf8/utf8_lstm_reversal_weights/checkpoint_dir_0/; mv -nv *.* data/utf8/utf8/utf8_lstm_reversal_weights/
```

```
[0]: ! # loading necessary
     ! freesound - ipgn bgs/dl
     !ffmpeg-zvs.display.textwrap\* dpipx\*
```

5.5 saw10_pad

```
[0]: ! # loading and make with madmom - essential
     ! madmom - madmom\*\*\*
```