Importing Libraries

In [220]:

```python
import pandas as pd
import numpy as np
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score, precision_score, recall_score, auc, f1_score, roc_curve
from tensorflow.keras.models import load_model
import tensorflow as tf
from sklearn.metrics import average_precision_score
from sklearn.metrics import precision_score
from sklearn import svm
import matplotlib.pyplot as plt
import pickle
import torch
import os
import sys
import glob
import json
```

Data Reading and Model Training

In [278]:

```python
# read and train the model
probabilities = dict()
def read_files():
    file_names = glob.glob('tt*')
    for i in file_names:
        print('-->For '+str(i))
        x_train = pd.read_csv(i+'/x_train.csv', index_col=0)
        y_train = pd.read_csv(i+'/y_train.csv', index_col=0)
        x_test = pd.read_csv(i+'/x_test.csv', index_col=0)
        y_test = pd.read_csv(i+'/y_test.csv', index_col=0)
        clf = RandomForestClassifier(random_state=42)
        clf = clf.fit(x_train, y_train.values.ravel())
        prob = clf.predict_proba(x_test)
#         y_score = clf.decision_function(x_test)
        probabilities[i] = prob
```

In [279]:

```python
# here the list of files that are read by the read_files()
read_files()
```

```
-->For tt0052357
-->For tt0063442
-->For tt0068646
-->For tt0073195
-->For tt0075314
-->For tt0078788
-->For tt0082089
-->For tt0086190
-->For tt0088247
-->For tt0088944
-->For tt0092099
-->For tt0096320
-->For tt0099423
-->For tt0100405
-->For tt0103776
-->For tt0103855
-->For tt0107290
-->For tt0108399
-->For tt0110604
-->For tt0112573
-->For tt0113277
-->For tt0114746
-->For tt0115759
-->For tt0116282
-->For tt0116922
-->For tt0117060
-->For tt0118715
-->For tt0119488
-->For tt0120382
-->For tt0120689
-->For tt0120890
-->For tt0123755
-->For tt0124315
-->For tt0137523
-->For tt0163025
-->For tt0172495
-->For tt0178868
-->For tt0190332
-->For tt0217505
-->For tt0253474
-->For tt0281358
-->For tt0319061
-->For tt0361748
-->For tt0379786
-->For tt0399201
-->For tt0409459
-->For tt0440963
-->For tt0443272
-->For tt0479884
-->For tt0780571
-->For tt0822832
-->For tt0945513
-->For tt0976051
-->For tt1001508
-->For tt1038919
-->For tt1099212
-->For tt1119646
-->For tt1205489
-->For tt1375666
-->For tt1412386
-->For tt1707386
-->For tt2024544
-->For tt2488496
-->For tt2582846
```

```python
In [280]: # Fetching ground-truth values for each .pkl_files
test_ground_truth = dict()
def read_y_test():
    file_names = glob.glob('tt*')
    for i in file_names:
        y_test = pd.read_csv(i+'/y_test.csv', index_col=0).values.ravel()
        test_ground_truth[i] = y_test
read_y_test()
test_ground_truth
```


```
Out[280]: {'tt0052357': array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0,
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        0], dtype=int64)}
```

Calculating Mean Average Precision

In [447]:
```python
ap = dict()
gt = dict()
pt = dict()
for i in test_ground_truth.keys():
    ap[i] = average_precision_score(test_ground_truth[i], probabilities[i][:,1:].ravel(), pos_label=0)
    gt[i] = test_ground_truth[i]
    pt[i] = probabilities[i][:,1:].ravel()
mAP = sum(ap.values()) / len(ap)
print('Mean Average Precision: ', mAP)
```

```
Mean Average Precision:  0.8535821012869251
```

Function to calculate MIOU

In [450]:
```python
def calc_miou(gt_dict, pr_dict, shot_to_end_frame_dict, threshold=0.5):
    """Maximum IoU (Miou) for scene segmentation.
    Miou measures how well the predicted scenes and ground-truth scenes overlap. The descriptions can be found in
    https://arxiv.org/pdf/1510.08893.pdf. Note the length of intersection or union is measured by the number of frames.
    Args:
        gt_dict: Scene transition ground-truths.
        pr_dict: Scene transition predictions.
        shot_to_end_frame_dict: End frame index for each shot.
        threshold: A threshold to filter the predictions.
    Returns:
        Mean MIoU, and a dict of MIoU for each movie.
    """
    def iou(x, y):
        s0, e0 = x
        s1, e1 = y
        smin, smax = (s0, s1) if s1 > s0 else (s1, s0)
        emin, emax = (e0, e1) if e1 > e0 else (e1, e0)
        return (emin - smax + 1) / (emax - smin + 1)

    def scene_frame_ranges(scene_transitions, shot_to_end_frame):
        end_shots = np.where(scene_transitions)[0]
        scenes = np.zeros((len(end_shots) + 1, 2), dtype=end_shots.dtype)
        scenes[:-1, 1] = shot_to_end_frame[end_shots]
        scenes[-1, 1] = shot_to_end_frame[len(scene_transitions)]
        scenes[1:, 0] = scenes[:-1, 1] + 1
        return scenes

    def miou(gt_array, pr_array, shot_to_end_frame):
        gt_scenes = scene_frame_ranges(gt_array, shot_to_end_frame)
        pr_scenes = scene_frame_ranges(pr_array >= threshold, shot_to_end_frame)
        assert gt_scenes[-1, -1] == pr_scenes[-1, -1]

        m = gt_scenes.shape[0]
        n = pr_scenes.shape[0]

        # IoU for (gt_scene, pr_scene) pairs
        iou_table = np.zeros((m, n))

        j = 0
        for i in range(m):
            # j start prior to i end
            while pr_scenes[j, 0] <= gt_scenes[i, 1]:
                iou_table[i, j] = iou(gt_scenes[i], pr_scenes[j])
                if j < n - 1:
                    j += 1
                else:
                    break
            # j end prior to (i + 1) start
            if pr_scenes[j, 1] < gt_scenes[i, 1] + 1:
                break
            # j start later than (i + 1) start
            if pr_scenes[j, 0] > gt_scenes[i, 1] + 1:
                j -= 1
        assert np.isnan(iou_table).sum() == 0
        assert iou_table.min() >= 0

        # Miou
        return (iou_table.max(axis=0).mean() + iou_table.max(axis=1).mean()) / 2

    assert gt_dict.keys() == pr_dict.keys()

    miou_dict = dict()

    for imdb_id in gt_dict.keys():
        miou_dict[imdb_id] = miou(gt_dict[imdb_id], pr_dict[imdb_id], shot_to_end_frame_dict[imdb_id])
    mean_miou = sum(miou_dict.values()) / len(miou_dict)

    return mean_miou, miou_dict
```

Calculating mean MIOU score

In [451]:
```python
scores = dict()
scores["Miou"], _ = calc_miou(gt, pt, hola)
print("Mean MIOU: ",scores["Miou"])
```

```
Mean MIOU:  0.458928112444725
```

Reading 'Shot-End Frame' for each .pkl file

In [347]:
```python
# Function to read 'Shot-End Frame' for each .pkl files'
def read_sef():
    sed = dict()
    from pathlib import Path
    from sklearn.model_selection import train_test_split
    for file in read_files():
        with open(file, 'rb') as f:
            pickle_model = pickle.load(f)
        imdb_ids = pickle_model.get('imdb_id')
        shot_end_frame = torch.as_tensor(pickle_model.get('shot_end_frame'))
        sed[imdb_ids] = shot_end_frame
    return sed
```

In [348]:
```python
# Function to read .pkl files
def read_files():
    file_names = glob.glob('data/tt*.pkl')
    return file_names
```

```
In [350]: hola = read_sef()
          hola

Out[350]: {'tt0052357': tensor([    45,   1149,   1437,  ..., 183782, 184354, 184794],
                 dtype=torch.int32),
           'tt0063442': tensor([   668,   1021,   1551,  ..., 159498, 159555, 161187],
                 dtype=torch.int32),
           'tt0068646': tensor([   291,   5922,   6198,  ..., 248908, 248962, 254844],
                 dtype=torch.int32),
           'tt0073195': tensor([  1380,   1527,   1548,  ..., 174965, 175622, 178406],
                 dtype=torch.int32),
           'tt0075314': tensor([  1634,   1758,   1816,   2858,   2986,   3289,   3460,   3627,   4195,
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