

LSTM supervised model for anomaly detection

Import libraries

```
In [ ]: import numpy as np
import pandas as pd
import os
from time import time

import warnings
warnings.filterwarnings('ignore')

from slidingWindows import find_length,plotFig
from sklearn.preprocessing import MinMaxScaler

import tensorflow as tf
import matplotlib.pyplot as plt
from matplotlib.collections import LineCollection
from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau, ModelCheckPoint
from tqdm import tqdm

c:\ProgramData\anaconda3\envs\TSB\lib\site-packages\numpy\_distributor_init.py:3
0: UserWarning: loaded more than 1 DLL from .libs:
c:\ProgramData\anaconda3\envs\TSB\lib\site-packages\numpy\.libs\libopenblas.EL2C6
PLE4ZYW3ECEVIV3OXXGRN2NRFM2.gfortran-win_amd64.dll
c:\ProgramData\anaconda3\envs\TSB\lib\site-packages\numpy\.libs\libopenblas.XWYDX
2IKJW2NMTWSFYNGFUWKQU3LYTCZ.gfortran-win_amd64.dll
    warnings.warn("loaded more than 1 DLL from .libs:")
```

Data and model utils

```
In [ ]: def data_preprocessing(filepath):

    # Prepare data for unsupervised method
    df = pd.read_csv(filepath, header=None).dropna().to_numpy()

    name = filepath.split('/')[-1]

    data = df[:,0].astype(float)
    label = df[:,1].astype(int)

    slidingWindow = find_length(data)

    # Check if "Dodgers" is the first dataset in the filename
    if "normality1_Dodgers" in name or "normality2_Dodgers" in name or "normality3_Dodgers" in name:
        # Skip the first 500 points for this specific case
        data = data[500:]
        label = label[500:]

    data_train = data[:int(0.15*len(data))]
    label_train = label[:int(0.15*len(data))]
    data_test = data[int(0.15*len(data)):]
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label_test = label[int(0.15*len(data)):]
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```

print(name)
print("Estimated Subsequence length: ",slidingWindow)
print("Time series length: ",len(data))
print("Number of abnormal points: ",list(label).count(1))
```

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return name, slidingWindow, data, label, data_train, label_train, data_test,
```

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def plot_sequences(X_train, y_train, X_test, y_test, slidingWindow):
    def plot_sequence(X, y, slidingWindow, title):
        plt.figure(figsize=(14, 6))

            # Create segments and colors for the LineCollection
        points = np.array([np.arange(len(X)), X]).T.reshape(-1, 1, 2)
        segments = np.concatenate([points[:-1], points[1:]], axis=1)
        colors = [ 'b' if label == 0 else 'r' for label in y]

        lc = LineCollection(segments, colors=colors, linewidths=2)
        plt.gca().add_collection(lc)

        plt.xlim(0, len(X))
        plt.ylim(min(X) - 1, max(X) + 1)
        plt.title(title)
        plt.xlabel('Index')
        plt.ylabel('Value')
        plt.show()

    # Plot for X_train
    plot_sequence(X_train, y_train, slidingWindow, 'X_train Sequence with Normal')

    # Plot for X_test
    plot_sequence(X_test, y_test, slidingWindow, 'X_test Sequence with Normal (B
```

```

In [ ]: def create_lstm_model(learning_rate):
    model = tf.keras.models.Sequential([
        tf.keras.layers.LSTM(256),
        tf.keras.layers.Dense(1, activation='sigmoid')
    ])
    optimizer = tf.keras.optimizers.Adam(learning_rate=learning_rate)
    model.compile(optimizer=optimizer, loss='binary_crossentropy')
    return model

def generate_sliding_windows(X_data, y_data, window_size, shift):
    X, y = [], []
    for i in range(len(X_data) - window_size):
        X.append(X_data[i:(i + window_size)])
        y.append(y_data[i + window_size-1])
    return np.array(X), np.array(y)

def train_lstm_model(X_train, y_train, X_val=None, y_val=None, window_size=50, sh
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    NUM_EPOCHS = 1000
    LEARNING_RATE = 0.0001

    X_train_samples, y_train_samples = generate_sliding_windows(X_train, y_train)

    # Reshape X_train_samples to fit LSTM input shape
    X_train_samples = X_train_samples.reshape((X_train_samples.shape[0], X_train
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        model = create_lstm_model(learning_rate=LEARNING_RATE)
```

```

# Fit the model
if X_val is not None:
    X_val_samples, y_val_samples = generate_sliding_windows(X_val, y_val, window_size=50)
    X_val_samples = X_val_samples.reshape((X_val_samples.shape[0], X_val_samples.shape[1] * X_val_samples.shape[2]))
    X_val_samples = np.array([X_val_samples[i:i+50] for i in range(0, len(X_val_samples), 50)])
    y_val_samples = np.array([y_val[i:i+50] for i in range(0, len(y_val), 50)])

    # Define callbacks
    early_stopping = EarlyStopping(monitor='val_loss', patience=5, restore_best_weights=True)
    reduce_lr = ReduceLROnPlateau(monitor='val_loss', factor=0.5, patience=3)
    model_checkpoint = ModelCheckpoint('best_model.h5', save_best_only=True)

    callbacks = [early_stopping, reduce_lr, model_checkpoint]
    history = model.fit(X_train_samples, y_train_samples, epochs=NUM_EPOCHS,
                         validation_data=(X_val_samples, y_val_samples), callbacks=callbacks)
else:

    # Define callbacks
    early_stopping = EarlyStopping(monitor='loss', patience=5, restore_best_weights=True)
    reduce_lr = ReduceLROnPlateau(monitor='loss', factor=0.5, patience=3)
    model_checkpoint = ModelCheckpoint('best_model.h5', save_best_only=True)

    callbacks = [early_stopping, reduce_lr, model_checkpoint]
    history = model.fit(X_train_samples, y_train_samples, epochs=NUM_EPOCHS,
                         callbacks=callbacks)

return model

def generate_sliding_windows_1(data, window_size, shift):
    X = []
    for i in range(len(data) - window_size + 1):
        X.append(data[i:(i + window_size)])
    return np.array(X)

def process_offline(model, X_test, window_size=50, shift=1):
    # Generate sliding windows from X_test
    X_test_windows = generate_sliding_windows_1(X_test, window_size, shift)
    scores = []

    for i in tqdm(range(len(X_test_windows)), desc="Processing batches"):
        X_batch = X_test_windows[i]
        if len(X_batch) == 0:
            break
        # Reshape X_batch to fit LSTM input shape
        X_batch = X_batch.reshape((1, X_batch.shape[0], 1))

        y_pred = model.predict(X_batch, verbose=0)
        scores.extend(y_pred.ravel())

    # Scale scores to range (0, 1)
    scores = MinMaxScaler(feature_range=(0, 1)).fit_transform(np.array(scores))
    return scores

def process_in_batches(model, X_test, batch_size=64, window_size=50, shift=1):
    # Generate sliding windows from X_test
    X_test_windows = generate_sliding_windows_1(X_test, window_size, shift)

    n_batches = len(X_test_windows) // batch_size
    scores = []

    for i in tqdm(range(n_batches + 1), desc="Processing batches"):
        start = i * batch_size
        end = start + batch_size
        X_batch = X_test_windows[start:end]
        if len(X_batch) == 0:
            break
        # Reshape X_batch to fit LSTM input shape
        X_batch = X_batch.reshape((batch_size, X_batch.shape[0], 1))

        y_pred = model.predict(X_batch, verbose=0)
        scores.extend(y_pred.ravel())

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        end = start + batch_size
        X_batch = X_test_windows[start:end]

        if len(X_batch) == 0:
            break

        # Reshape X_batch to fit LSTM input shape
        X_batch = X_batch.reshape((X_batch.shape[0], X_batch.shape[1], 1))

        y_pred = model.predict(X_batch, verbose=0)
        scores.extend(y_pred.ravel())

        # Scale scores to range (0, 1)
        scores = MinMaxScaler(feature_range=(0, 1)).fit_transform(np.array(scores))
    return scores

# Function to simulate streaming environment with pseudo-labeling and a progress bar
def process_in_batches_with_pseudo_labeling(model, X_test, batch_size=64, confidence_threshold=0.95):
    # Generate sliding windows from X_test
    X_test_windows = generate_sliding_windows_1(X_test, window_size, shift)

    n_batches = len(X_test_windows) // batch_size
    scores = []

    buffer_X_data = []
    buffer_y_data = []
    for i in tqdm(range(n_batches + 1), desc="Processing batches"):
        start = i * batch_size
        end = start + batch_size
        X_batch = X_test_windows[start:end]
        if len(X_batch) == 0:
            break

        # Reshape X_batch to fit LSTM input shape
        X_batch = X_batch.reshape((X_batch.shape[0], X_batch.shape[1], 1))

        y_pred = model.predict(X_batch, verbose=0)
        scores.extend(y_pred.ravel())

        if buffer_X_data == []:
            buffer_X_data = X_batch
        else:
            buffer_X_data = np.concatenate([buffer_X_data, X_batch])
        if buffer_y_data == []:
            buffer_y_data = y_pred
        else:
            buffer_y_data = np.concatenate([buffer_y_data, y_pred])

    # Identify high confidence predictions
    # Create the new array based on the threshold
    if i%10 == 0 and i!=0:
        y_pred_confident = MinMaxScaler(feature_range=(0,1)).fit_transform(np.array(buffer_y_data))
        y_pred_confident = np.where(y_pred_confident > confidence_threshold, 1, 0)
        model.fit(buffer_X_data, y_pred_confident, epochs=1, verbose=0, batch_size=batch_size)
        buffer_X_data = []
        buffer_y_data = []

    # Scale scores to range (0,1)

```

```
scores = MinMaxScaler(feature_range=(0,1)).fit_transform(np.array(scores).reshape(-1,1))
return scores
```

Load datasets and train lstm models on train sets

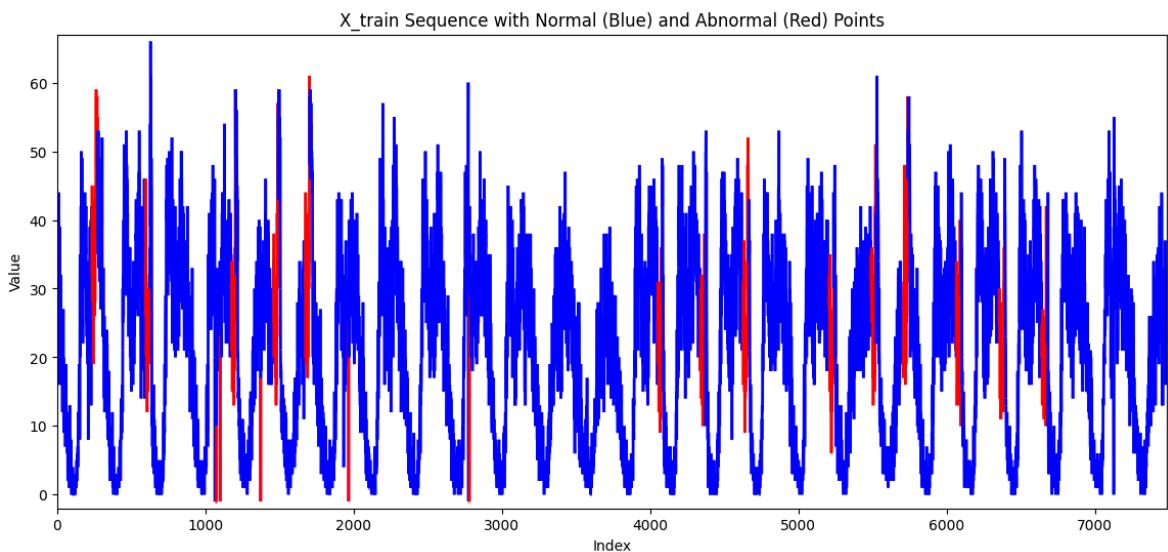
```
In [ ]: # Directory containing the .out files
directory = 'generated_data'

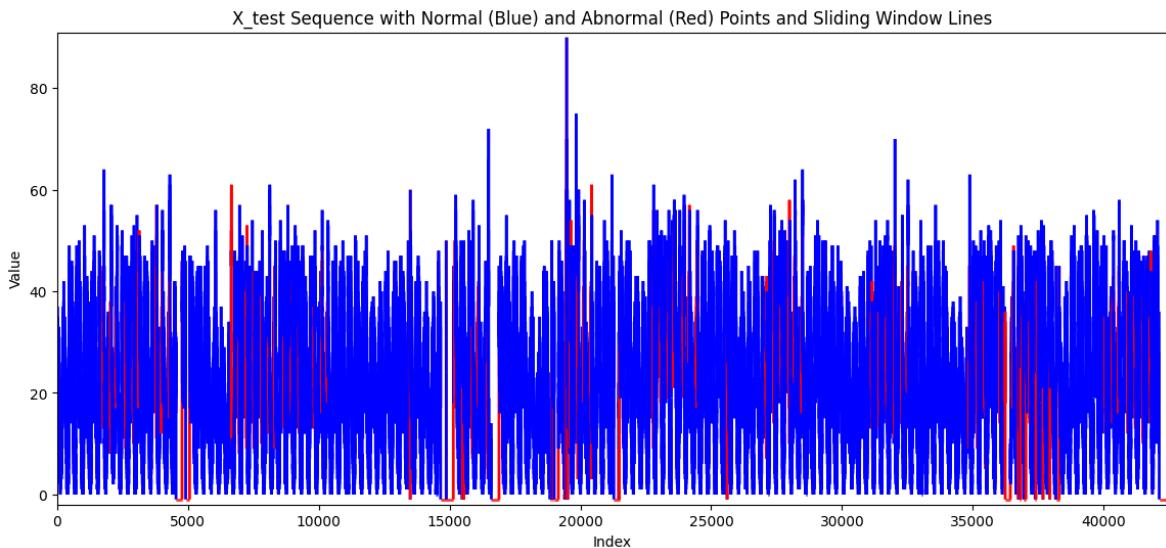
# Initialize an empty list to store the file paths
file_paths = []

# Walk through the directory
for filename in os.listdir(directory):
    if filename.endswith('.out'):
        # Construct the full file path
        full_path = os.path.join(directory, filename)
        # Append the full path to the list
        file_paths.append(full_path)
```

```
In [ ]: for filepath in file_paths[:3]:
    name, slidingWindow, data, label, X_train, y_train, X_test, y_test = data_pr
    print(f"Total points in train set: {X_train.shape[0]}")
    print(f"Number of abnormal points in train set: {sum(y_train==1)}")
    plot_sequences(X_train, y_train, X_test, y_test, slidingWindow)
```

generated_data\normality1_Dodgers.out
Estimated Subsequence length: 288
Time series length: 49900
Number of abnormal points: 5233
Total points in train set: 7485
Number of abnormal points in train set: 486





generated_data\normality1_MGAB.out

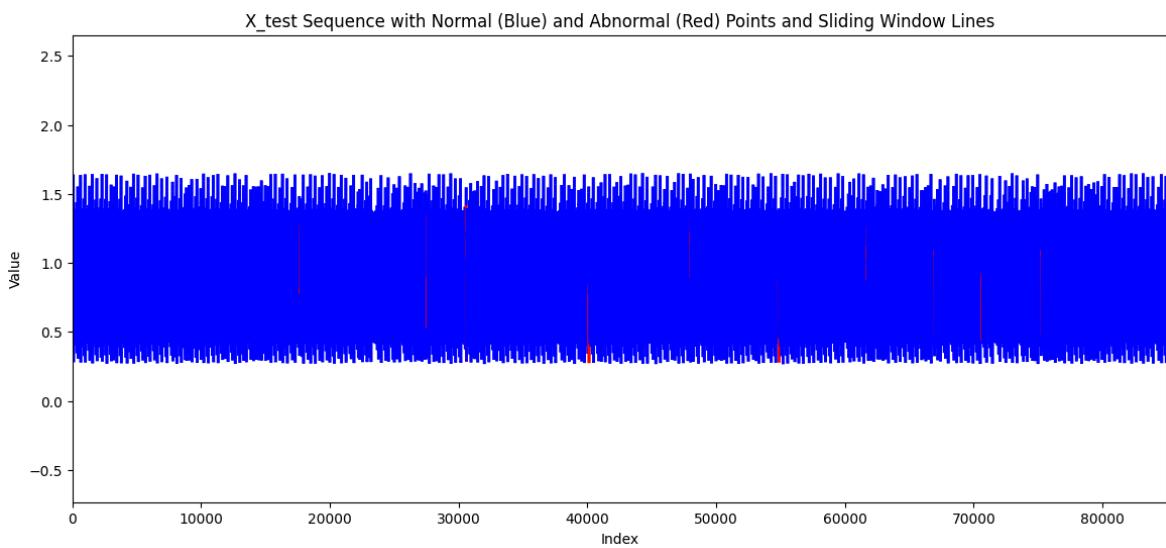
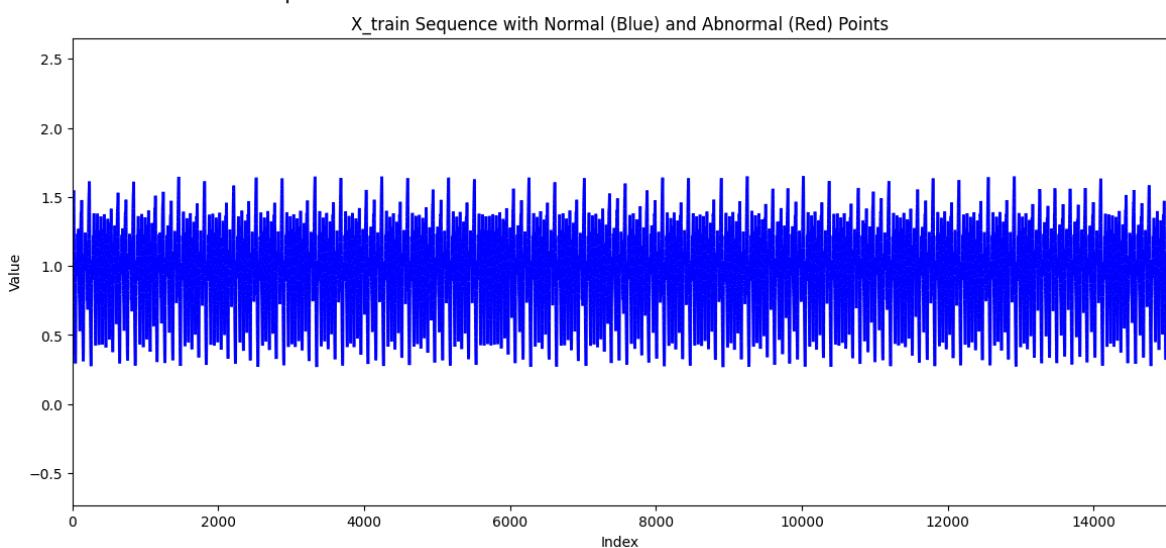
Estimated Subsequence length: 49

Time series length: 100000

Number of abnormal points: 200

Total points in train set: 15000

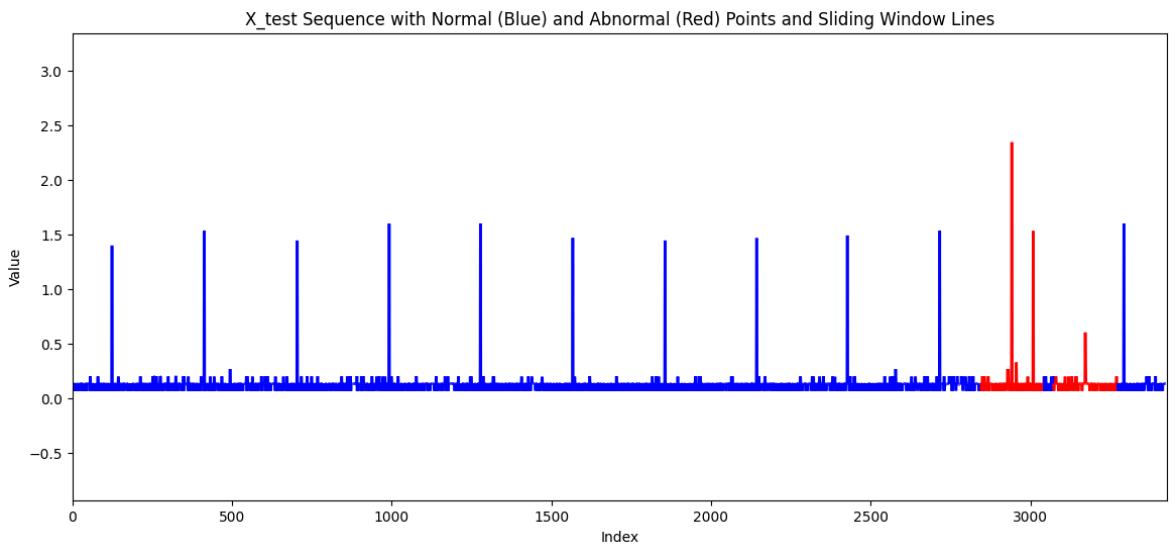
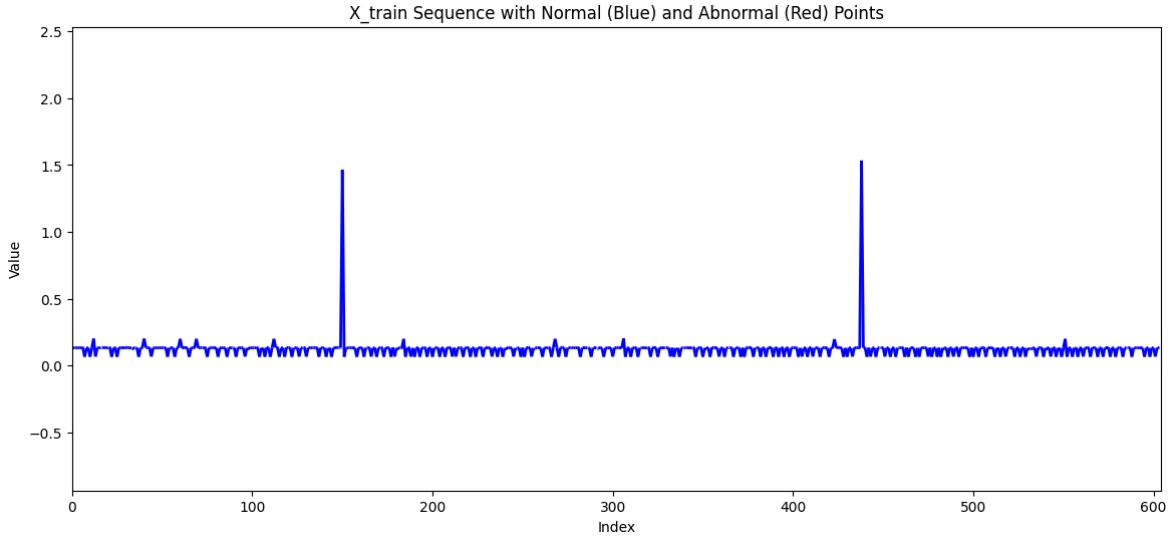
Number of abnormal points in train set: 0



```

generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400
Total points in train set: 604
Number of abnormal points in train set: 0

```



```

In [ ]: models = {}

In [ ]: for filepath in file_paths:

    name, slidingWindow, data, label, X_train_val, y_train_val, X_test, y_test =
    if "normality2_Dodgers" in name or "normality3_Dodgers" in name:
        model = models['generated_data\\normality1_Dodgers.out']
    elif "normality2_MGAB" in name or "normality3_MGAB" in name:
        model = models['generated_data\\normality1_MGAB.out']
    elif "normality2_NAB" in name or "normality3_NAB" in name:
        model = models['generated_data\\normality1_NAB.out']
    else:
        start_time = time()

        X_train = X_train_val[:int(0.8*len(X_train_val))]
        y_train = y_train_val[:int(0.8*len(X_train_val))]
        X_val = X_train_val[int(0.8*len(X_train_val)):]
        y_val = y_train_val[int(0.8*len(X_train_val)):]
        model = train_lstm_model(X_train.reshape((-1, 1, 1)), y_train, X_val=X_v
end_time = time()

```

```
print(f"Model for {filepath} trained succesfully in {(end_time-start_time)}\n"
      f"seconds")
```

```
models[filepath] = model
```

```
generated_data\normality1_Dodgers.out
Estimated Subsequence length: 288
Time series length: 49900
Number of abnormal points: 5233
Model for generated_data\normality1_Dodgers.out trained succesfully in 119.0 s.
generated_data\normality1_MGAB.out
Estimated Subsequence length: 49
Time series length: 100000
Number of abnormal points: 200
Model for generated_data\normality1_MGAB.out trained succesfully in 253.8 s.
generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400
Model for generated_data\normality1_NAB.out trained succesfully in 19.8 s.
generated_data\normality2_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 149900
Number of abnormal points: 5433
generated_data\normality2_Dodgers_NAB.out
Estimated Subsequence length: 288
Time series length: 53931
Number of abnormal points: 5633
generated_data\normality2_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 150400
Number of abnormal points: 5812
generated_data\normality2_MGAB_NAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
generated_data\normality2_NAB_Dodgers.out
Estimated Subsequence length: 288
Time series length: 54431
Number of abnormal points: 6012
generated_data\normality2_NAB_MGAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
generated_data\normality3_Dodgers_MGAB_NAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
generated_data\normality3_Dodgers_NAB_MGAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
generated_data\normality3_MGAB_Dodgers_NAB.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
generated_data\normality3_MGAB_NAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
generated_data\normality3_NAB_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 154431
Number of abnormal points: 6212
generated_data\normality3_NAB_MGAB_Dodgers.out
```

```
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
```

Offline option

```
In [ ]: WINDOW_SIZE= 50

In [ ]: for filepath in file_paths:
    name, slidingWindow, data, label, X_train, y_train, X_test, y_test = data_pr
    X_test_reshaped = X_test.reshape((-1, 1, 1))

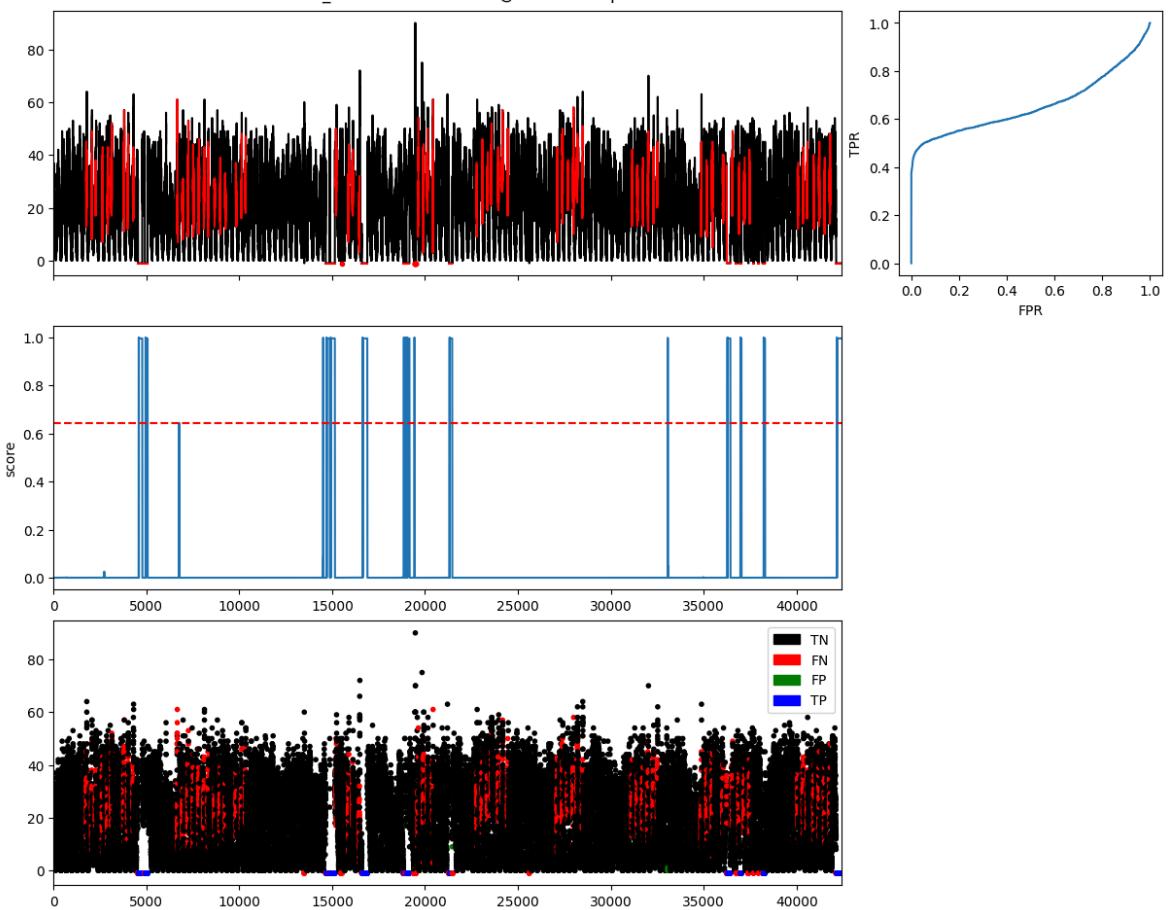
    model = models[filepath]
    # Process test data in batches to simulate streaming
    score = process_in_batches(model, X_test, batch_size=len(X_test))

    zeros = np.zeros(WINDOW_SIZE-1)
    new_score = np.concatenate((zeros,score))
    plotFig(X_test, y_test, new_score, slidingWindow, fileName=name, modelName=""

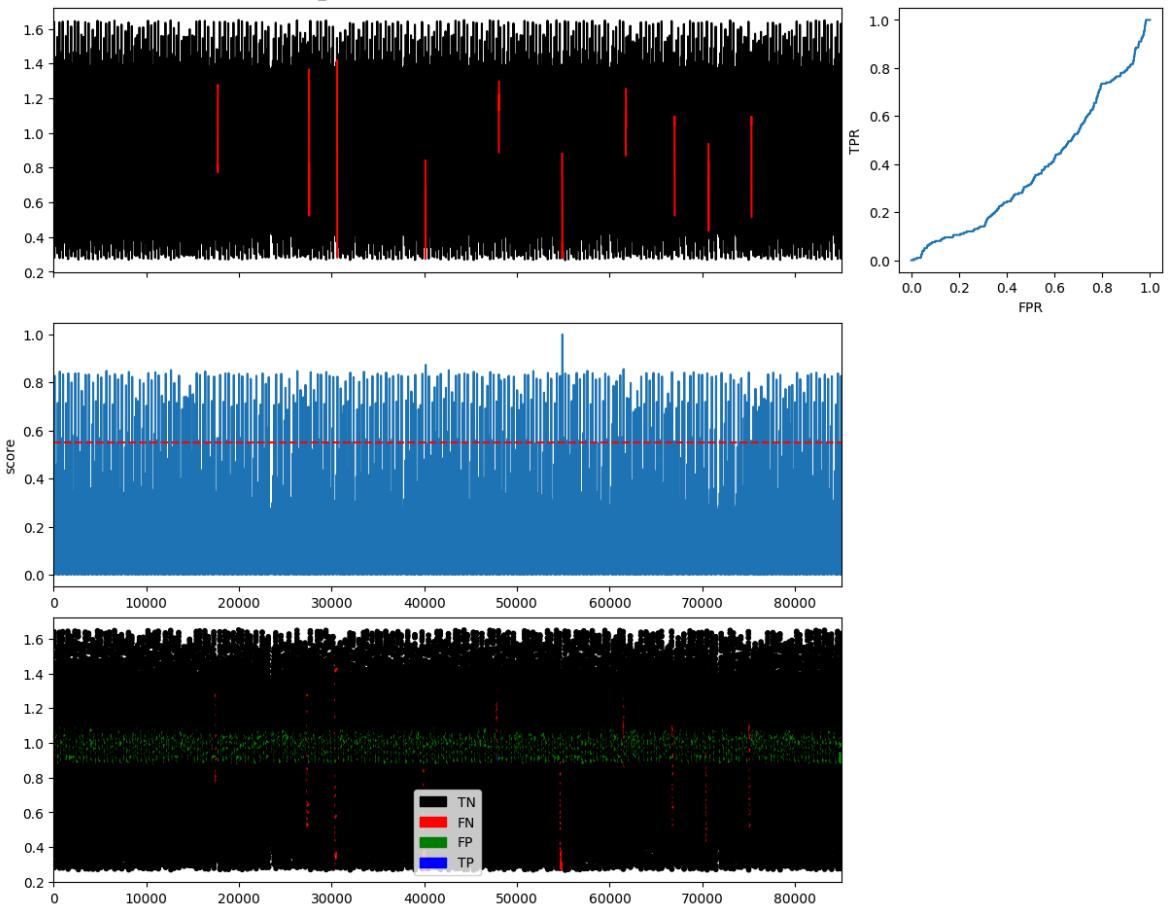
generated_data\normality1_Dodgers.out
Estimated Subsequence length: 288
Time series length: 49900
Number of abnormal points: 5233
Processing batches: 100%|██████████| 1/1 [00:43<00:00, 43.24s/it]
generated_data\normality1_MGAB.out
Estimated Subsequence length: 49
Time series length: 100000
Number of abnormal points: 200
Processing batches: 100%|██████████| 1/1 [01:25<00:00, 85.10s/it]
generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400
Processing batches: 100%|██████████| 1/1 [00:03<00:00,  3.16s/it]
generated_data\normality2_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 149900
Number of abnormal points: 5433
Processing batches: 100%|██████████| 1/1 [01:53<00:00, 113.35s/it]
generated_data\normality2_Dodgers_NAB.out
Estimated Subsequence length: 288
Time series length: 53931
Number of abnormal points: 5633
Processing batches: 100%|██████████| 1/1 [00:40<00:00, 40.95s/it]
generated_data\normality2_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 150400
Number of abnormal points: 5812
Processing batches: 100%|██████████| 1/1 [01:54<00:00, 114.37s/it]
generated_data\normality2_MGAB_NAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 1/1 [01:19<00:00, 79.56s/it]
```

```
generated_data\normality2_NAB_Dodgers.out
Estimated Subsequence length: 288
Time series length: 54431
Number of abnormal points: 6012
Processing batches: 100%|██████████| 1/1 [00:40<00:00, 40.98s/it]
generated_data\normality2_NAB_MGAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 1/1 [01:16<00:00, 76.34s/it]
generated_data\normality3_Dodgers_MGAB_NAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 1/1 [02:07<00:00, 127.34s/it]
generated_data\normality3_Dodgers_NAB_MGAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 1/1 [01:54<00:00, 114.70s/it]
generated_data\normality3_MGAB_Dodgers_NAB.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 1/1 [02:03<00:00, 123.17s/it]
generated_data\normality3_MGAB_NAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 1/1 [02:01<00:00, 121.84s/it]
generated_data\normality3_NAB_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 1/1 [02:02<00:00, 122.79s/it]
generated_data\normality3_NAB_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 1/1 [01:51<00:00, 111.96s/it]
```

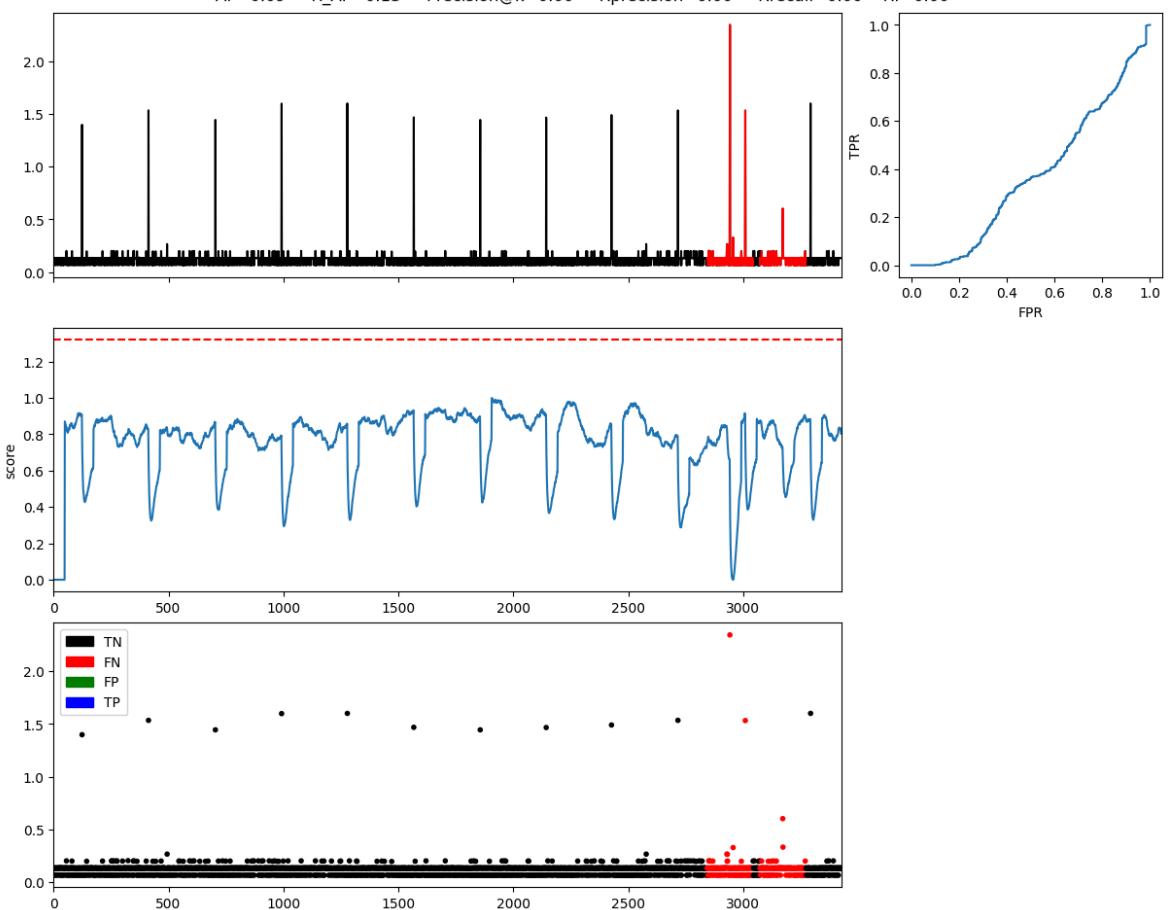
generated_data\normality1_Dodgers.out window=288 LSTM (process in batches)
AUC=0.66 R_AUC=0.85 Precision=0.99 Recall=0.37 F=0.54 ExistenceReward=0.13 OverlapReward=0.05
AP=0.55 R_AP=0.69 Precision@k=0.37 Rprecision=0.84 Rrecall=0.07 Rf=0.13



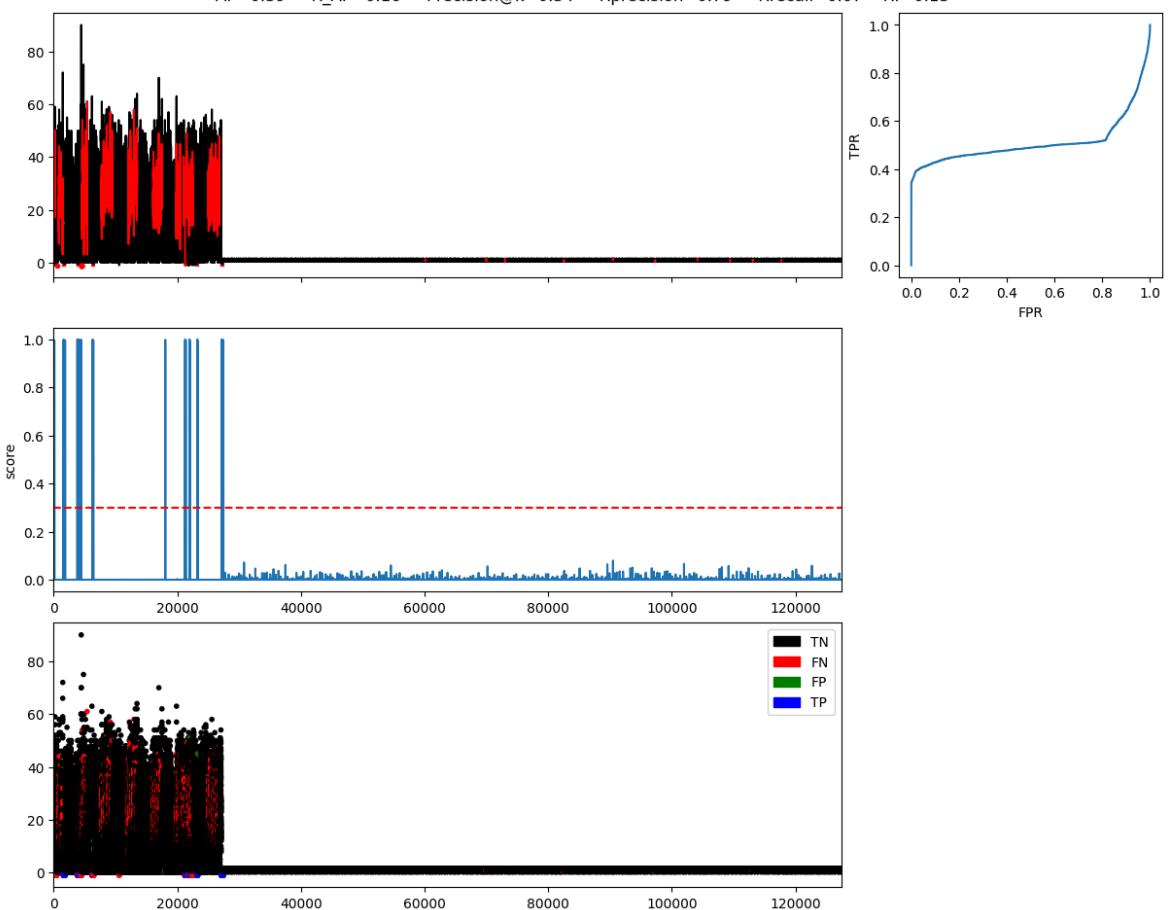
generated_data\normality1_MGAB.out window=49 LSTM (process in batches)
AUC=0.39 R_AUC=0.69 Precision=0.00 Recall=0.01 F=0.00 ExistenceReward=0.10 OverlapReward=0.01
AP=0.0 R_AP=0.01 Precision@k=0.01 Rprecision=0.00 Rrecall=0.03 Rf=0.00



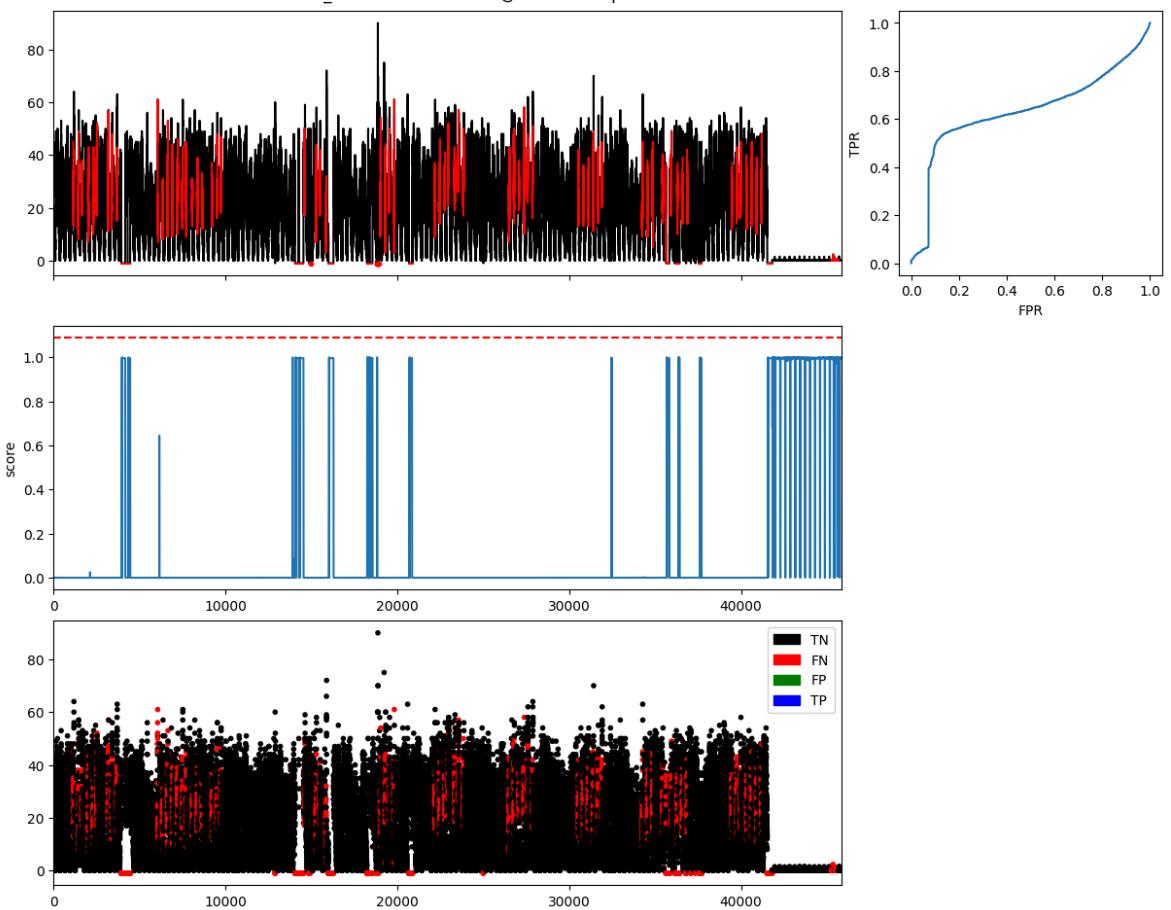
generated_data\normality1_NAB.out window=289 LSTM (process in batches)
AUC=0.37 R_AUC=0.43 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.09 R_AP=0.13 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



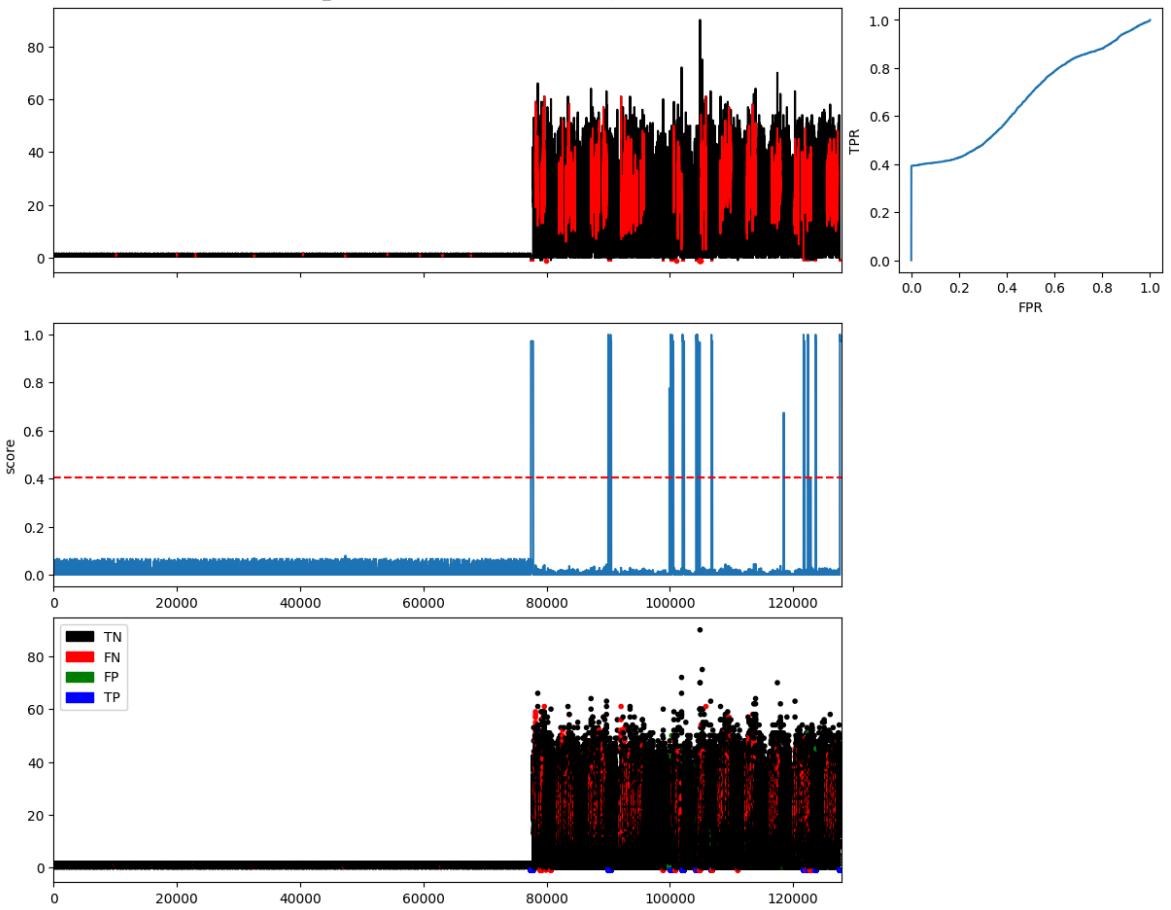
generated_data\normality2_Dodgers_MGAB.out window=288 LSTM (process in batches)
AUC=0.51 R_AUC=0.41 Precision=0.97 Recall=0.34 F=0.50 ExistenceReward=0.12 OverlapReward=0.05
AP=0.39 R_AP=0.16 Precision@k=0.34 Rprecision=0.79 Rrecall=0.07 Rf=0.13



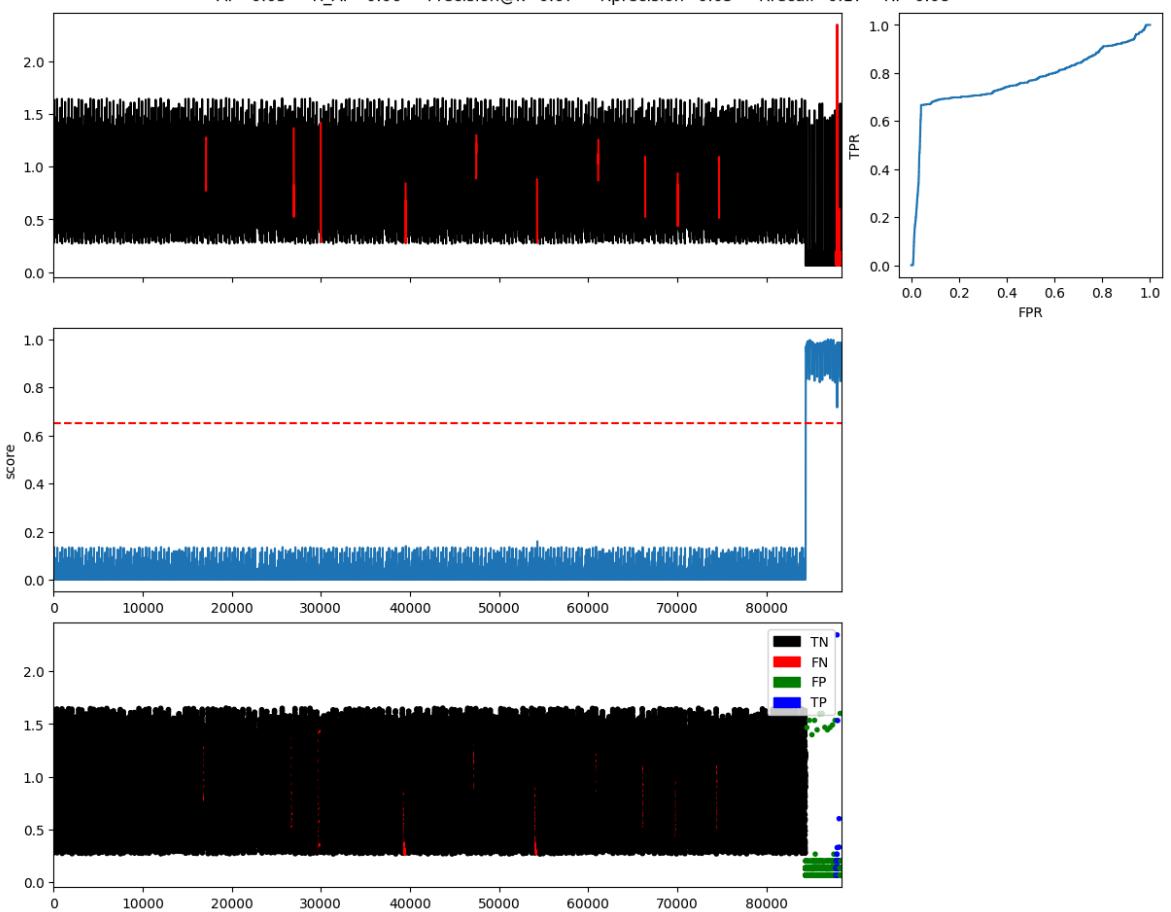
generated_data\normality2_Dodgers_NAB.out window=288 LSTM (process in batches)
AUC=0.63 R_AUC=0.78 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.27 R_AP=0.49 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



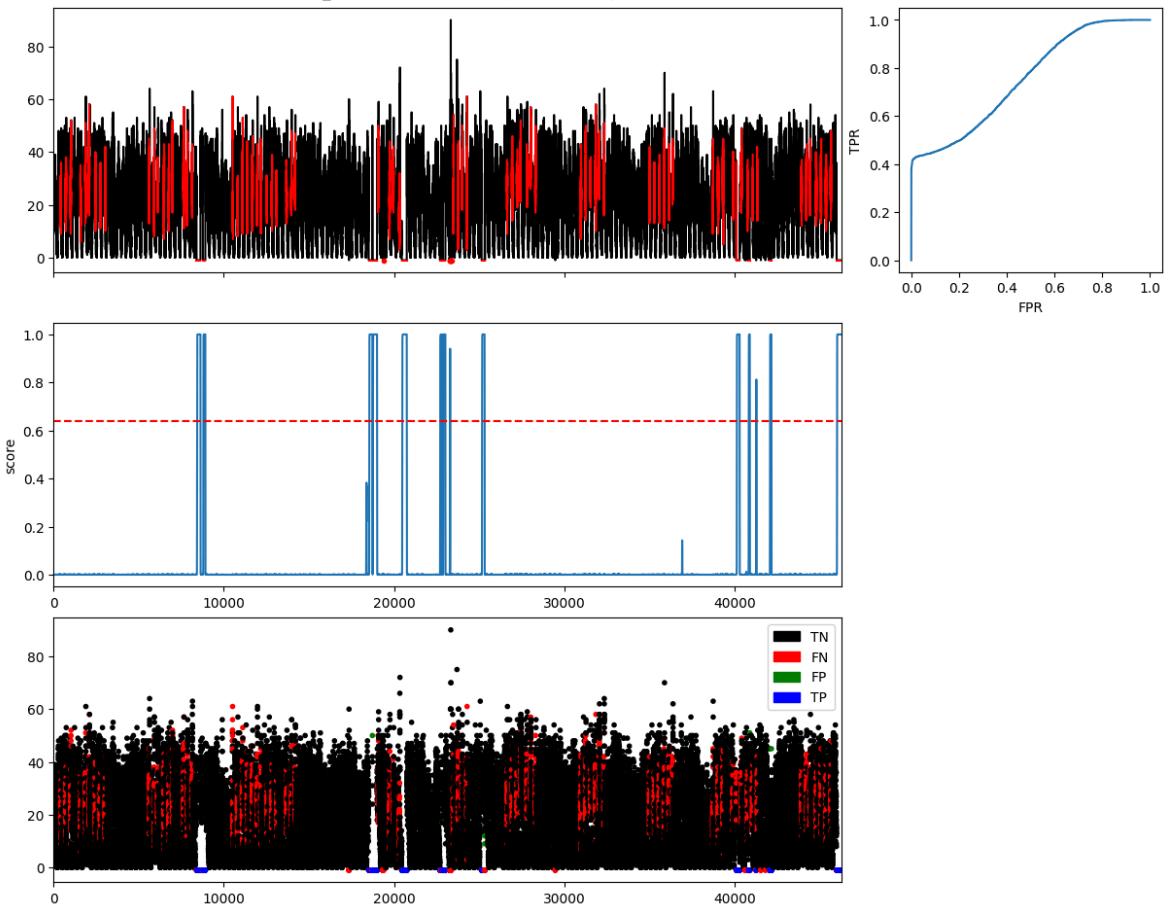
generated_data\normality2_MGAB_Dodgers.out window=49 LSTM (process in batches)
AUC=0.67 R_AUC=0.76 Precision=0.97 Recall=0.39 F=0.55 ExistenceReward=0.12 OverlapReward=0.10
AP=0.43 R_AP=0.21 Precision@k=0.39 Rprecision=0.77 Rrecall=0.10 Rf=0.18



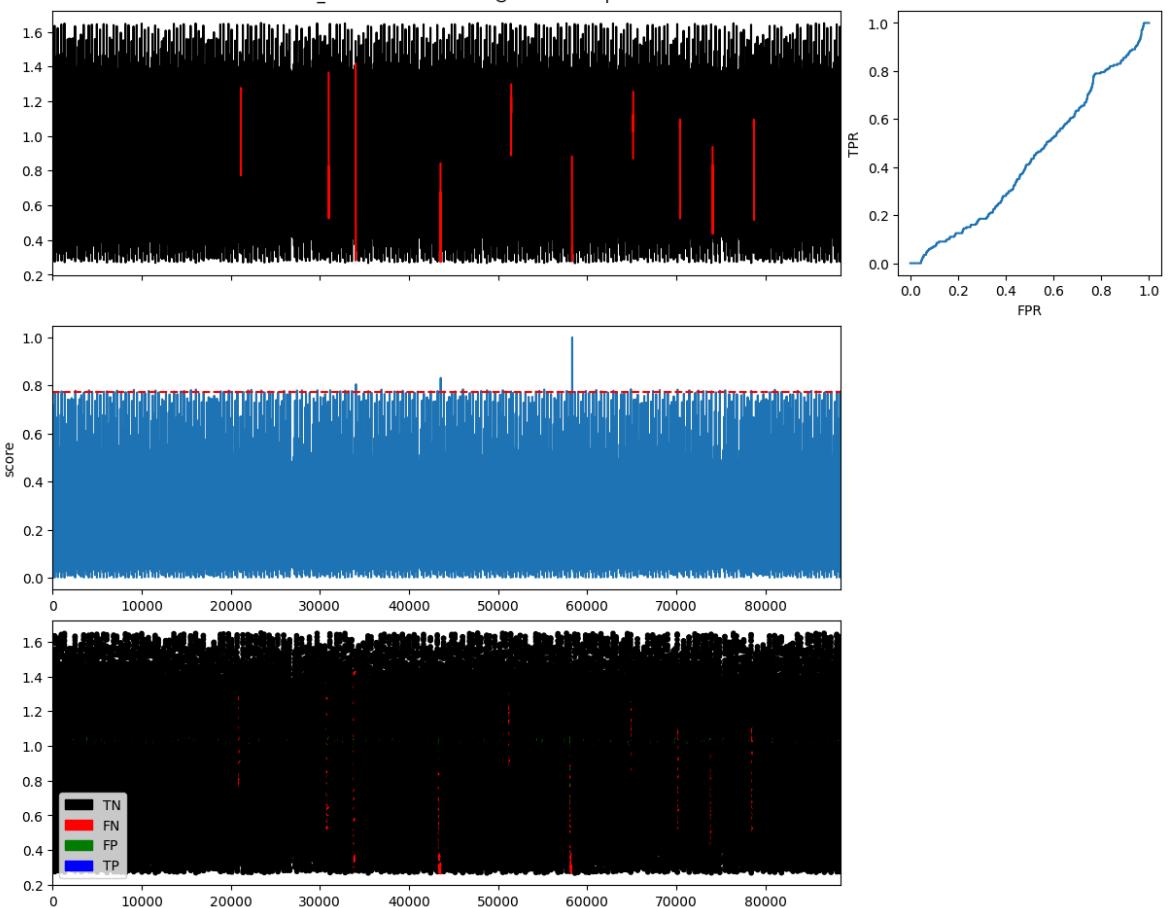
generated_data\normality2_MGAB_NAB.out window=49 LSTM (process in batches)
AUC=0.77 R_AUC=0.81 Precision=0.10 Recall=0.67 F=0.17 ExistenceReward=0.17 OverlapReward=0.17
AP=0.05 R_AP=0.06 Precision@k=0.67 Rprecision=0.05 Rrecall=0.17 Rf=0.08



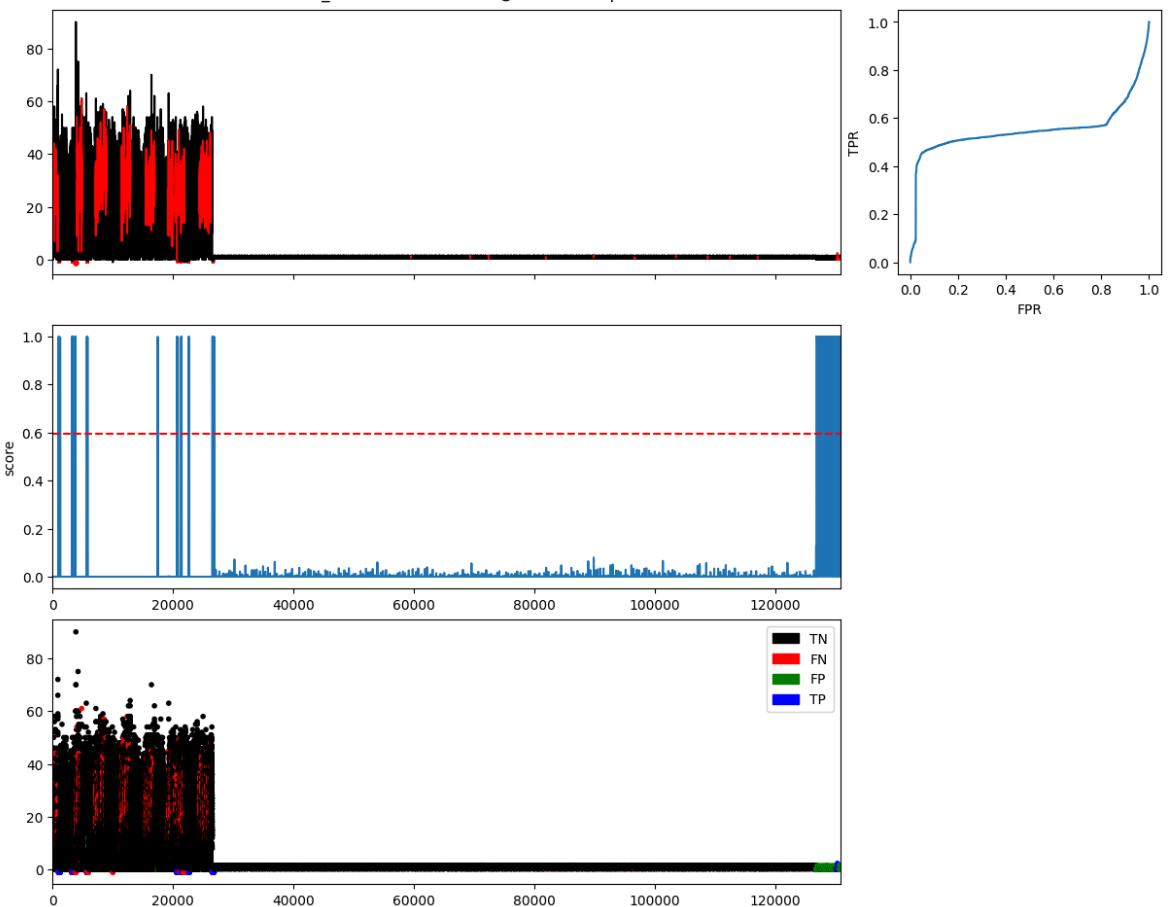
generated_data\normality2_NAB_Dodgers.out window=288 LSTM (process in batches)
AUC=0.75 R_AUC=0.88 Precision=0.99 Recall=0.38 F=0.55 ExistenceReward=0.14 OverlapReward=0.11
AP=0.53 R_AP=0.74 Precision@k=0.38 Rprecision=0.94 Rrecall=0.11 Rf=0.20



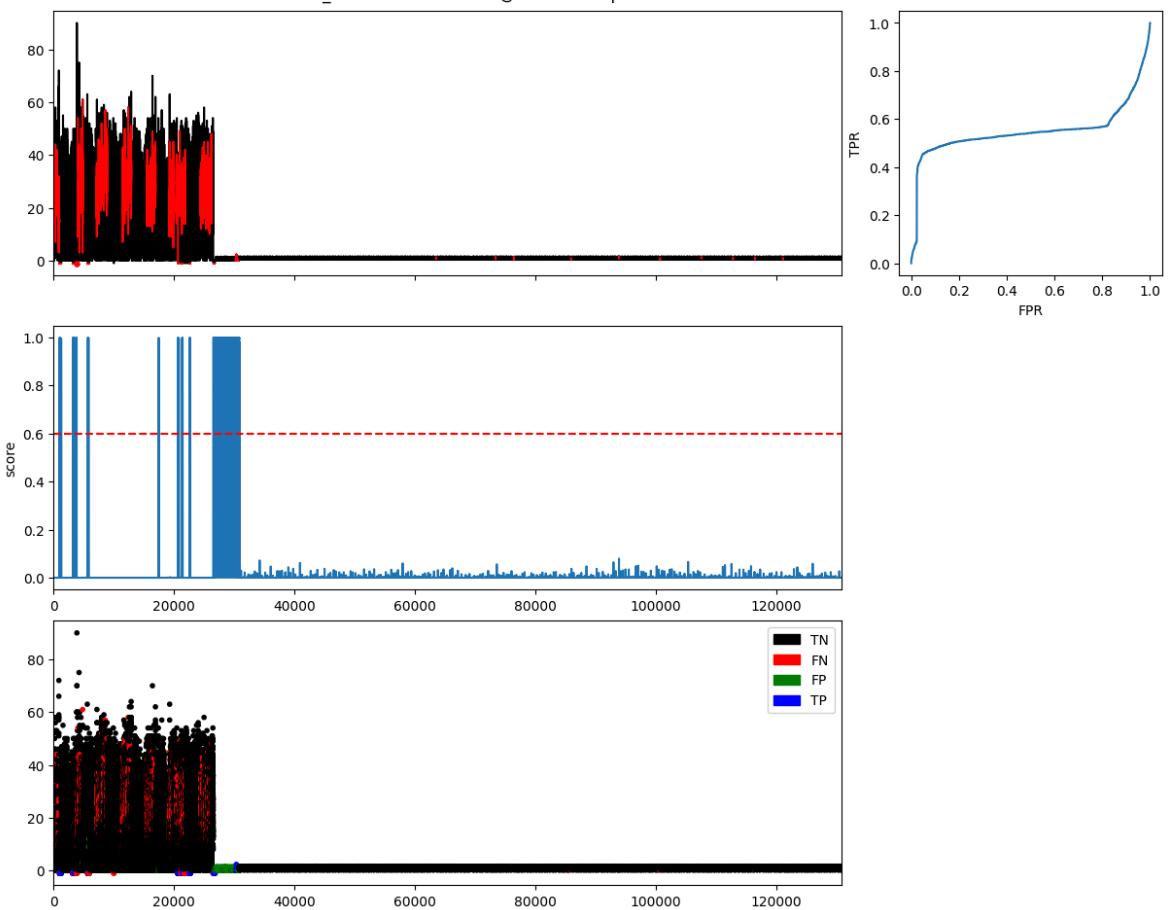
generated_data\normality2_NAB_MGAB.out window=49 LSTM (process in batches)
AUC=0.44 R_AUC=0.68 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.0 R_AP=0.02 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



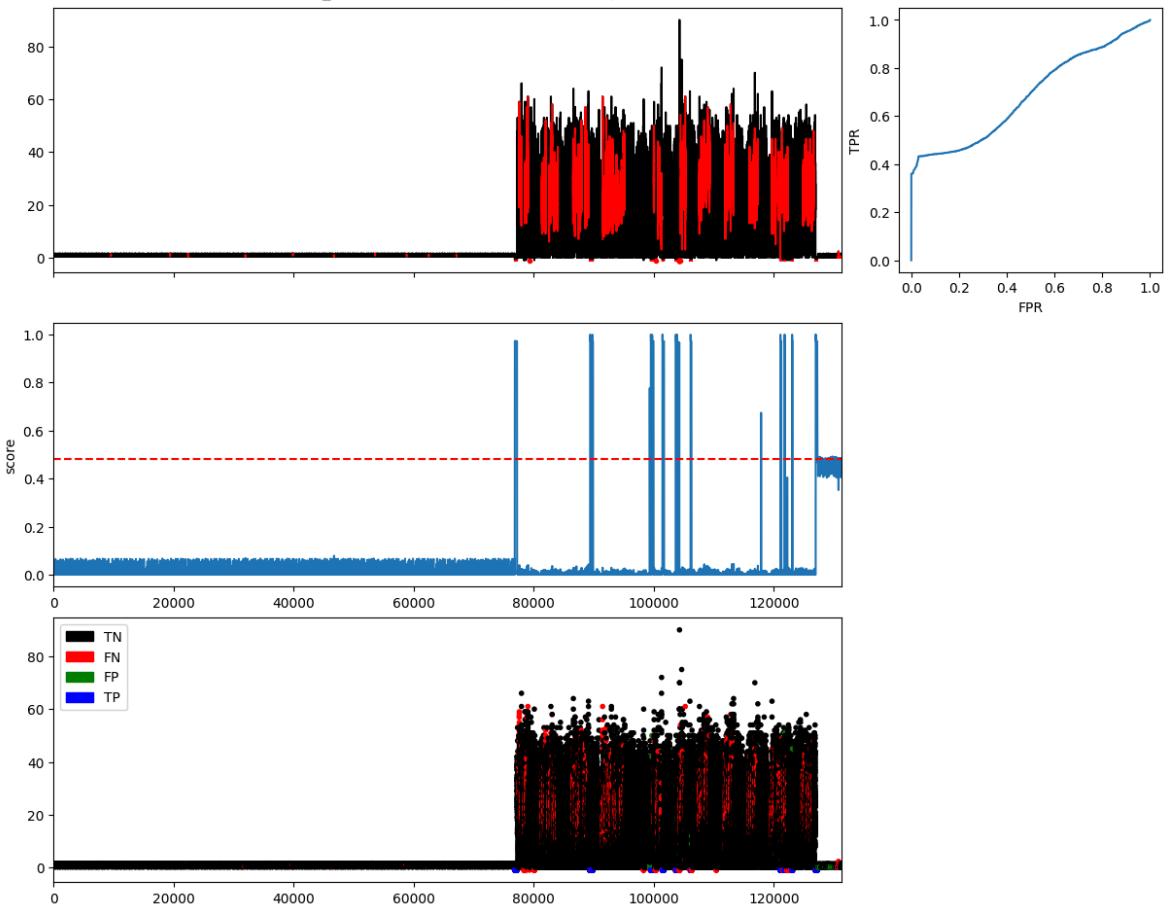
generated_data\normality3_Dodgers_MGAB_NAB.out window=288 LSTM (process in batches)
AUC=0.55 R_AUC=0.44 Precision=0.30 Recall=0.39 F=0.34 ExistenceReward=0.14 OverlapReward=0.06
AP=0.16 R_AP=0.12 Precision@k=0.39 Rprecision=0.53 Rrecall=0.07 Rf=0.13



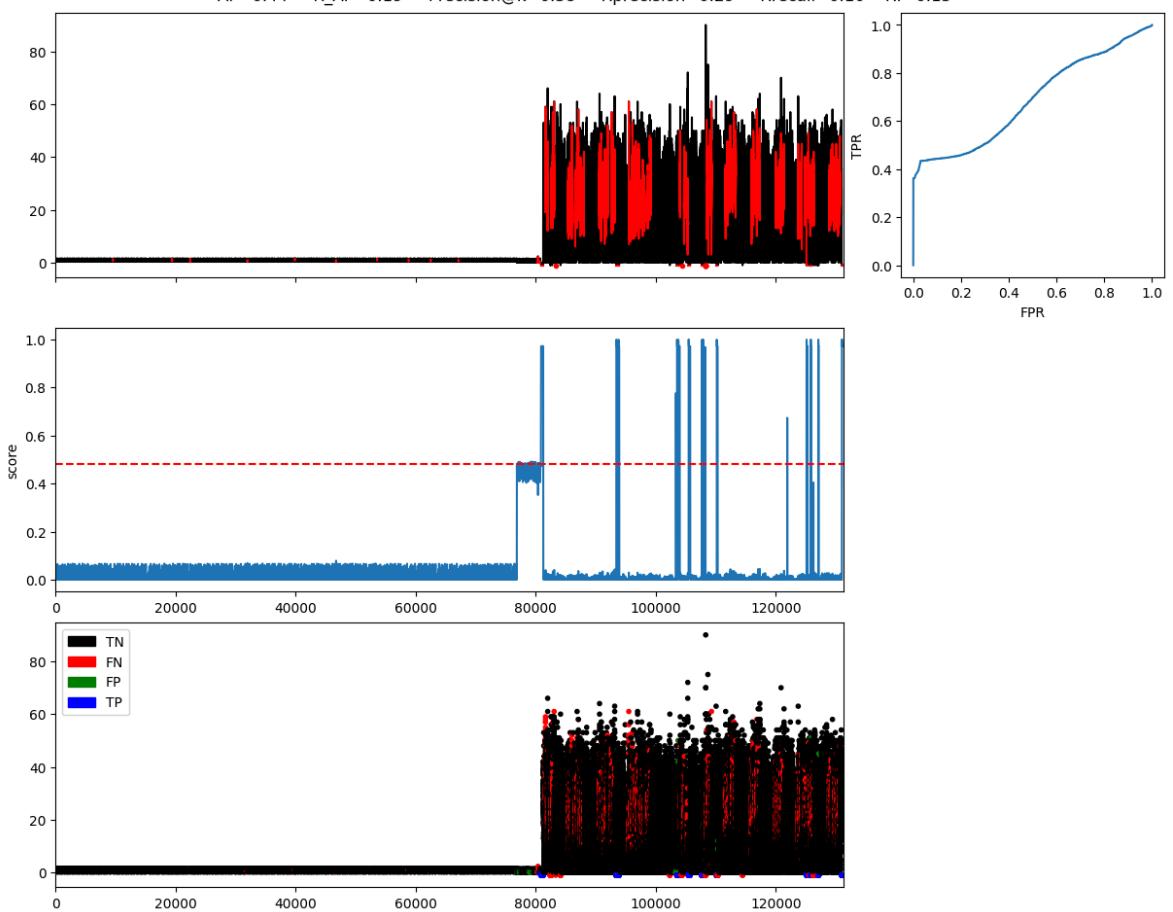
generated_data\normality3_Dodgers_NAB_MGAB.out window=288 LSTM (process in batches)
AUC=0.55 R_AUC=0.44 Precision=0.30 Recall=0.39 F=0.34 ExistenceReward=0.14 OverlapReward=0.06
AP=0.15 R_AP=0.12 Precision@k=0.39 Rprecision=0.54 Rrecall=0.07 Rf=0.13



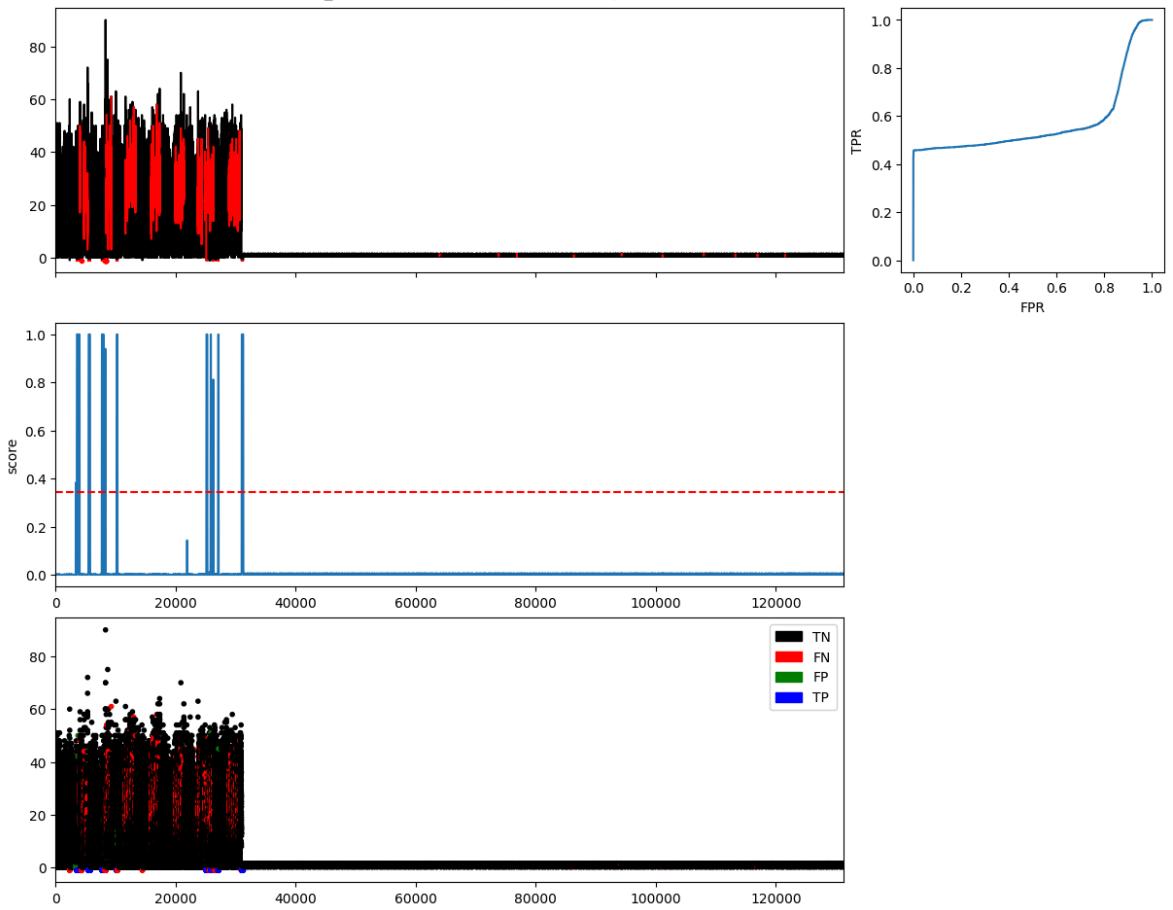
generated_data\normality3_MGAB_Dodgers_NAB.out window=49 LSTM (process in batches)
AUC=0.69 R_AUC=0.75 Precision=0.62 Recall=0.38 F=0.47 ExistenceReward=0.13 OverlapReward=0.10
AP=0.44 R_AP=0.19 Precision@k=0.38 Rprecision=0.32 Rrecall=0.10 Rf=0.16

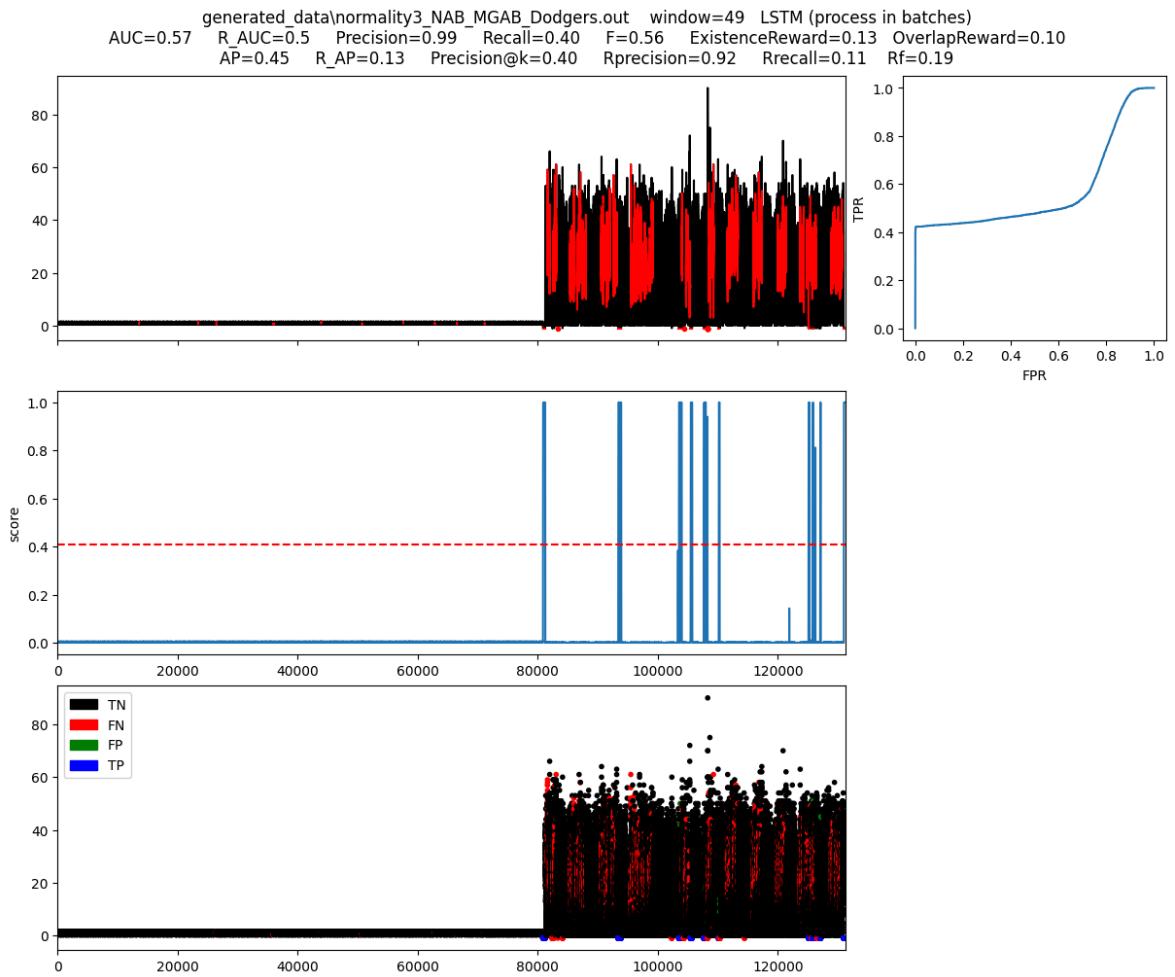


generated_data\normality3_MGAB_NAB_Dodgers.out window=49 LSTM (process in batches)
AUC=0.69 R_AUC=0.75 Precision=0.61 Recall=0.38 F=0.47 ExistenceReward=0.13 OverlapReward=0.10
AP=0.44 R_AP=0.19 Precision@k=0.38 Rprecision=0.29 Rrecall=0.10 Rf=0.15



generated_data\normality3_NAB_Dodgers_MGAB.out window=288 LSTM (process in batches)
AUC=0.57 R_AUC=0.46 Precision=0.97 Recall=0.43 F=0.59 ExistenceReward=0.16 OverlapReward=0.12
AP=0.47 R_AP=0.16 Precision@k=0.43 Rprecision=0.78 Rrecall=0.13 Rf=0.22





Online options

Train a simple lstm model and detect anomalies in the test set

```
In [ ]: BATCH_SIZE = 1000
WINDOW_SIZE= 50
```

Variation 1 - Process in batches

```
In [ ]: for filepath in file_paths:
    name, slidingWindow, data, label, X_train, y_train, X_test, y_test = data_pr
    X_test_reshaped = X_test.reshape((-1, 1, 1))

    model = models[filepath]
    # Process test data in batches to simulate streaming
    score = process_in_batches(model, X_test, batch_size=BATCH_SIZE)

    zeros = np.zeros(WINDOW_SIZE-1)
    new_score = np.concatenate((zeros,score))
    plotFig(X_test, y_test, new_score, BATCH_SIZE, fileName=name, modelName="LST
```

generated_data\normality1_Dodgers.out

Estimated Subsequence length: 288

Time series length: 49900

Number of abnormal points: 5233

Processing batches: 100%|██████████| 43/43 [00:37<00:00, 1.16it/s]

```
generated_data\normality1_MGAB.out
Estimated Subsequence length: 49
Time series length: 100000
Number of abnormal points: 200
Processing batches: 100%|██████████| 85/85 [01:14<00:00, 1.14it/s]
generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400
Processing batches: 100%|██████████| 4/4 [00:03<00:00, 1.21it/s]
generated_data\normality2_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 149900
Number of abnormal points: 5433
Processing batches: 100%|██████████| 128/128 [01:43<00:00, 1.24it/s]
generated_data\normality2_Dodgers_NAB.out
Estimated Subsequence length: 288
Time series length: 53931
Number of abnormal points: 5633
Processing batches: 100%|██████████| 46/46 [00:36<00:00, 1.27it/s]
generated_data\normality2_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 150400
Number of abnormal points: 5812
Processing batches: 100%|██████████| 128/128 [01:43<00:00, 1.23it/s]
generated_data\normality2_MGAB_NAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 89/89 [01:12<00:00, 1.24it/s]
generated_data\normality2_NAB_Dodgers.out
Estimated Subsequence length: 288
Time series length: 54431
Number of abnormal points: 6012
Processing batches: 100%|██████████| 47/47 [01:06<00:00, 1.42s/it]
generated_data\normality2_NAB_MGAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 89/89 [02:12<00:00, 1.49s/it]
generated_data\normality3_Dodgers_MGAB_NAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [03:11<00:00, 1.46s/it]
generated_data\normality3_Dodgers_NAB_MGAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [03:12<00:00, 1.47s/it]
generated_data\normality3_MGAB_Dodgers_NAB.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [03:08<00:00, 1.43s/it]
```

```
generated_data\normality3_MGAB_NAB_Dodgers.out
```

```
Estimated Subsequence length: 49
```

```
Time series length: 154431
```

```
Number of abnormal points: 6212
```

```
Processing batches: 100%|██████████| 132/132 [02:58<00:00, 1.35s/it]
```

```
generated_data\normality3_NAB_Dodgers_MGAB.out
```

```
Estimated Subsequence length: 288
```

```
Time series length: 154431
```

```
Number of abnormal points: 6212
```

```
Processing batches: 100%|██████████| 132/132 [03:20<00:00, 1.52s/it]
```

```
generated_data\normality3_NAB_MGAB_Dodgers.out
```

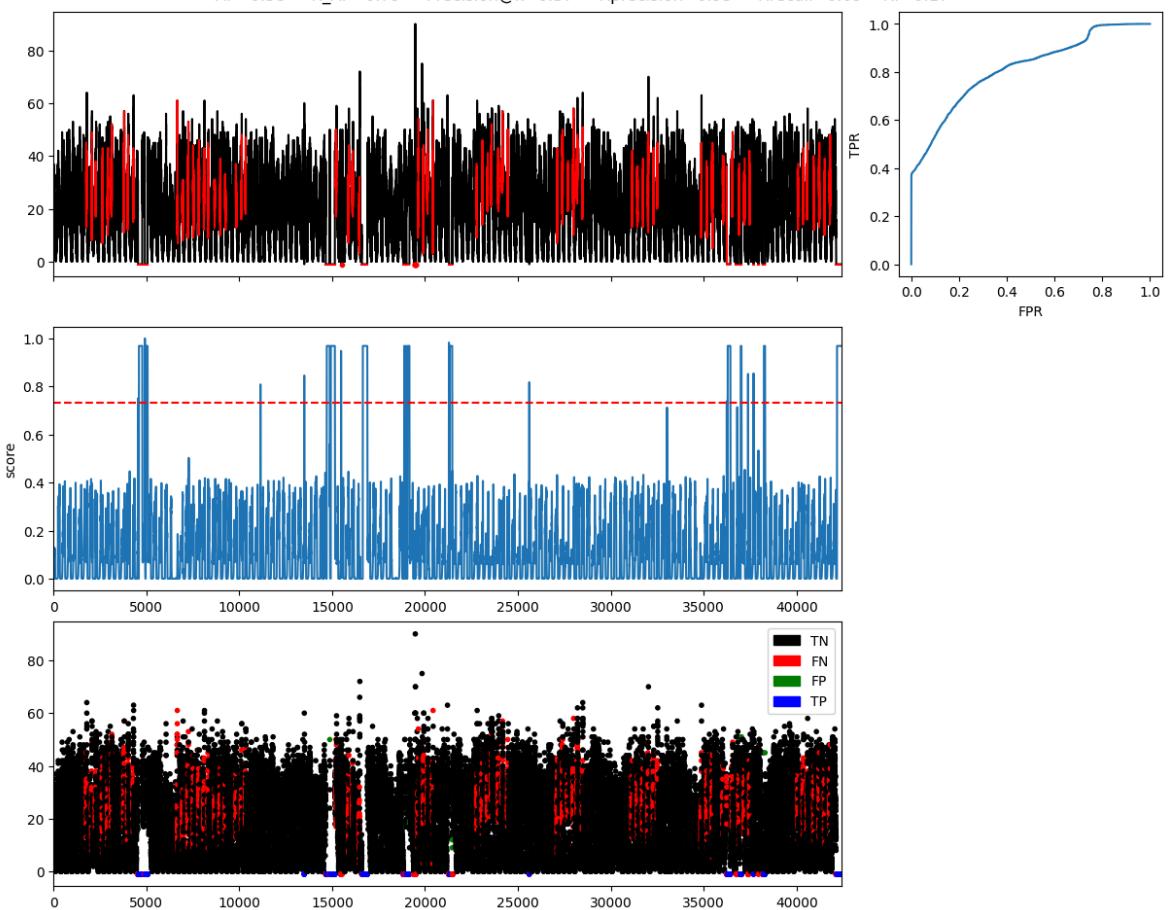
```
Estimated Subsequence length: 49
```

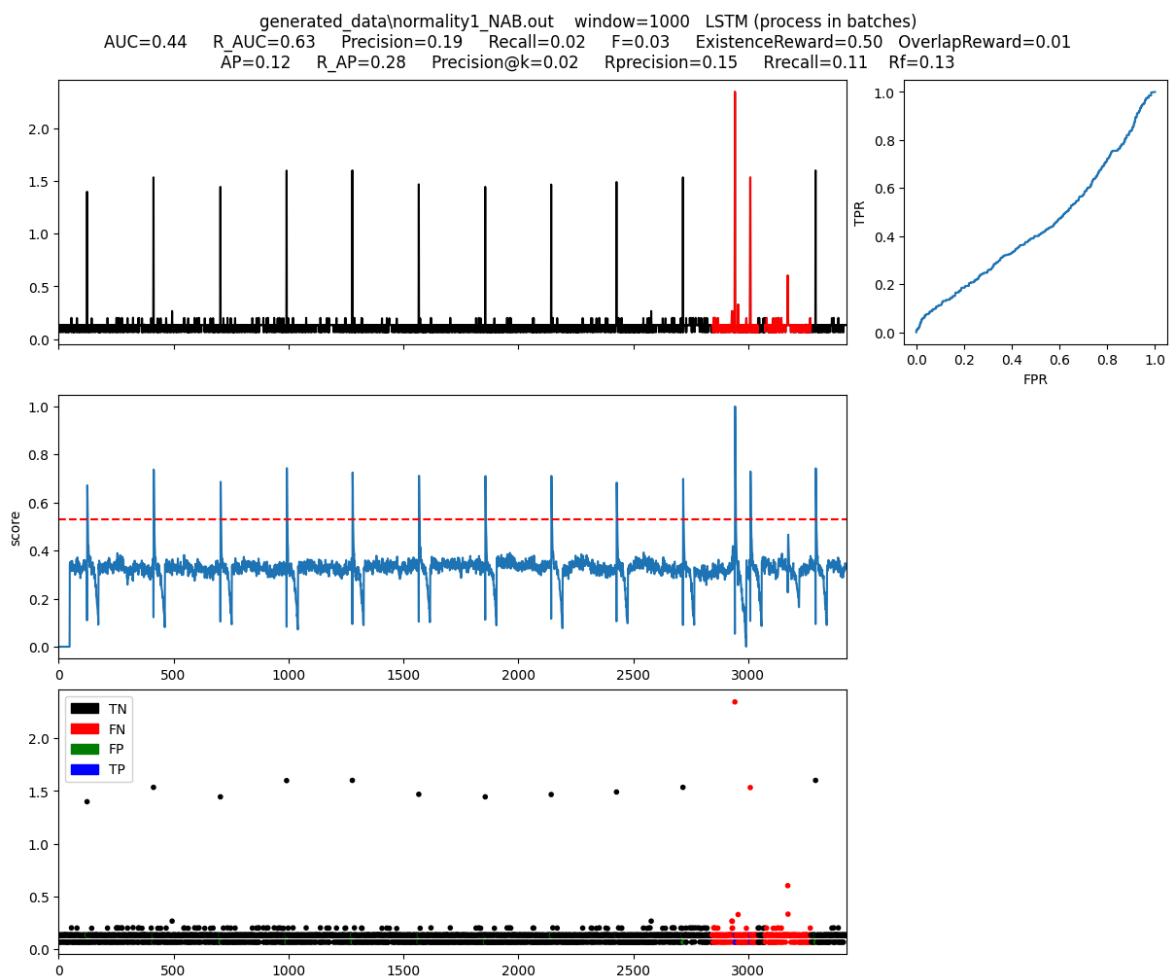
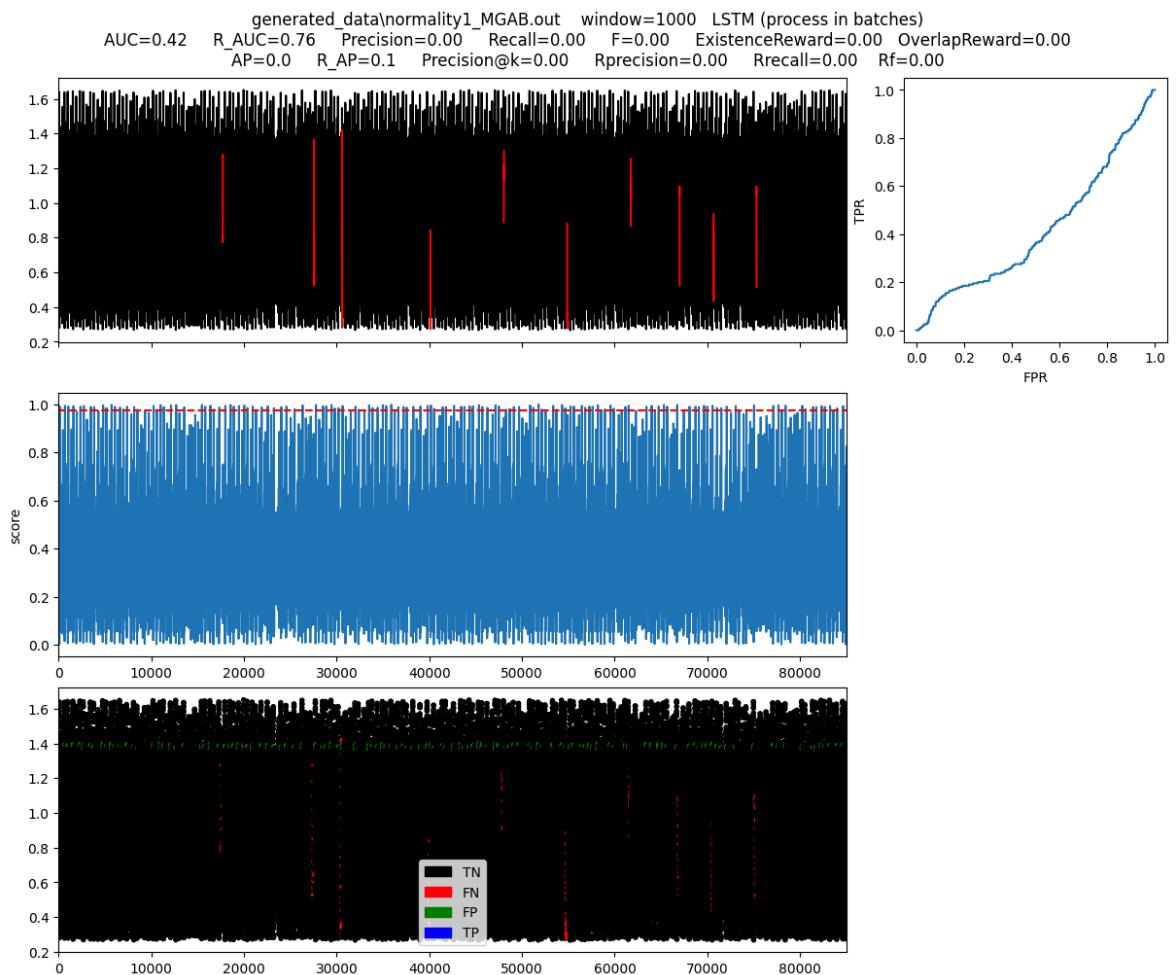
```
Time series length: 154431
```

```
Number of abnormal points: 6212
```

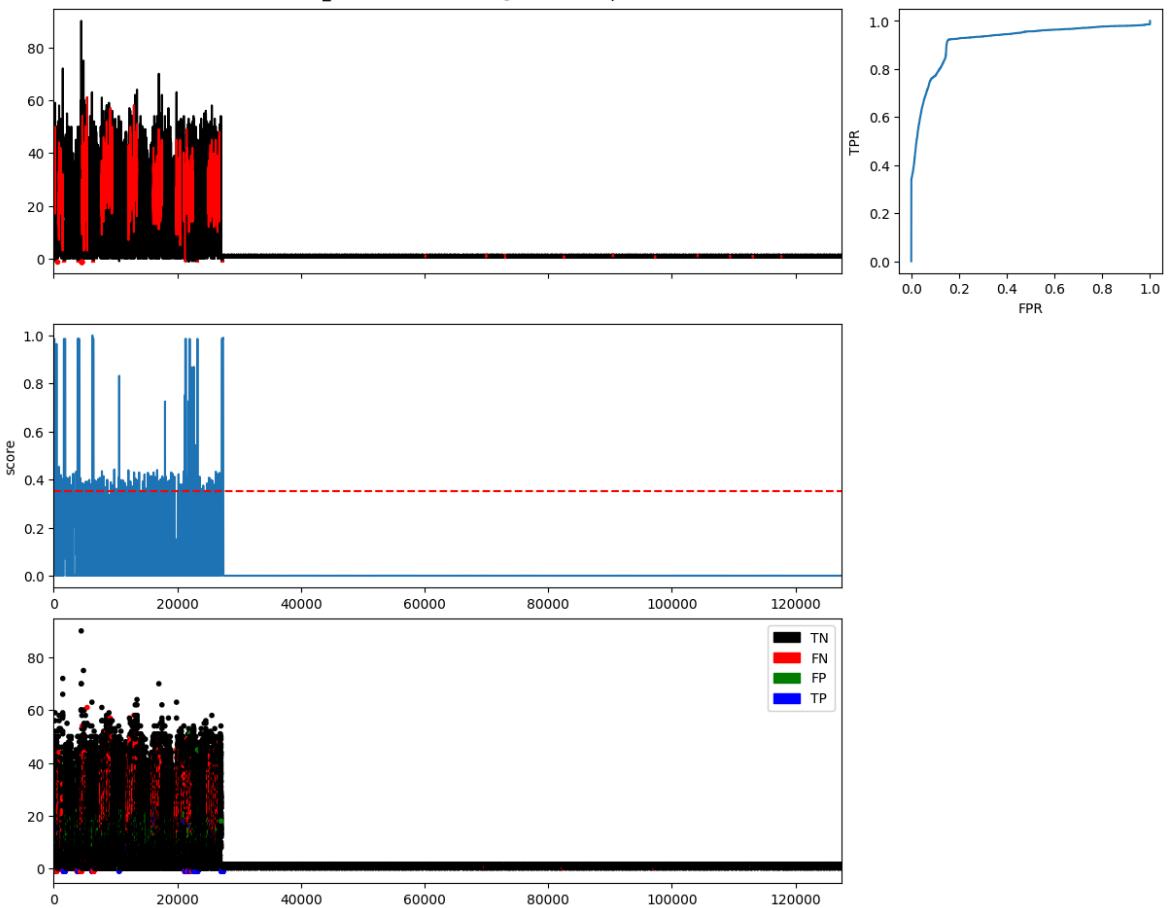
```
Processing batches: 100%|██████████| 132/132 [03:01<00:00, 1.37s/it]
```

```
generated_data\normality1_Dodgers.out window=1000 LSTM (process in batches)  
AUC=0.81 R_AUC=0.88 Precision=0.99 Recall=0.37 F=0.53 ExistenceReward=0.16 OverlapReward=0.08  
AP=0.58 R_AP=0.79 Precision@k=0.37 Rprecision=0.95 Rrecall=0.09 Rf=0.17
```

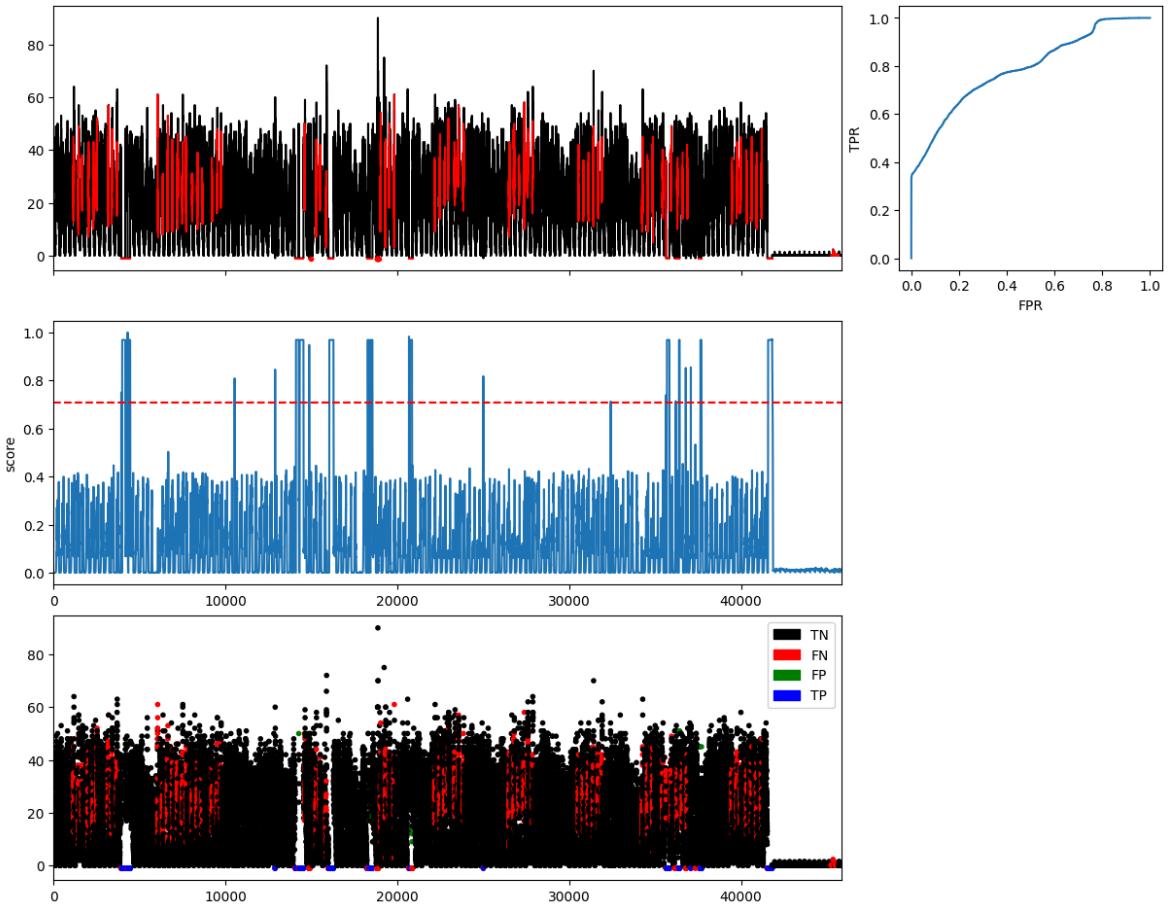




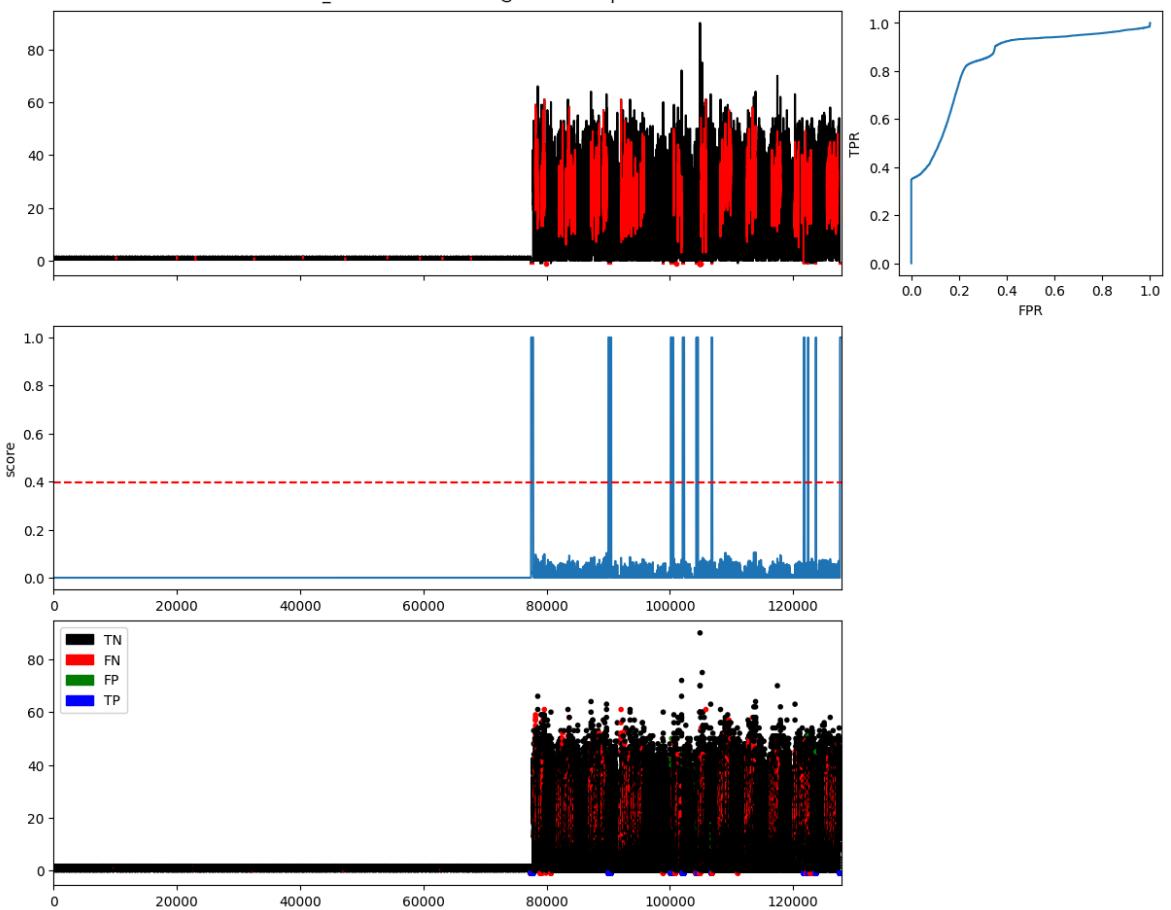
generated_data\normality2_Dodgers_MGAB.out window=1000 LSTM (process in batches)
AUC=0.92 R_AUC=0.96 Precision=0.73 Recall=0.36 F=0.48 ExistenceReward=0.34 OverlapReward=0.10
AP=0.53 R_AP=0.78 Precision@k=0.36 Rprecision=0.18 Recall=0.15 Rf=0.16



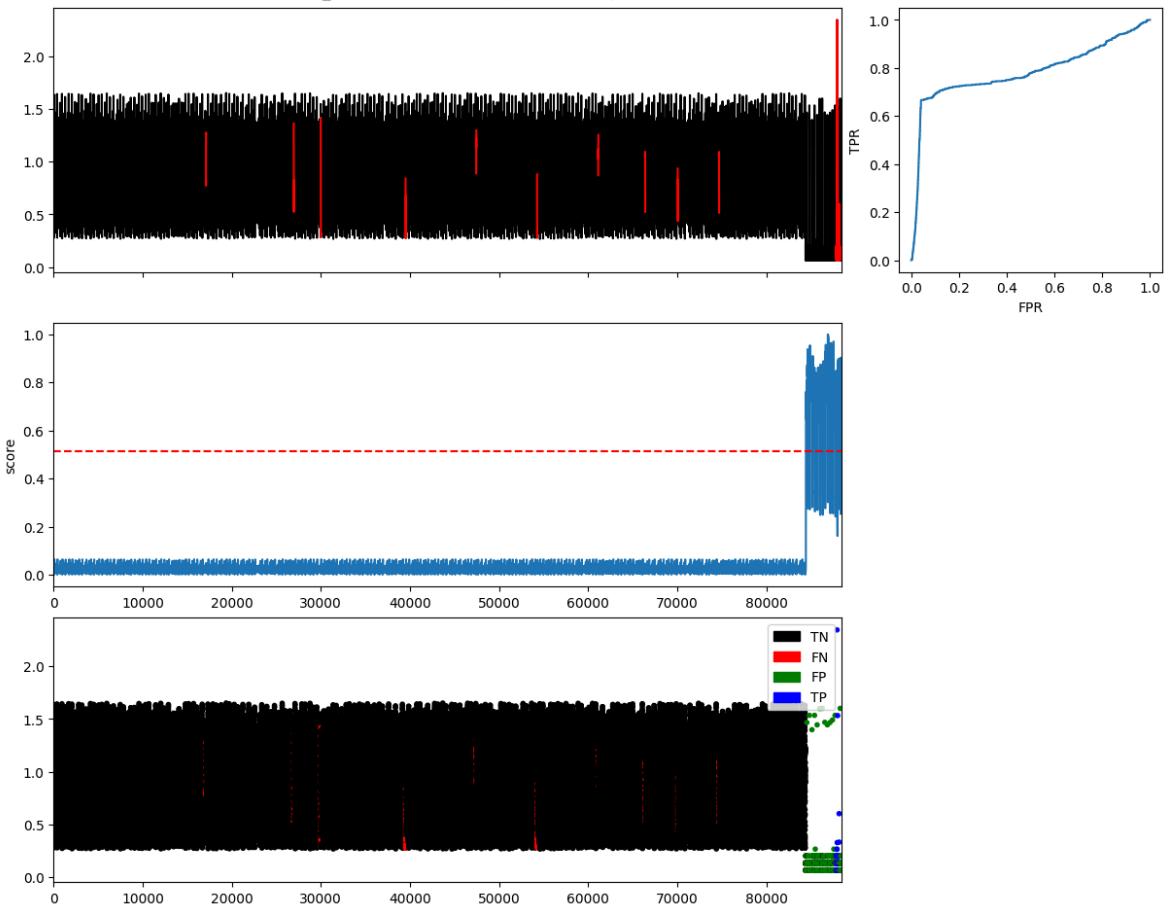
generated_data\normality2_Dodgers_NAB.out window=1000 LSTM (process in batches)
AUC=0.79 R_AUC=0.88 Precision=0.97 Recall=0.34 F=0.50 ExistenceReward=0.17 OverlapReward=0.07
AP=0.54 R_AP=0.8 Precision@k=0.34 Rprecision=0.91 Recall=0.09 Rf=0.17



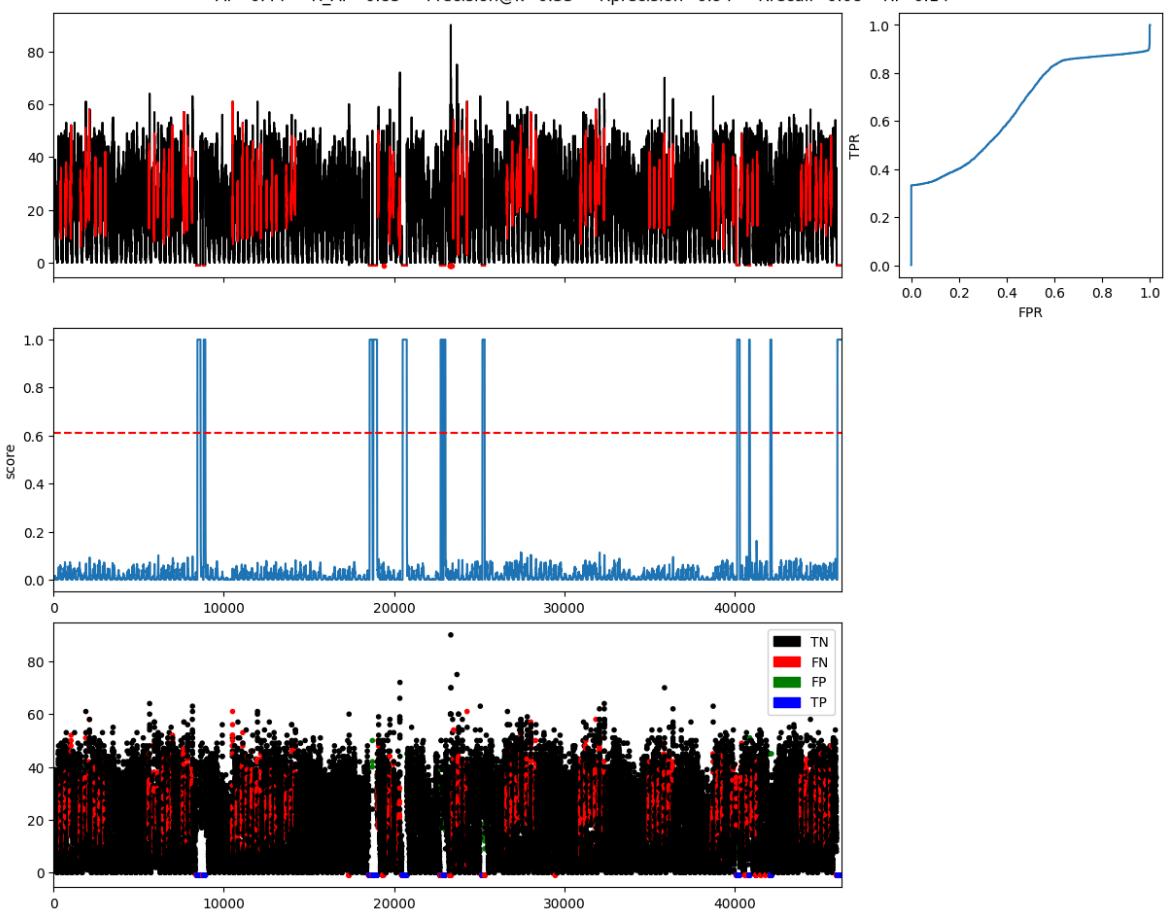
generated_data\normality2_MGAB_Dodgers.out window=1000 LSTM (process in batches)
AUC=0.84 R_AUC=0.93 Precision=0.98 Recall=0.35 F=0.51 ExistenceReward=0.10 OverlapReward=0.07
AP=0.45 R_AP=0.81 Precision@k=0.35 Rprecision=0.95 Rrecall=0.07 Rf=0.13



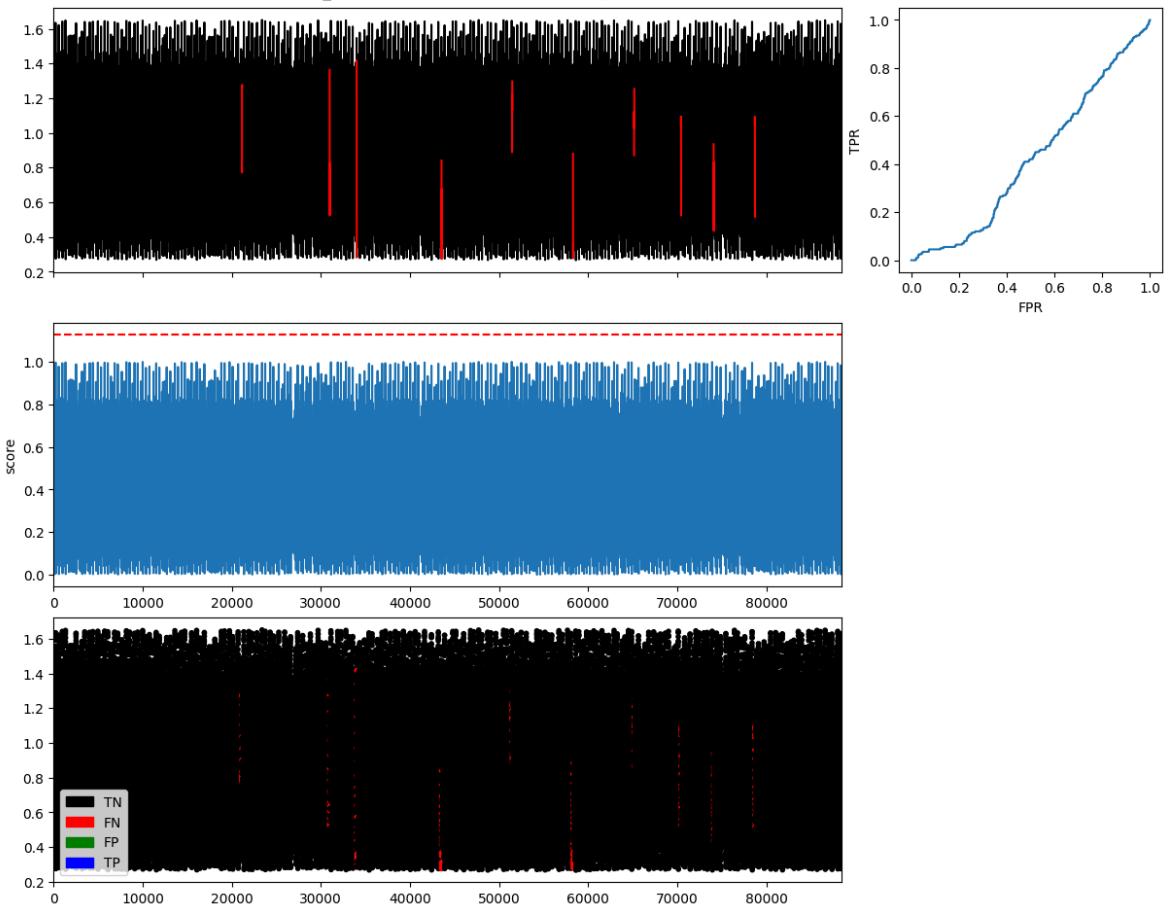
generated_data\normality2_MGAB_NAB.out window=1000 LSTM (process in batches)
AUC=0.78 R_AUC=0.79 Precision=0.10 Recall=0.59 F=0.16 ExistenceReward=0.17 OverlapReward=0.07
AP=0.05 R_AP=0.16 Precision@k=0.59 Rprecision=0.18 Rrecall=0.09 Rf=0.12



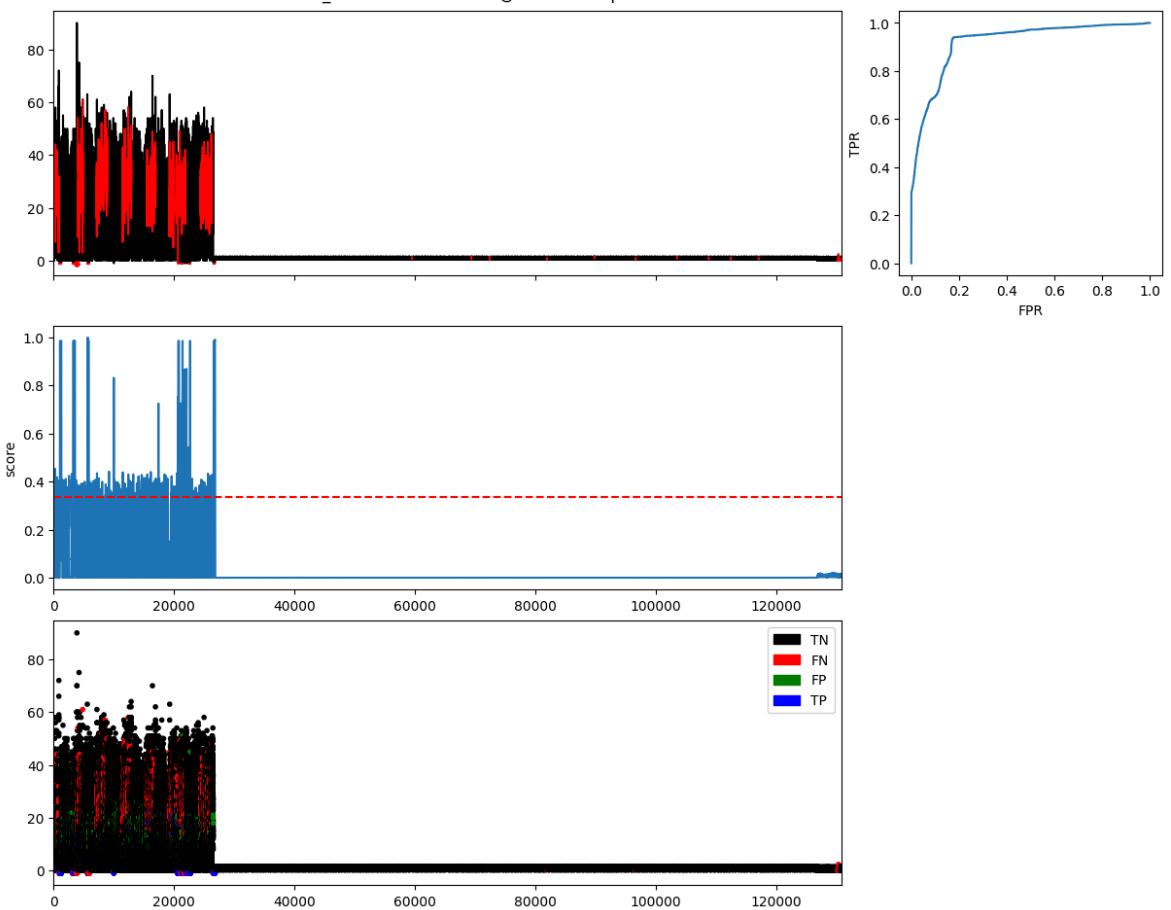
generated_data\normality2_NAB_Dodgers.out window=1000 LSTM (process in batches)
AUC=0.66 R_AUC=0.91 Precision=0.98 Recall=0.33 F=0.50 ExistenceReward=0.11 OverlapReward=0.07
AP=0.44 R_AP=0.85 Precision@k=0.33 Rprecision=0.94 Rrecall=0.08 Rf=0.14



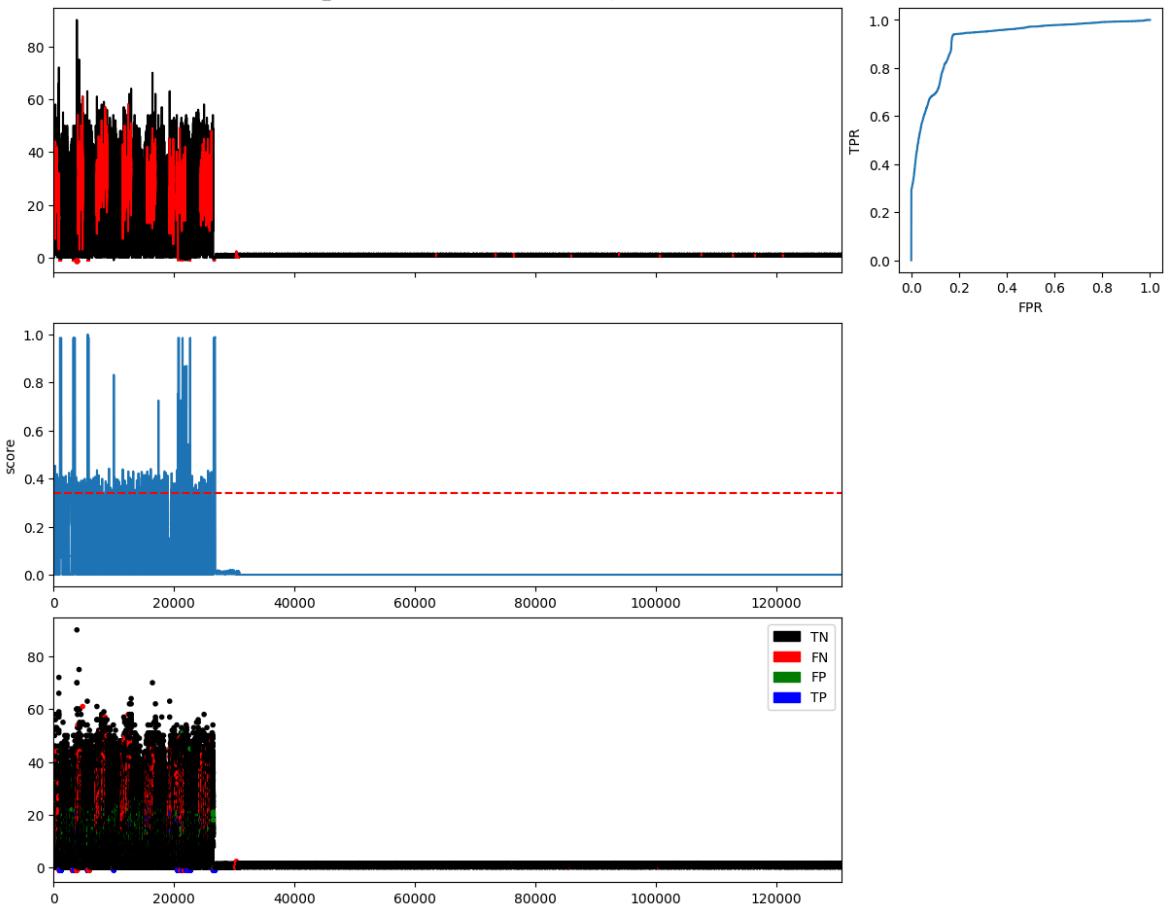
generated_data\normality2_NAB_MGAB.out window=1000 LSTM (process in batches)
AUC=0.42 R_AUC=0.76 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.0 R_AP=0.1 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



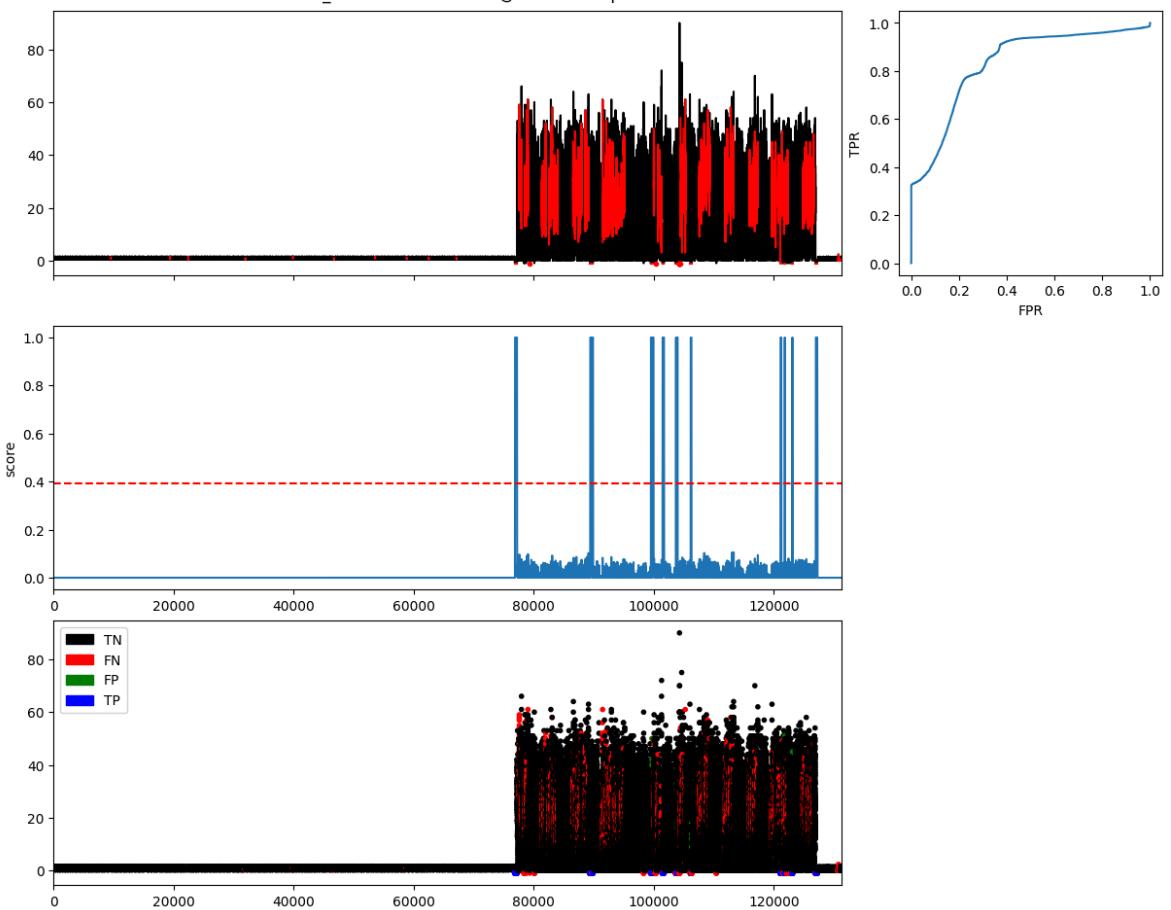
generated_data\normality3_Dodgers_MGAB_NAB.out window=1000 LSTM (process in batches)
AUC=0.92 R_AUC=0.95 Precision=0.62 Recall=0.32 F=0.42 ExistenceReward=0.36 OverlapReward=0.09
AP=0.48 R_AP=0.72 Precision@k=0.32 Rprecision=0.19 Rrecall=0.15 Rf=0.16



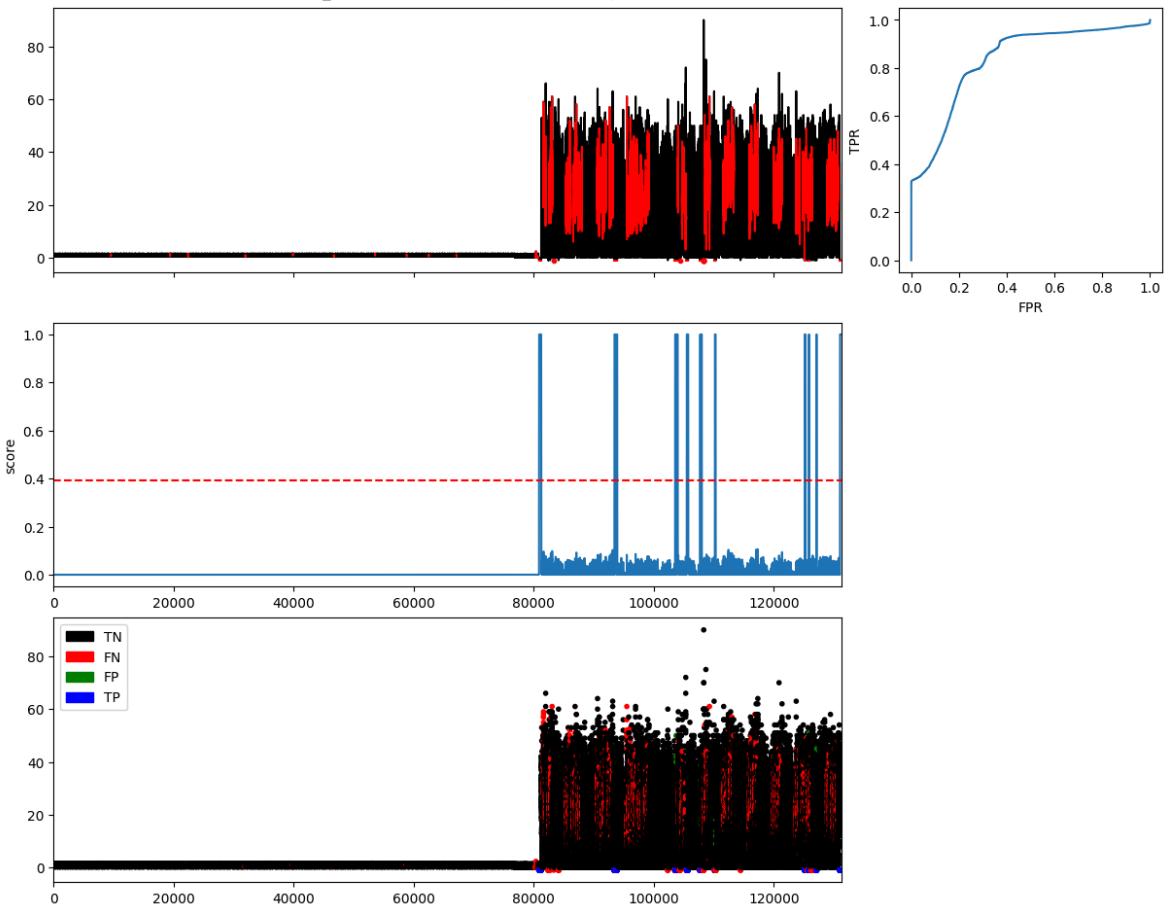
generated_data\normality3_Dodgers_NAB_MGAB.out window=1000 LSTM (process in batches)
AUC=0.92 R_AUC=0.95 Precision=0.62 Recall=0.32 F=0.42 ExistenceReward=0.36 OverlapReward=0.09
AP=0.47 R_AP=0.73 Precision@k=0.32 Rprecision=0.18 Rrecall=0.15 Rf=0.16



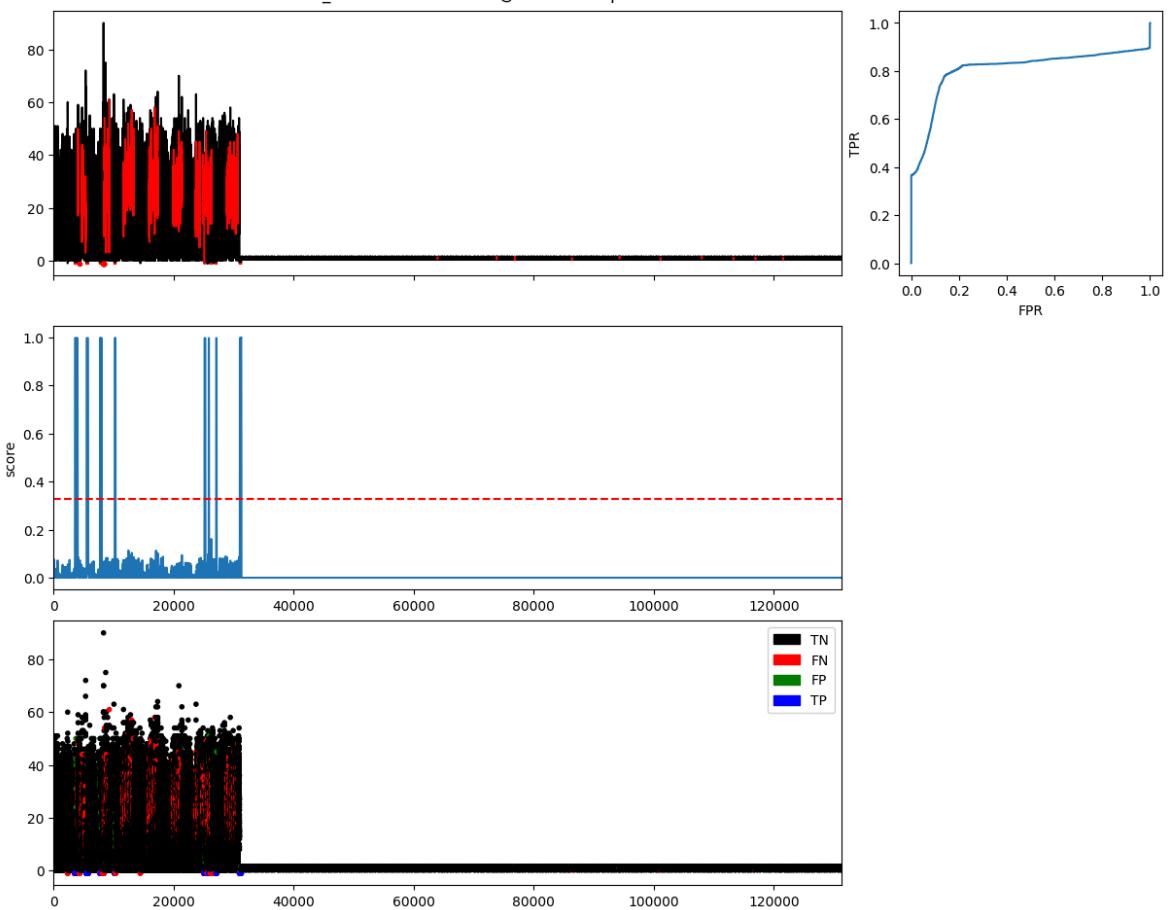
generated_data\normality3_MGAB_Dodgers_NAB.out window=1000 LSTM (process in batches)
AUC=0.83 R_AUC=0.92 Precision=0.96 Recall=0.33 F=0.49 ExistenceReward=0.10 OverlapReward=0.06
AP=0.43 R_AP=0.79 Precision@k=0.33 Rprecision=0.94 Rrecall=0.07 Rf=0.13



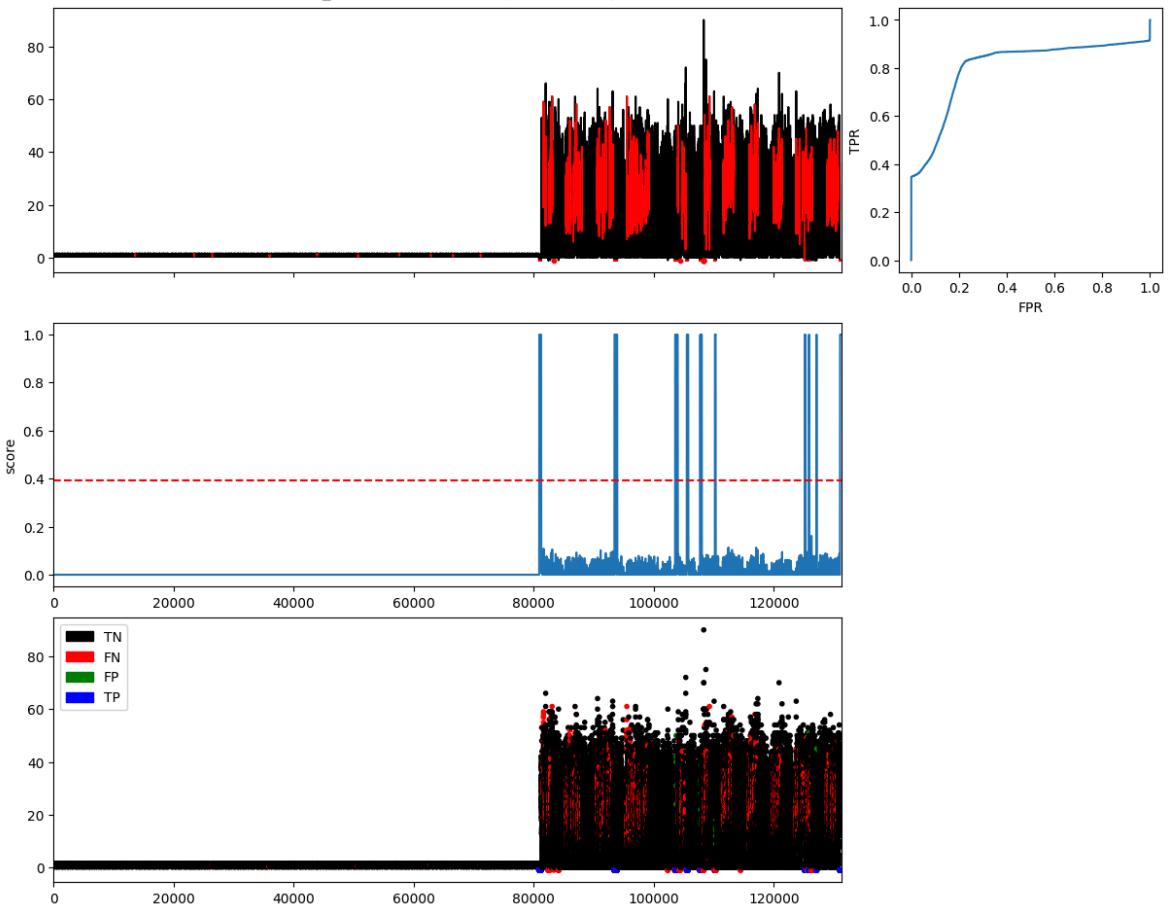
generated_data\normality3_MGAB_NAB_Dodgers.out window=1000 LSTM (process in batches)
AUC=0.83 R_AUC=0.92 Precision=0.98 Recall=0.33 F=0.49 ExistenceReward=0.10 OverlapReward=0.06
AP=0.43 R_AP=0.79 Precision@k=0.33 Rprecision=0.95 Rrecall=0.07 Rf=0.13



generated_data\normality3_NAB_Dodgers_MGAB.out window=1000 LSTM (process in batches)
AUC=0.81 R_AUC=0.95 Precision=0.94 Recall=0.37 F=0.53 ExistenceReward=0.11 OverlapReward=0.07
AP=0.46 R_AP=0.77 Precision@k=0.37 Rprecision=0.89 Rrecall=0.08 Rf=0.14



generated_data\normality3_NAB_MGAB_Dodgers.out window=1000 LSTM (process in batches)
AUC=0.80 R_AUC=0.93 Precision=0.97 Recall=0.35 F=0.51 ExistenceReward=0.10 OverlapReward=0.06
AP=0.45 R_AP=0.81 Precision@k=0.35 Rprecision=0.92 Rrecall=0.07 Rf=0.13

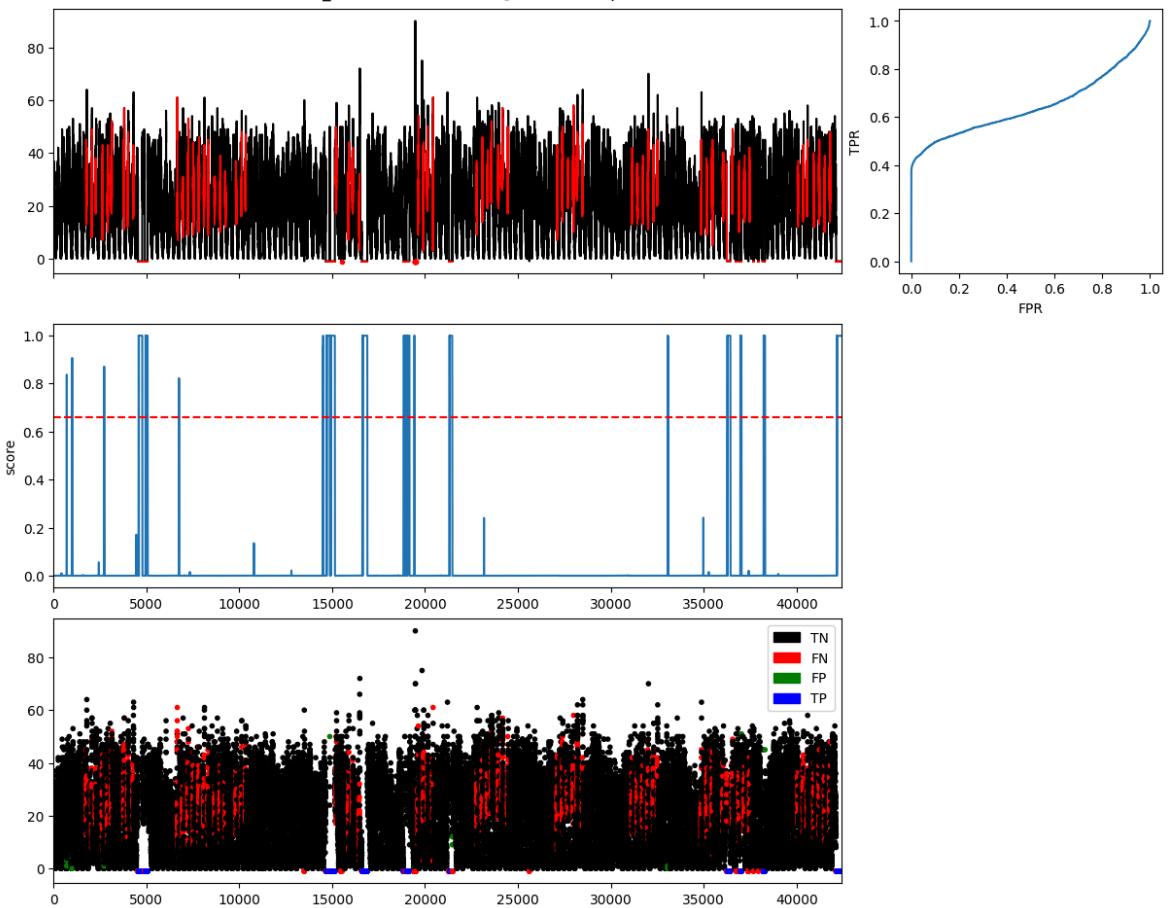


Variation 2 - Process in batches with pseudo labeling

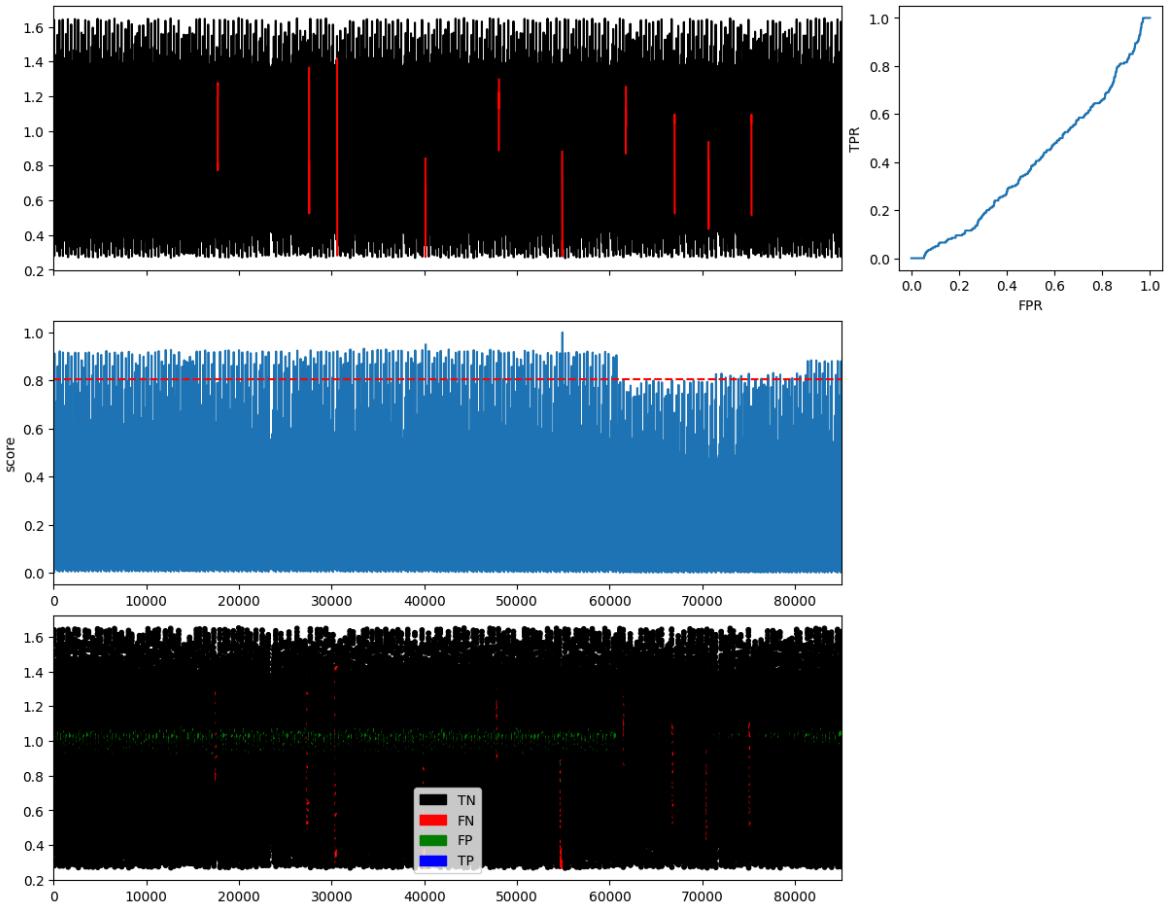
```
In [ ]: for filepath in file_paths:  
    name, slidingWindow, data, label, X_train, y_train, X_test, y_test = data_pr  
    X_test_reshaped = X_test.reshape((-1, 1, 1))  
  
    model = models[filepath]  
    # Process test data in batches to simulate streaming  
    score = process_in_batches_with_pseudo_labeling(model, X_test, batch_size=BATCH_SIZE)  
  
    zeros = np.zeros(WINDOW_SIZE-1)  
    new_score = np.concatenate((zeros, score))  
    plotFig(X_test, y_test, new_score, BATCH_SIZE, fileName=name, modelName="LSTM")  
  
generated_data\normality1_Dodgers.out  
Estimated Subsequence length: 288  
Time series length: 49900  
Number of abnormal points: 5233  
Processing batches: 100%|██████████| 43/43 [01:57<00:00, 2.74s/it]  
generated_data\normality1_MGAB.out  
Estimated Subsequence length: 49  
Time series length: 100000  
Number of abnormal points: 200  
Processing batches: 100%|██████████| 85/85 [03:51<00:00, 2.73s/it]  
generated_data\normality1_NAB.out  
Estimated Subsequence length: 289  
Time series length: 4031  
Number of abnormal points: 400  
Processing batches: 100%|██████████| 4/4 [00:04<00:00, 1.12s/it]  
generated_data\normality2_Dodgers_MGAB.out  
Estimated Subsequence length: 288  
Time series length: 149900  
Number of abnormal points: 5433  
Processing batches: 100%|██████████| 128/128 [05:01<00:00, 2.36s/it]  
generated_data\normality2_Dodgers_NAB.out  
Estimated Subsequence length: 288  
Time series length: 53931  
Number of abnormal points: 5633  
Processing batches: 100%|██████████| 46/46 [01:36<00:00, 2.10s/it]  
generated_data\normality2_MGAB_Dodgers.out  
Estimated Subsequence length: 49  
Time series length: 150400  
Number of abnormal points: 5812  
Processing batches: 100%|██████████| 128/128 [05:17<00:00, 2.48s/it]  
generated_data\normality2_MGAB_NAB.out  
Estimated Subsequence length: 49  
Time series length: 104031  
Number of abnormal points: 600  
Processing batches: 100%|██████████| 89/89 [03:34<00:00, 2.41s/it]  
generated_data\normality2_NAB_Dodgers.out  
Estimated Subsequence length: 288  
Time series length: 54431  
Number of abnormal points: 6012  
Processing batches: 100%|██████████| 47/47 [01:40<00:00, 2.14s/it]
```

```
generated_data\normality2_NAB_MGAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 89/89 [03:22<00:00, 2.28s/it]
generated_data\normality3_Dodgers_MGAB_NAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [05:08<00:00, 2.35s/it]
generated_data\normality3_Dodgers_NAB_MGAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [05:09<00:00, 2.36s/it]
generated_data\normality3_MGAB_Dodgers_NAB.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [05:13<00:00, 2.38s/it]
generated_data\normality3_MGAB_NAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [07:34<00:00, 3.44s/it]
generated_data\normality3_NAB_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [08:11<00:00, 3.73s/it]
generated_data\normality3_NAB_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [08:35<00:00, 3.90s/it]
```

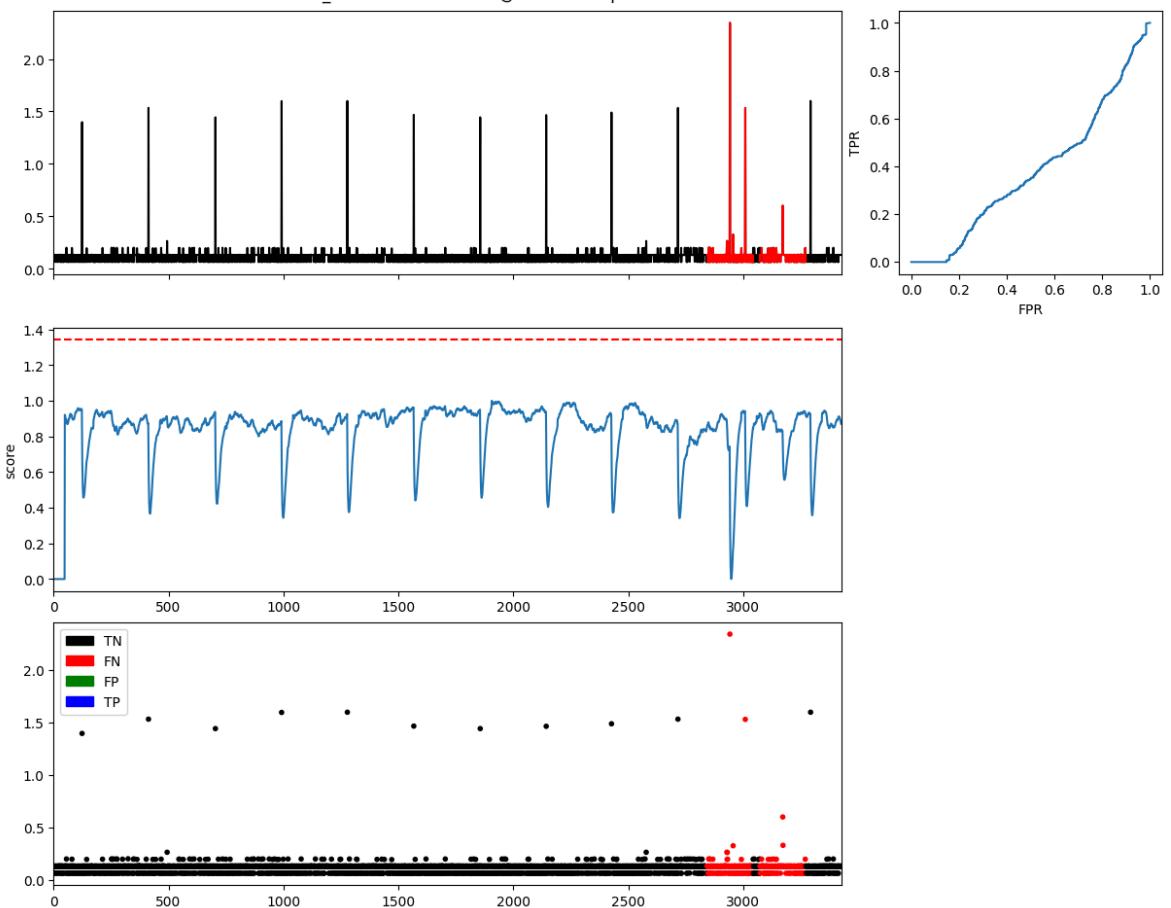
generated_data\normality1_Dodgers.out window=1000 LSTM (pseudo labeling)
AUC=0.65 R_AUC=0.91 Precision=0.98 Recall=0.38 F=0.55 ExistenceReward=0.13 OverlapReward=0.06
AP=0.53 R_AP=0.84 Precision@k=0.38 Rprecision=0.75 Rrecall=0.07 Rf=0.13



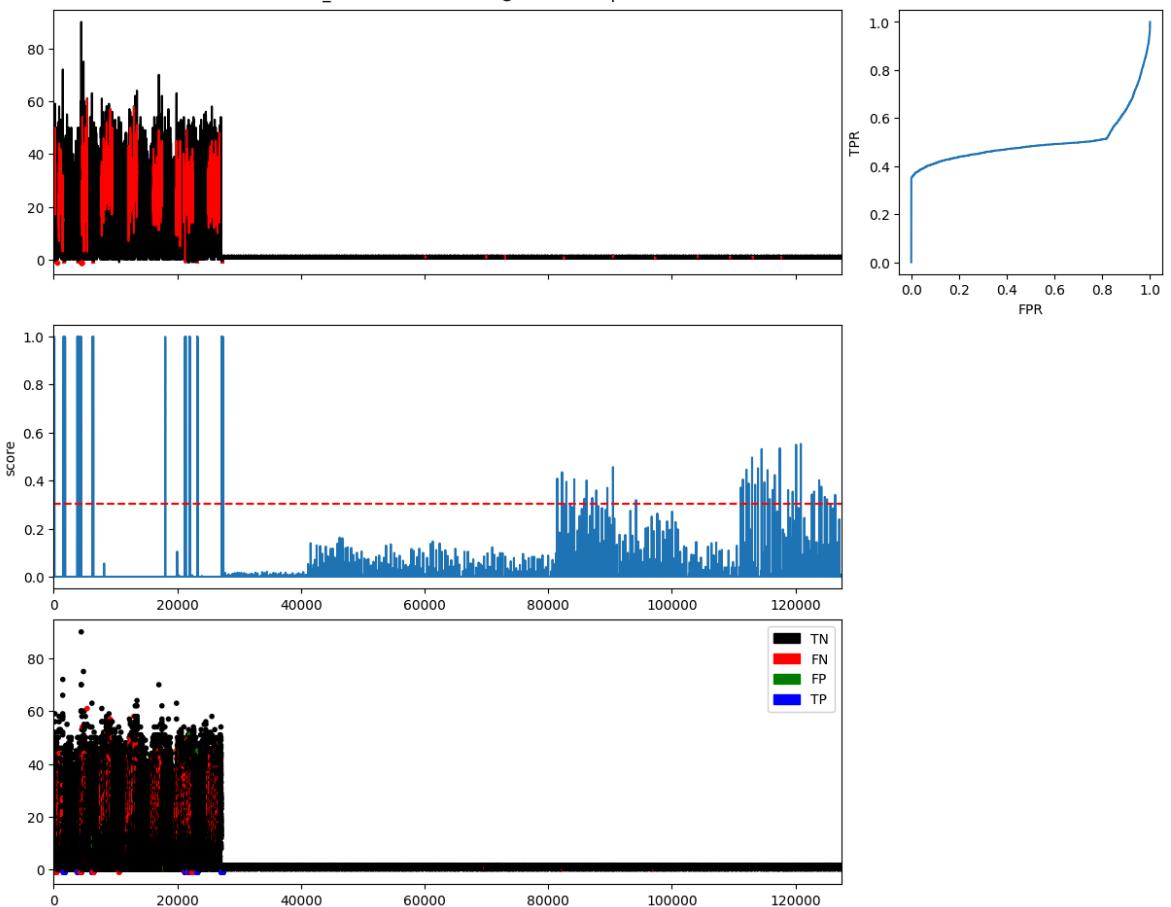
generated_data\normality1_MGAB.out window=1000 LSTM (pseudo labeling)
AUC=0.40 R_AUC=0.75 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.0 R_AP=0.1 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



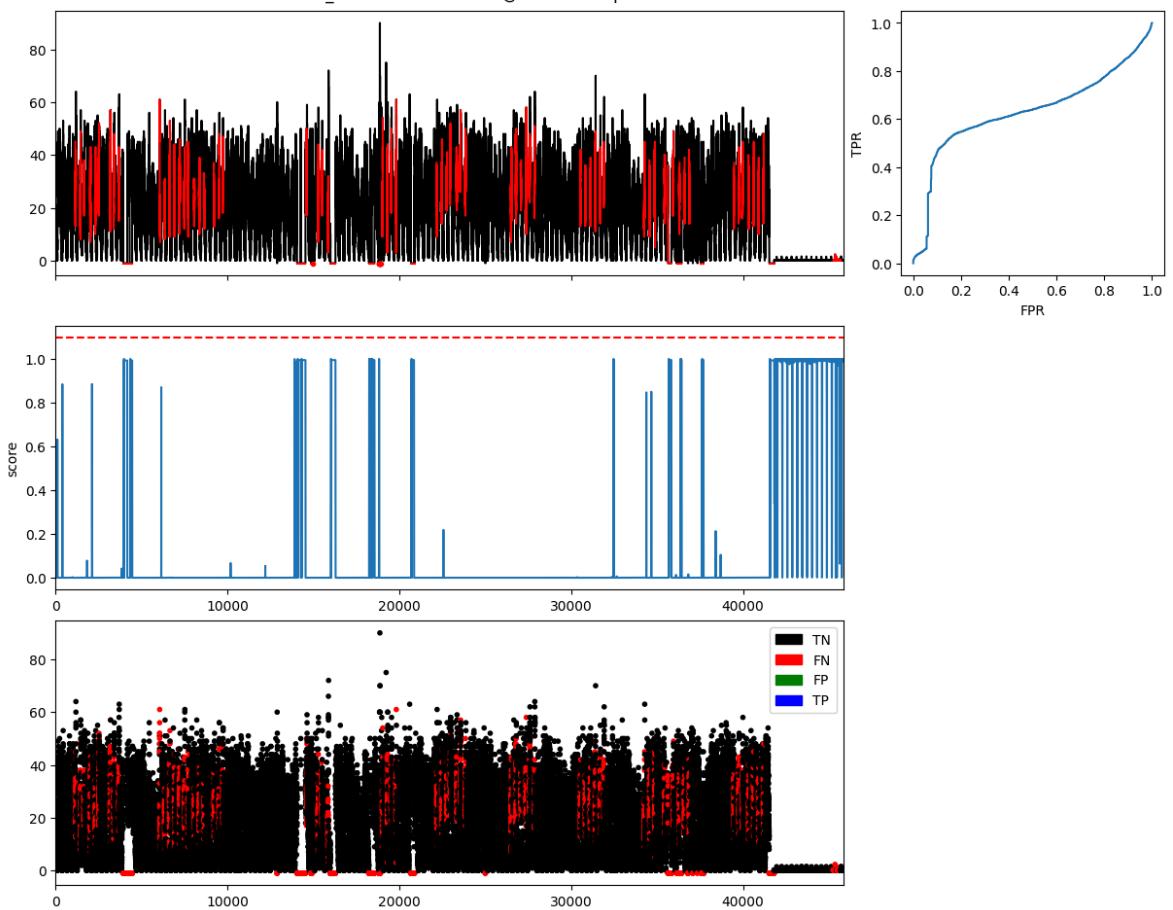
generated_data\normality1_NAB.out window=1000 LSTM (pseudo labeling)
AUC=0.38 R_AUC=0.54 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.09 R_AP=0.21 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



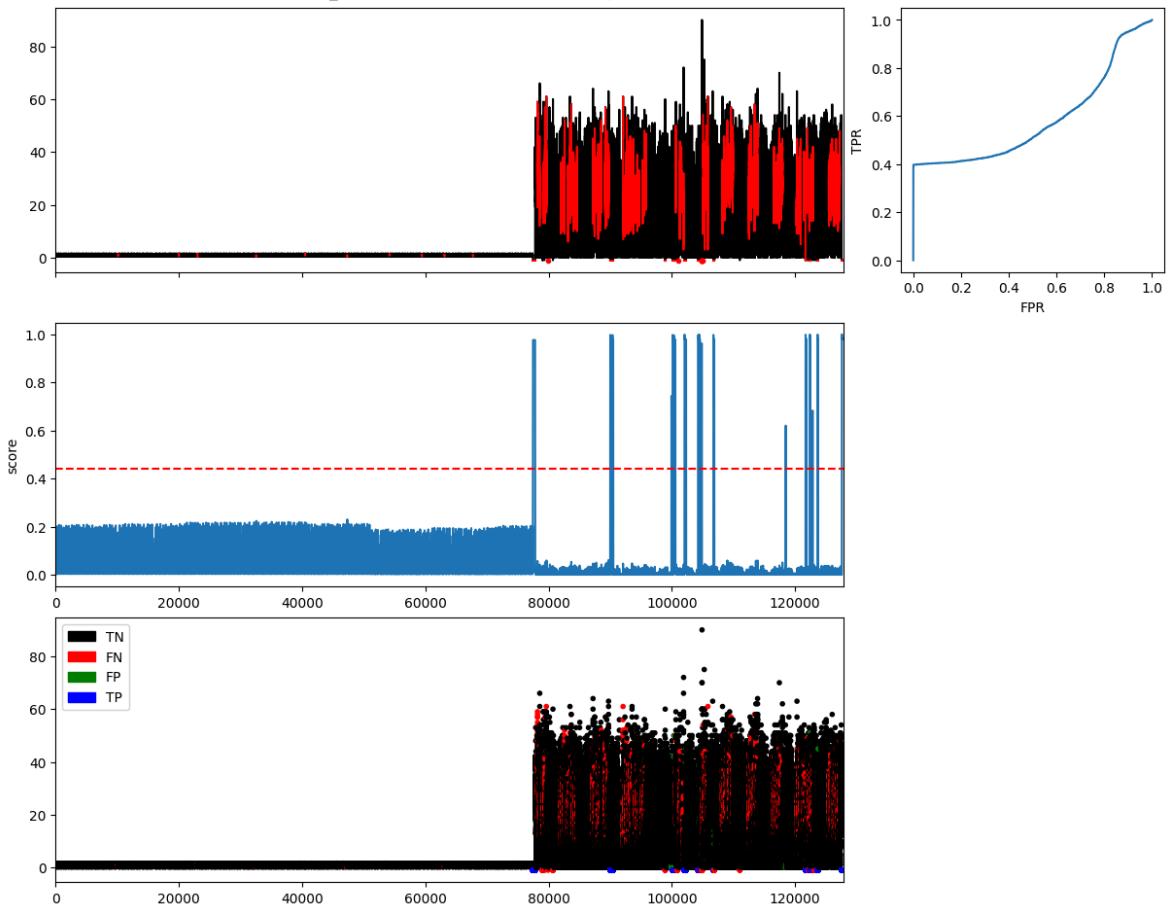
generated_data\normality2_Dodgers_MGAB.out window=1000 LSTM (pseudo labeling)
AUC=0.50 R_AUC=0.51 Precision=0.94 Recall=0.35 F=0.51 ExistenceReward=0.13 OverlapReward=0.06
AP=0.38 R_AP=0.21 Precision@k=0.35 Rprecision=0.32 Rrecall=0.08 Rf=0.12



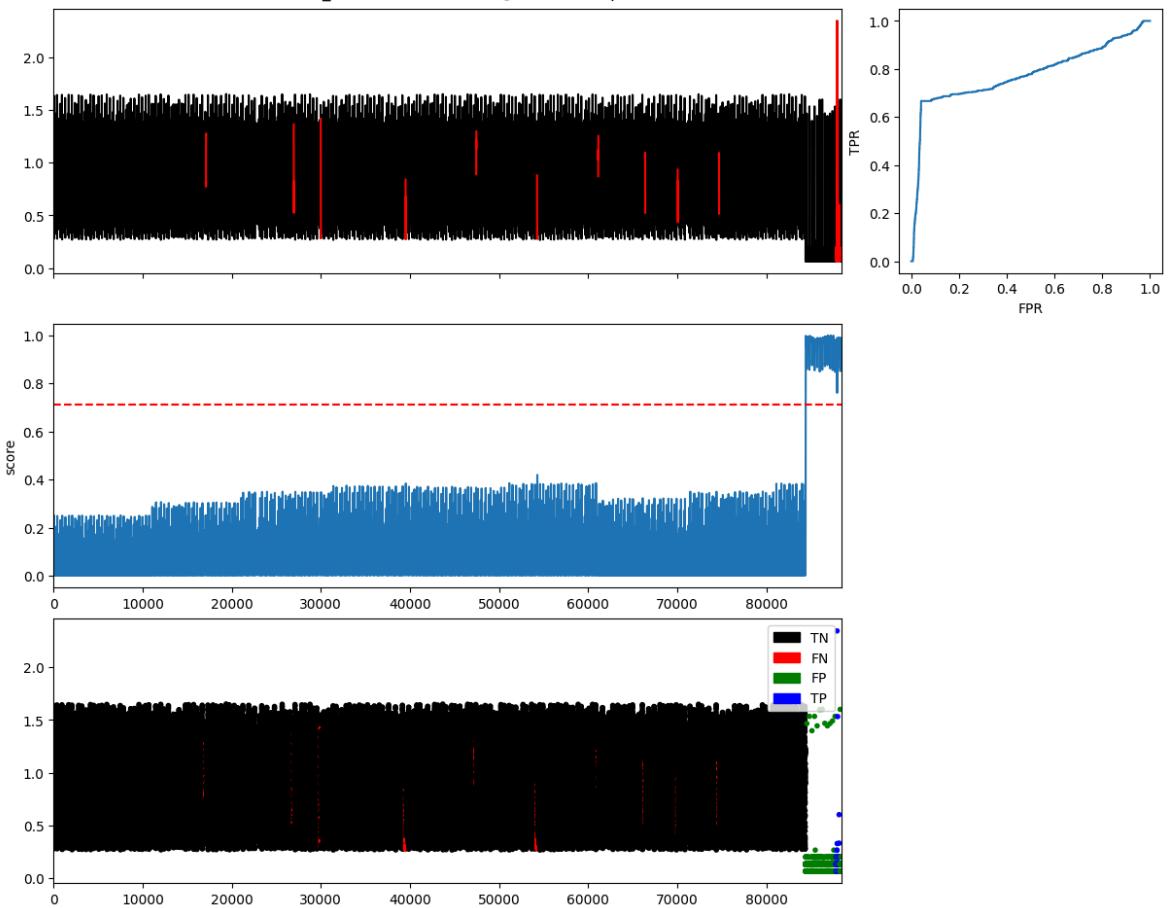
generated_data\normality2_Dodgers_NAB.out window=1000 LSTM (pseudo labeling)
AUC=0.63 R_AUC=0.84 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.25 R_AP=0.67 Precision@k=0.00 Rprecision=0.00 Recall=0.00 Rf=0.00



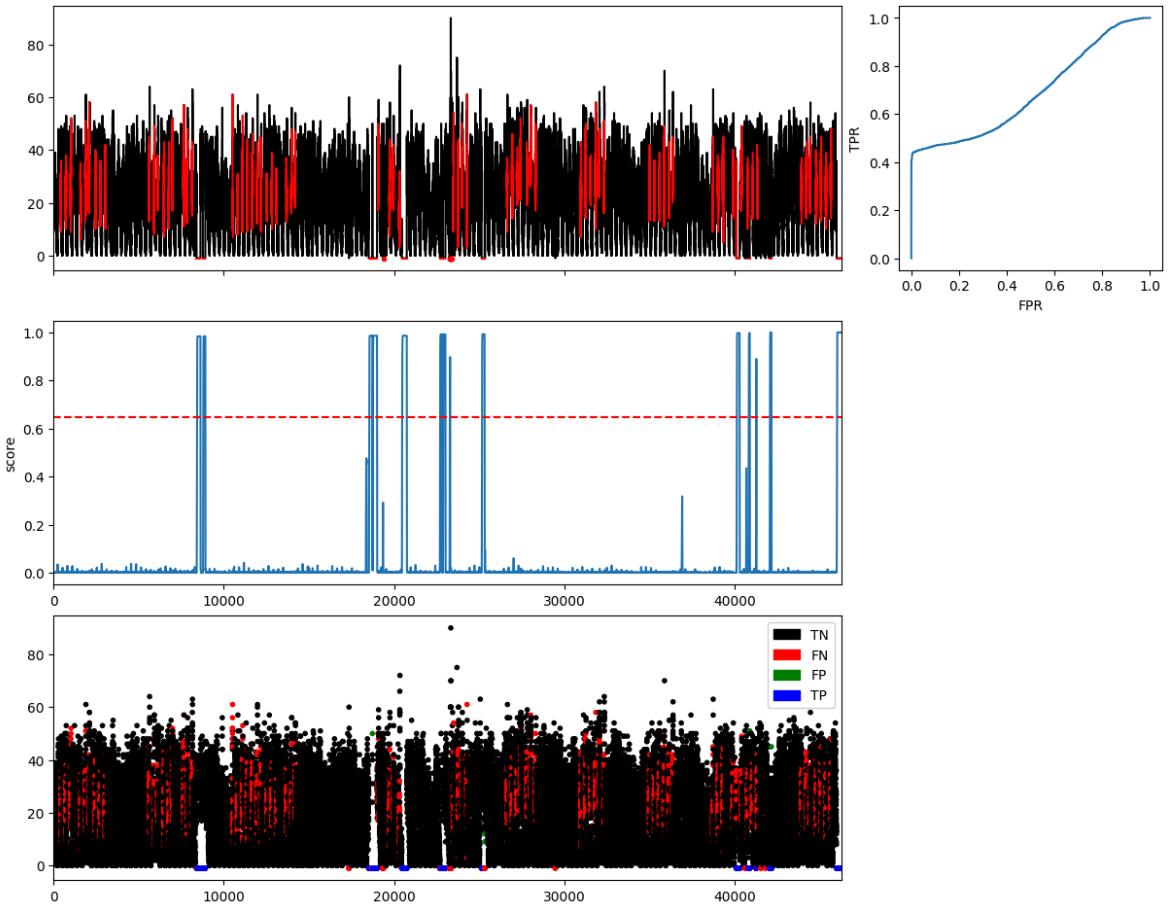
generated_data\normality2_MGAB_Dodgers.out window=1000 LSTM (pseudo labeling)
AUC=0.58 R_AUC=0.62 Precision=0.97 Recall=0.39 F=0.56 ExistenceReward=0.13 OverlapReward=0.10
AP=0.43 R_AP=0.3 Precision@k=0.39 Rprecision=0.80 Recall=0.11 Rf=0.19



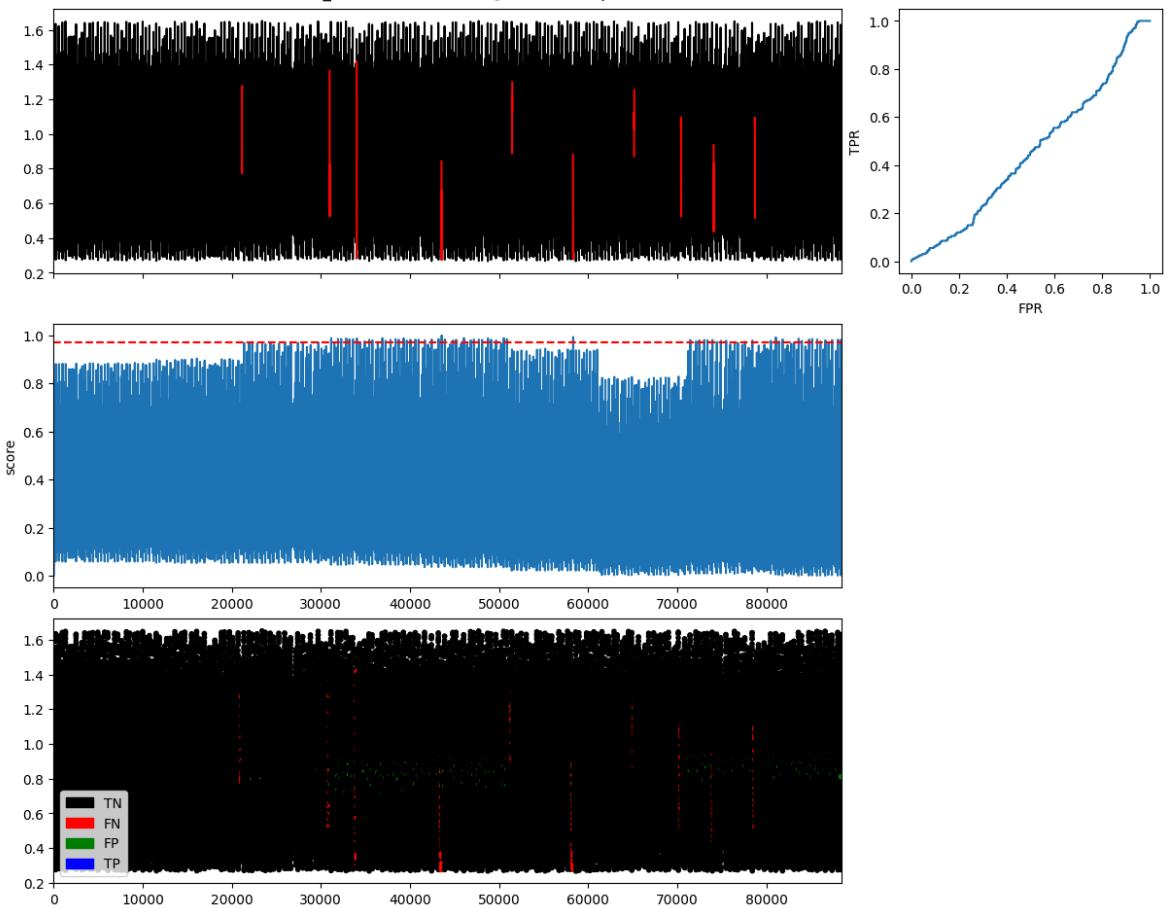
generated_data\normality2_MGAB_NAB.out window=1000 LSTM (pseudo labeling)
 AUC=0.78 R_AUC=0.8 Precision=0.10 Recall=0.67 F=0.17 ExistenceReward=0.17 OverlapReward=0.17
 AP=0.05 R_AP=0.16 Precision@k=0.67 Rprecision=0.05 Rrecall=0.17 Rf=0.08



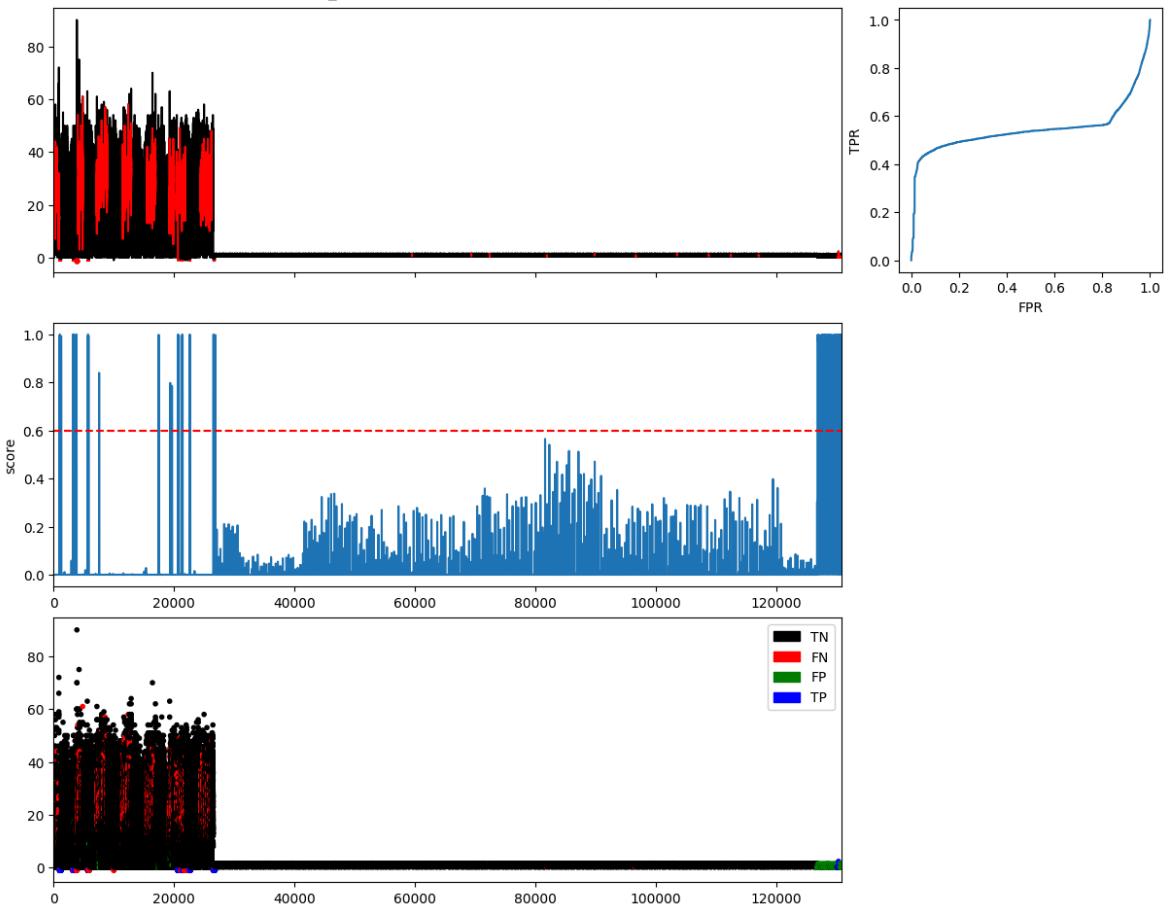
generated_data\normality2_NAB_Dodgers.out window=1000 LSTM (pseudo labeling)
 AUC=0.69 R_AUC=0.92 Precision=0.99 Recall=0.40 F=0.57 ExistenceReward=0.14 OverlapReward=0.11
 AP=0.53 R_AP=0.86 Precision@k=0.40 Rprecision=0.93 Rrecall=0.12 Rf=0.21



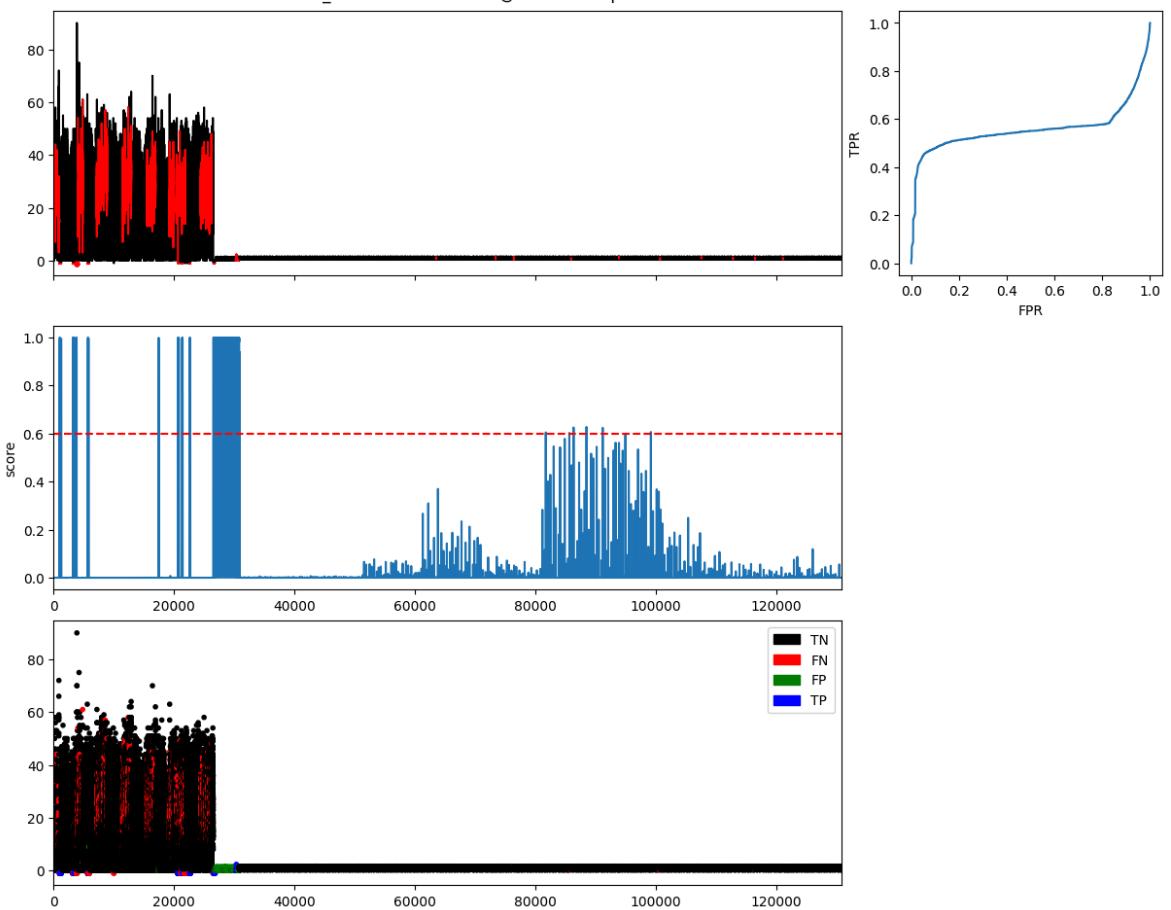
generated_data\normality2_NAB_MGAB.out window=1000 LSTM (pseudo labeling)
AUC=0.45 R_AUC=0.75 Precision=0.01 Recall=0.01 F=0.01 ExistenceReward=0.10 OverlapReward=0.01
AP=0.0 R_AP=0.1 Precision@k=0.01 Rprecision=0.00 Recall=0.02 Rf=0.01



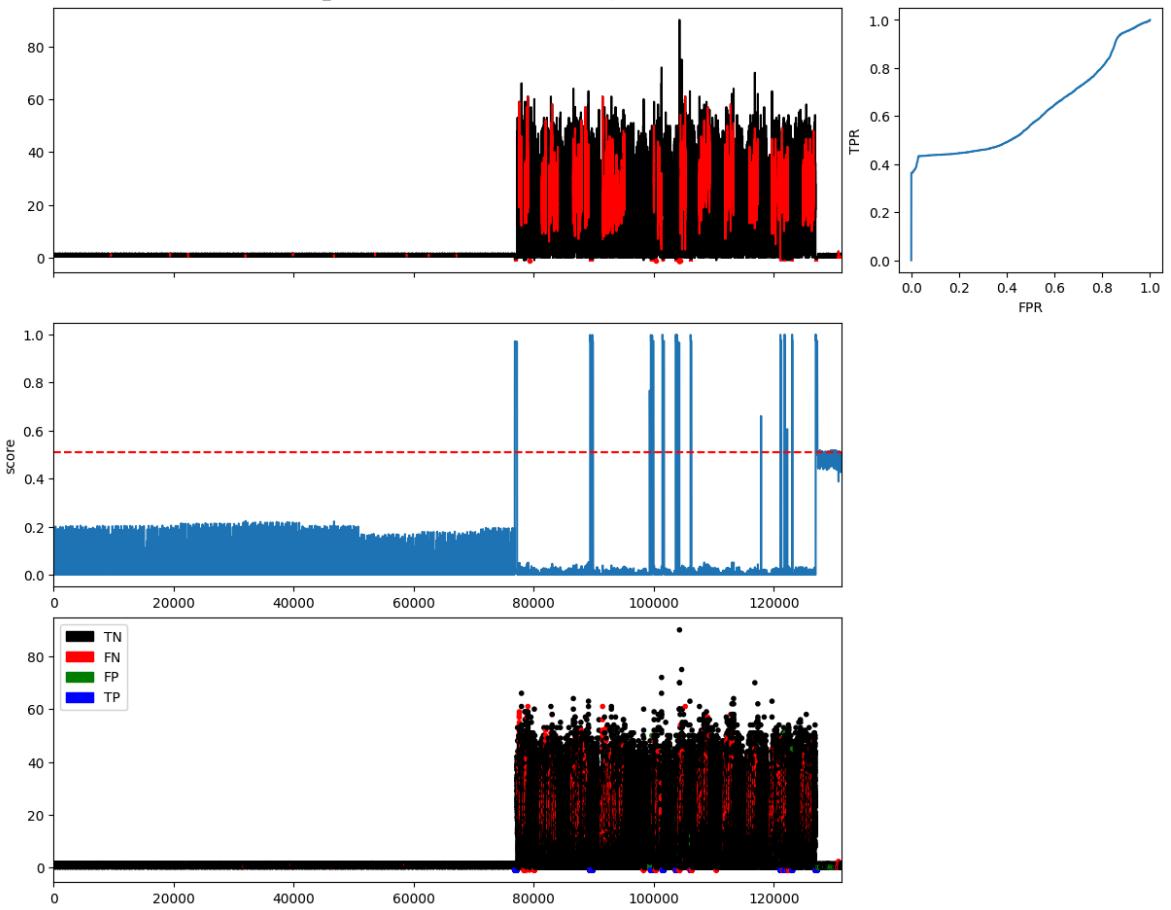
generated_data\normality3_Dodgers_MGAB_NAB.out window=1000 LSTM (pseudo labeling)
AUC=0.55 R_AUC=0.54 Precision=0.30 Recall=0.40 F=0.35 ExistenceReward=0.14 OverlapReward=0.06
AP=0.18 R_AP=0.2 Precision@k=0.40 Rprecision=0.49 Recall=0.07 Rf=0.13



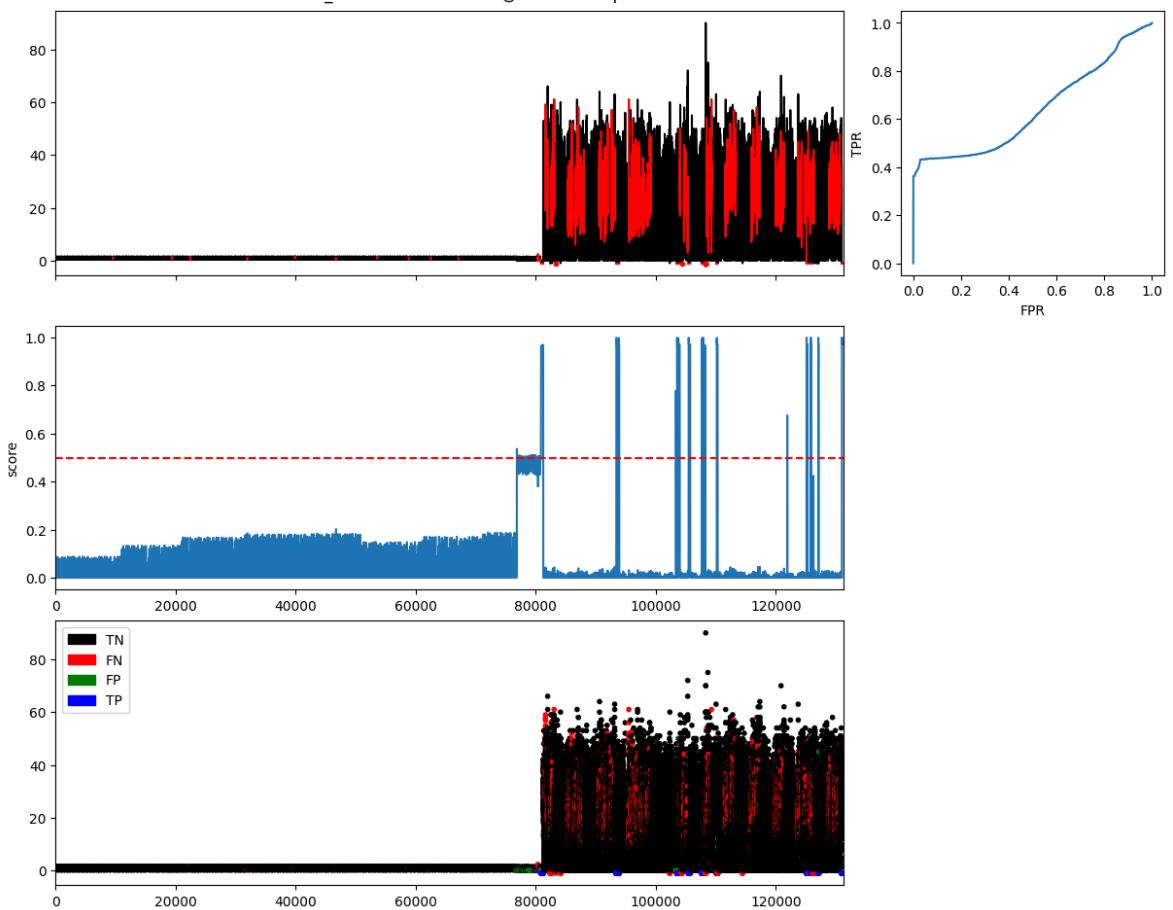
generated_data\normality3_Dodgers_NAB_MGAB.out window=1000 LSTM (pseudo labeling)
AUC=0.56 R_AUC=0.56 Precision=0.30 Recall=0.40 F=0.34 ExistenceReward=0.15 OverlapReward=0.06
AP=0.19 R_AP=0.22 Precision@k=0.40 Rprecision=0.47 Rrecall=0.07 Rf=0.13



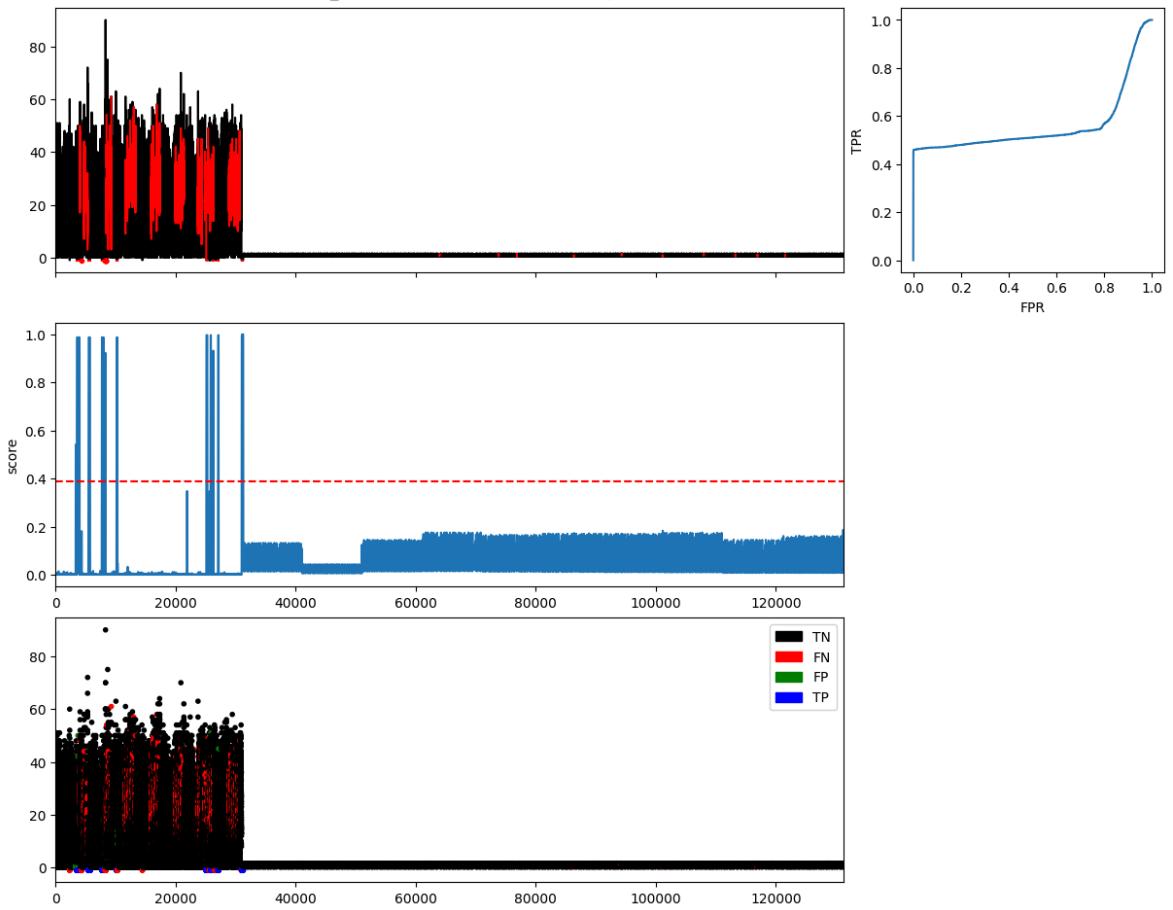
generated_data\normality3_MGAB_Dodgers_NAB.out window=1000 LSTM (pseudo labeling)
AUC=0.62 R_AUC=0.66 Precision=0.62 Recall=0.37 F=0.47 ExistenceReward=0.14 OverlapReward=0.10
AP=0.43 R_AP=0.32 Precision@k=0.37 Rprecision=0.28 Rrecall=0.11 Rf=0.15

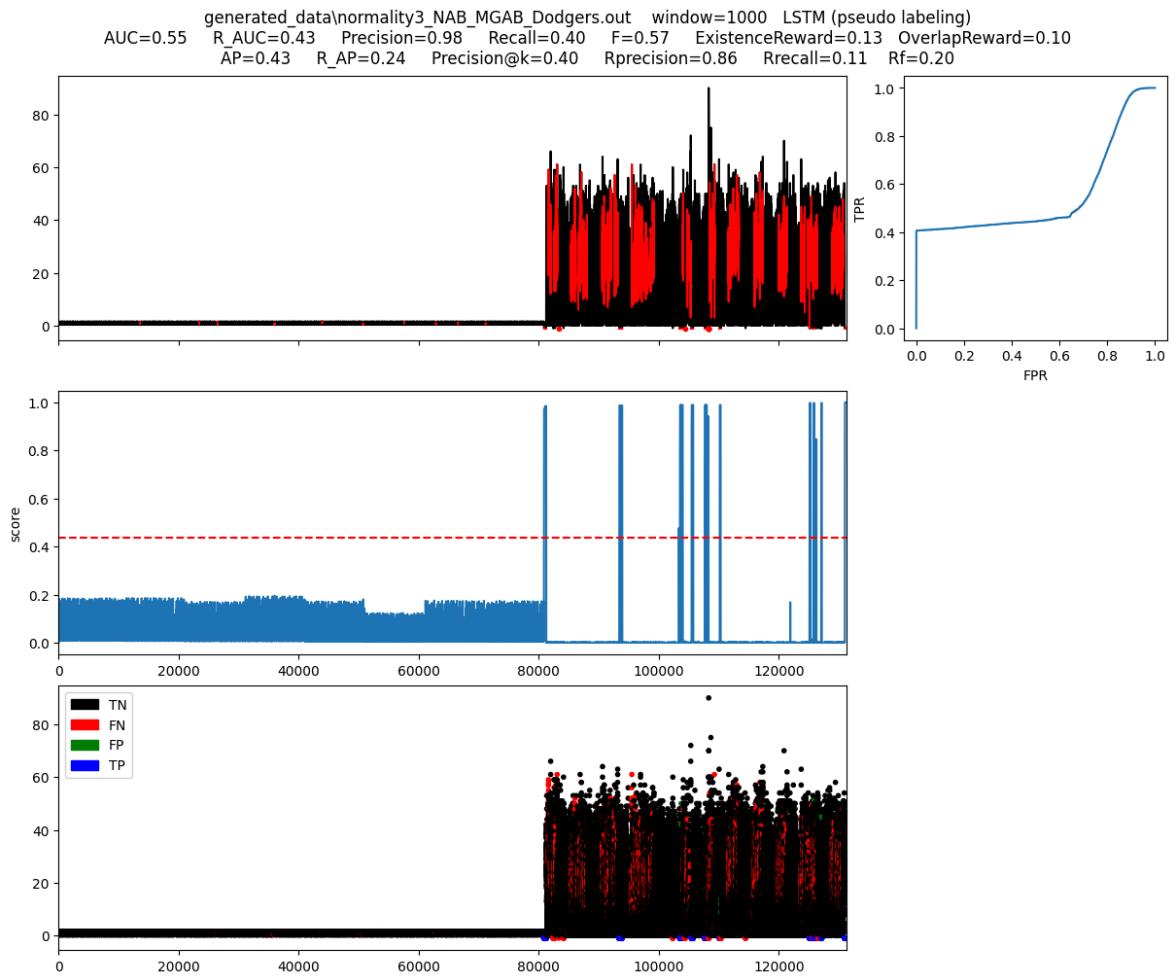


generated_data\normality3_MGAB_NAB_Dodgers.out window=1000 LSTM (pseudo labeling)
AUC=0.64 R_AUC=0.68 Precision=0.51 Recall=0.39 F=0.44 ExistenceReward=0.13 OverlapReward=0.10
AP=0.43 R_AP=0.31 Precision@k=0.39 Rprecision=0.31 Rrecall=0.10 Rf=0.16



generated_data\normality3_NAB_Dodgers_MGAB.out window=1000 LSTM (pseudo labeling)
AUC=0.56 R_AUC=0.44 Precision=0.96 Recall=0.45 F=0.61 ExistenceReward=0.17 OverlapReward=0.14
AP=0.48 R_AP=0.2 Precision@k=0.45 Rprecision=0.84 Rrecall=0.15 Rf=0.25





Variation 3 - Process with general model in batches

```
In [ ]: combined_X_train_data = []
combined_X_val_data = []
combined_y_train_data = []
combined_y_val_data = []

for filepath in file_paths[:3]:
    name, slidingWindow, data, label, X_train_val, y_train_val, X_test, y_test =
        name, slidingWindow, data, label, X_train_val, y_train_val, X_test, y_test =
        X_train = X_train_val[:int(0.8*len(X_train_val))]
        y_train = y_train_val[:int(0.8*len(X_train_val))]
        X_val = X_train_val[int(0.8*len(X_train_val)):]
        y_val = y_train_val[int(0.8*len(X_train_val)):]
        combined_X_train_data.append(X_train)
        combined_y_train_data.append(y_train)
        combined_X_val_data.append(X_val)
        combined_y_val_data.append(y_val)

    X_train_combined = np.concatenate(combined_X_train_data)
    y_train_combined = np.concatenate(combined_y_train_data)
    X_val_combined = np.concatenate(combined_X_val_data)
    y_val_combined = np.concatenate(combined_y_val_data)

    start_time = time()
    combined_model = train_lstm_model(X_train_combined.reshape((-1, 1, 1)), y_train)
    end_time = time()
```

```

models['Combined_data'] = combined_model
print(f"General model trained succesfully in {(end_time-start_time):.1f} s.")

generated_data\normality1_Dodgers.out
Estimated Subsequence length: 288
Time series length: 49900
Number of abnormal points: 5233
generated_data\normality1_MGAB.out
Estimated Subsequence length: 49
Time series length: 100000
Number of abnormal points: 200
generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400
General model trained succesfully in 535.0 s.

```

```
In [ ]: for filepath in file_paths:
    name, slidingWindow, data, label, X_train, y_train, X_test, y_test = data_pr
    X_test_reshaped = X_test.reshape((-1, 1, 1))

    model = models['Combined_data']
    # Process test data in batches to simulate streaming
    score = process_in_batches(model, X_test, batch_size=BATCH_SIZE)
```

```

zeros = np.zeros(WINDOW_SIZE-1)
new_score = np.concatenate((zeros,score))
plotFig(X_test, y_test, new_score, BATCH_SIZE, fileName=name, modelName="LST")

```

```

generated_data\normality1_Dodgers.out
Estimated Subsequence length: 288
Time series length: 49900
Number of abnormal points: 5233
Processing batches: 100%|██████████| 43/43 [01:00<00:00, 1.40s/it]
generated_data\normality1_MGAB.out
Estimated Subsequence length: 49
Time series length: 100000
Number of abnormal points: 200

```

```

Processing batches: 100%|██████████| 85/85 [02:11<00:00, 1.55s/it]
generated_data\normality1_NAB.out
Estimated Subsequence length: 289
Time series length: 4031
Number of abnormal points: 400

```

```

Processing batches: 100%|██████████| 4/4 [00:05<00:00, 1.25s/it]
generated_data\normality2_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 149900
Number of abnormal points: 5433

```

```

Processing batches: 100%|██████████| 128/128 [03:33<00:00, 1.66s/it]
generated_data\normality2_Dodgers_NAB.out
Estimated Subsequence length: 288
Time series length: 53931
Number of abnormal points: 5633

```

```

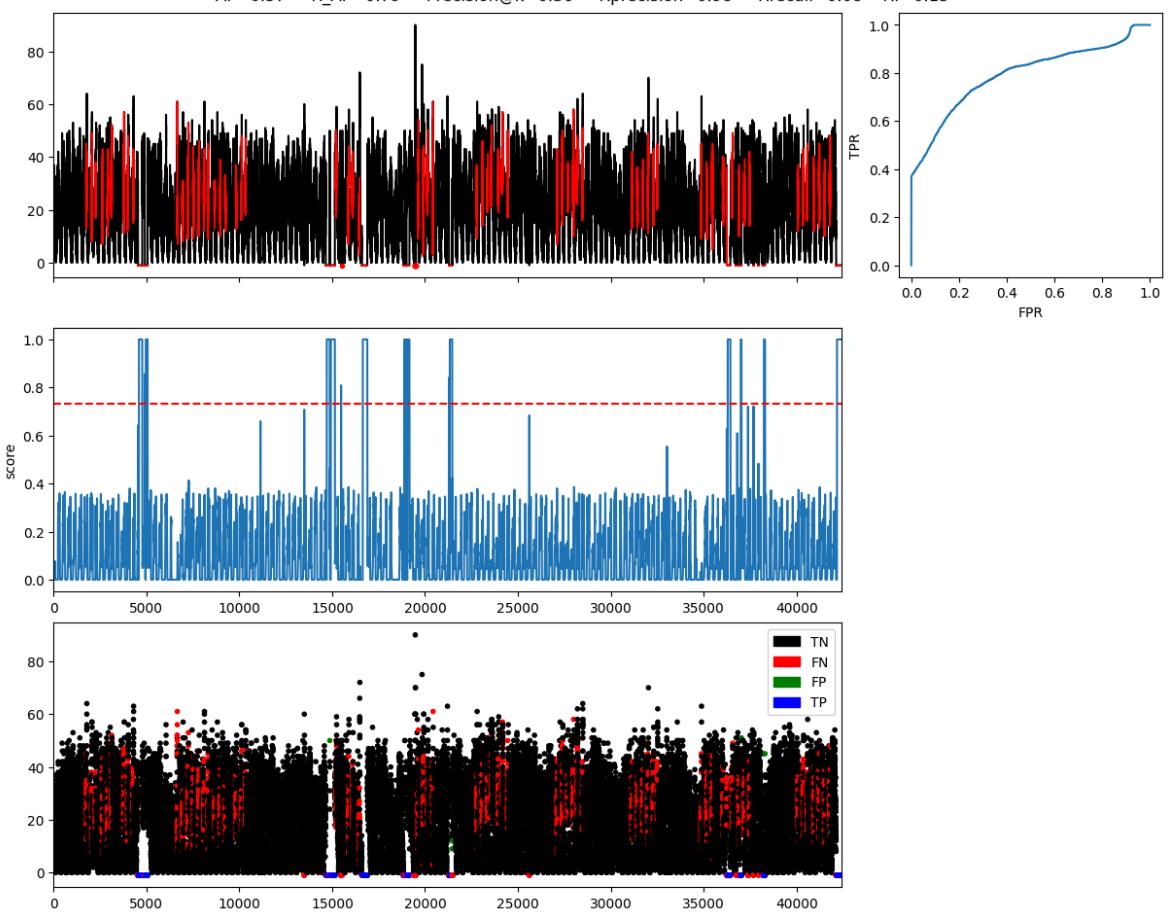
Processing batches: 100%|██████████| 46/46 [01:12<00:00, 1.57s/it]
generated_data\normality2_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 150400
Number of abnormal points: 5812

```

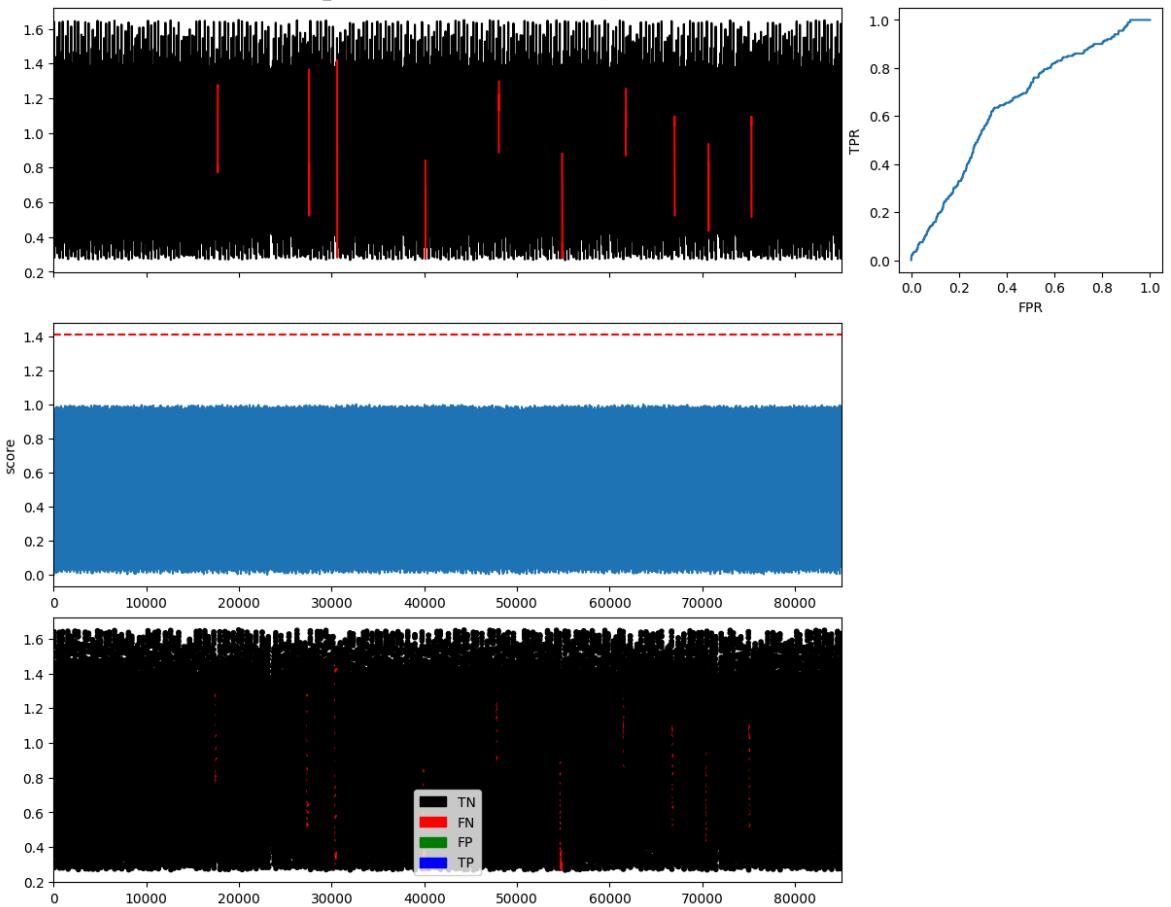
```
Processing batches: 100%|██████████| 128/128 [03:11<00:00, 1.50s/it]
```

```
generated_data\normality2_MGAB_NAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 89/89 [02:16<00:00, 1.54s/it]
generated_data\normality2_NAB_Dodgers.out
Estimated Subsequence length: 288
Time series length: 54431
Number of abnormal points: 6012
Processing batches: 100%|██████████| 47/47 [01:17<00:00, 1.64s/it]
generated_data\normality2_NAB_MGAB.out
Estimated Subsequence length: 49
Time series length: 104031
Number of abnormal points: 600
Processing batches: 100%|██████████| 89/89 [01:27<00:00, 1.02it/s]
generated_data\normality3_Dodgers_MGAB_NAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [02:03<00:00, 1.06it/s]
generated_data\normality3_Dodgers_NAB_MGAB.out
Estimated Subsequence length: 288
Time series length: 153931
Number of abnormal points: 5833
Processing batches: 100%|██████████| 131/131 [01:47<00:00, 1.22it/s]
generated_data\normality3_MGAB_Dodgers_NAB.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [02:06<00:00, 1.04it/s]
generated_data\normality3_MGAB_NAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [01:57<00:00, 1.12it/s]
generated_data\normality3_NAB_Dodgers_MGAB.out
Estimated Subsequence length: 288
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [02:00<00:00, 1.09it/s]
generated_data\normality3_NAB_MGAB_Dodgers.out
Estimated Subsequence length: 49
Time series length: 154431
Number of abnormal points: 6212
Processing batches: 100%|██████████| 132/132 [02:05<00:00, 1.05it/s]
```

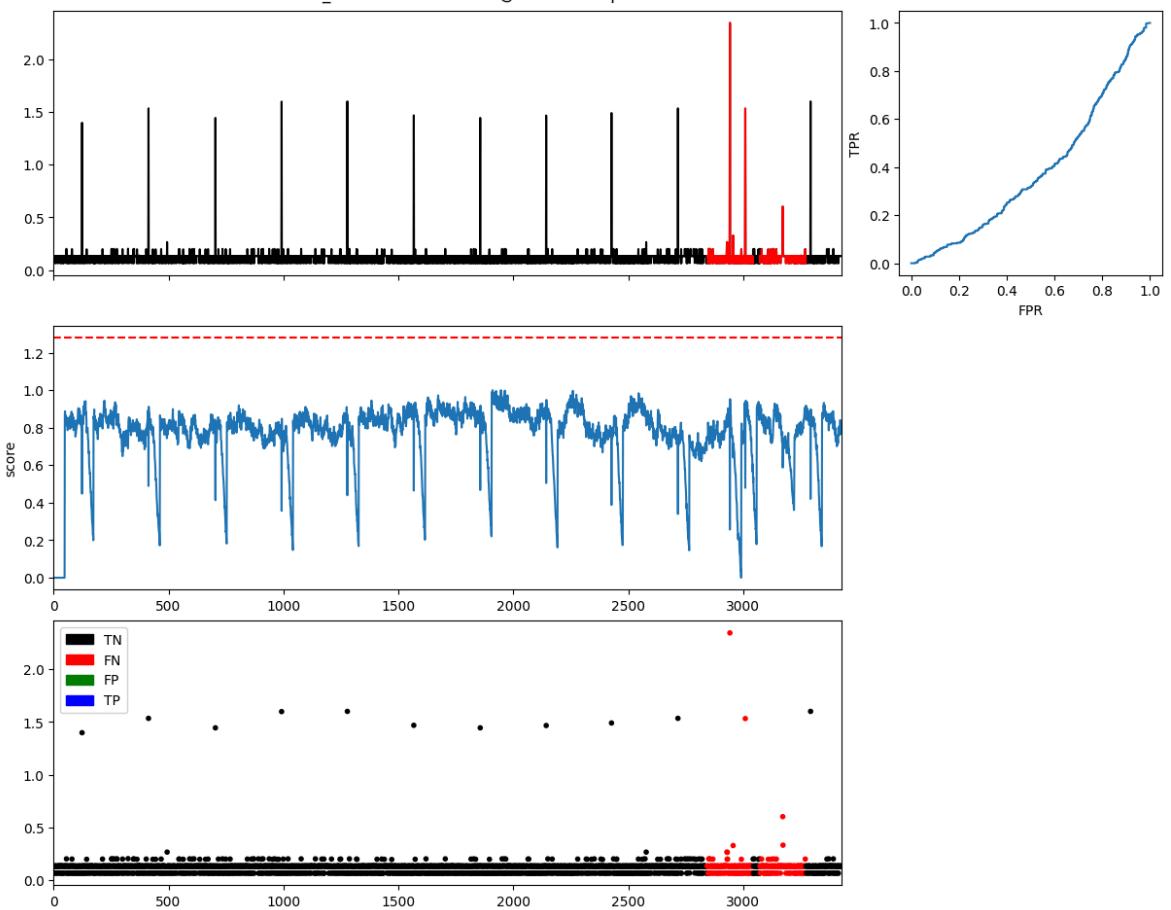
generated_data\normality1_Dodgers.out window=1000 LSTM (general model)
AUC=0.79 R_AUC=0.88 Precision=0.99 Recall=0.36 F=0.53 ExistenceReward=0.12 OverlapReward=0.07
AP=0.57 R_AP=0.79 Precision@k=0.36 Rprecision=0.98 Recall=0.08 Rf=0.15



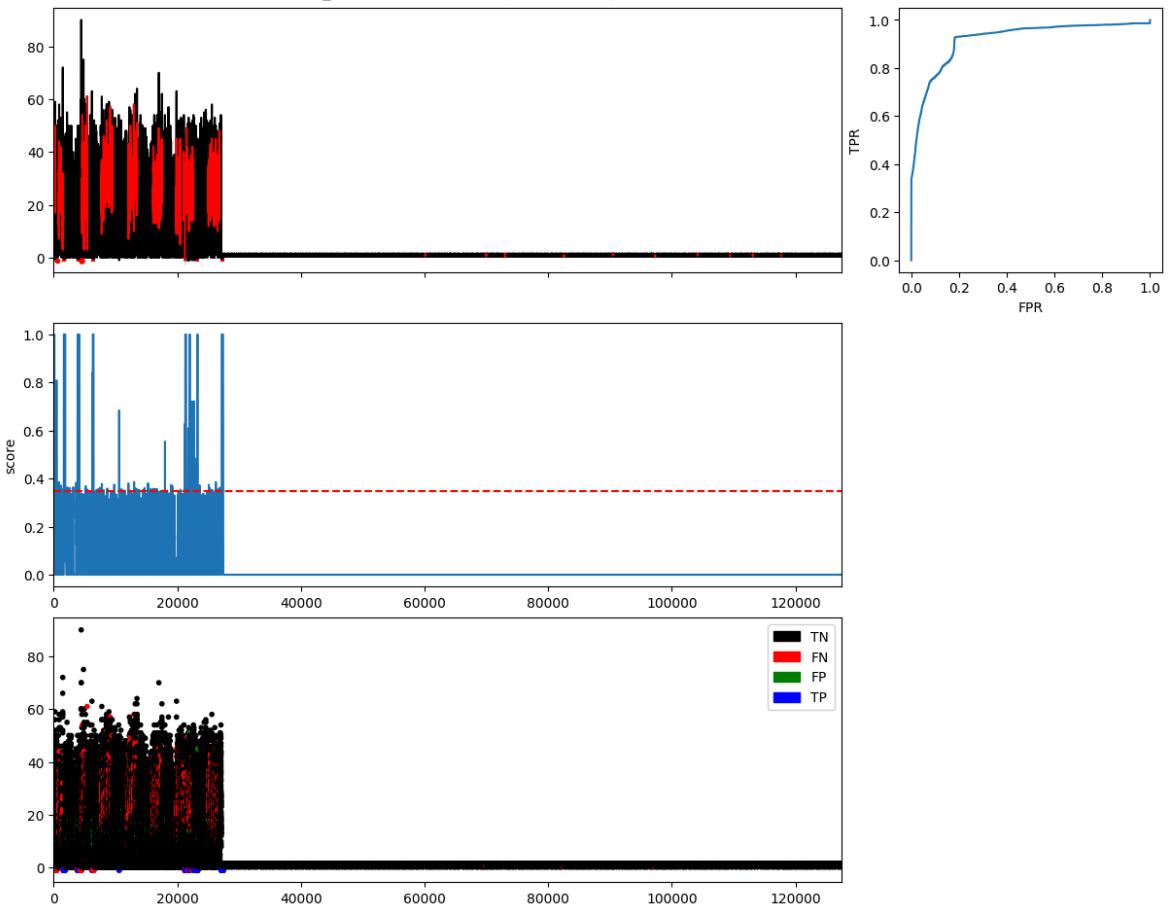
generated_data\normality1_MGAB.out window=1000 LSTM (general model)
AUC=0.65 R_AUC=0.76 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.0 R_AP=0.1 Precision@k=0.00 Rprecision=0.00 Recall=0.00 Rf=0.00



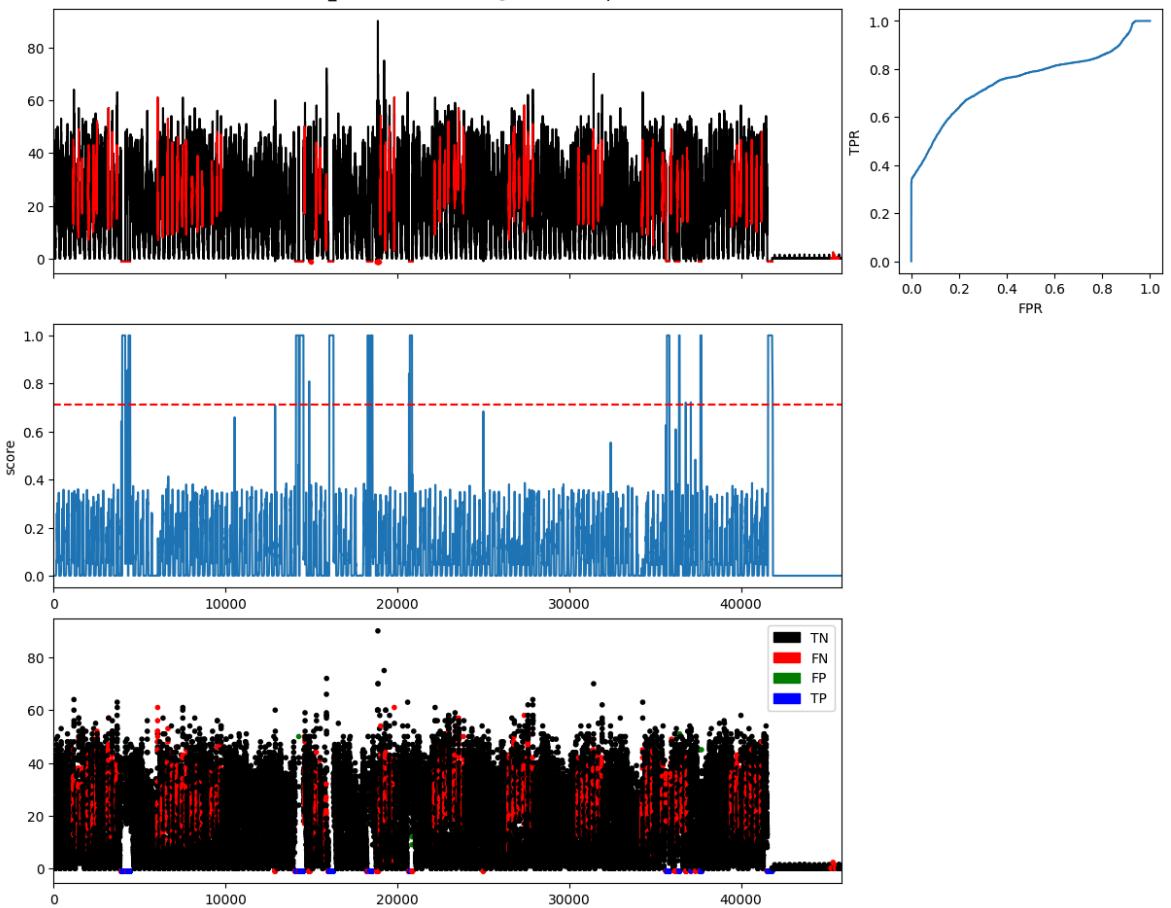
generated_data\normality1_NAB.out window=1000 LSTM (general model)
AUC=0.39 R_AUC=0.56 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.09 R_AP=0.22 Precision@k=0.00 Rprecision=0.00 Rrecall=0.00 Rf=0.00



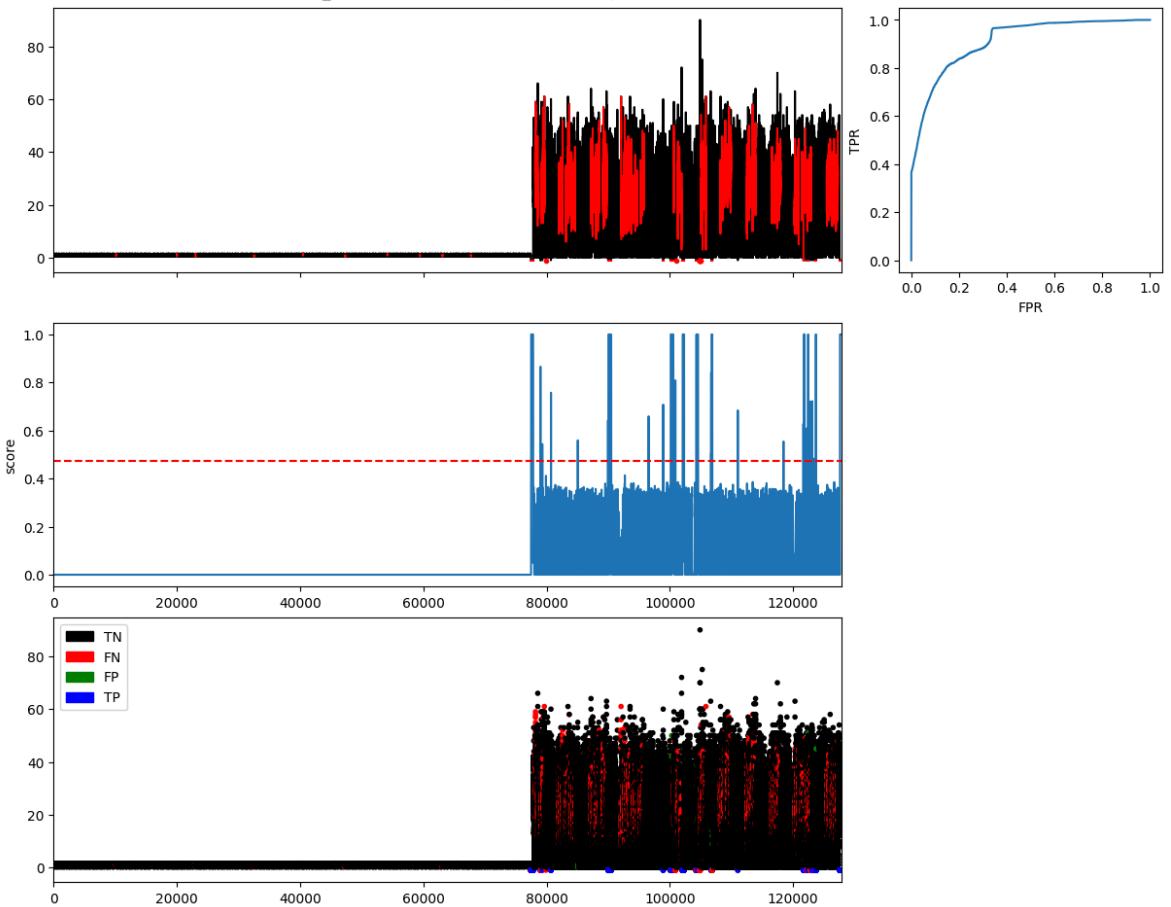
generated_data\normality2_Dodgers_MGAB.out window=1000 LSTM (general model)
AUC=0.92 R_AUC=0.96 Precision=0.88 Recall=0.34 F=0.49 ExistenceReward=0.23 OverlapReward=0.08
AP=0.52 R_AP=0.78 Precision@k=0.34 Rprecision=0.27 Rrecall=0.11 Rf=0.16



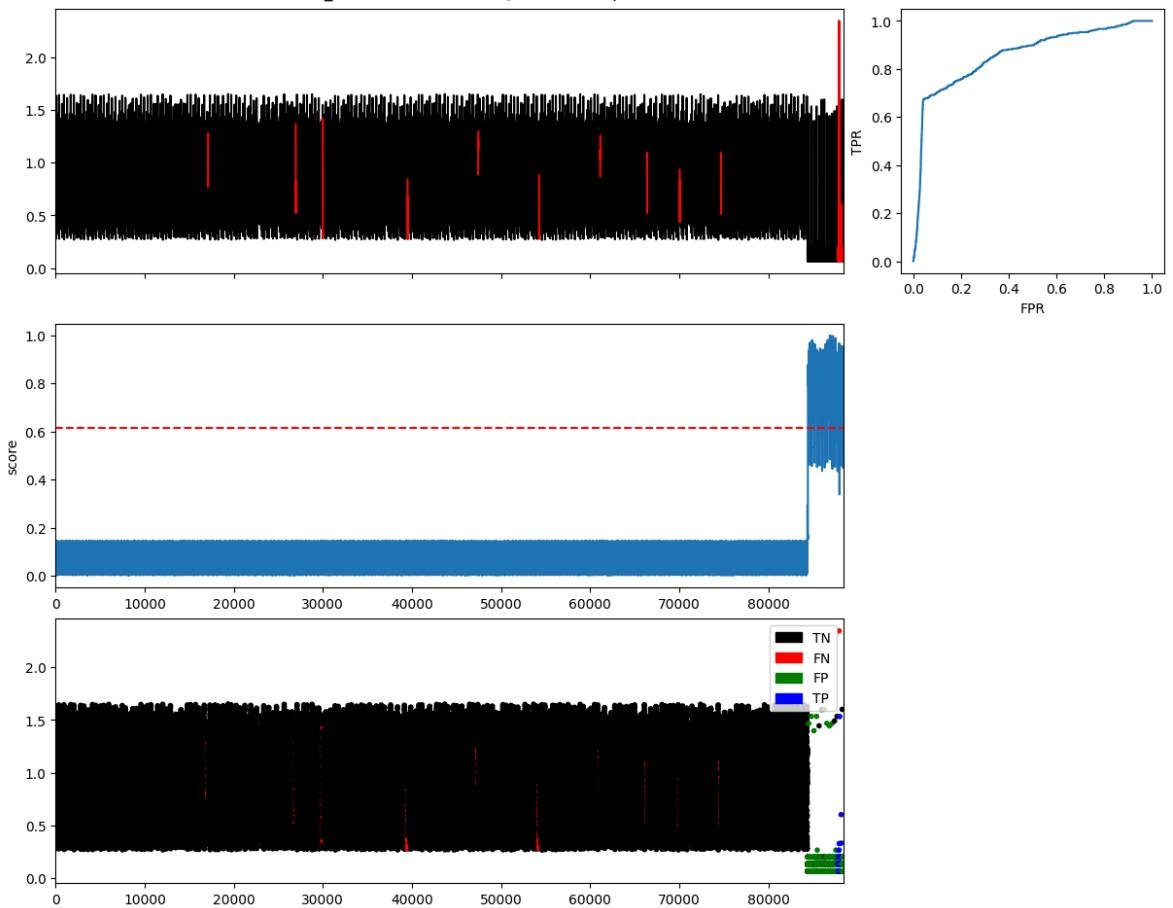
generated_data\normality2_Dodgers_NAB.out window=1000 LSTM (general model)
AUC=0.75 R_AUC=0.87 Precision=0.97 Recall=0.33 F=0.49 ExistenceReward=0.14 OverlapReward=0.07
AP=0.54 R_AP=0.8 Precision@k=0.33 Rprecision=0.98 Rrecall=0.08 Rf=0.15



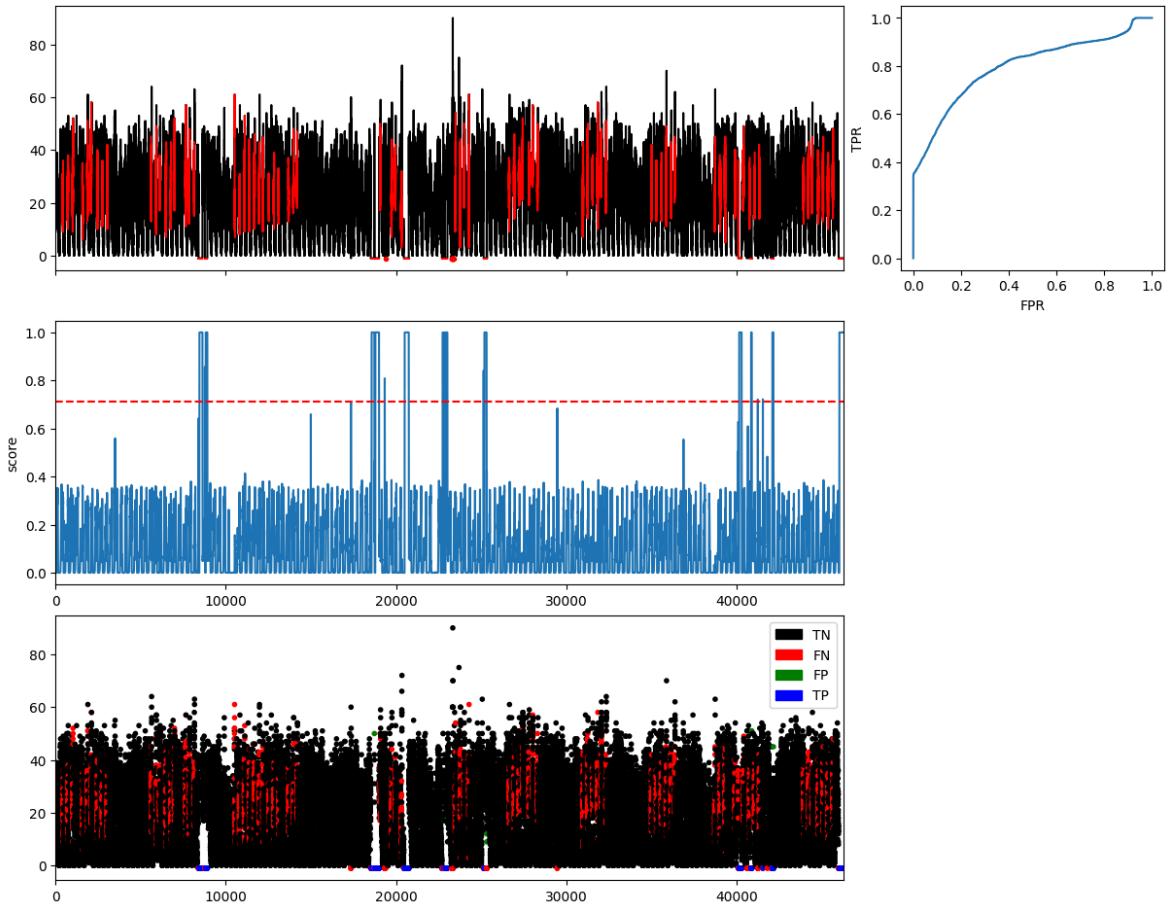
generated_data\normality2_MGAB_Dodgers.out window=1000 LSTM (general model)
AUC=0.91 R_AUC=0.93 Precision=0.98 Recall=0.36 F=0.53 ExistenceReward=0.17 OverlapReward=0.09
AP=0.57 R_AP=0.79 Precision@k=0.36 Rprecision=0.89 Rrecall=0.11 Rf=0.19



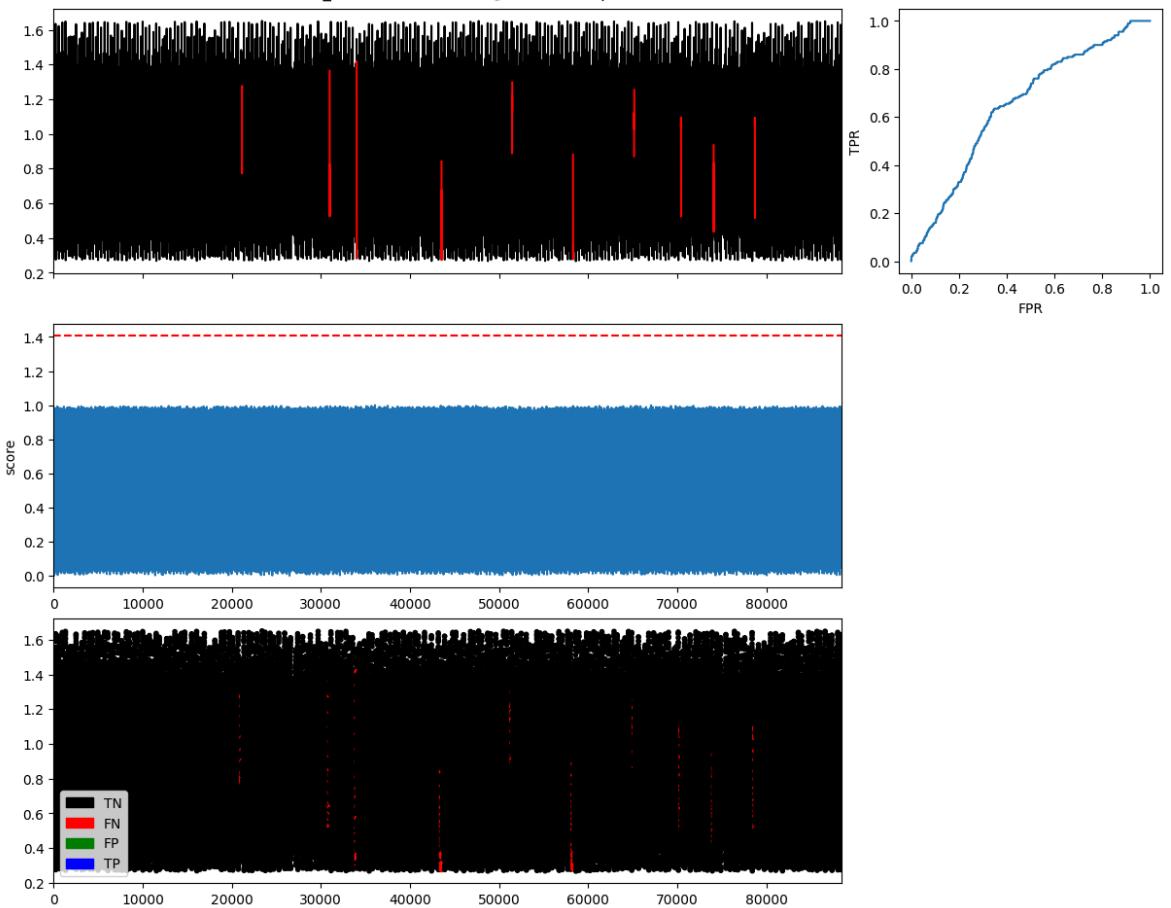
generated_data\normality2_MGAB_NAB.out window=1000 LSTM (general model)
AUC=0.86 R_AUC=0.79 Precision=0.10 Recall=0.62 F=0.17 ExistenceReward=0.17 OverlapReward=0.07
AP=0.06 R_AP=0.16 Precision@k=0.62 Rprecision=0.17 Rrecall=0.09 Rf=0.11



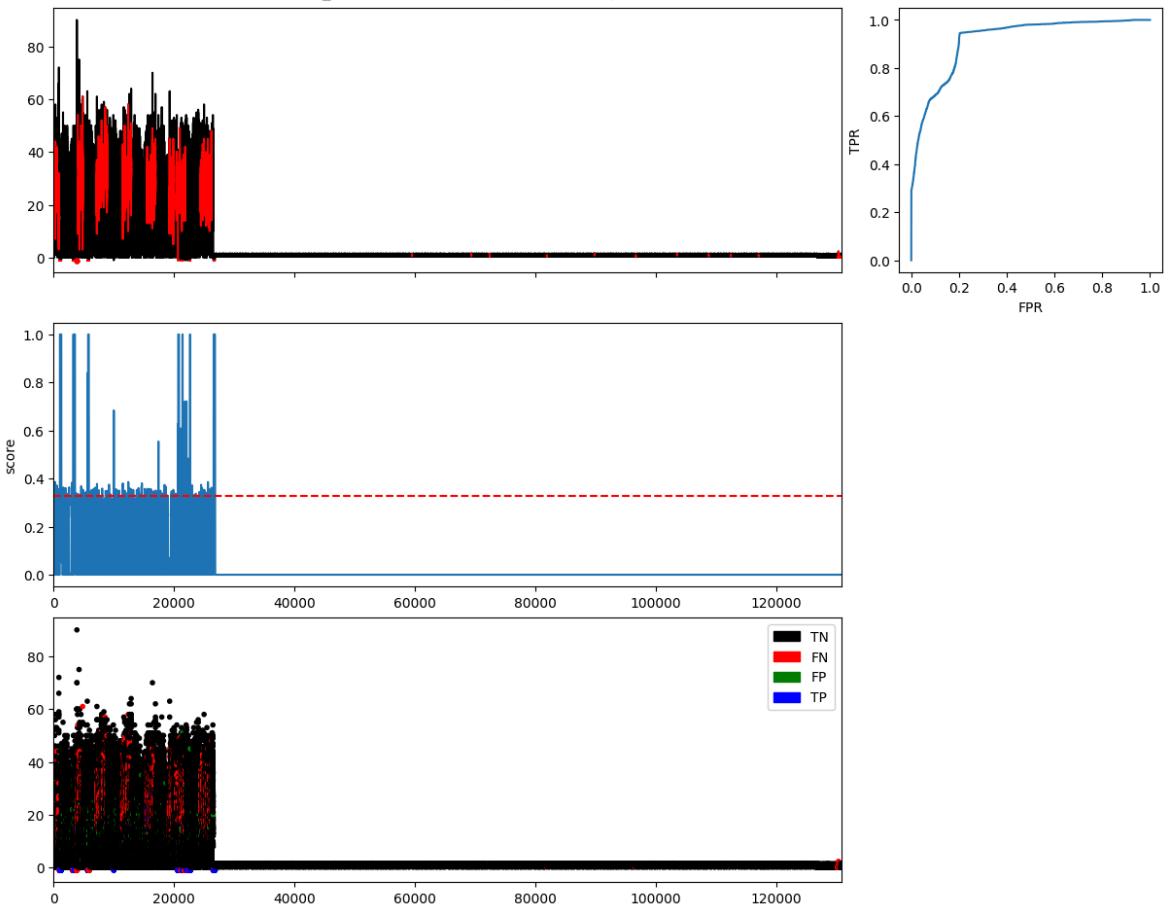
generated_data\normality2_NAB_Dodgers.out window=1000 LSTM (general model)
AUC=0.80 R_AUC=0.88 Precision=0.99 Recall=0.34 F=0.50 ExistenceReward=0.13 OverlapReward=0.06
AP=0.56 R_AP=0.8 Precision@k=0.34 Rprecision=0.98 Rrecall=0.08 Rf=0.14



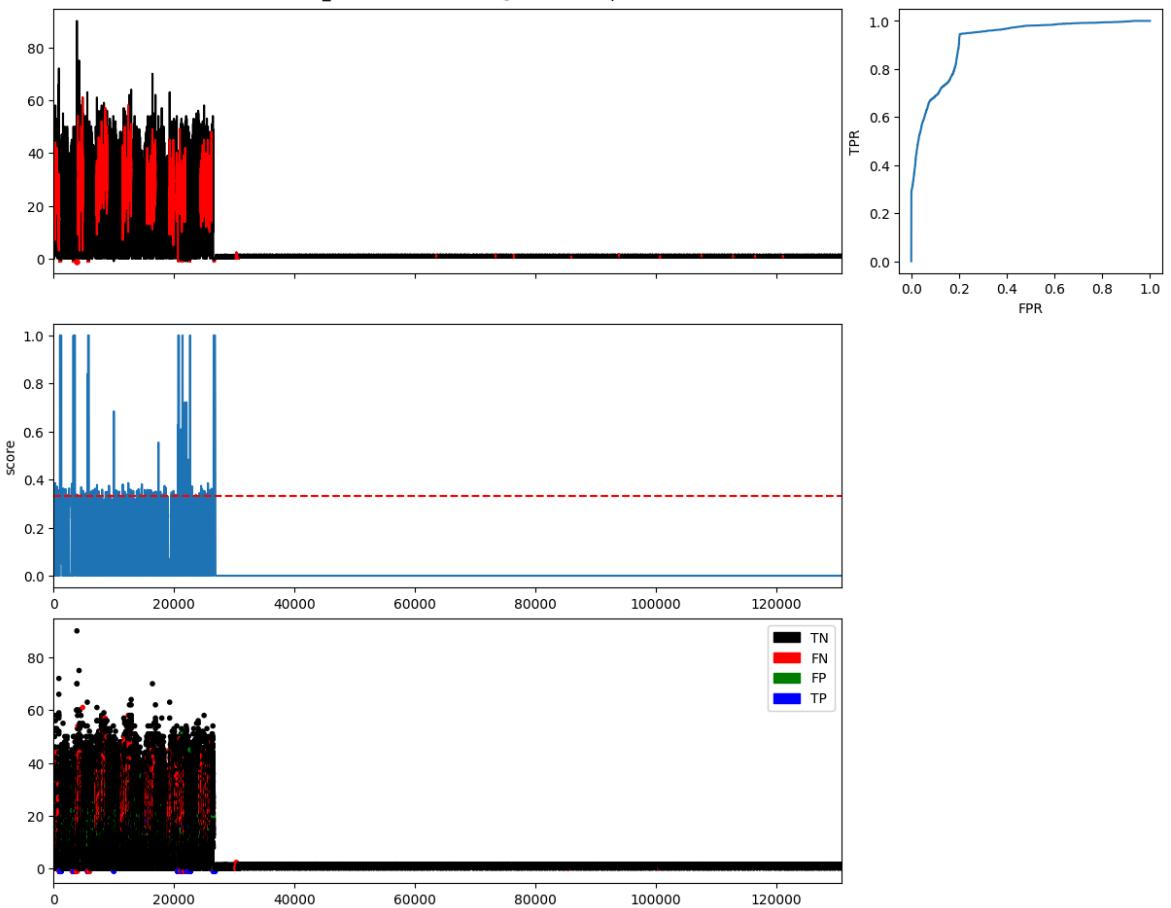
generated_data\normality2_NAB_MGAB.out window=1000 LSTM (general model)
AUC=0.65 R_AUC=0.76 Precision=0.00 Recall=0.00 F=0.00 ExistenceReward=0.00 OverlapReward=0.00
AP=0.0 R_AP=0.1 Precision@k=0.00 Rprecision=0.00 Recall=0.00 Rf=0.00



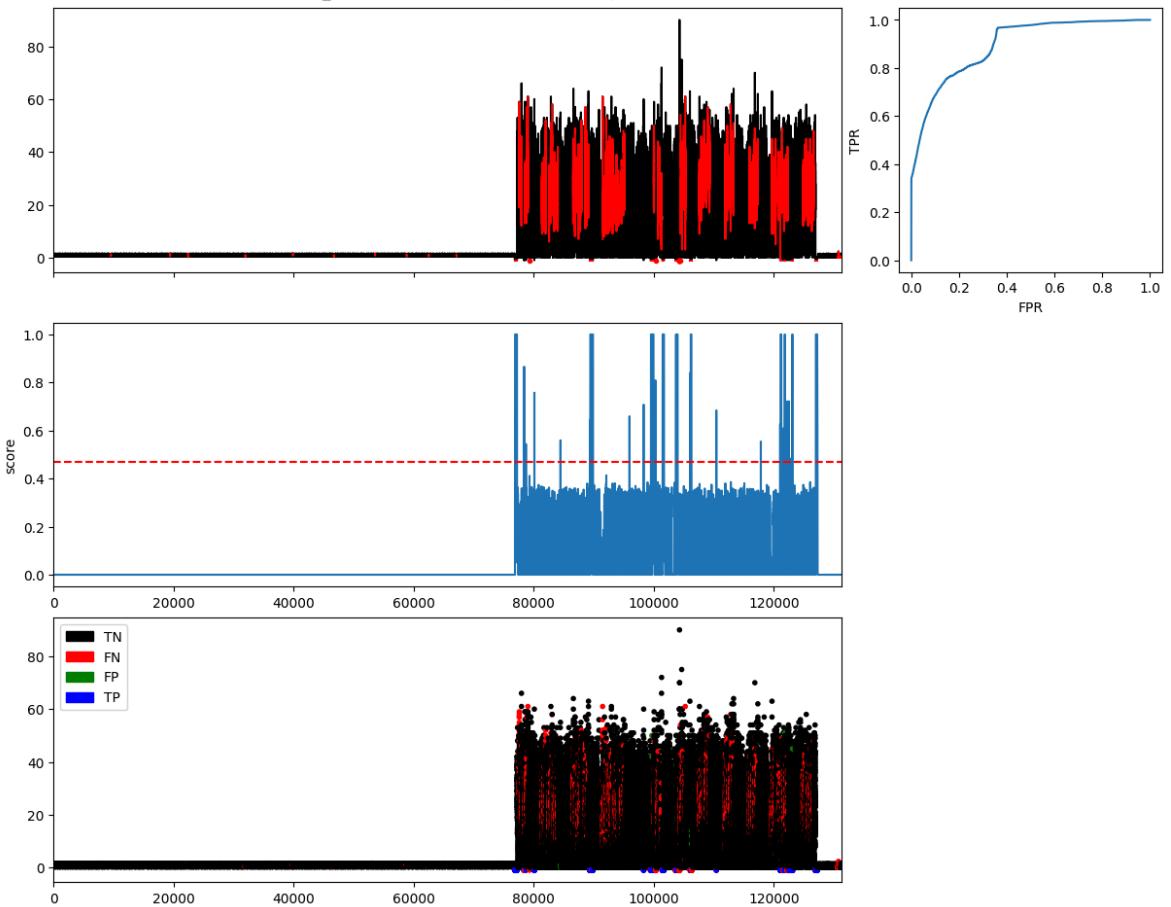
generated_data\normality3_Dodgers_MGAB_NAB.out window=1000 LSTM (general model)
AUC=0.92 R_AUC=0.94 Precision=0.75 Recall=0.30 F=0.43 ExistenceReward=0.29 OverlapReward=0.08
AP=0.47 R_AP=0.74 Precision@k=0.30 Rprecision=0.22 Recall=0.13 Rf=0.16



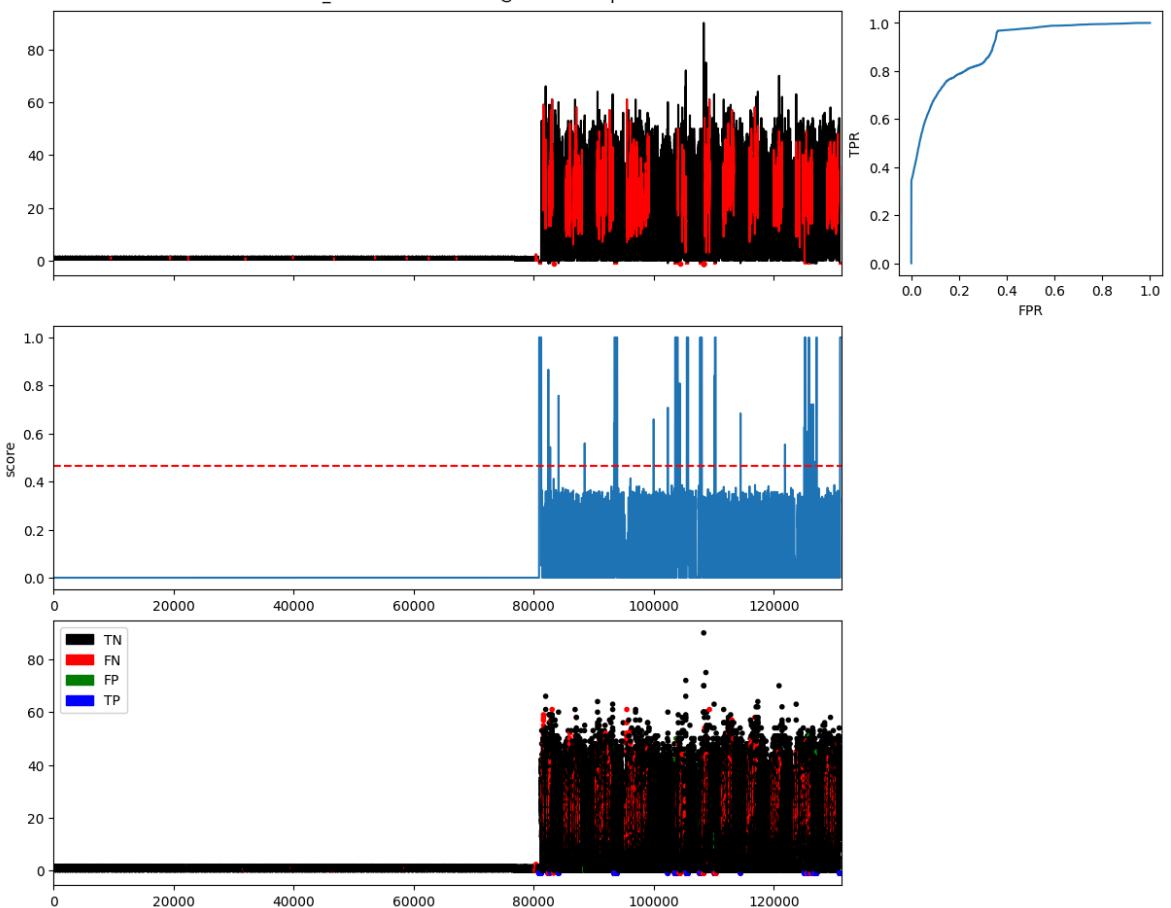
generated_data\normality3_Dodgers_NAB_MGAB.out window=1000 LSTM (general model)
AUC=0.92 R_AUC=0.95 Precision=0.76 Recall=0.30 F=0.43 ExistenceReward=0.29 OverlapReward=0.08
AP=0.47 R_AP=0.75 Precision@k=0.30 Rprecision=0.22 Rrecall=0.13 Rf=0.16



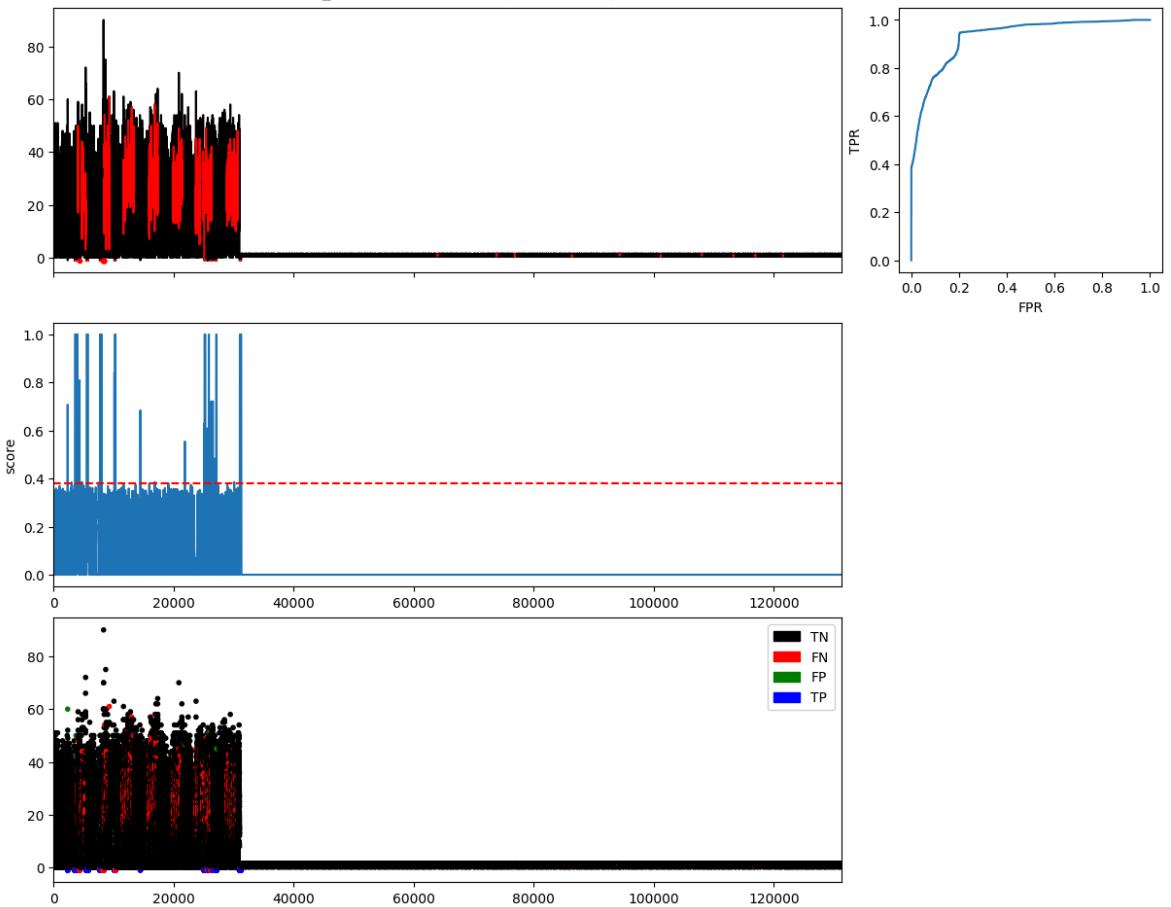
generated_data\normality3_MGAB_Dodgers_NAB.out window=1000 LSTM (general model)
AUC=0.89 R_AUC=0.92 Precision=0.96 Recall=0.34 F=0.50 ExistenceReward=0.17 OverlapReward=0.09
AP=0.54 R_AP=0.77 Precision@k=0.34 Rprecision=0.88 Rrecall=0.10 Rf=0.19



generated_data\normality3_MGAB_NAB_Dodgers.out window=1000 LSTM (general model)
AUC=0.90 R_AUC=0.92 Precision=0.98 Recall=0.34 F=0.51 ExistenceReward=0.17 OverlapReward=0.09
AP=0.54 R_AP=0.77 Precision@k=0.34 Rprecision=0.89 Rrecall=0.10 Rf=0.19



generated_data\normality3_NAB_Dodgers_MGAB.out window=1000 LSTM (general model)
AUC=0.93 R_AUC=0.95 Precision=0.96 Recall=0.38 F=0.55 ExistenceReward=0.21 OverlapReward=0.09
AP=0.55 R_AP=0.75 Precision@k=0.38 Rprecision=0.76 Rrecall=0.12 Rf=0.20



generated_data\normality3_NAB_MGAB_Dodgers.out window=1000 LSTM (general model)
AUC=0.91 R_AUC=0.93 Precision=0.98 Recall=0.36 F=0.53 ExistenceReward=0.17 OverlapReward=0.09
AP=0.57 R_AP=0.79 Precision@k=0.36 Rprecision=0.89 Rrecall=0.11 Rf=0.19

