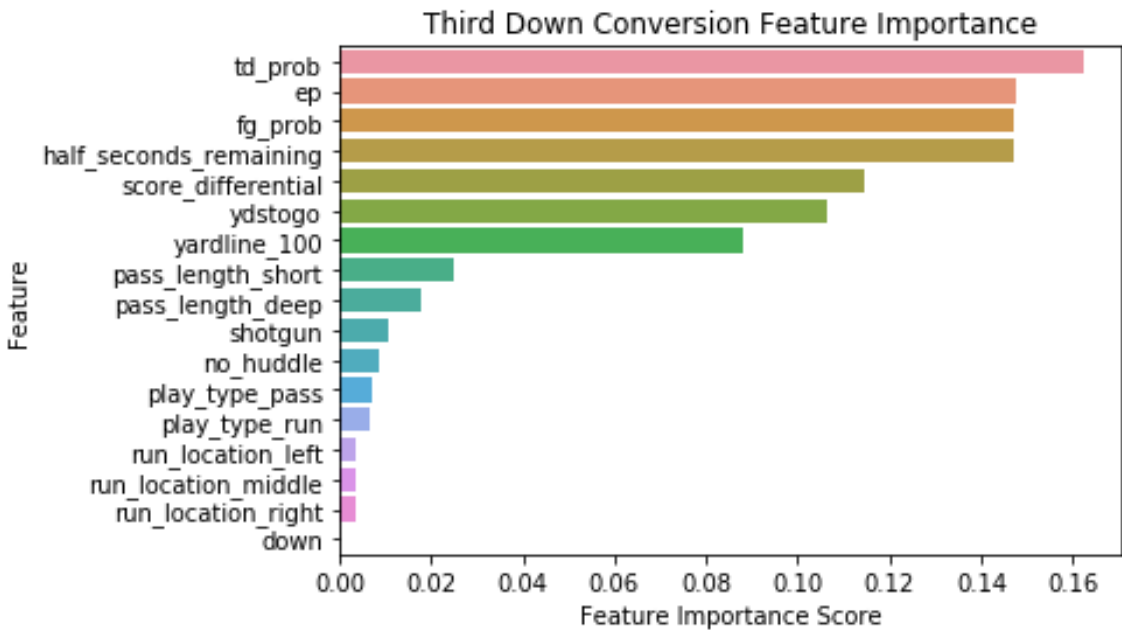# 3rd Down Conversion Random Forest Model
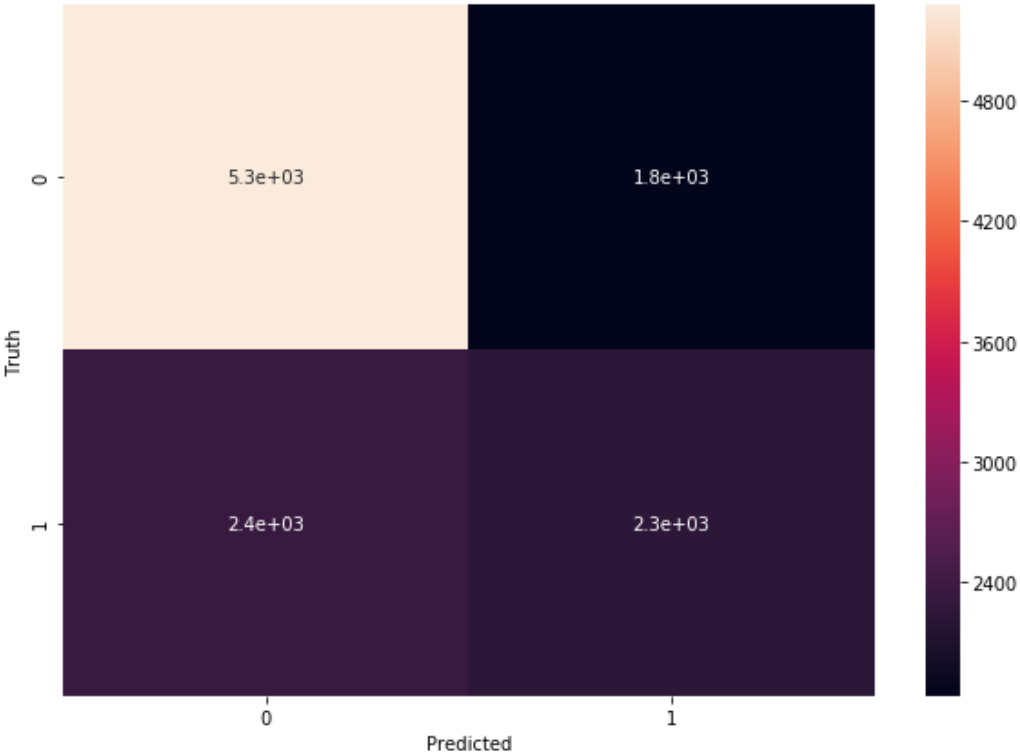

Third Down Conversion Feature Importance

n = 46877

Confusion Matrix:
[[5279 1835]
 [2355 2251]]

Classification Report

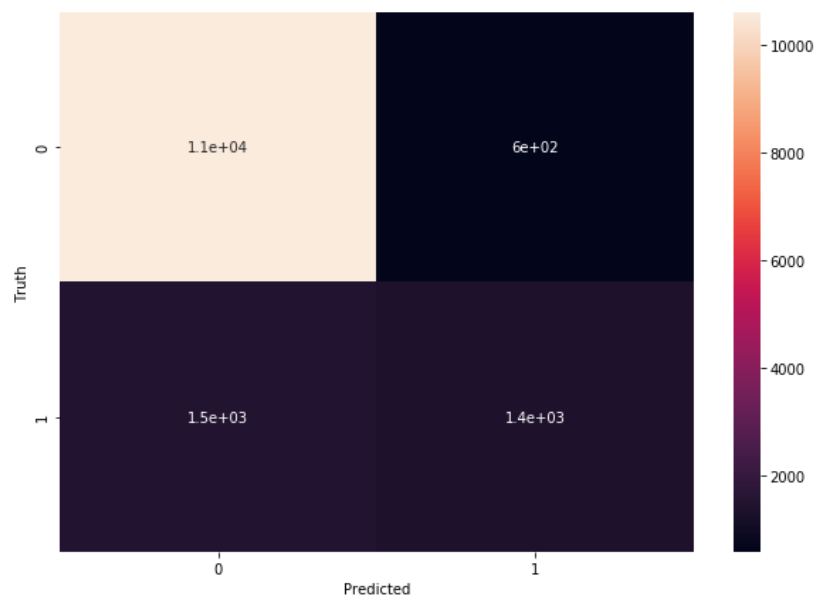|	precision	recall	f1-score	support
0.0	0.69	0.74	0.72	7114
1.0	0.55	0.49	0.52	4606
micro avg	0.64	0.64	0.64	11720
macro avg	0.62	0.62	0.62	11720
weighted avg	0.64	0.64	0.64	11720

3rd Down Run/Pass Random Forest Confusion Matrix

3rd Down Run/Pass No YTG Constraints

```
Confusion Matrix:
[[10611   595]
 [ 1499  1359]]

Classification Report
              precision    recall  f1-score   support

           0       0.88      0.95      0.91     11206
           1       0.70      0.48      0.56      2858

   micro avg       0.85      0.85      0.85     14064
   macro avg       0.79      0.71      0.74     14064
weighted avg       0.84      0.85      0.84     14064
```
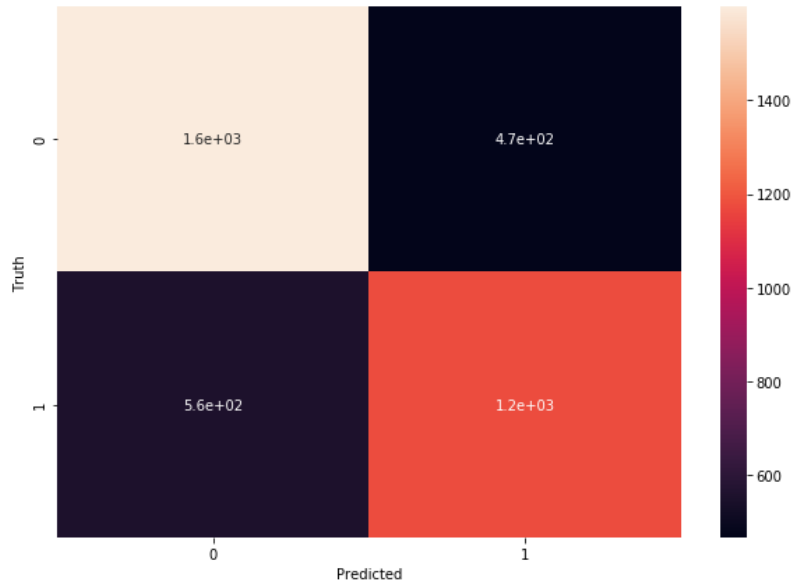
n = 46877

3rd Down Run/Pass <=3 YTG

```
Confusion Matrix:
[[1599  468]
 [ 555 1176]]

Classification Report
              precision    recall  f1-score   support

           0       0.74      0.77      0.76      2067
           1       0.72      0.68      0.70      1731

   micro avg       0.73      0.73      0.73      3798
   macro avg       0.73      0.73      0.73      3798
weighted avg       0.73      0.73      0.73      3798
```

n = 12657

3rd Down Run/Pass <=1 YTG

```
Confusion Matrix:
[[173 279]
 [162 973]]

Classification Report
              precision    recall  f1-score   support

           0       0.52      0.38      0.44       452
           1       0.78      0.86      0.82      1135

   micro avg       0.72      0.72      0.72      1587
   macro avg       0.65      0.62      0.63      1587
weighted avg       0.70      0.72      0.71      1587
```
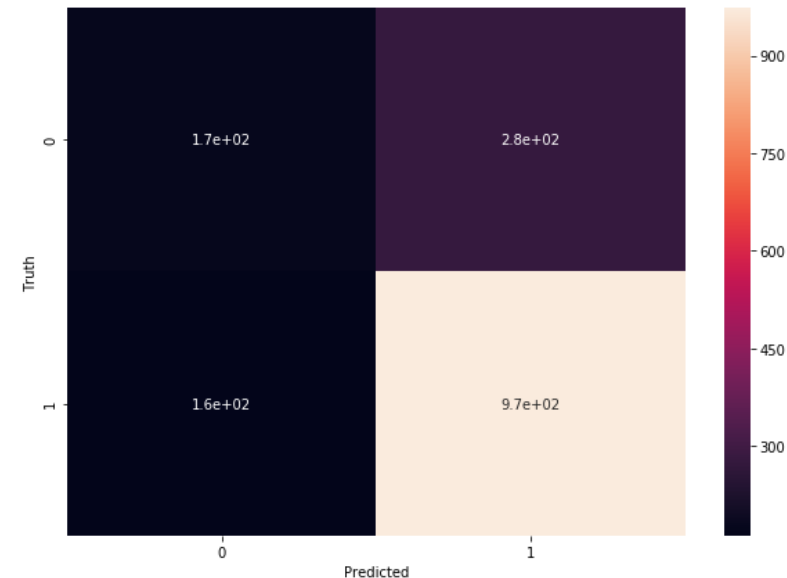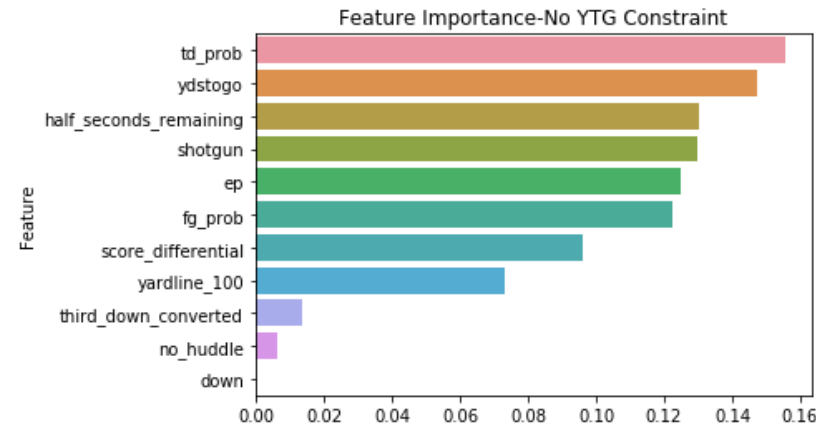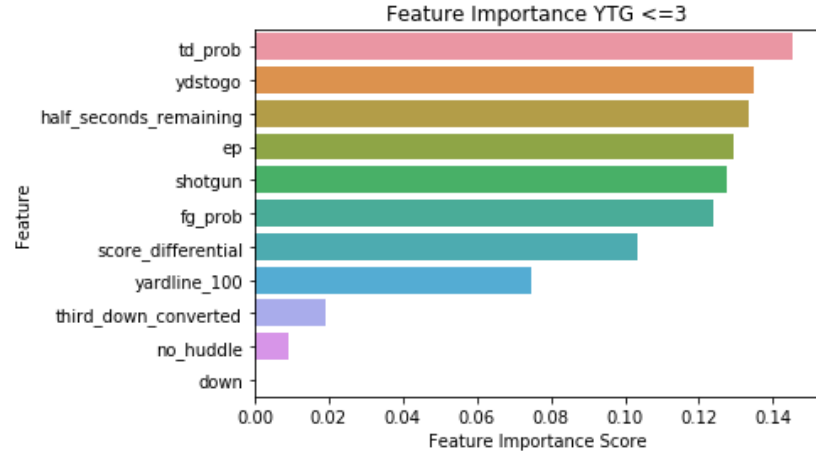
n = 5290

3rd Down Run/Pass Random Forest Feature Weights
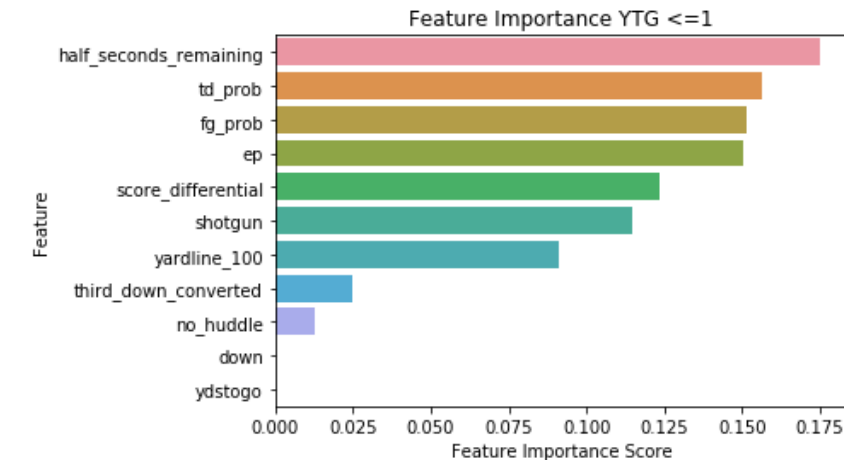
- 3rd Down Run/Pass No YTG Constraints

- 3rd Down Run/Pass <=3 YTG

- 3rd Down Run/Pass <=1 YTG

Feature Importance-No YTG Constraint

Feature	Score
td_prob	0.155520
ydstogo	0.147366
half_seconds_remaining	0.130070
shotgun	0.129944
ep	0.125123
fg_prob	0.122270
score_differential	0.096070
yardline_100	0.073235
third_down_converted	0.013885
no_huddle	0.006516

Feature Importance YTG <=3

Feature	Score
td_prob	0.145190
ydstogo	0.134772
half_seconds_remaining	0.133216
ep	0.129464
shotgun	0.127437
fg_prob	0.123822
score_differential	0.103371
yardline_100	0.074695
third_down_converted	0.019099
no_huddle	0.008934

Feature Importance YTG <=1

Feature	Score
half_seconds_remaining	0.175023
td_prob	0.156305
fg_prob	0.151725
ep	0.150161
score_differential	0.123795
shotgun	0.114977
yardline_100	0.090982
third_down_converted	0.024623
no_huddle	0.012409