```
TARGET_BAD_FLAG      int64
TARGET_LOSS_AMT    float64
LOAN                 int64
MORTDUE            float64
VALUE              float64
REASON              object
JOB                 object
YOJ                float64
DEROG              float64
DELINQ             float64
CLAGE              float64
NINQ               float64
CLNO               float64
DEBTINC            float64
dtype: object
 here is i ..... TARGET_BAD_FLAG  ..... and here is the type int64
 here is i ..... TARGET_LOSS_AMT  ..... and here is the type float64
 here is i ..... LOAN  ..... and here is the type int64
 here is i ..... MORTDUE  ..... and here is the type float64
 here is i ..... VALUE  ..... and here is the type float64
 here is i ..... REASON  ..... and here is the type object
 here is i ..... JOB  ..... and here is the type object
 here is i ..... YOJ  ..... and here is the type float64
 here is i ..... DEROG  ..... and here is the type float64
 here is i ..... DELINQ  ..... and here is the type float64
 here is i ..... CLAGE  ..... and here is the type float64
 here is i ..... NINQ  ..... and here is the type float64
 here is i ..... CLNO  ..... and here is the type float64
 here is i ..... DEBTINC  ..... and here is the type float64
 here is i ..... TARGET_BAD_FLAG  ..... and here is the type int64
 here is i ..... TARGET_LOSS_AMT  ..... and here is the type float64
 here is i ..... LOAN  ..... and here is the type int64
 here is i ..... MORTDUE  ..... and here is the type float64
 here is i ..... VALUE  ..... and here is the type float64
 here is i ..... YOJ  ..... and here is the type float64
 here is i ..... DEROG  ..... and here is the type float64
 here is i ..... DELINQ  ..... and here is the type float64
 here is i ..... CLAGE  ..... and here is the type float64
 here is i ..... NINQ  ..... and here is the type float64
 here is i ..... CLNO  ..... and here is the type float64
 here is i ..... DEBTINC  ..... and here is the type float64
 here is i ..... IMP_REASON  ..... and here is the type object
 here is i ..... IMP_JOB  ..... and here is the type object
```

```
MORTDUE518
M_MORTDUE
IMP_MORTDUE
 -------
VALUE
112
M_VALUE
IMP_VALUE
 -------
YOJ
515
M_YOJ
IMP_YOJ
 -------
DEROG
708
M_DEROG
IMP_DEROG
 -------
DELINQ
580
M_DELINQ
IMP_DELINQ
 -------
CLAGE
308
M_CLAGE
IMP_CLAGE
 -------
NINQ
510
M_NINQ
IMP_NINQ
 -------
CLNO
222
M_CLNO
IMP_CLNO
 -------
DEBTINC
1267
M_DEBTINC
IMP_DEBTINC

FLAG DATA
TRAINING =  (4768, 45)
TEST =  (1192, 45)
       TARGET_BAD_FLAG  TARGET_LOSS_AMT
count            941.0       941.000000
```

mean	1.0	13634.824655
std	0.0	10836.172568
min	1.0	224.000000
25%	1.0	5837.000000
50%	1.0	11266.000000
75%	1.0	18069.000000
max	1.0	78987.000000

	TARGET_BAD_FLAG	TARGET_LOSS_AMT
count	248.0	248.000000
mean	1.0	12578.879032
std	0.0	10833.019569
min	1.0	320.000000
25%	1.0	4921.000000
50%	1.0	9693.500000
75%	1.0	15601.250000
max	1.0	73946.000000

	TARGET_BAD_FLAG	TARGET_LOSS_AMT
count	941.0	941.000000
mean	1.0	12335.320935
std	0.0	7581.043758
min	1.0	224.000000
25%	1.0	5837.000000
50%	1.0	11266.000000
75%	1.0	18069.000000
max	1.0	25000.000000

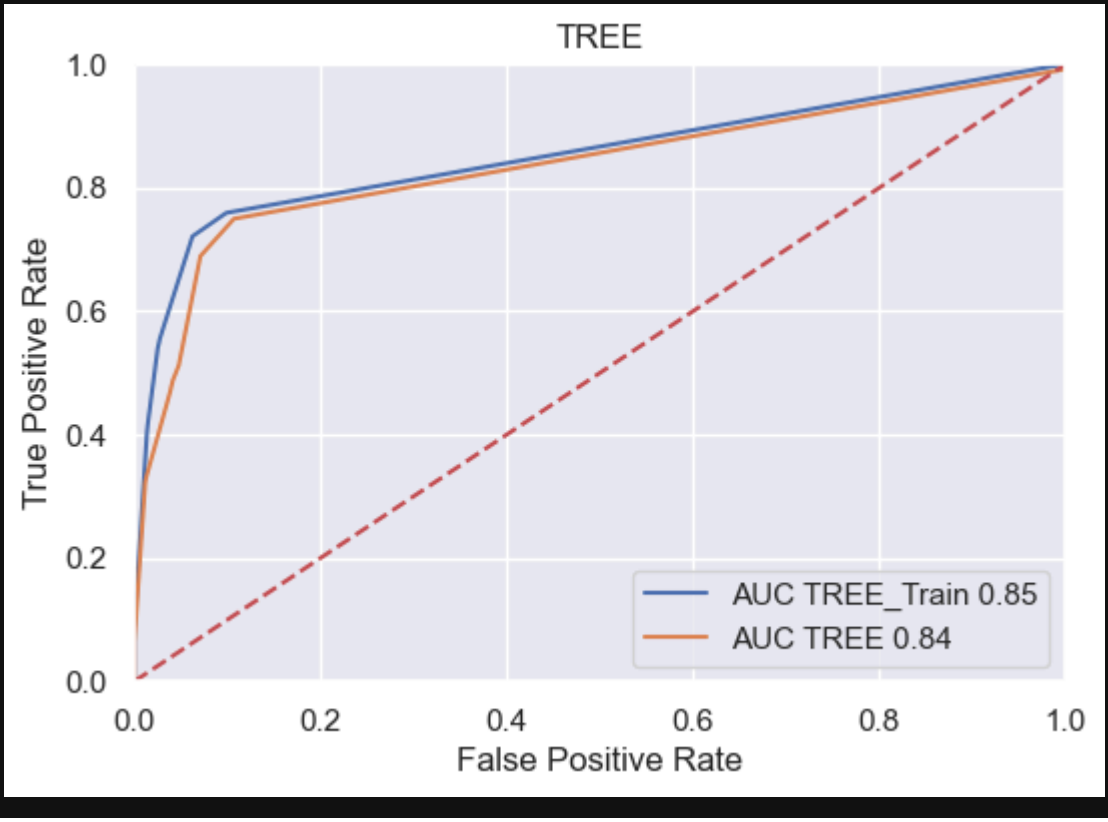
	TARGET_BAD_FLAG	TARGET_LOSS_AMT
count	248.0	248.000000
mean	1.0	11294.310484
std	0.0	7507.998084
min	1.0	320.000000
25%	1.0	4921.000000
50%	1.0	9693.500000
75%	1.0	15601.250000
max	1.0	25000.000000

======

AMOUNT DATA

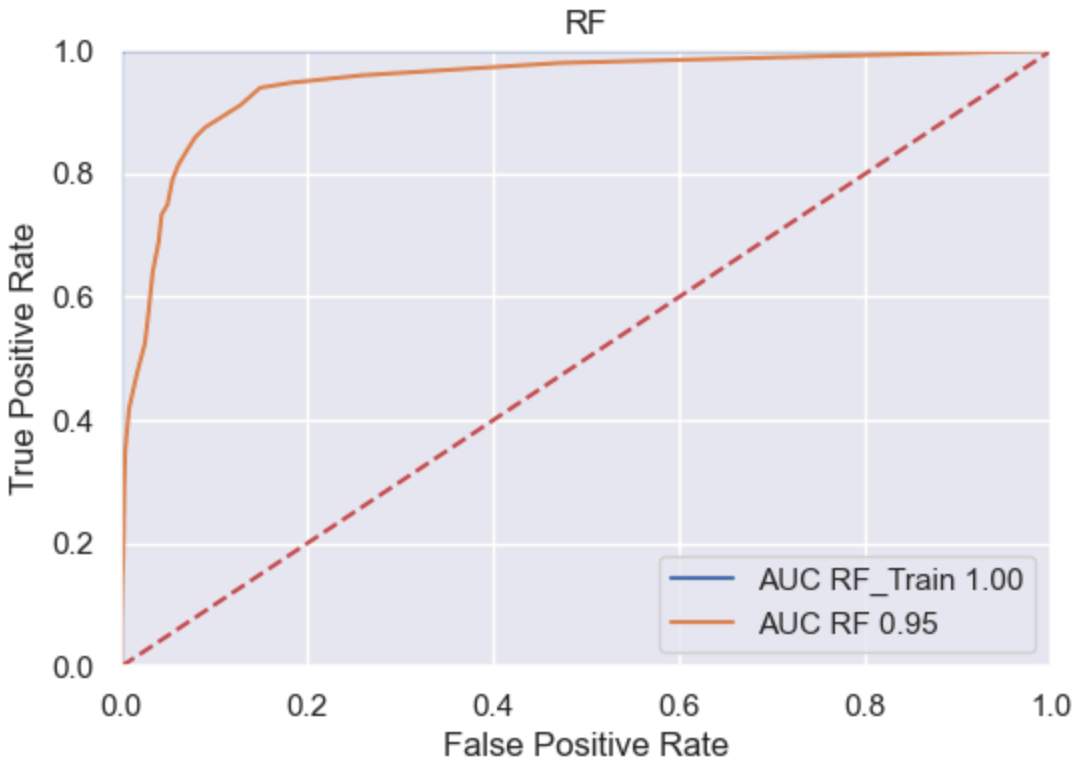
TRAINING = (941, 45)

```
TEST =  (248, 2)
```

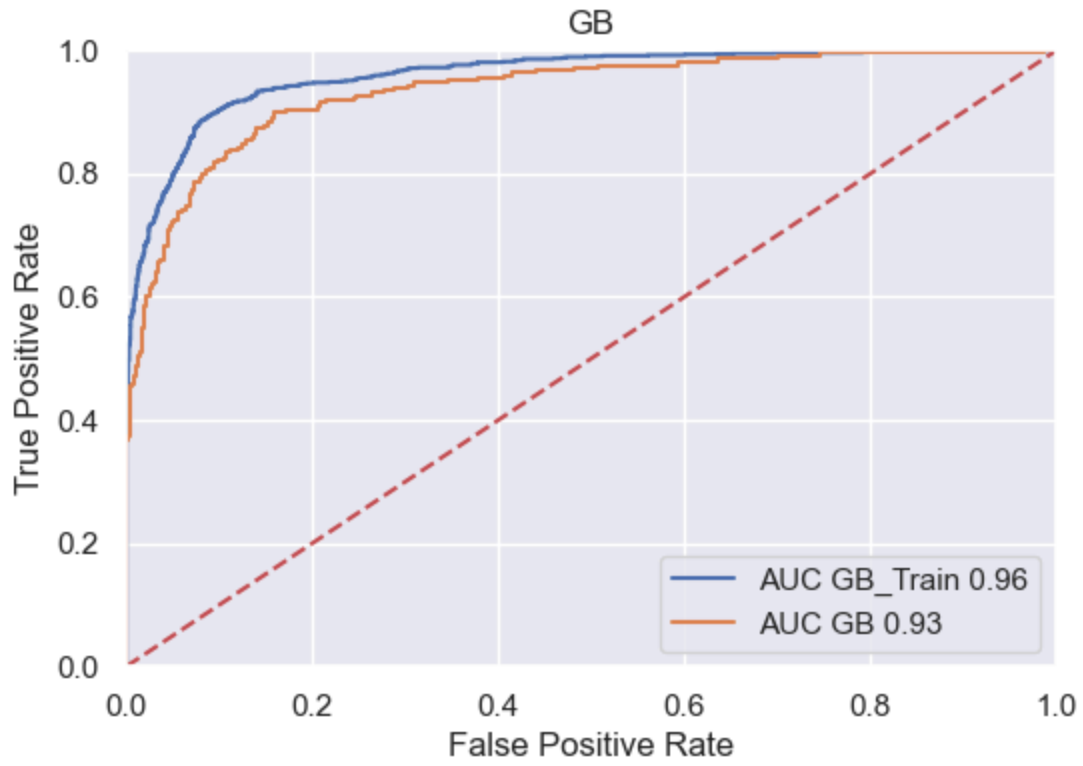


[44]:

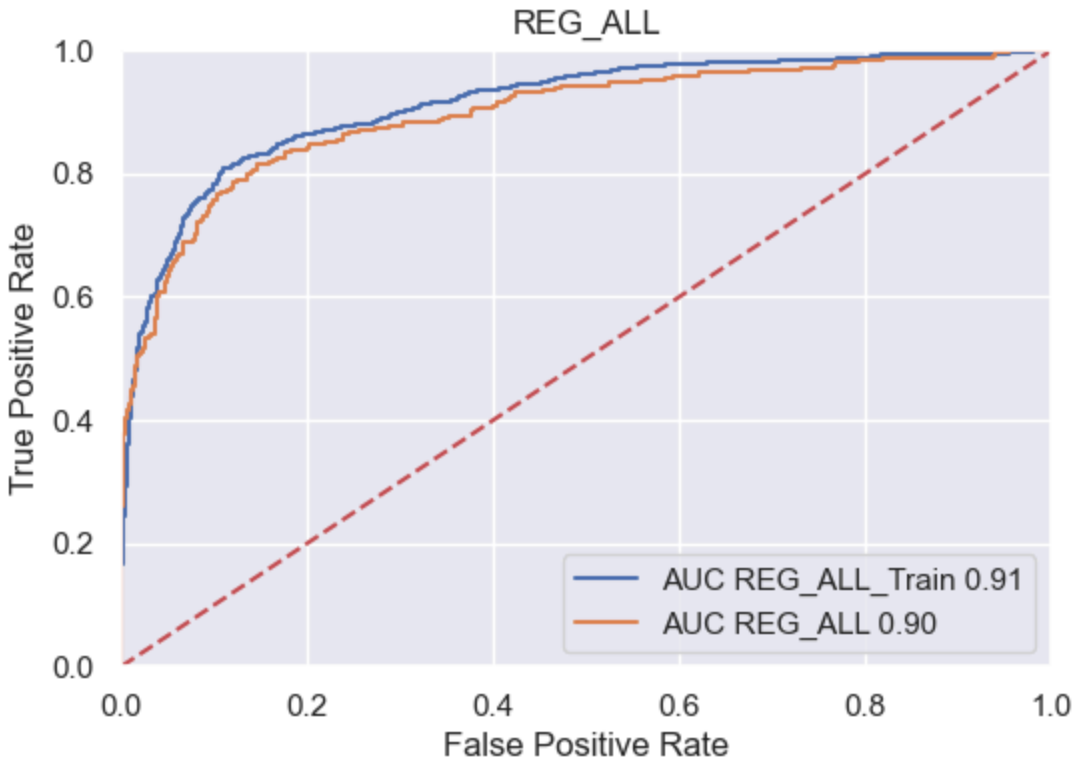
```
TREE CLASSIFICATION ACCURACY
======
TREE_Train  =  0.8949244966442953
------


TREE  =  0.8791946308724832
------


TREE RMSE ACCURACY
======
TREE_Train  =  3209.472815354772
------


TREE  =  4060.582571899168
```



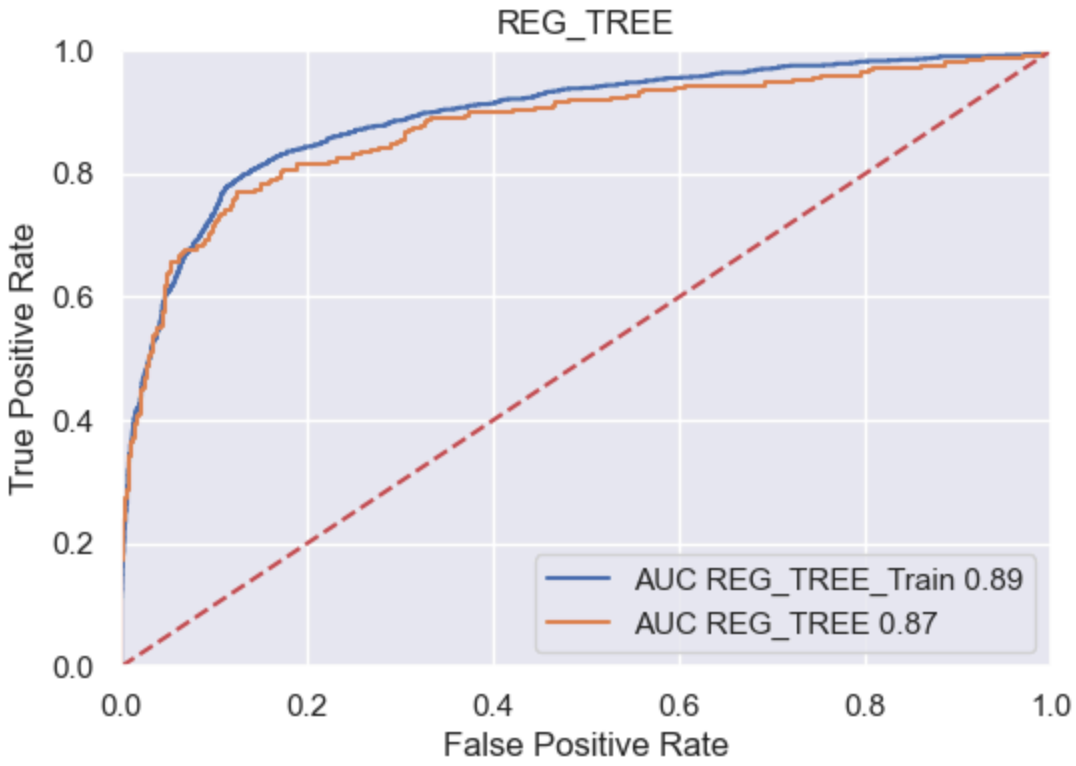

```
RF RMSE ACCURACY
======
RF_Train  =  839.4239385773091
------


RF  =  2447.497299177313
------
```




```
GB CLASSIFICATION ACCURACY
======
GB_Train  =  0.923238255033557
------


GB  =  0.8993288590604027
------


GB RMSE ACCURACY
======
GB_Train  =  1065.275666938704
------


GB  =  2145.840250137111
------
```

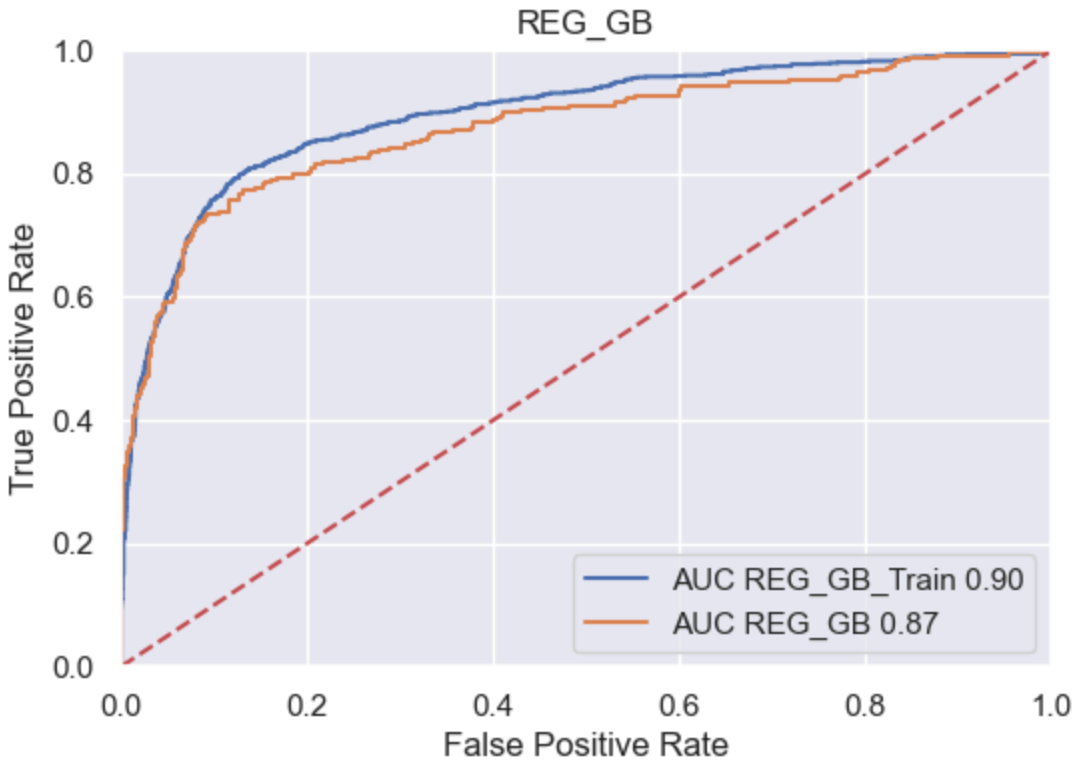



```
REG_ALL CLASSIFICATION ACCURACY
======
REG_ALL_Train  =  0.894505033557047
------


REG_ALL  =  0.8825503355704698
------


REG_ALL RMSE ACCURACY
======
REG_ALL_Train  =  2783.277293930165
------


REG_ALL  =  3072.2852144300423
```



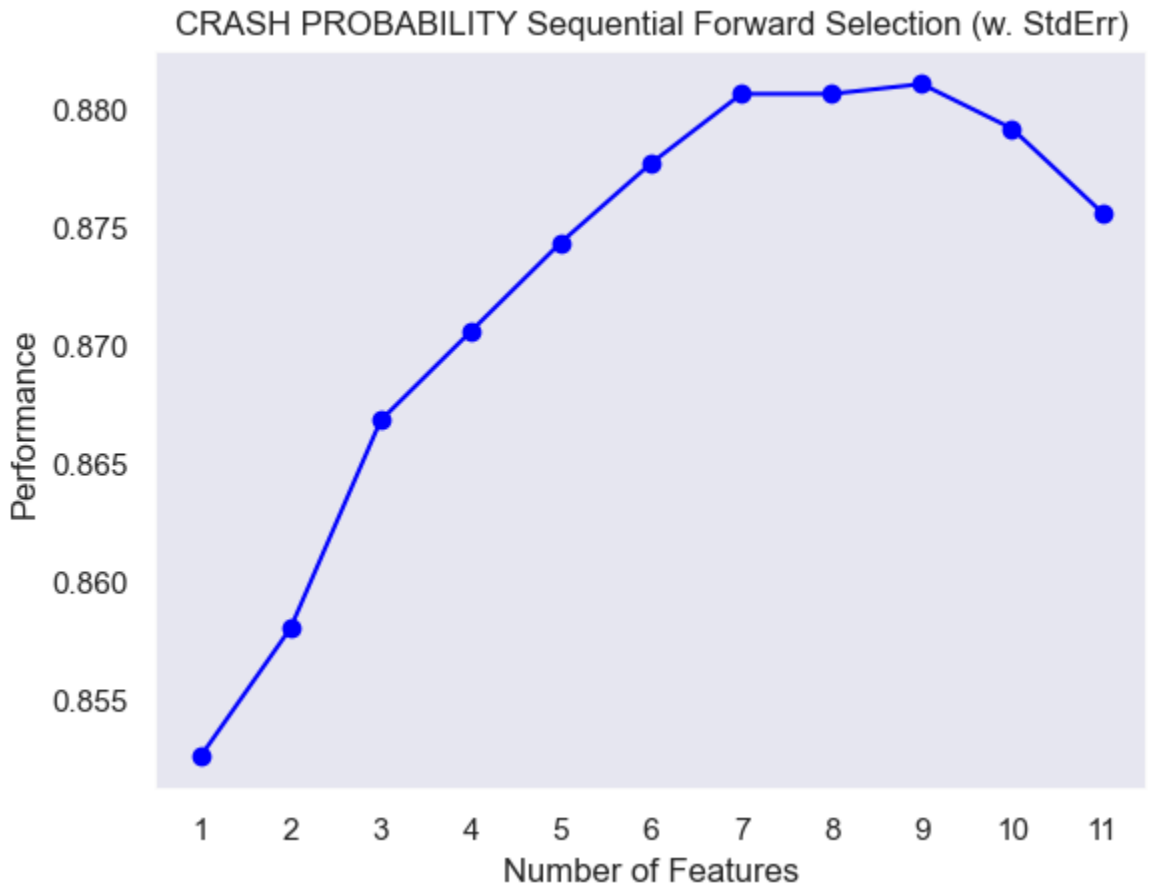

```
REG_TREE CLASSIFICATION ACCURACY
======
REG_TREE_Train  =  0.8823406040268457
------


REG_TREE  =  0.8825503355704698
------


REG_TREE RMSE ACCURACY
======
REG_TREE_Train  =  3290.3356937459766
------


REG_TREE  =  3369.8441989476996
------



CRASH
---------
Total Variables:  12
INTERCEPT  =  -4.910552651891257
TRUNC_IMP_CLAGE  =  -0.007272773598108123
```

```
TRUNC_M_DEBTINC  =  2.7537471103181783
TRUNC_IMP_DEBTINC  =  0.10787822418578795
O_M_VALUE  =  3.762628917682505
TRUNC_IMP_MORTDUE  =  -1.5812053121740765e-06
TRUNC_IMP_VALUE  =  -7.830169235519388e-07
TRUNC_M_YOJ  =  -0.25126160808008813
TRUNC_IMP_YOJ  =  -0.019938205930096882
TRUNC_M_DEROG  =  -0.8467225386241177
O_IMP_DELINQ  =  1.9621166389166644
TRUNC_IMP_DELINQ  =  0.6739635679475566

DAMAGES
---------
Total Variables:  7
INTERCEPT  =  -7725.029708292941
TRUNC_IMP_CLAGE  =  -21.485319431823452
TRUNC_LOAN  =  0.520784452928946
TRUNC_IMP_CLNO  =  222.60016109628697
TRUNC_M_DEBTINC  =  3914.075656790706
TRUNC_IMP_DEBTINC  =  176.29168119026724
TRUNC_IMP_DELINQ  =  873.50090474527
('TRUNC_M_DEBTINC', 100)
('TRUNC_IMP_DEBTINC', 29)
('TRUNC_IMP_DELINQ', 17)
('TRUNC_IMP_CLAGE', 16)
('O_M_VALUE', 7)
('TRUNC_IMP_DEROG', 6)
('TRUNC_LOAN', 5)
('TRUNC_IMP_YOJ', 5)



('TRUNC_LOAN', 100)
('TRUNC_IMP_CLNO', 15)
('TRUNC_M_DEBTINC', 7)
('TRUNC_IMP_DEBTINC', 6)
('TRUNC_IMP_CLAGE', 5)
```



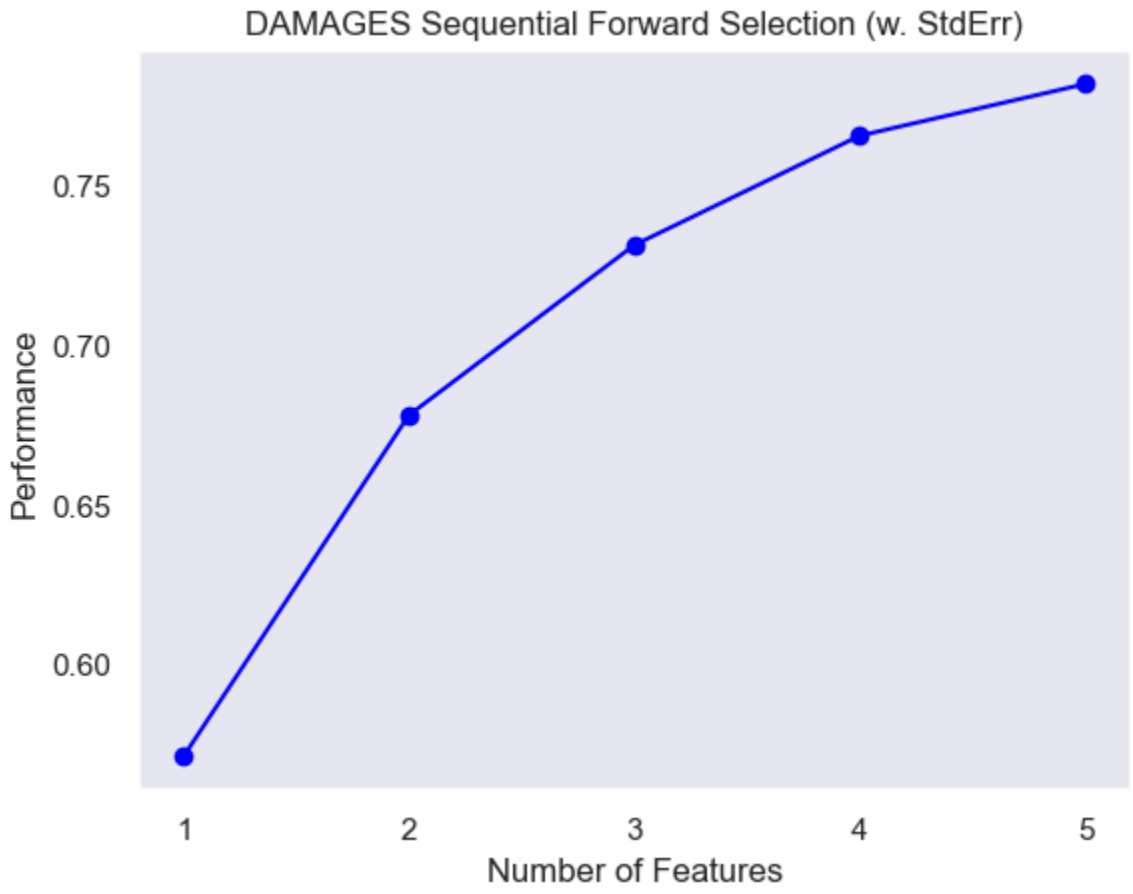

```
REG_GB CLASSIFICATION ACCURACY
======
REG_GB_Train  =  0.8800335570469798
------


REG_GB  =  0.8699664429530202
------


REG_GB RMSE ACCURACY
======
REG_GB_Train  =  3481.2752577897204
------


REG_GB  =  3485.721813361359
------



CRASH
---------
Total Variables:  9
INTERCEPT  =  -5.133542490655469
TRUNC_M_DEBTINC  =  2.704779570399715
```

```
TRUNC_IMP_DEBTINC  =  0.10422846436570259
TRUNC_IMP_DELINQ  =  0.6750877699512154
TRUNC_IMP_CLAGE  =  -0.007120368123936009
O_M_VALUE  =  3.4863081876711974
TRUNC_IMP_DEROG  =  0.6749262333228718
TRUNC_LOAN  =  -8.013818497908666e-06
TRUNC_IMP_YOJ  =  -0.013914465274243552

DAMAGES
---------
Total Variables:  6
INTERCEPT  =  -7209.919364442414
TRUNC_LOAN  =  0.523630210295835
TRUNC_IMP_CLNO  =  245.75523232439494
TRUNC_M_DEBTINC  =  4148.191984335896
TRUNC_IMP_DEBTINC  =  159.1585663795947
TRUNC_IMP_CLAGE  =  -19.5433202549057
```



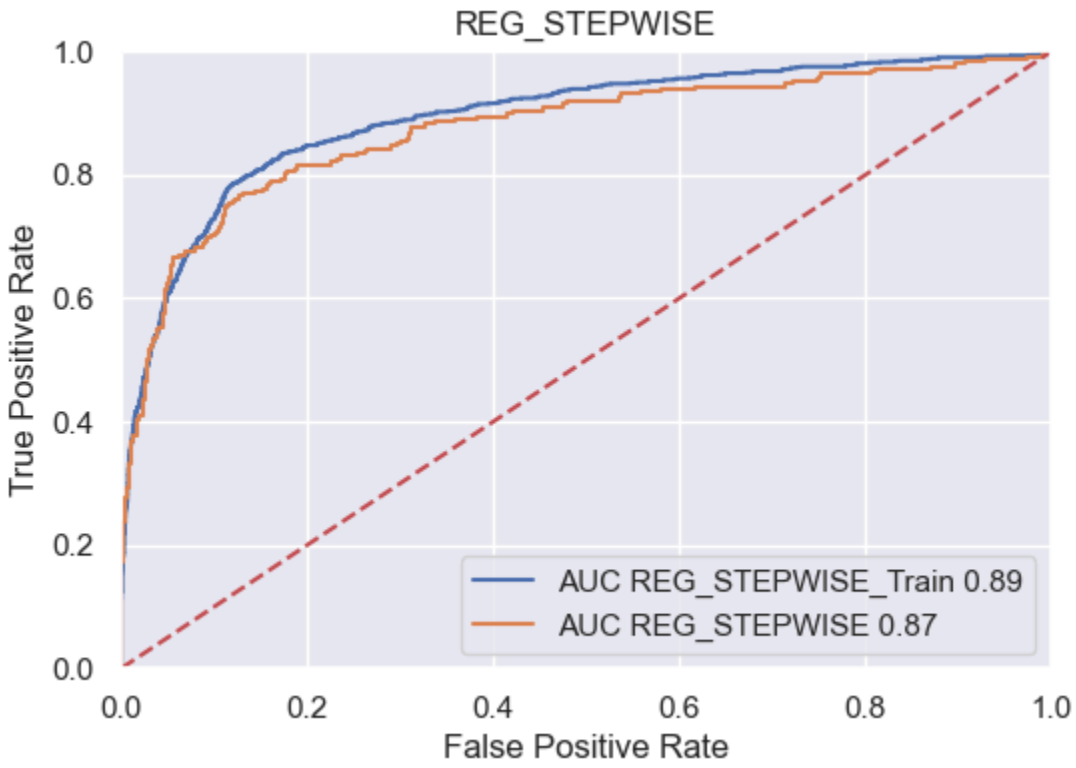

```
argmax
feature_names    (0, 1, 2, 3, 5, 7, 8, 9, 10)
avg_score                            0.881084
Name: 9, dtype: object
 ..................
```

```
('0', '1', '2', '3', '5', '7', '8', '9', '10')
TRUNC_IMP_CLAGE
TRUNC_M_DEBTINC
TRUNC_IMP_DEBTINC
O_M_VALUE
TRUNC_IMP_VALUE
TRUNC_IMP_YOJ
TRUNC_M_DEROG
O_IMP_DELINQ
TRUNC_IMP_DELINQ
```



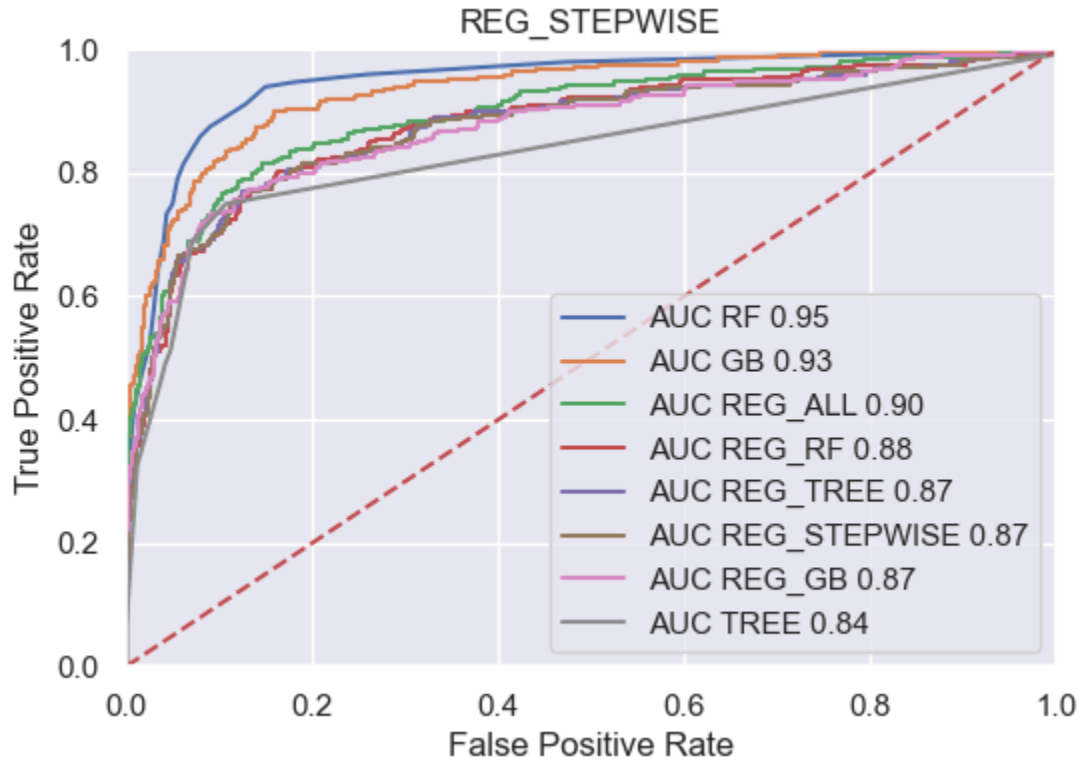

```
.....................
argmax
feature_names    (0, 1, 2, 3, 4)
avg_score               0.781503
Name: 5, dtype: object
 .....................
('0', '1', '2', '3', '4')
TRUNC_LOAN
TRUNC_IMP_CLNO
TRUNC_M_DEBTINC
TRUNC_IMP_DEBTINC
```

TRUNC_IMP_CLAGE




```
REG_STEPWISE CLASSIFICATION ACCURACY
======
REG_STEPWISE_Train  =  0.8812919463087249
------


REG_STEPWISE  =  0.8817114093959731
------


REG_STEPWISE RMSE ACCURACY
======
REG_STEPWISE_Train  =  3481.2752577897204
------


REG_STEPWISE  =  3485.721813361359
------



CRASH
---------
Total Variables:  10
```

```
INTERCEPT  =  -4.944247488700305
TRUNC_IMP_CLAGE  =  -0.007354192920854032
TRUNC_M_DEBTINC  =  2.758436599908932
TRUNC_IMP_DEBTINC  =  0.10767681278575571
O_M_VALUE  =  3.7321092096715884
TRUNC_IMP_VALUE  =  -1.6659966022777662e-06
TRUNC_IMP_YOJ  =  -0.018763773478173658
TRUNC_M_DEROG  =  -0.8790759136246141
O_IMP_DELINQ  =  1.9929767971982317
TRUNC_IMP_DELINQ  =  0.6772913872801917

DAMAGES
---------
Total Variables:  6
INTERCEPT  =  -7209.919364442414
TRUNC_LOAN  =  0.523630210295835
TRUNC_IMP_CLNO  =  245.75523232439494
TRUNC_M_DEBTINC  =  4148.191984335896
TRUNC_IMP_DEBTINC  =  159.1585663795947
TRUNC_IMP_CLAGE  =  -19.5433202549057
```




```
ALL CLASSIFICATION ACCURACY
======
RF  =  0.910234899328859
------
```

GB = 0.8993288590604027

REG_ALL = 0.8825503355704698

REG_TREE = 0.8825503355704698

REG_STEPWISE = 0.8817114093959731

REG_RF = 0.8808724832214765

TREE = 0.8791946308724832

REG_GB = 0.8699664429530202

ALL DAMAGE MODEL ACCURACY
======
GB = 2673.695406076005

RF = 3176.8467886784924

REG_ALL = 3485.721813361359

REG_TREE = 3485.721813361359

REG_RF = 3485.721813361359

REG_GB = 3485.721813361359

REG_STEPWISE = 3485.721813361359

TREE = 4177.049779501949