

ROC curve

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Clear workspace

```
clear all; clc; close all;
```

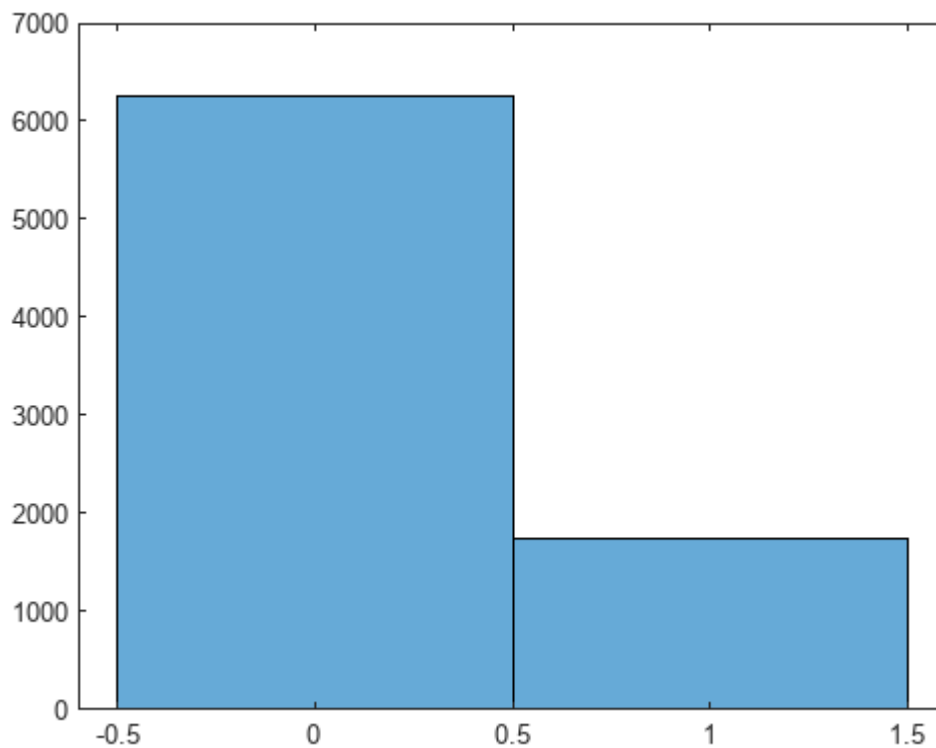
Initialize variables

Load table

```
churn = readtable('churn.csv');
```

values: actual churned cliets data

```
values = churn.Churned;  
histogram(values)
```



scores: scores after model reconstruction with 2 most relevant variables

```
modelspec = ['Churned ~ Age + Churned_contacts'];  
mdl = fitglm(churn, modelspec, Distribution='binomial');  
scores = mdl.Fitted.Probability;
```

threshold: row vector of evenly spaced values

```
threshold = linspace(0,1,200);
```

Compute matrix

```
prediction = scores>threshold;
```

Get TP, TN, FP, FN matrixes

```
truepositive = prediction & values;  
TP = sum(truepositive,1);  
  
falsepositive = prediction & ~values;  
FP = sum(falsepositive,1);  
  
truenegative = ~prediction & ~values;  
TN = sum(truenegative,1);  
  
falsenegative = ~prediction & values;  
FN = sum(falsenegative,1);  
  
% Check  
max(sum([TP; FP; TN; FN],1))
```

```
ans = 8000
```

```
min(sum([TP; FP; TN; FN],1))
```

```
ans = 8000
```

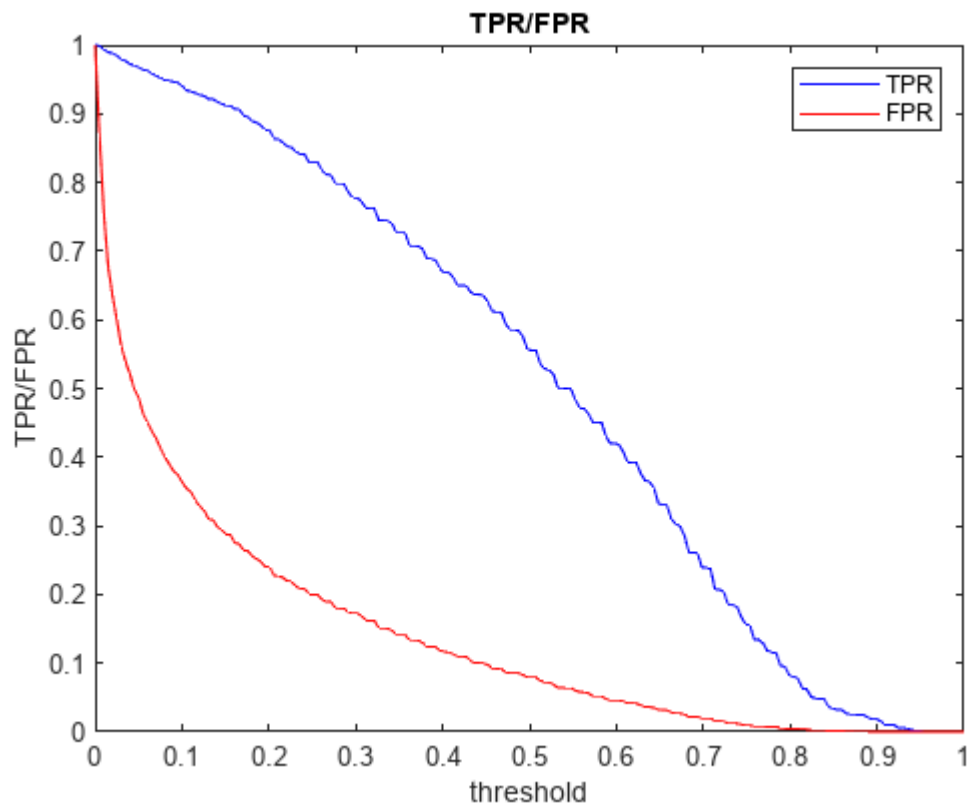
Compute TPR and FPR and print

```
TPR = TP./(TP+FN);  
FPR = FP./(FP+TN);
```

plot

```
figure(2)  
plot(threshold,TPR,'b')  
hold on  
plot(threshold,FPR,'r')  
hold off  
legend('TPR','FPR')  
xlabel('threshold')
```

```
ylabel('TPR/FPR')
title('TPR/FPR')
% saveas(gcf,'04_ROC/TPR_FPR_churn.png')
```



ROC curve

```
AUC = 0;
for ii=2:size(FPR,2)
    AUC = AUC + abs((FPR(ii)-FPR(ii-1)))*(TPR(ii)+TPR(ii-1))/2;
end

figure(3)
plot(FPR,TPR,'b')
xlabel('FPR')
ylabel('TPR')
text(0.6,0.2, strcat('AUC=', num2str(AUC)))
title('ROC curve')
% saveas(gcf,'04_ROC/ROC_churn.png')
```

