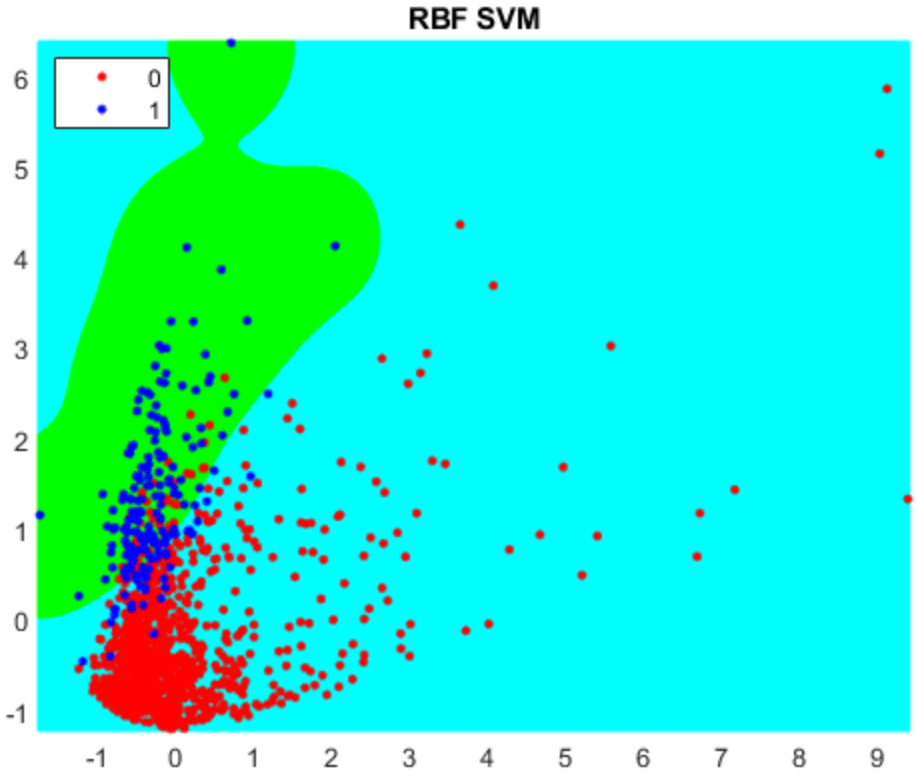
Trevor Tracy

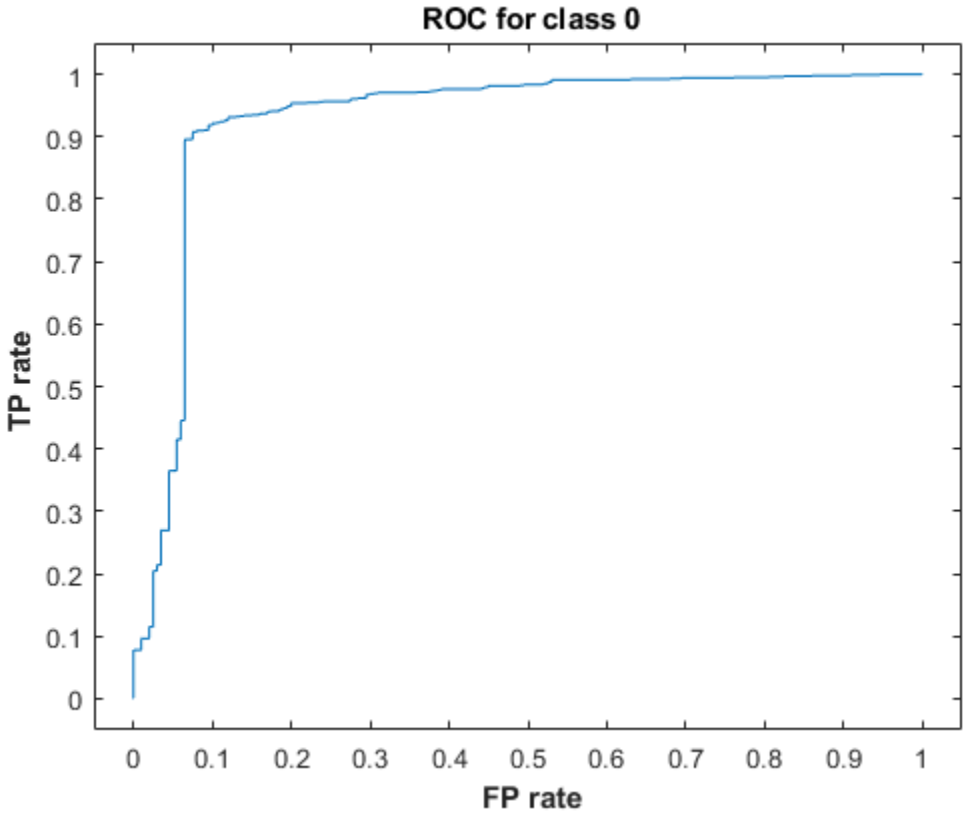
a8.m

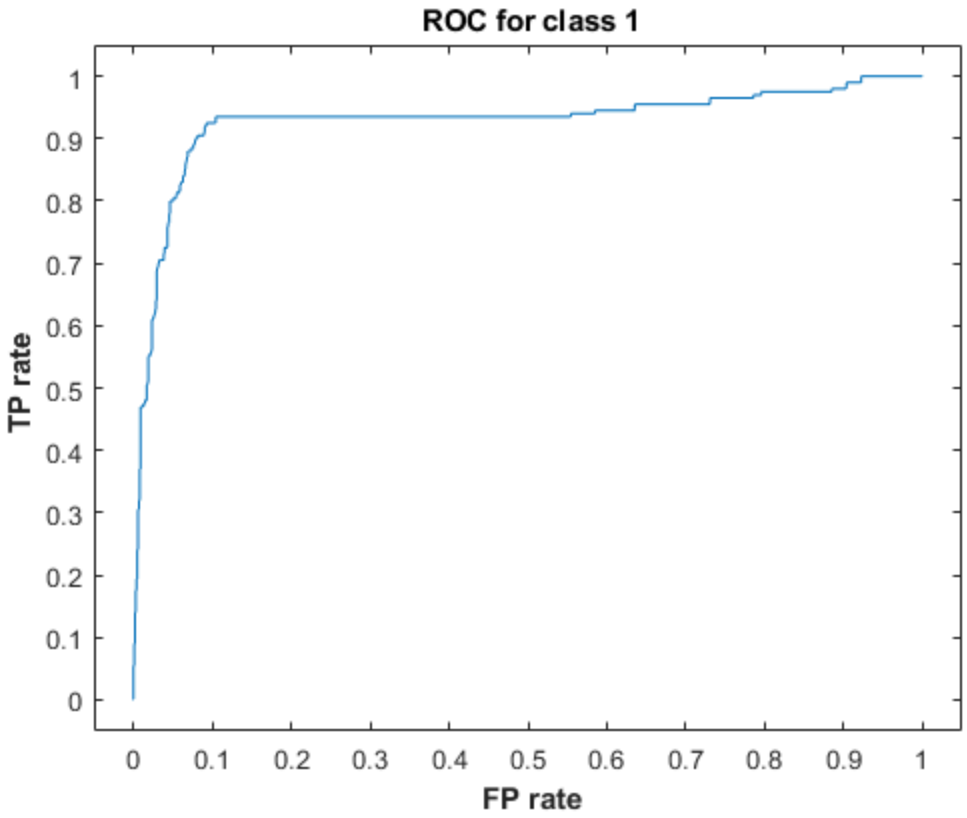
```
function a8
clear all, close all hidden

% Load the csv file
cd = readtable('ML_HW_Data_CellDNA.csv');

% Convert dependent variable to binary
Y = cd(:,[14]);
tempTable = table2array(Y);
tempTable(tempTable~=0)=1;
Y = array2table(tempTable);

% Run zscores on numerical values: columns 1-13 [0-12]
% Make array (to perform zscore), then revert data to table again
cdReg = cd;
cdReg(:, [1 2 3 4 5 6 7 8 9 10 11 12 13]) = ...
    array2table(zscore(table2array(cd(:, [1 2 3 4 5 6 7 8 9 10 11 12 13]))));
cdReg(:, 14) = Y;

% Put Data in X and Y
%X = cdReg(:, [1 2 3 4 5 6 7 8 9 10 11 12 13]); % option 0 for all data
X = cdReg(:, [5 4]); % option for visual boundary
X = table2array(X);
Y = table2array(Y);

% Setup SVM Inputs
ContraintBox = 1;

% Build RBF SVM
RBF_SVM = fitcsvm(X, Y, 'BoxConstraint',
 ContraintBox, 'KernelFunction', 'RBF', 'KernelScale', 1);

% Prepare Grid for Plotting
gap = 0.01;
[x1Grid,x2Grid] = meshgrid(min(X(:,1)) : gap : max(X(:,1)), min(X(:,2)) :
 gap : max(X(:,2)));
xGrid = [x1Grid(:),x2Grid(:)];

% Reformat X and Y
x_cell = num2cell(X);
y_cell = num2cell(Y);

% Plot RBF SVM
Plot2DDecisionBoundary(RBF_SVM, X, Y, xGrid, 'RBF SVM')

% Get Accuracy, Precision, and Recall for Each Class
[predictClasses,proba] = predict(RBF_SVM, X);
CFM_Stats(Y, predictClasses)
```

```
% 5. Roc Curves
[xpos, ypos, T, AUC0] = perfcurve(Y, proba(:, 1), 0);
figure, plot(xpos, ypos)
xlim([-0.05 1.05]), ylim([-0.05 1.05]), xlabel('\bf FP rate'),  ylabel('\bf TP
 rate')
title('\bf ROC for class 0')
[xpos, ypos, T, AUC1] = perfcurve(Y, proba(:, 2), 1);
figure, plot(xpos, ypos)
xlim([-0.05 1.05]), ylim([-0.05 1.05]), xlabel('\bf FP rate'),  ylabel('\bf TP
 rate')
title('\bf ROC for class 1')

return;

function Plot2DDecisionBoundary(model, X, Y, gridIn, plotTitle)
[yh, ~] = predict(model, gridIn);
gscatter(gridIn(:,1), gridIn(:,2), yh, 'cg'), hold on,
gscatter(X(:,1), X(:,2), Y, 'rb', '.', 10);
title(['\bf' plotTitle])
axis tight, drawnow
```

```
Confusion Matrix:
   973    44
    55   145

Overall accuracy = 0.91865

ans =

  2×6 table

    accuracy    precision    recall     Fscore     sensitivity    specificity
    ________    _________    _______    _______    ___________    ___________

    0.91865       0.9465     0.95674    0.95159      0.95674          0.725
    0.91865       0.7672       0.725     0.7455        0.725        0.95674
```


RBF SVM
0
1
6
5
4
3
2
1
0
-1
-1
0
1
2
3
4
5
6
7
8
9


ROC for class 0
TP rate
FP rate
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1



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