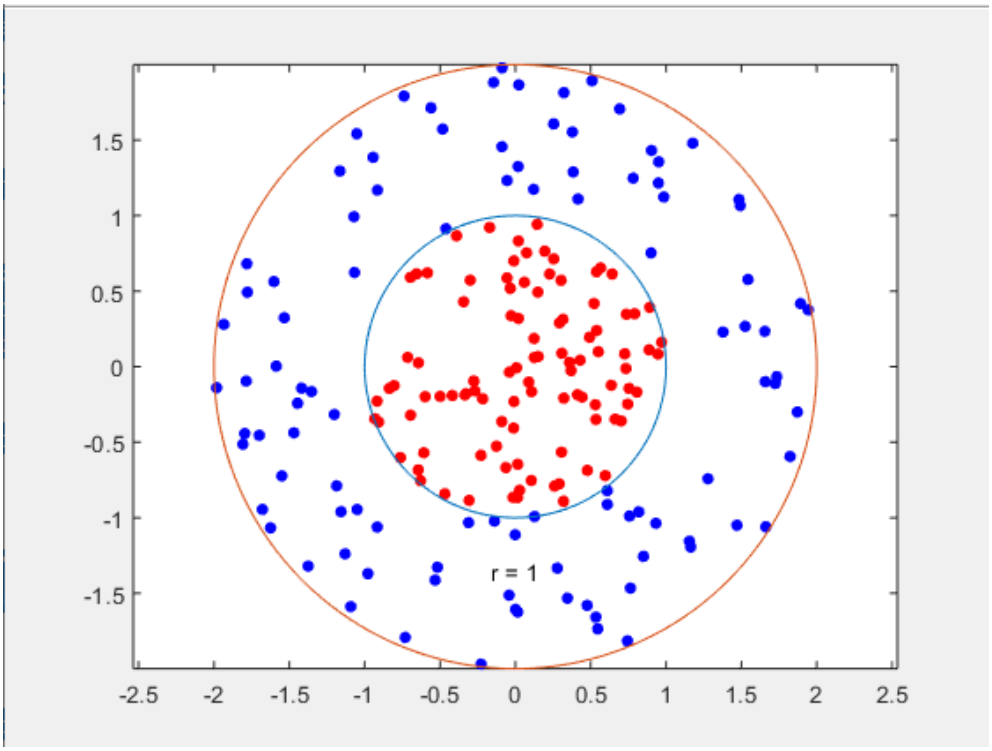
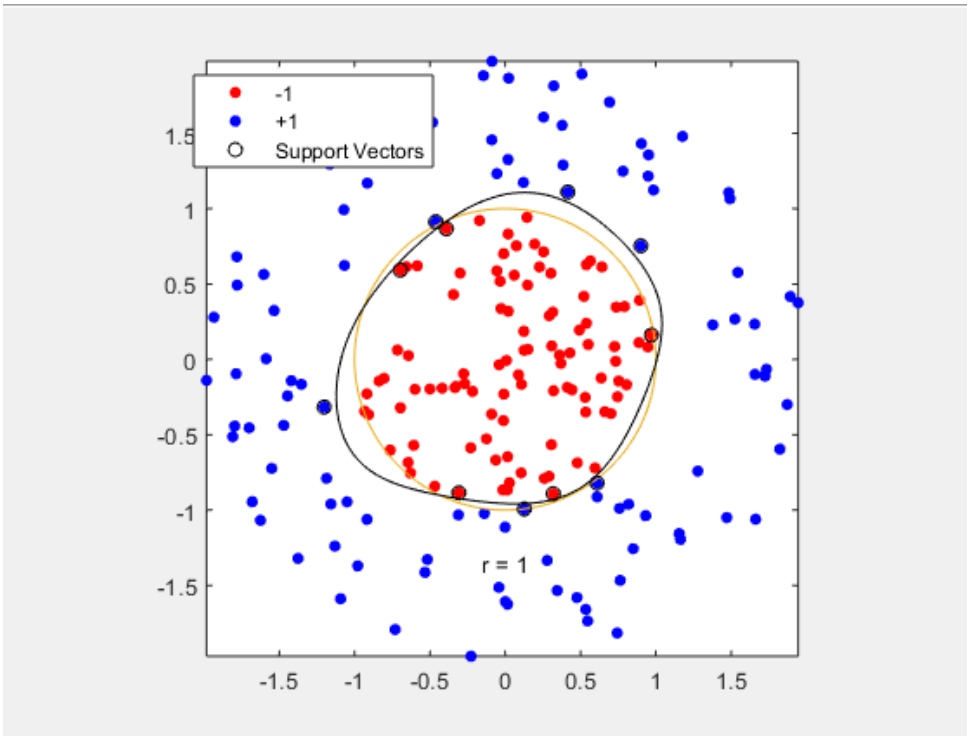
```
%{
Generates 100 points uniformly distributed in the unit disk
by generating a random radius(r) and angle(t) and then plotting
(r*cos(t), r*sin(t))
%}
        rng(1); % For reproducibility
        r = sqrt(rand(100,1)); % Radius
        t = 2*pi*rand(100,1);  % Angle
        data1 = [r.*cos(t), r.*sin(t)]; % Points

% Creates 100 more points in a ring around the original set of points
        r2 = sqrt(3*rand(100,1)+1); % Radius
        t2 = 2*pi*rand(100,1);      % Angle
        data2 = [r2.*cos(t2), r2.*sin(t2)]; % points

% Plots both sets of points and plots circles of radii 1 and 2 for comparison
        figure;
        plot(data1(:,1),data1(:,2),'r.','MarkerSize',15)
        hold on
        plot(data2(:,1),data2(:,2),'b.','MarkerSize',15)
        ezpolar(@(x)1);ezpolar(@(x)2);
        axis equal
        hold off
```

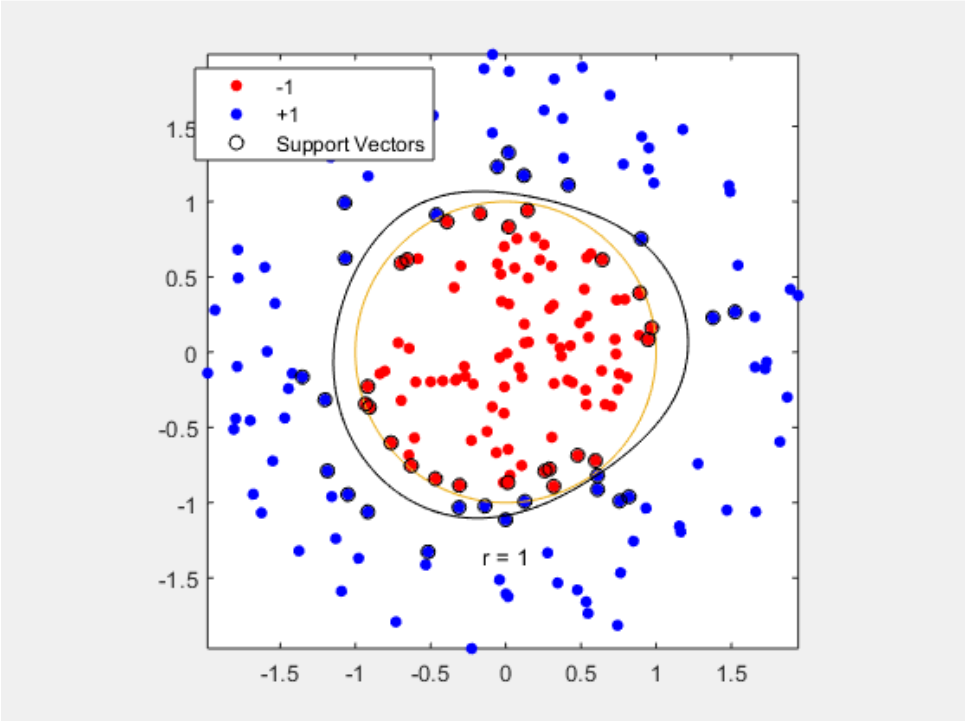



```
% Puts the data into one matrix and then makes a vector of the classifications
        data3 = [data1;data2];
        theclass = ones(200,1);
        theclass(1:100) = -1;

%{
Uses KernelFunction set to 'rbf' and BoxConstraint set to Inf
to train a SVM classifier

Then plots the decision boundary of the SVM and flags the
support vectors
%}
        %Train the SVM Classifier
        cl = fitcsvm(data3,theclass,'KernelFunction','rbf',...
            'BoxConstraint',Inf,'ClassNames',[-1,1]);
```

```
% Predict scores over the grid
d = 0.02;
[x1Grid,x2Grid] = meshgrid(min(data3(:,1)):d:max(data3(:,1)),...
    min(data3(:,2)):d:max(data3(:,2)));
xGrid = [x1Grid(:),x2Grid(:)];
[~,scores] = predict(cl,xGrid);

% Plot the data and the decision boundary
figure;
h(1:2) = gscatter(data3(:,1),data3(:,2),theclass,'rb','.');
hold on
ezpolar(@(x)1);
h(3) = plot(data3(cl.IsSupportVector,1),data3(cl.IsSupportVector,2),'ko');
contour(x1Grid,x2Grid,reshape(scores(:,2),size(x1Grid)),[0 0],'k');
legend(h,{'-1','+1','Support Vectors'});
axis equal
hold off
% fitcsvm makes a classifier that is close to a circle of radius 1
```



```
%{
Remove the BoxConstraint, allowing for a more circular line,
but also more misclassifications
%}

    cl2 = fitcsvm(data3,theclass,'KernelFunction','rbf');
    [~,scores2] = predict(cl2,xGrid);

    figure;
    h(1:2) = gscatter(data3(:,1),data3(:,2),theclass,'rb','.');
    hold on
    ezpolar(@(x)1);
    h(3) = plot(data3(cl2.IsSupportVector,1),data3(cl2.IsSupportVector,2),'ko');
    contour(x1Grid,x2Grid,reshape(scores2(:,2),size(x1Grid)),[0 0],'k');
    legend(h,{'-1','+1','Support Vectors'});
    axis equal
    hold off
```



Command Window

```
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data2 = [r2.*cos(t2), r2.*sin(t2)]; % points
>> diary SVM.txt
>> %{
Plots both sets of points and plots circles of radii 1 and 2 for comparison
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[~,scores2] = predict(cl2,xGrid);

figure;
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hold on
ezpolar(@(x)1);
h(3) = plot(data3(cl2.IsSupportVector,1),data3(cl2.IsSupportVector,2),'ko');
contour(x1Grid,x2Grid,reshape(scores2(:,2),size(x1Grid)),[0 0],'k');
legend(h,{'-1','+1','Support Vectors'});
axis equal
hold off
>> diary off
fx >>
```

Example From:

https://www.mathworks.com/help/stats/support-vector-machines-for-binary-classification.html#bsr5oqx