

SVM Data:

SVM Kernel	Mean	Standard Deviation
RBF	0.94	0.032
Linear	0.59	0.0018
Poly	0.59	0.0018
Sigmoid	0.51	0.072

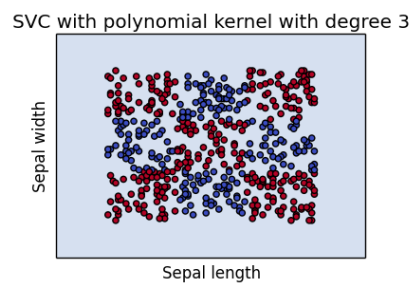
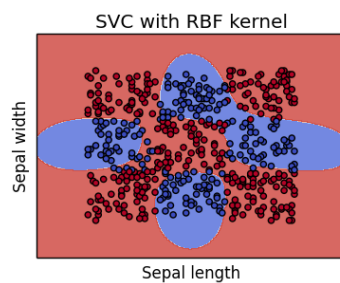
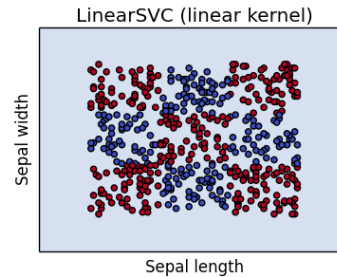
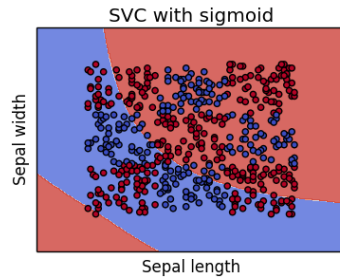
KNN Data:

K=\$	Mean	Standard Deviation
K=1	0.96	0.02
K=5	0.94	0.025
K=10	0.98	0.024
K=15	0.98	0.030

Decision Tree:

Max Depth	Mean	Standard Deviation
1	0.59	0.0018
2	0.65	0.035
4	0.96	0.017
8	0.96	0.011
16	0.96	0.011

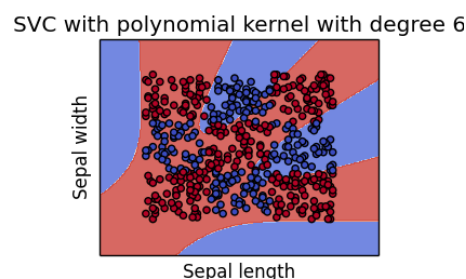
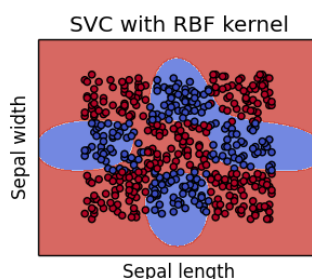
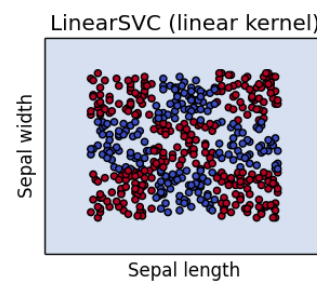
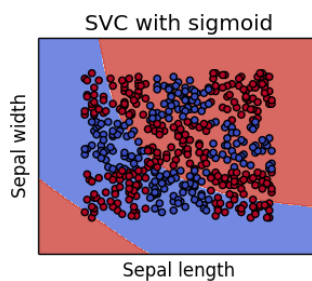
SVM Plots:



Discussion:

The best kernel function for the SVM is the RBF kernel with a mean accuracy score in cross validation of 94%. The sigmoid function is second best despite having a lower mean score than both the linear and poly kernels, it has a higher standard deviation which allows for more variance in classification. Linear, and poly both have low mean score values, and a low standard deviation so neither can be plotted.

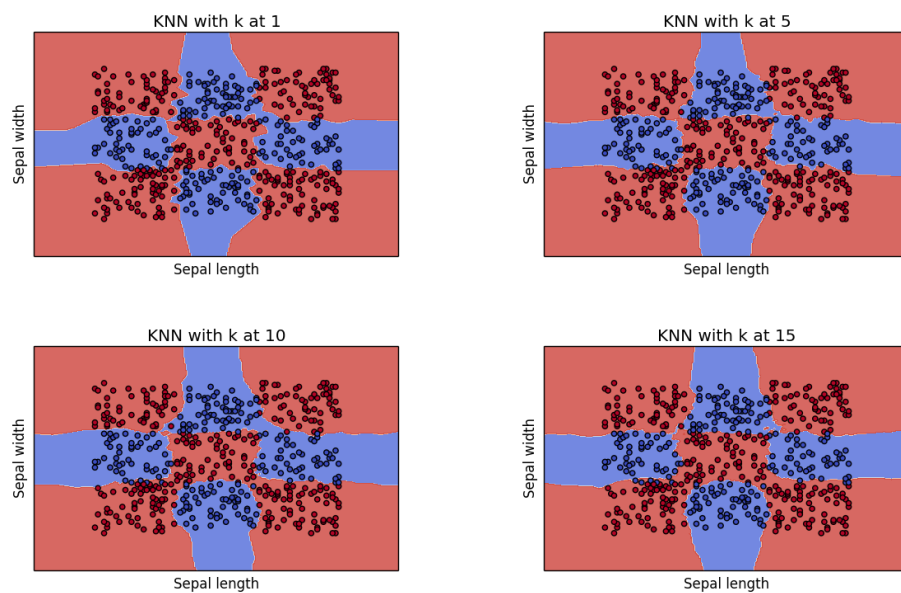
I ran the poly kernel with a degree 6 polynomial kernel instead of degree 3, and this increased the accuracy, and allowed for a plotting of values:



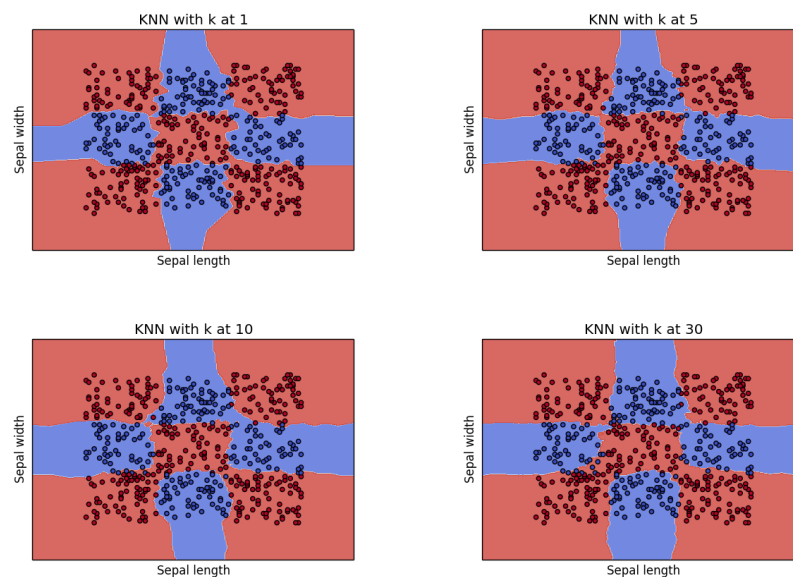
The standard deviation of the poly kernel with a degree 6 is **0.0509**, and has a mean score of **0.68**.

The K-nearest neighbors approach worked very well, and had a mean score of over 90 for all depths of 1 - 15. I ran a KNN with $k=30$, and that ended up with a standard deviation of 0.029, and a mean of a 0.96. This went down from a 98 mean from $k=15$, so it appears that when the k goes up the mean goes down.

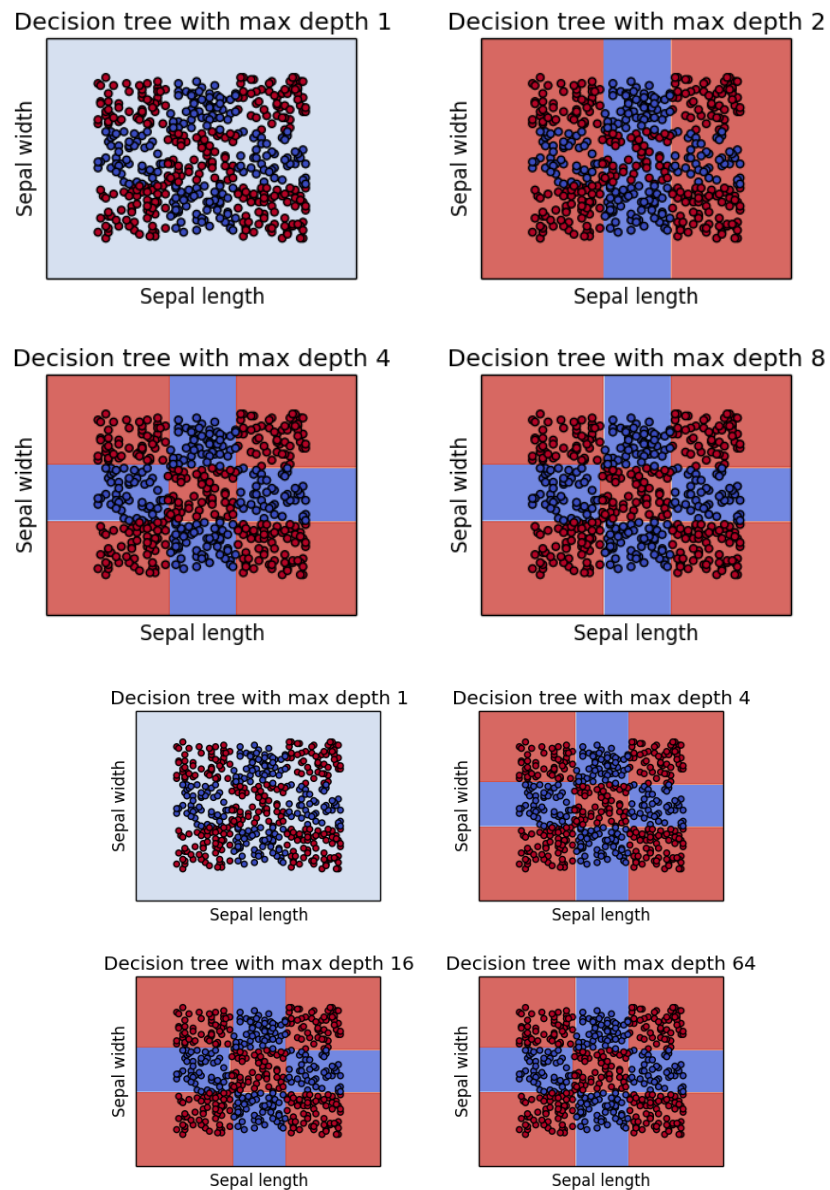
Here are the plots of the KNN models:



Here are the KNN Models including K at 30:



The decision tree model was very consistent with the mean remaining at 96 when the max depth is at 4, and above. I ran the decision trees with a max depth of 1,4,16,64, and 256 and the mean remained the same, as did the standard deviation. Here are the plots for the for the decision tree:



Overall, I think KNN is the best option as long as the K is kept in the in the 10-15 range. I think the decision tree is the safest bet for this data, but does not seem to allow for much

improvement once the depth goes over 4. The SVM does not do well at all except for the RBF kernel, but not any better than the KNN or decision tree.