**Com S 474 Homework 7**

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Background pattern

Description automatically generated

a)

A picture containing background pattern

Description automatically generated

b) Given the discussions during lecture I would expect max margin, logsitic regression, linear disciminant analysis and SVC to have linear boundary classifications. After looking at the results of the graphs this seemed to be the case. From the methods that produced linear boundaries it appears that they have similar boundaries with the main notable diffence being that they had different slopes. I also saw that with SVC for the circle graph that the boundaries seemed to be flipped on where the red and blue was and max margin had the opposite slopes.

c) Given the discussions during lecture I expected that Quadratic disciminant analysis and SVC with polynomial degree 2 to have quadratic boundaries. Looking at the results of the graph that seemed to be the case since they produced quadratic like boundaries. For the methods that produced quadratic boundaries they seemed to be similar but also different in their circles graphs however QDA greatly differs from that of SVC with polynomial 2 on the moons graph where SVC with polynomial degree 2 held a more of an elipse boundary whereas the QDA was more of a curved line.

d) Yes looking at the results of the linearly serpable graph it appears that they can be separated in linear fashion for QDA (if QDA can be classified as non-linear) while the other graphs don’t produce boundaries that appear linear. Looking at the graphs more curvature can be seen which implies less of a linear boundary.

e) When comparing LDA to QDA on their linearly seperable graphs they look similar with both producing results that could be seperated by a linear boundary since QDA has the ability to still show linear boundaries (discussed during lecture) with the only notable difference being that with QDA slight curvature can be noted. On their moon graph QDA does a better job than LDA on fitting the data since it has more flexibility and the same can be seen with their circle graphs as well for the same reasons.

f) For SVC for the linearly seperable graphs the default does a good job on fiiting/classifying that data. However, with the other two graph results moon and circle as you move to the right in SVC (from defualt🡪polynomial degree 2🡪polynomial degree 5🡪Radial Basic Function it does a better job at fiiting since those methods begin to have more flexibility and can adhere more to what the input data is.