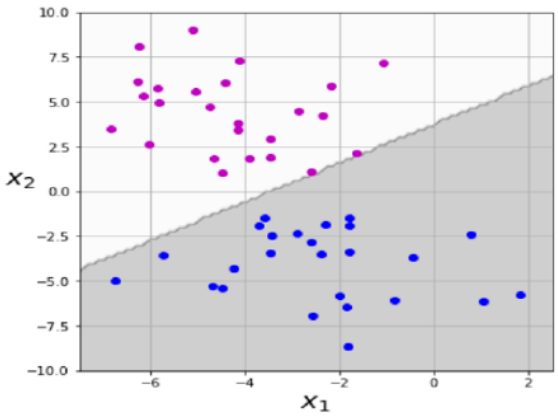
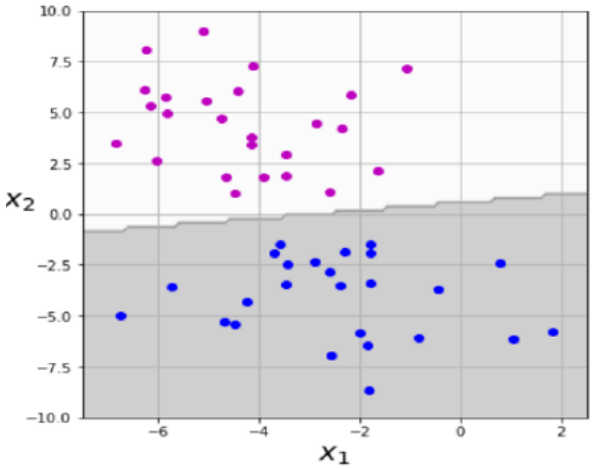
Q2 – SVM

A

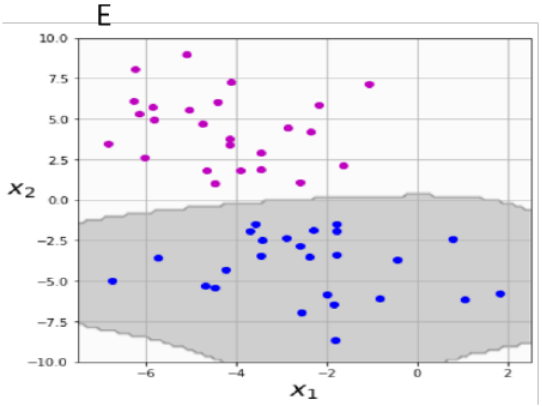


D

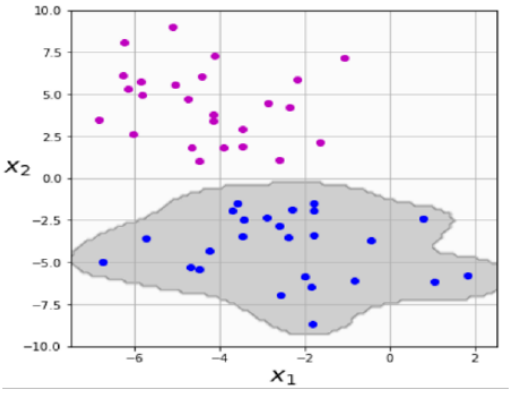


We can see clearly that the boundary line is a straight one, meaning that the kernel is linear in both. It is known that the strength of the regularization is proportional to C. It means that for high values of C, we have strong regularization, short margins and smaller probability to have samples between them. It decreases the model's ability to generalize and risk overfitting the training examples. weak regularization is the opposite; longer margins yet higher probability to have samples between them. On sketch A, it appears that the margins were not determined by the two purple samples that were almost misclassified, thus we can infer that the regularization is smaller. To conclude – A was classified by linear kernel with C = 0.01 and D by linear kernel with C =1.

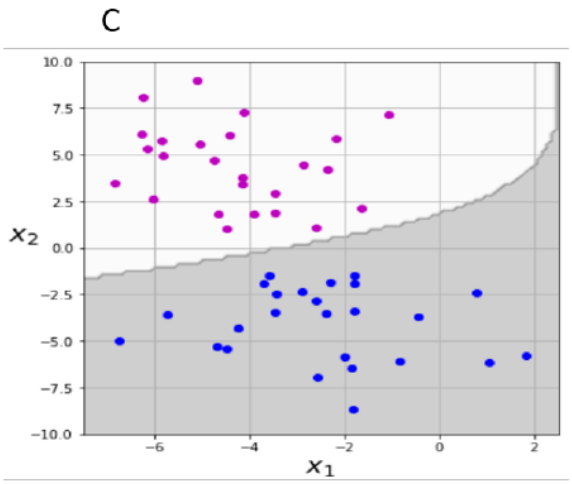
E

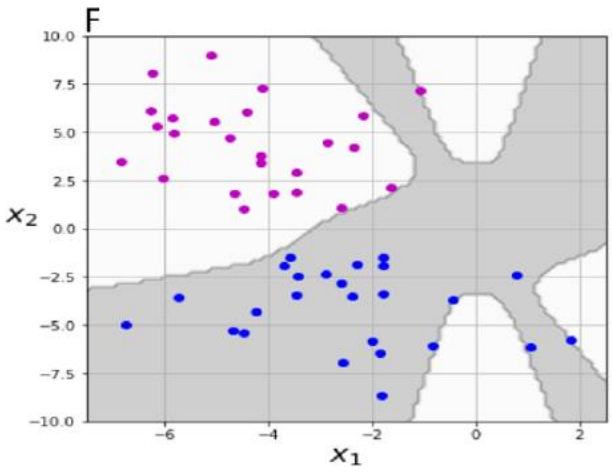


B



Here, the boundary line is roughly circular, so the kernel in both is RBF. Now we have to decide between γ's. γ is another regularization parameter, inversely correlated to the classification's variance. Wider area (high variance) indicates on a low value of gamma. On sketch E, the classification's region is bigger than on sketch B, so we can infer that the lower value of γ belongs to sketch E. To conclude – E was classified by RBF kernel with $\gamma = 0.2$ and B by RBF kernel with $\gamma = 1$.





Finally, we have to determine the polynomial degree of each of these models. We deduce from the boundaries' shapes that they are not linear nor circular. We know that the higher the degree, the greater the model's complexity. Sketch F has a much more complicated boundary line the sketch C, so we can conclude that F has a higher degree. To summarize – C was classified by polynomial kernel of degree 2, and F by degree 10.

Final summation:

A – 1

B – 5

C – 3

D – 2

E – 6

F – 4