ALR - ECEN4493 - HW3

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1. In Section 2.5, vary the regularization parameter λ and observe the changes to the decision boundary and the accuracy. Plot the decision boundaries for different λ and comment on why you observe such behavior.

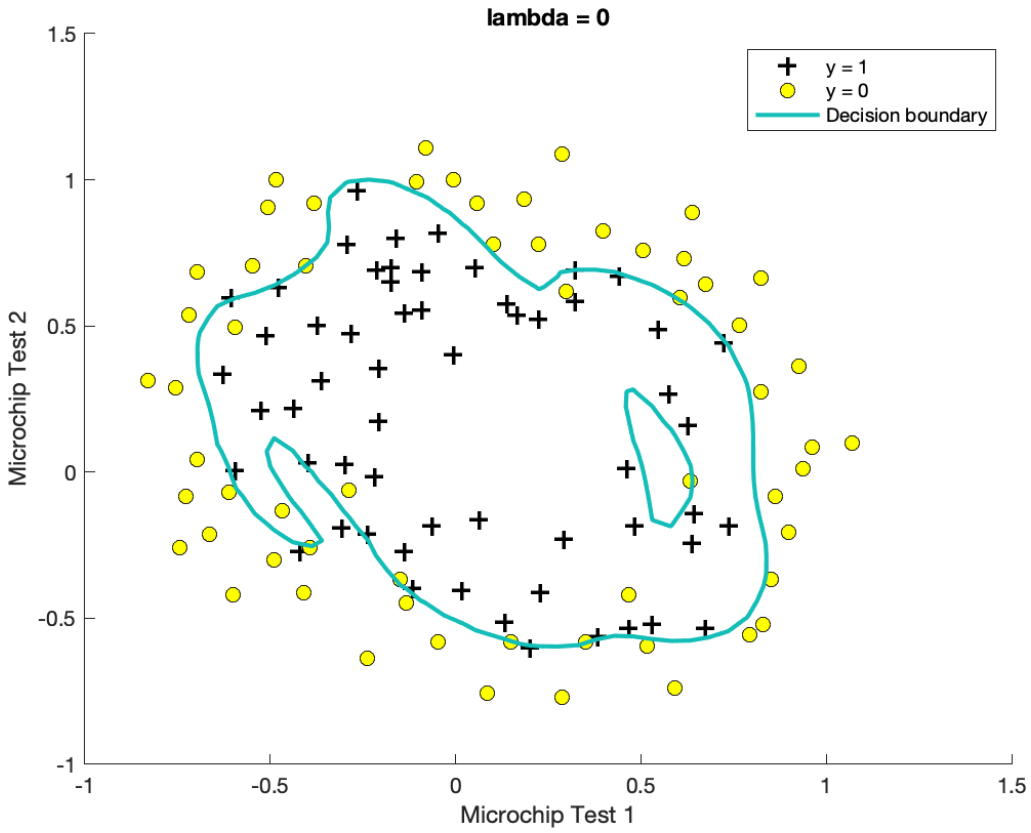

Figure 1: Decision Boundary for $\lambda = 0$

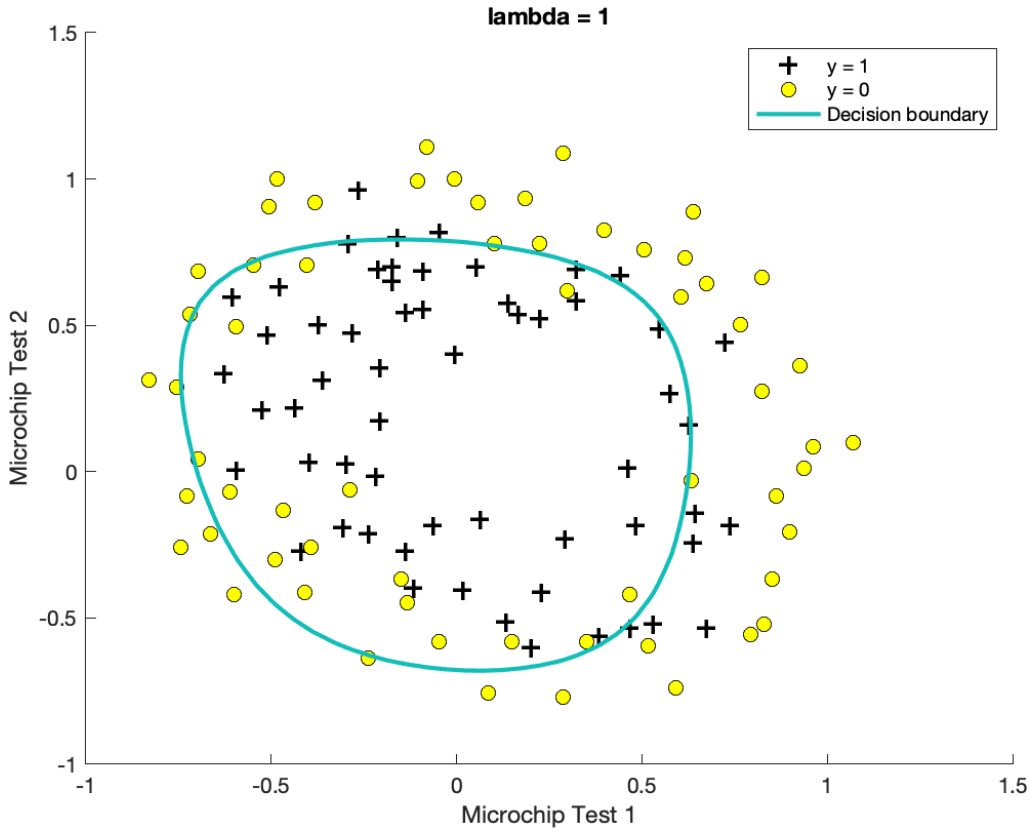

Figure 2: Decision Boundary for $\lambda = 1$

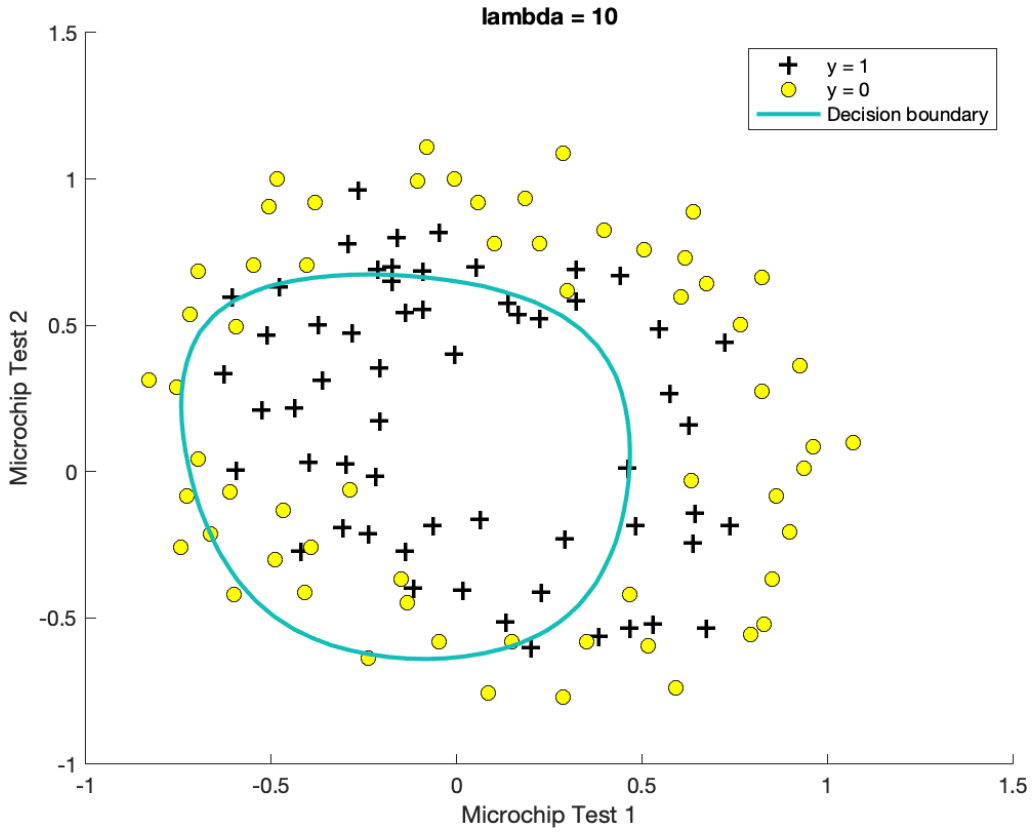

Figure 3: Decision Boundary for $\lambda = 10$

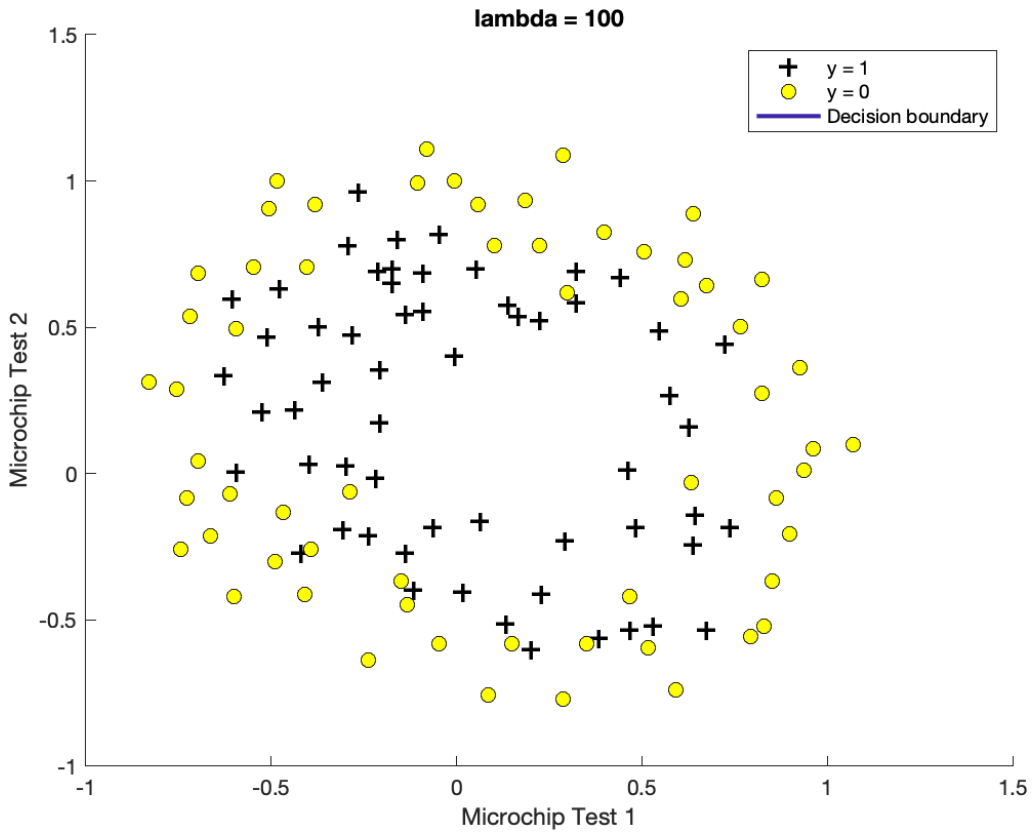

Figure 4: Decision Boundary for $\lambda = 10$

When small λ is used, the decision boundary encapsulates the entirety of the data, but the boundary is complicated and over-fitting 1. When we increase λ to 1, we see a less complex boundary, but the boundary is under-fitting. Typically, we would expect $\lambda = 1$ to provide a good decision boundary 2, but I believe there may be some error within the code as it replicates the $\lambda = 100$ image within the MATLAB file. Regardless, as λ increases we see a less complex boundary with under-fitting, it is important to find a good "middle-ground" when selecting λ.