Implantation of Linear Verses Locally Weighted Regression

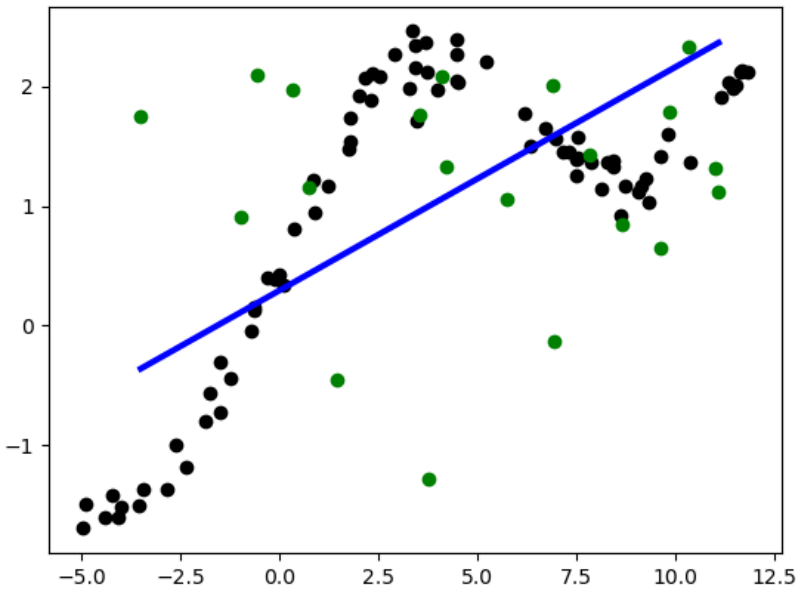
Train Data Length: 80

Test Data Length: 20

Part 1) Linear Regression

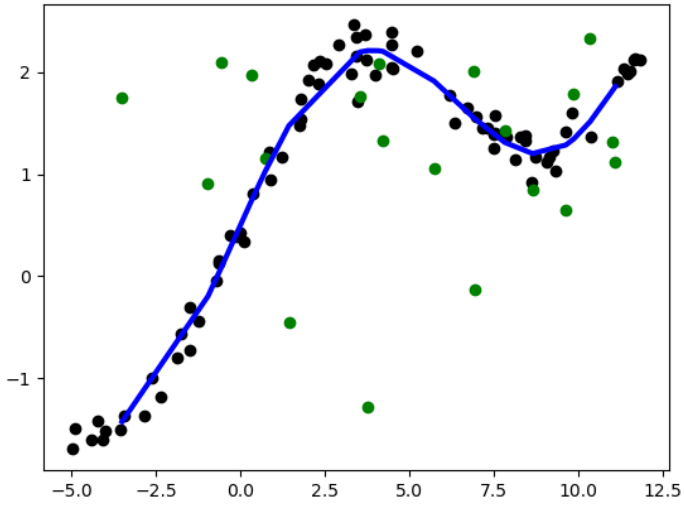
When $\Phi = X\Theta$

Mean squared error: 1.46



When $\Phi = X\Theta + (X\Theta)^2 + \ldots + (X\Theta)^9$

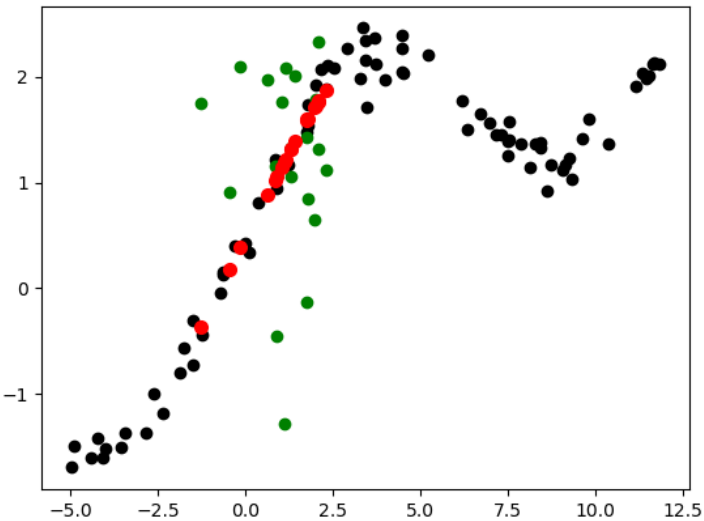
Mean squared error: 1.98



Part 2) Locally Weighted Regression

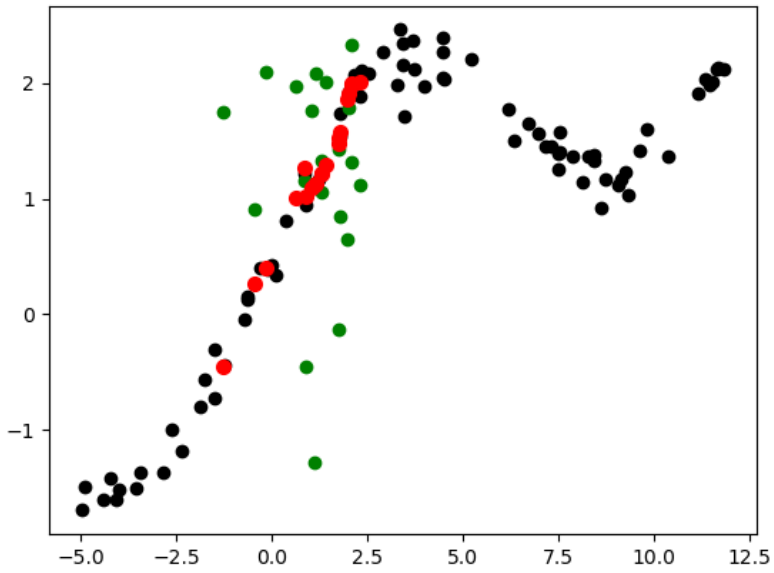
When tau = 0.8:

Mean squared error: 1.24



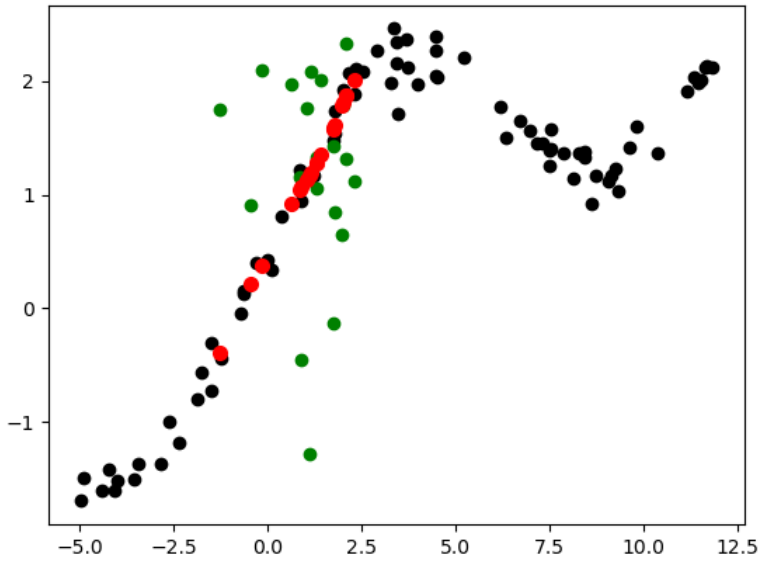
When tau = 0.1:

Mean squared error: 1.24



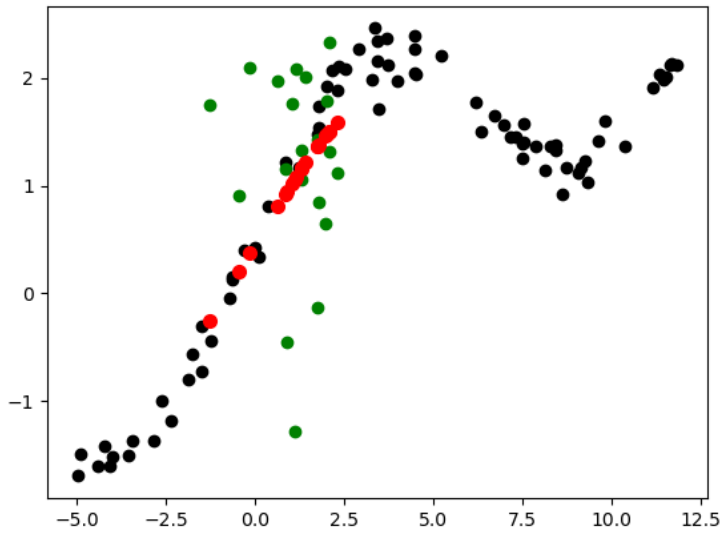
When tau = 0.3:

Mean squared error: 1.27



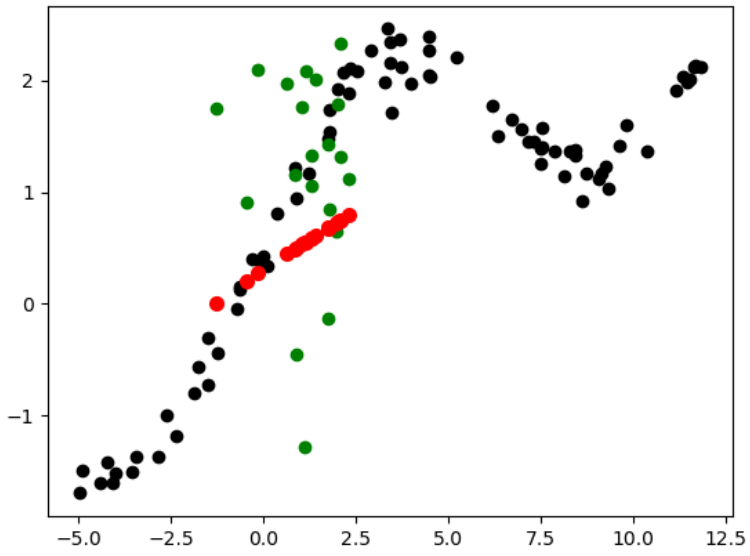
When tau = 2:

Mean squared error: 1.14



When tau = 10:

Mean squared error: 1.29



As you see, tau determines how wide of an area should be influenced on prediction of a point, so as tau gets bigger results tend to generalize.

But We don't want it to be too general because we're predicting one particular point; and we don't want a very narrow area and we like to rely on more near points as possible.

The results are proof of what I'm saying. For example, the model with tau=2, has the best prediction between them with MSE = 1.21 which is lesser than MSE of the Θ function with complexity of 9 degrees! This is one the advantages of weighted regression. It's a perfect choice for small, one featured datasets. The disadvantages are the memory they occupy and they're not so optimal for big datasets.

I used the Andrew Ng Lecture to understand locally weighted regression.