CS335(AIML) - Lab01 - Report

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1.2c

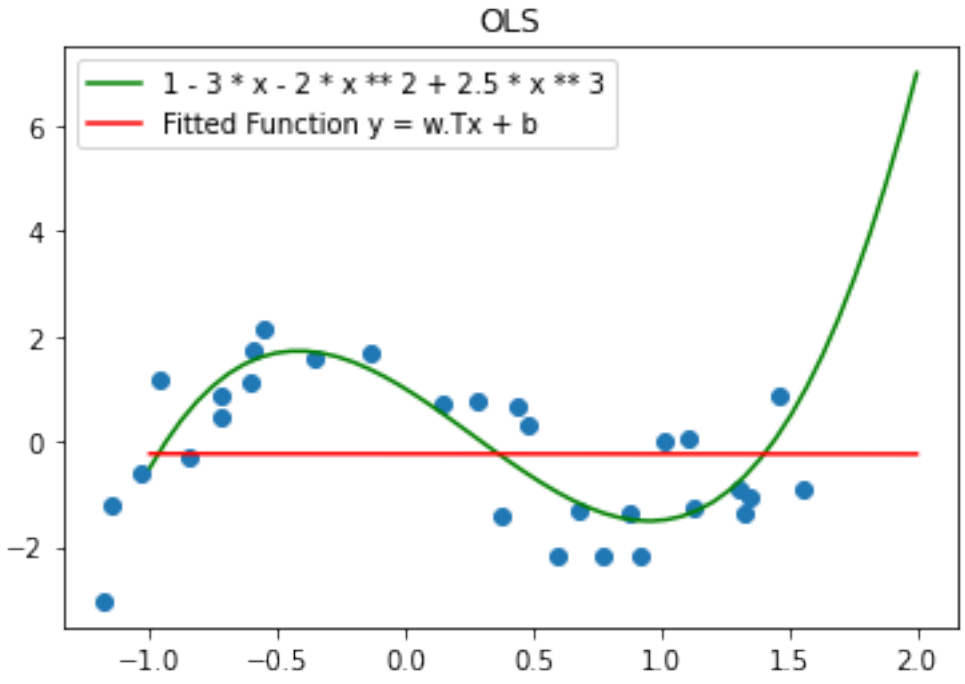

Figure 1: single var grad

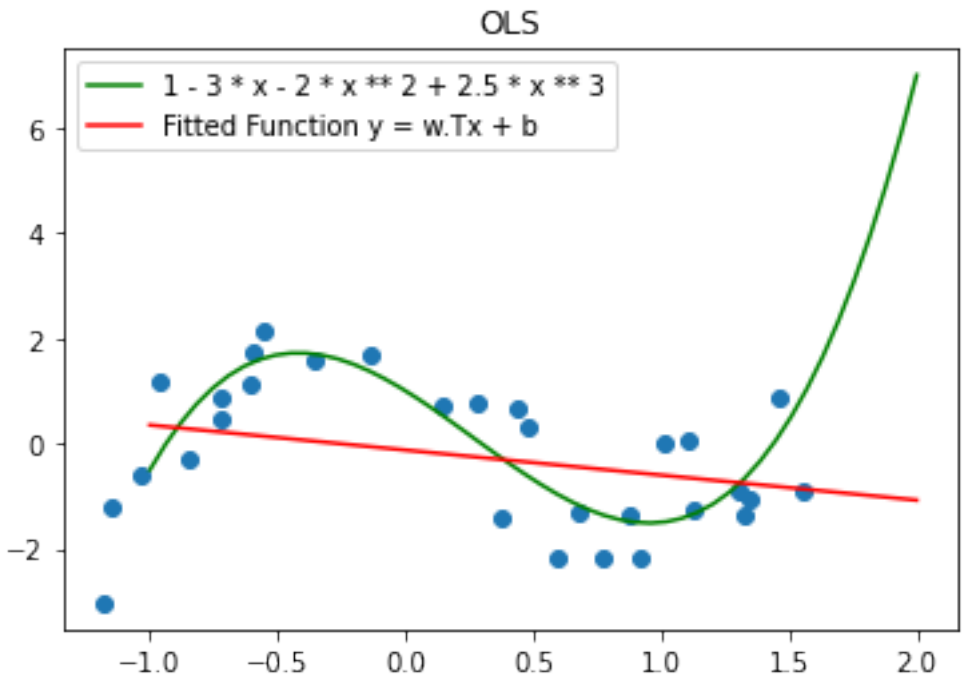

Figure 2: single var closed form

1.2d

No, it is not possible to obtain such a solution using singlevar_grad() for which its training loss is strictly less than that of solution obtained by singlevar_closedform(). Because in the closed form (if possible for given data set) we are exactly deriving the value of **w** and **b** which minimize the training loss, while in gradient descendent method we are minimising the same thing but which converges to minima only if we are choosing correct value of learning rate and iteration even though still there will be some minute error to find **w** for minima.

2.2b

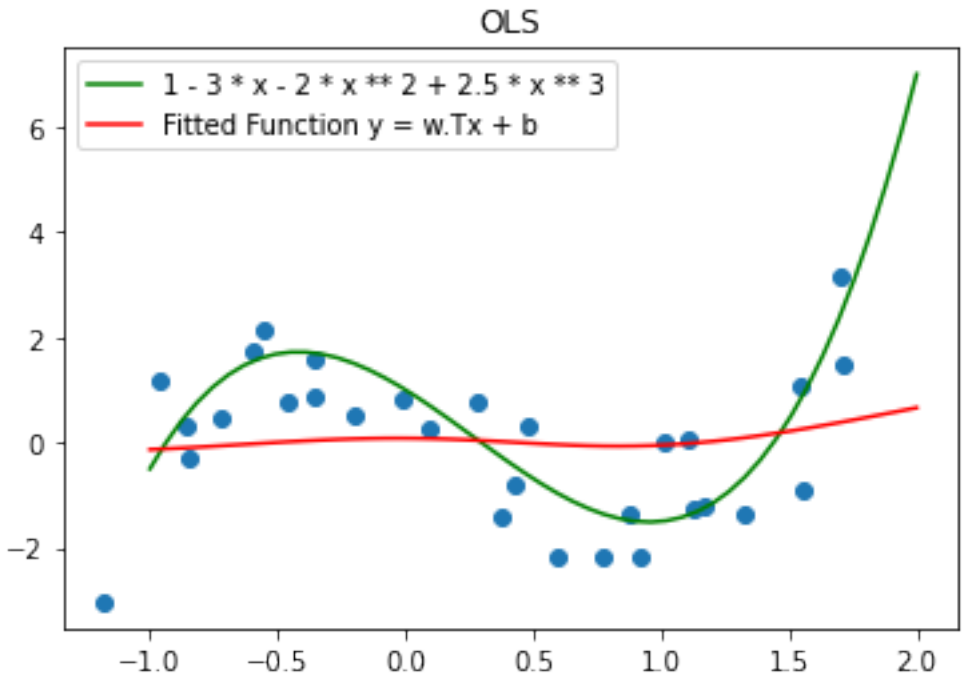

Figure 3: multi var grad

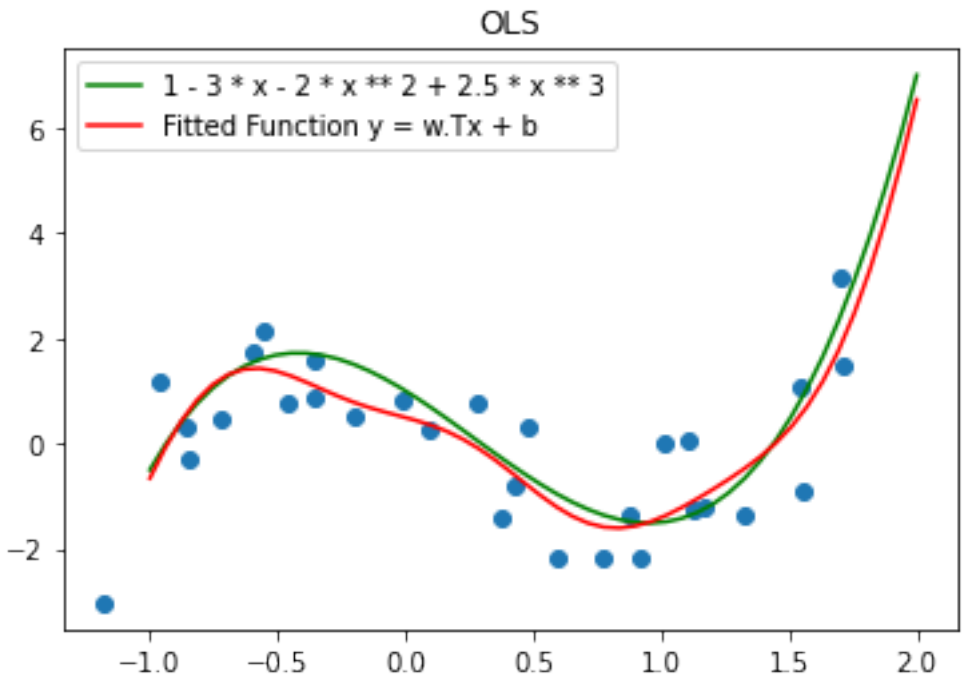

Figure 4: multi var closed form

2.2c

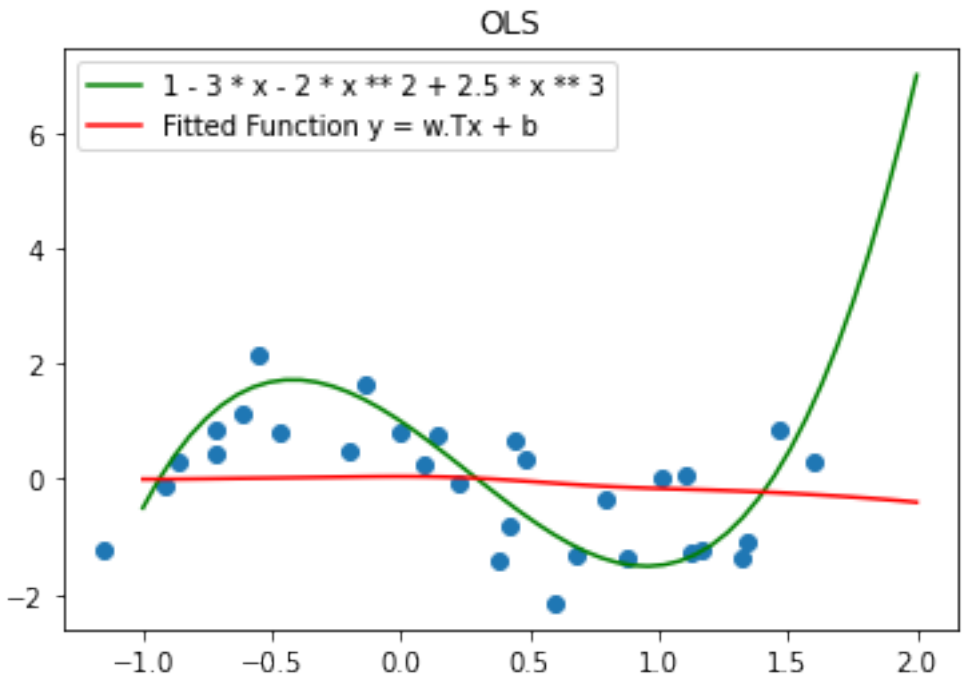

Figure 5: multi var reg grad

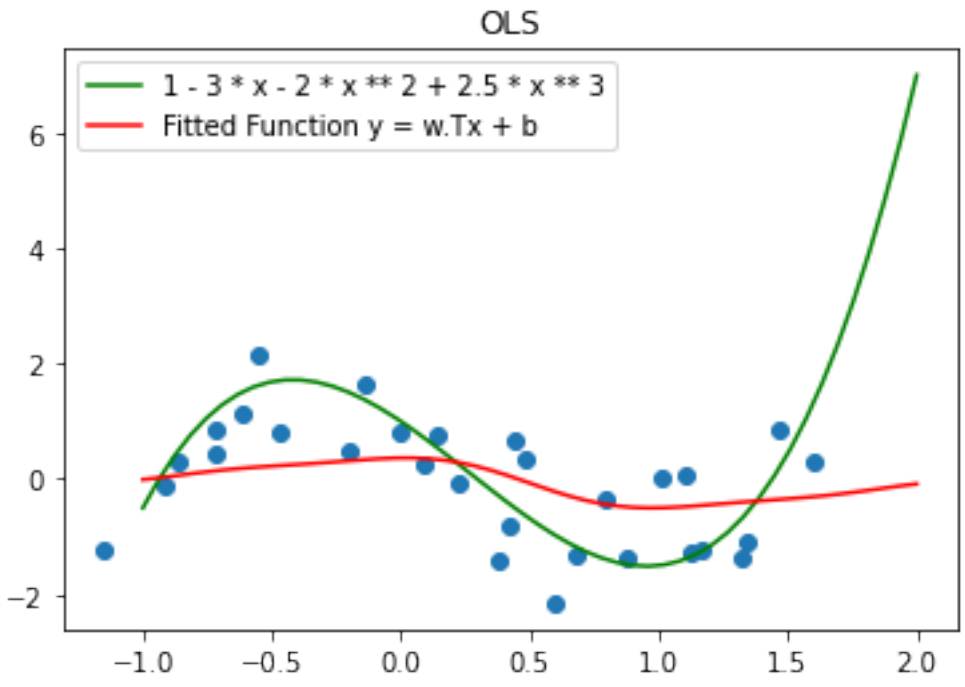

Figure 6: multi var reg closed form

3.3a

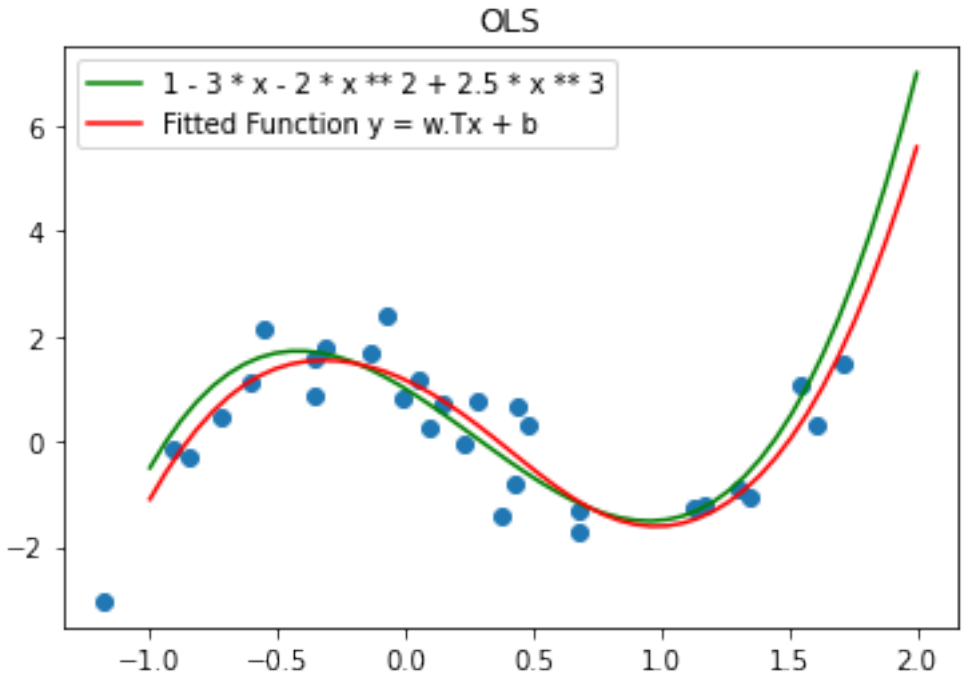

Figure 7: bayesion

3.3b

Some times $\mathbf{X}^\intercal\mathbf{X}$ may be not invertible matrix which causes problem as mentioned in 2.1(d)
but in this case we adding some extra term (σ_0) which makes it invertible sometimes

Q-4

- closed form (multi var) is giving better results in less run time
- Bayesian Linear Regression is giving better plot
  but it depends on how we are choosing value of σ^2
- Regularization (ridge regression) is giving greater loss as compared to without regularization methods
- while other methods are facing more difference at every run (i.e. outliers are affecting more as compared to regularization method)
- on my device runtime is almost same for all and of course if we are increasing iteration runtime of gradient descendent will increase.
- so finally based on my results
  singlevar_grad() $\approx$ single_var_closedform() $<$ multivar_grad() $\leq$ multivar_reg_grad() $\leq$ multivar_reg_closedform() $\leq$ bayesion $\approx$ multivar_closedform()