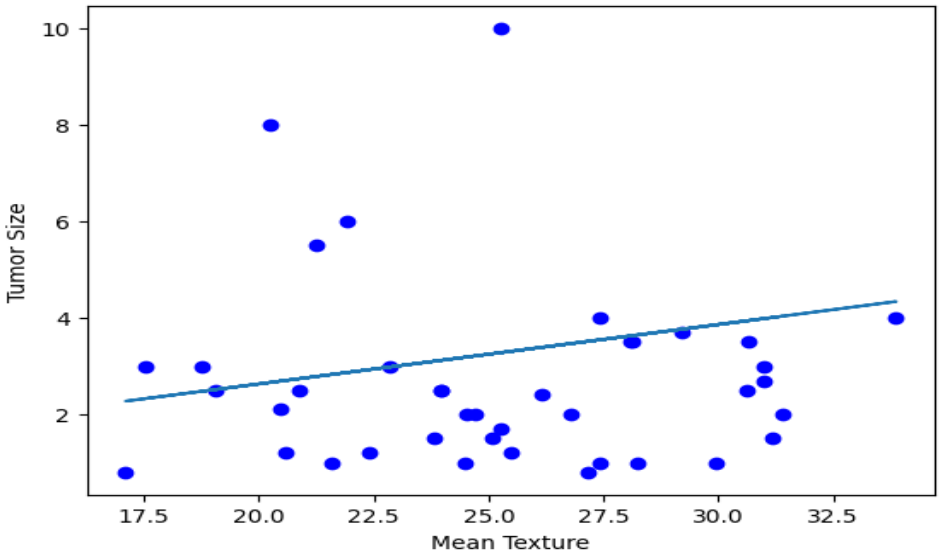
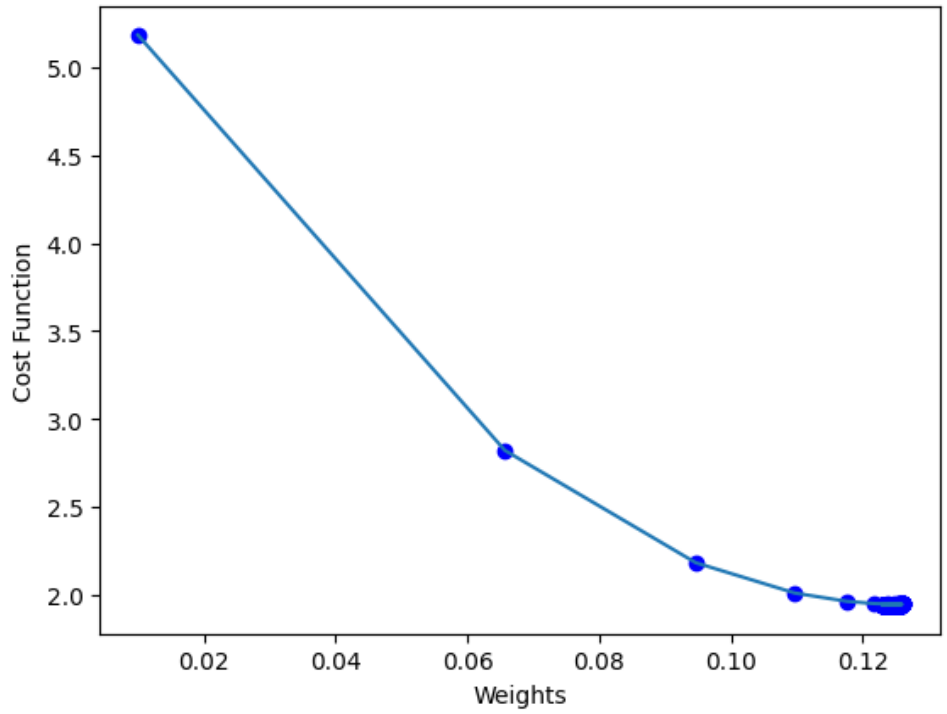
Assignment Report – Mahesh Varma Dommaraju

1.a. The optimized coefficients are theta is `[0.17169618, 0.12305428]` where the feature used is "Mean Texture" with the target variable "Tumor Size".



The above figure shows the regression line with variable Mean Texture. As we can see regression with one variable performs poorly.
Below figure shows how cost function varies with weights.



1.b. In figure of cost function vs weights, I choose cost function as mean square error. We can observe mean squared error decreasing with updating weights.

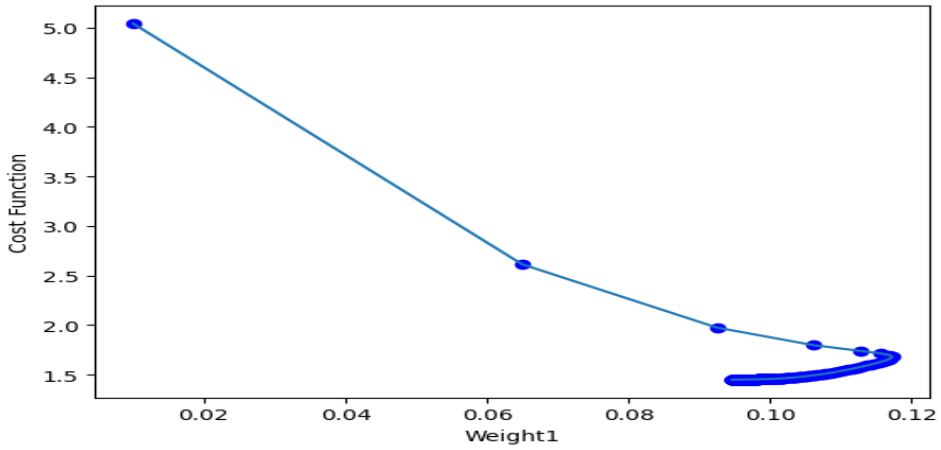
Other evaluation metrics:

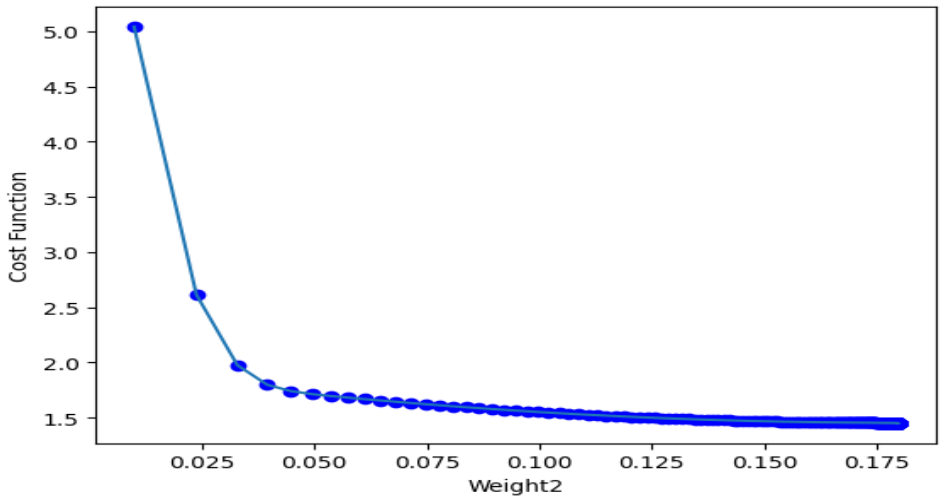
Mse = 2.1442794935802265

R2 = 0.8305565532115363

Adjustedr2 = 0.8213974479797275

2.a figures below describe 2 variable linear regression





Above figures show relation of cost function with weight parameter1 and weight parameter2. As we can see from above weight parameter2 has more significance than 1 and influence the model behaviour accordingly. And it gradually reduces compared to first model

2.b

Evaluation Metrics:

Mse = 1.7316861078750698

R2 = 0.7591752993525289

Adjustedr2 = 0.739106574298573

When compared with model of single variable this model performed better as mse decreased from 2.14 to 1.73

3.a

From iteration 1 to 3 I can see the significant increase in the R2 and from iteration 4 there is no such improvement in the R2 with the value stabilized at 0.9730 which is good enough for predicting the model with the parameters [0.07393045 0.93761519 0.99276994 0.1741231] after this the variables doesn't show any significance from adding it, it can either lead to poor performance or it just increases the load of computation. Here crietirea for the selection of feature is R2 must be showing significant improvement compared to previous

3.b The backward stepwise performs poor because of the existence of the multi-co-linearity which drops the performance of the predictor hence there is no such significance improve in the R2 value, here crietirea for dropping the feature is R2 must be better than compared to previous I.e significant improvement.

3.c. From the above analysis the model Forward step-wise shows far better improvement for predicting the output and with less computation.

3.d. From the analysis of 2 and 3, The forward step-wise performs better than linear regression with 2 variables, which concludes that more relevent features presented in the forward stepwise compared to linear regression with 2 variables.

4.a The Regularization might not have a big impact on the best model forward stepwise because the features that present in it are relevent and there is less chance of presenting multicollinear between them because after each addition of variable the improvement in the evaluation can be seen significantly.

4.b. The scaling function can effect the predictor for the best model but the traning time or learning rate can be slowed down due to the scaling such as min max scaling, depending on the data the scaling. It may not be suitable because it can produce the noise sometimes which can might lead to the worst performance than current model.