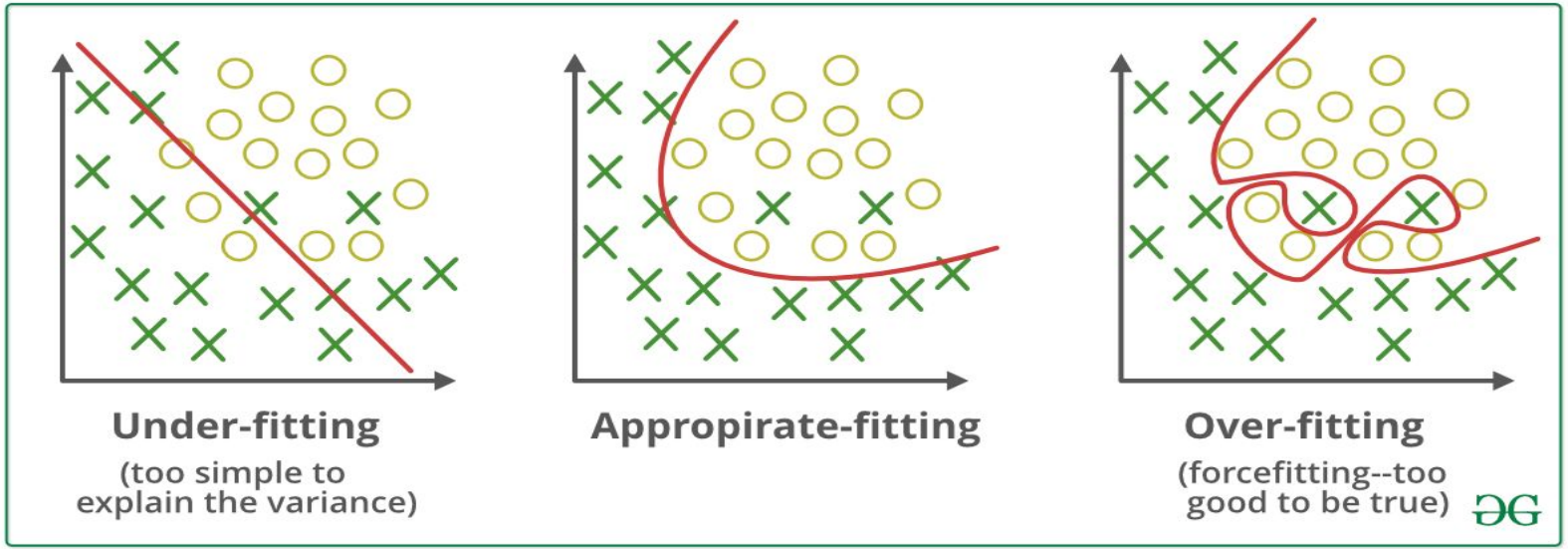
Regularization

--> It **is a technique used to reduce the errors by fitting the function appropriately on the given training set and avoid overfitting.**

--> It works by adding a penalty to the complex model.



Types of Regularization :

1) Ridge Regression(L2)

2) Lasso Regression(L1)

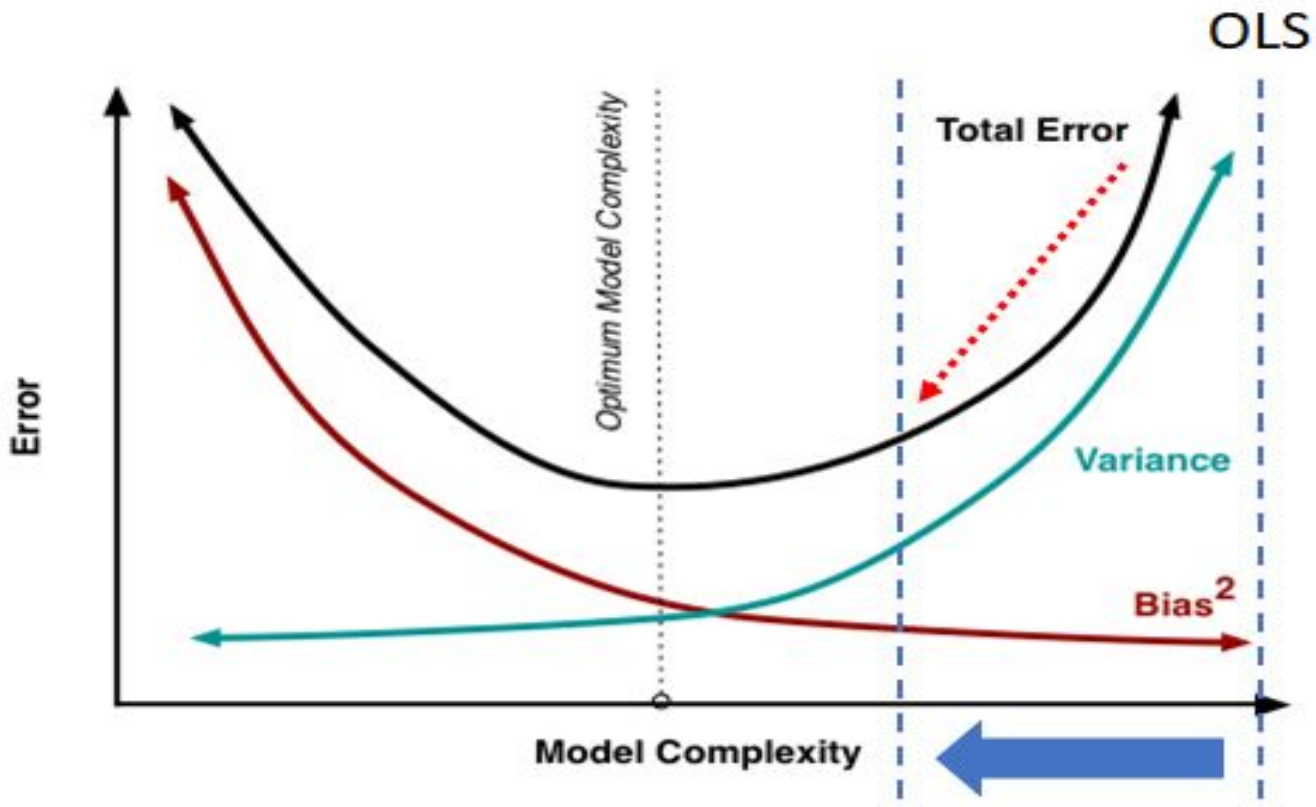
1) Ridge Regression(L2):

-> If the cost function is altered by adding the penalty term to it.

-> Amount of bias added to the model.

-> We can calculate it by multiplying with the lambda to the squared weight of each individual feature.

-> lambda is a Hyperparameter Known as regularisation constant and it is greater than zero.


OLS
Optimum Model Complexity
Total Error
Error
Variance
Bias^2
Model Complexity

2) Lasso Regression(L1):

-> It is regularization technique to reduce the complexity of the model.

-> It is similar to the Ridge Regression except that the penalty term contains only the absolute weights instead of a square of weights.

-> Since it takes absolute values, hence, it can shrink the slope to 0.

-> whereas Ridge Regression can only shrink it near to 0.

-> some features are completely neglected for model evaluation.

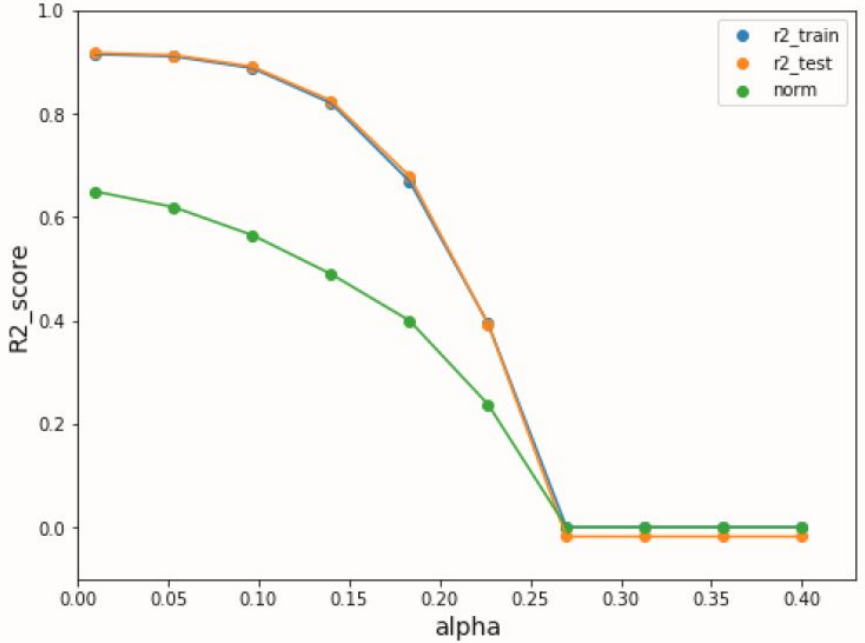
-> Hence, the Lasso regression can help us to reduce the overfitting in the model as well as the feature selection.

LASSO Regression Tutorial

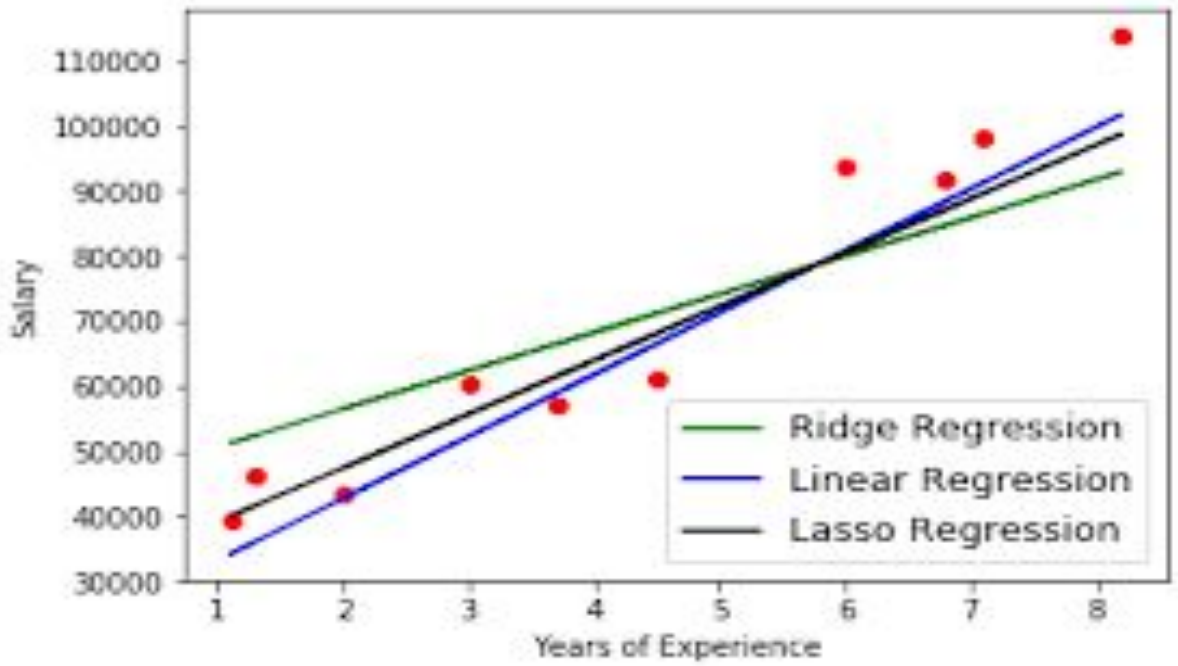
$$\hat{y}_i = w_0 + \sum_{j=1}^{m} X_{ij} w_j$$

$$J(w) = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 + \alpha \sum_{j=1}^{m} |w_j|$$

$$\|w\|^2 = \sum_{j=1}^{m} |w_j|^2$$



Difference B/W Ridge,Lasso and Linear Regression



--> Ridge regression is mostly used to reduce the overfitting in the model, and it includes all the features present in the model.

--> It reduces the complexity of the model by shrinking the coefficients.

--> Lasso Regression helps to reduce the overfitting in the model as well as feature selection.