Contents

[**Ridge Regression :** 2](#_Toc92956286)

[**Limitation of Ridge Regression:** 3](#_Toc92956287)

[**Lasso Regression :-** 3](#_Toc92956288)

[**Limitation of Lasso Regression:** 4](#_Toc92956289)

# **Ridge Regression :**

* In Ridge regression, we add a penalty term which is equal to the square of the coefficient. The L2 term is equal to the square of the magnitude of the coefficients. We also add a coefficient lambda to control that penalty term.
* In this case if lambda is zero then the equation is the basic OLS else if lambda > 0 then it will add a constraint to the coefficient. As we increase the value of lambda this constraint causes the value of the coefficient to tend towards zero.
* This leads to both low variance (as some coefficient leads to negligible effect on prediction) and low bias (minimization of coefficient reduce the dependency of prediction on a particular variable).

Chart, scatter chart

Description automatically generated

**Credit:-statquest**

What we do in practice, is to introduce a Bias that we call **Lambda**, and the **Penalty Function** is:lambda\*slope^2.The Lambda is a penalty terms and this value is called **Ridge Regression** or **L2**.

**Diagram

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**Credit:-statquest**

Text

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## **Limitation of Ridge Regression:**

* Ridge regression decreases the complexity of a model but does not reduce the number of variables since it never leads to a coefficient been zero rather only minimizes it. Hence, this model is not good for feature reduction.

# **Lasso Regression :-**

* Lasso regression stands for Least Absolute Shrinkage and Selection Operator. It adds penalty term to the cost function. This term is the absolute sum of the coefficients. As the value of coefficients increases from 0 this term penalizes, cause model, to decrease the value of coefficients in order to reduce loss.
* The difference between ridge and lasso regression is that it tends to make coefficients to absolute zero as compared to Ridge which never sets the value of coefficient to absolute zero.
* It is similar to RIDGE REGRESSION except to a very important difference: the **Penalty Function** now is: lambda\*|slope|

Diagram

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**Credit:- statquest**

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## **Limitation of Lasso Regression:**

* Lasso sometimes struggles with some types of data. If the number of predictors (p) is greater than the number of observations (n), Lasso will pick at most n predictors as non-zero, even if all predictors are relevant (or may be used in the test set).
* If there are two or more highly collinear variables then LASSO regression select one of them randomly which is not good for the interpretation of data

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