Elastic Net regression

Elastic Net is a regression algorithm that combines the properties of Lasso and Ridge regression. Lasso regression performs feature selection by shrinking the coefficients of less important features to zero, whereas Ridge regression shrinks the coefficients of less important features towards zero without actually eliminating them. Elastic Net combines the strengths of both algorithms and can handle situations where there are more variables than observations, and some of the variables are highly correlated.

Elastic Net is useful in situations where there are a large number of variables and many of them may not be important predictors. It is commonly used in areas such as finance, economics, and biology.

The working of Elastic Net can be explained as follows:

The Elastic Net algorithm starts by setting random values for the coefficients of all variables.

The algorithm then calculates the mean squared error (MSE) between the predicted values and the actual values of the response variable.

The Elastic Net algorithm then adds two penalty terms to the MSE: the L1 penalty and the L2 penalty.

The L1 penalty is the sum of the absolute values of the coefficients of all variables multiplied by a hyperparameter alpha. This penalty encourages sparsity and helps to eliminate irrelevant variables.

The L2 penalty is the sum of the squares of the coefficients of all variables multiplied by a hyperparameter lambda. This penalty helps to reduce the impact of multicollinearity.

The Elastic Net algorithm then finds the coefficients that minimize the MSE plus the penalty terms using a process called coordinate descent.

Coordinate descent involves updating the coefficients of each variable one at a time while holding the other coefficients fixed.

The Elastic Net algorithm repeats steps 2-7 until it converges to a set of coefficients that minimizes the MSE plus the penalty terms.

An example of where Elastic Net could be useful is in predicting housing prices based on various factors such as location, size, and number of rooms. In this case, there may be many variables that could potentially be important predictors, but not all of them will be significant. Elastic Net can be used to select the most important variables and estimate their coefficients.