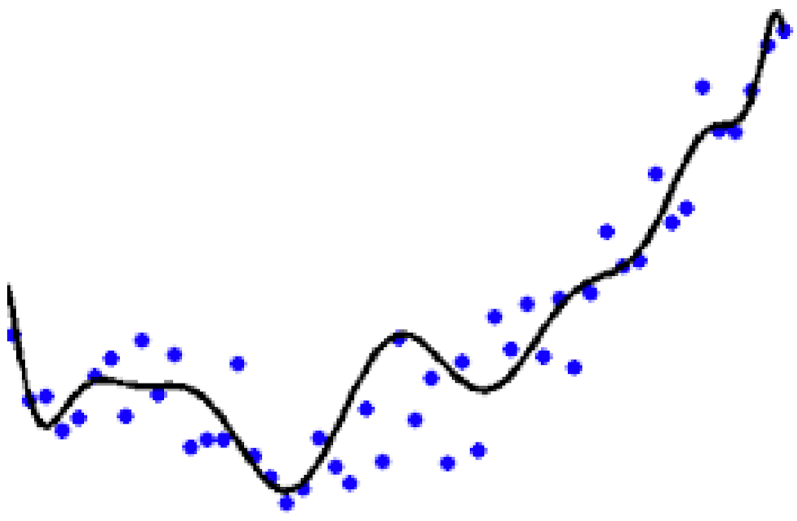
Day 10: Regularised Regression Methods



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Need of Advance Methods

- In real data there are large number of features which increases the complexity of the model.
- If we use basic regression methods then the model overfits the data. Overfitting is the problem where model generalises training data perfectly but performs poorly on the test data.
- Also, computational complexity in such cases is very high.
- Here comes advanced regression methods which uses regularization to overcome such issues.

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What is Regularization

- Regularization is the technique that prevents overfitting of the model.
- It improves generalisation of the model by adding penalty to the loss function during training.
- It regularises the coefficients of features towards small value in order to make the model less complex and generalise well.
- Using regularization can improve the accuracy of the model.
- There are three regularization techniques, Ridge, Lasso, and Elastic Net.
- Based on the use of these regulariation methods, we have three different regression methods.

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Lasso Regression

- The lasso regression performs LASSO (Least Absolute Shrinkage and Selection Operator) regularization, also called the L1 regularization.
- It regularises the model by adding penalty equal to the absolute value of coefficients of each feature multiplied by lambda.
- Lambda is the regularising parameter. Higher the value of lambda, higher the effect of regularization.
- Since lasso takes the absolute value of coefficients, it can shrink the coefficients to zero which certainly helps in feature selection.
- It there are large number of features then lasso method will pick only important features, reducing the complexity of the model.

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Ridge Regression

- The ridge regression performs ridge regularization which is also called the L2 regularization.
- It regularises the model by adding penalty equal to the square of coefficients of each feature multiplied by lambda.
- Higher the value of lambda, higher the effect of regularization.
- It performs regularization by reducing the coefficients to smaller value and does not make it completely zero like ridge.
- It is used when there is high collinearity among the independent variables.

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Elastic Net Regression

- The elastic net regression is the combination of lasso and ridge regressions. It is trade off between lasso and ridge.
- It regularises the model by adding penalty equal to the sum of absolute value and square of coefficients of each feature.
- Here, one more parameter along with lambda is required to control the percentage of ridge and lasso, which is alpha.
- Elastic net tackles the shortcomings of lasso and ridge and has properties of both.

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End Notes

- Choosing the right value of lambda (regularising parameter) is important. As the value of lambda increases the model becomes less overfit. But if lambda is very high then model can under-fit the data. Under-fit is the condition in which model is too simple to capture the data.
- Ridge is mostly used to reduce overfitting and complexity.
- Lasso is mostly used for feature selection.
- In case of high dimensionality, multicollinearity use regularised regression methods.

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