Day 22:
Bias & Variance

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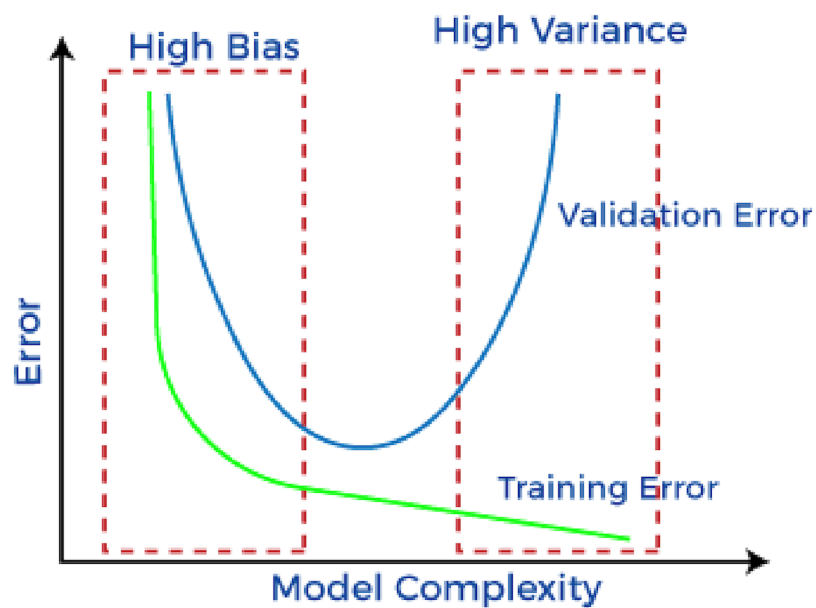
Types of Error in ML

- Error is measure of how accurately an algorithm is performing and predicting the target value.
- There are two types of error in Machine Learning, Reducible and Irreducible error.
- Reducible error: These error can be reduced to improve the model performance. Bias and Variance comes under this.
- Irreducible error: These error can't be reduced and are always present in the model. The cause of these error is unknown.

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Bias

- The difference between predicted value and actual value is called the bias.
- It is the inability of the model to predict the actual value.
- High biased models are considered to be underfitted. The model will not match the training data closely.
- Low biased models are considered to be overfitted. The model will closely match to the training data.
- High bias can be identified if the model has high training as well as testing error.

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Variance

- The variance is the amount by which the performance of a predictive model changes when it is trained on different subsets of the training data.
- It is a variability of the model that how much it is sensitive to change in training data.
- Low variance means that the model is less sensitive to changes in the training data. It causes underfitting.
- High variance means that the model is highly sensitive to changes in training data. It causes overfitting.
- High variance can be identified if the model has low training error and high testing error.

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Bias & Variance Trade-Off

- Low bias and low variance is the ideal case but in practice, it is not possible because bias and variance are inversely proportional to each other.
- If the model is underfitted then it may be on high bias and low variance. If the model is overfitted then it may be on low bias and high variance.
- Underfitting is when model is too simple and overfitting is when model is too complex.
- A model can't be more complex and less complex at the same time. Hence, there must be a perfect trade-off between bias and variance.
- A model with balanced bias and variance is said to have optimal generalisation power.

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