

Bias - Variance Tradeoff

classmate

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$$\text{Total error} = \text{bias}^2 + \text{variance} + \text{irreducible error (noise)}$$

Bias :-

Bias is the difference between the predicted value and the expected value. Model with high bias pays very little attention to the training data and oversimplifies the model. It always leads to high error on both training and test data.

Variance :-

Variance is the variability of model prediction for a given data point or a value which tells us spread of data. Model with high variance pays a lot of attention to the training data. It takes into account the noise as well. As a result, such models perform very well on training data but have high error on test data.

- Underfitting - Underfitting happens when a model is unable to capture the underlying pattern of data. These models have high bias and low variance.
- Overfitting - Overfitting happens when a model captures the noise along with the underlying pattern in data. These models have high variance and low bias.

Therefore, we need to minimize variance and bias to minimize the total error. A good model finds the right balance without overfitting or underfitting the data.

