## Cheat Sheet - Bias-Variance Tradeoff

## What is Bias?

$$bias = \mathbb{E}[f'(x)] - f(x)$$

- Error between average model prediction and ground truth
- The bias of the estimated function tells us the capacity of the underlying model to predict the values

## What is Variance?

nat is Variance? 
$$variance = \mathbb{E}\Big[\big(f'(x) - \mathbb{E}[f'(x)]\big)^2\Big]$$
 Average variability in the model prediction for the given dataset

- The variance of the estimated function tells you how much the function can adjust to the change in the dataset

**High Bias** 

→ Overly-simplified Model

→ Under-fitting

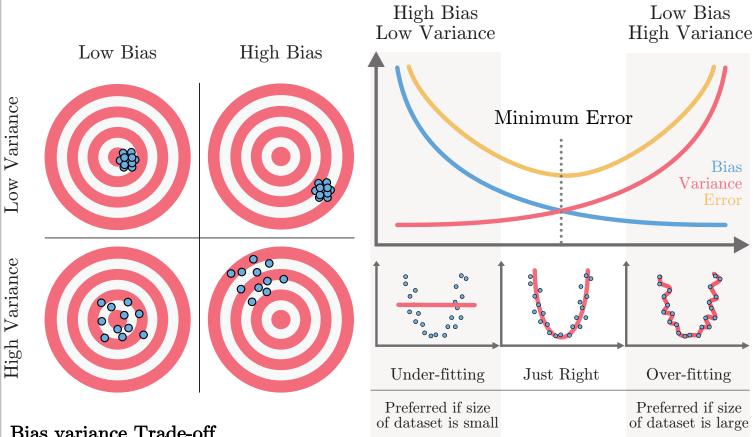
→ High error on both test and train data

High Variance — Overly-complex Model

→ Over-fitting

Low error on train data and high on test

Starts modelling the noise in the input



## Bias variance Trade-off

- Increasing bias (not always) reduces variance and vice-versa
- $Error = bias^2 + variance + irreducible error$
- The best model is where the error is reduced.
- Compromise between bias and variance

Source: https://www.cheatsheets.aqeel-anwar.com Tutorial: Click here

