$$\textbf{Estimate } \hat{f} = \textbf{Learn } \hat{f}$$

sources of error:

irreducible error ϵ

reducible error $\hat{f}$

the squared error for a given estimate $\hat{f}$ is

$$E(\text{actual} - \text{predicted})^2 = E(Y - \hat{Y})^2$$

which factors as

$$E[f(\mathbf{X}) + \epsilon - \hat{f}(\mathbf{X})]^2$$

$$\underbrace{[f(\mathbf{X}) - \hat{f}(\mathbf{X})^2]}_{\text{reducible}} + \underbrace{\text{Var}(\epsilon)}_{\text{irreducible}}$$

*until now, **training data** was the only data we considered*

*we compute **reducible error** (or MSE) on **the same data used to learn** $\hat{f}$*

let's change that!

$$Y = f(X) + \epsilon$$

Estimate $\hat{f}$ = Learn $\hat{f}$

irreducible error ϵ

reducible error $\hat{f}$

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