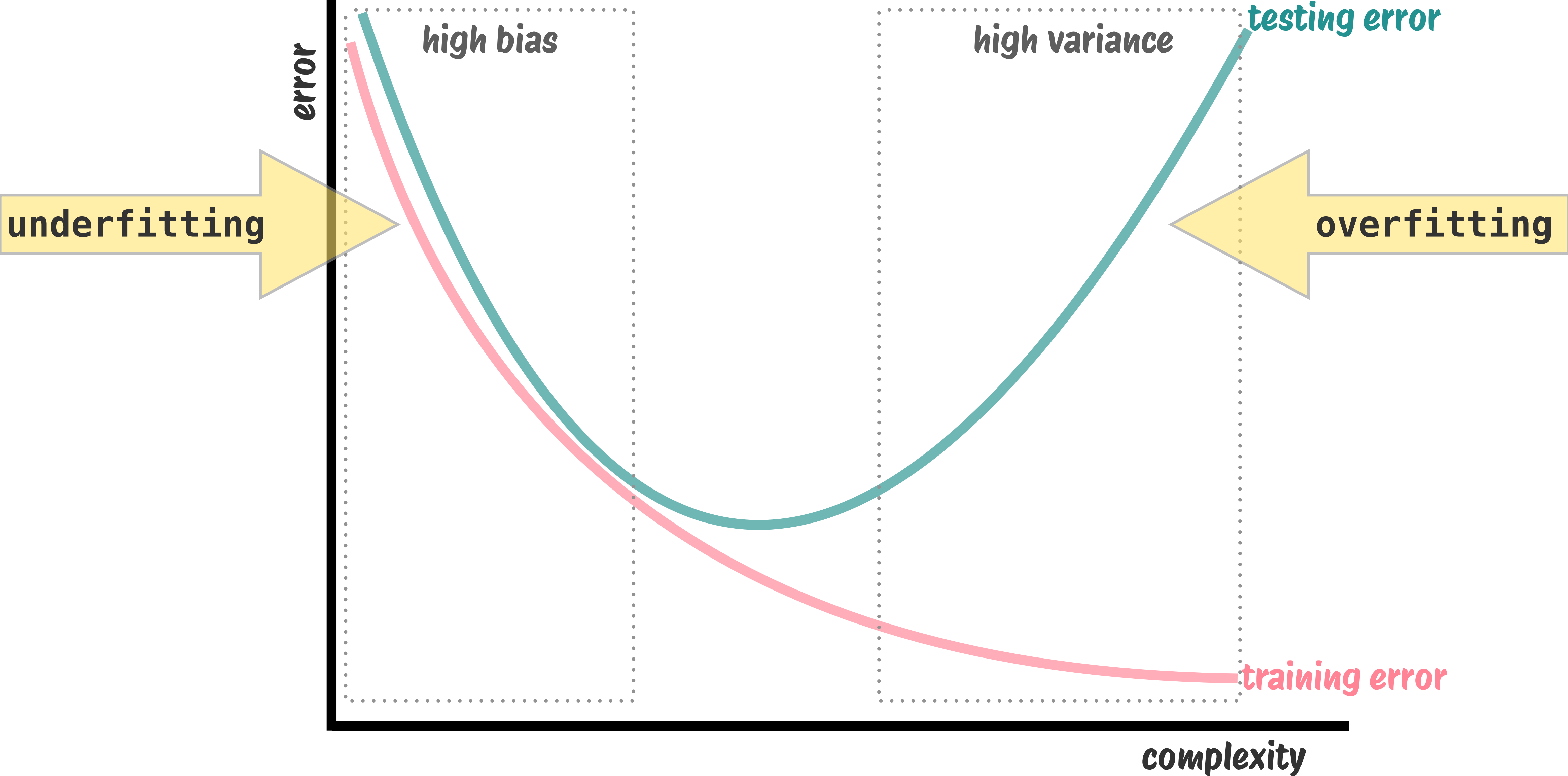
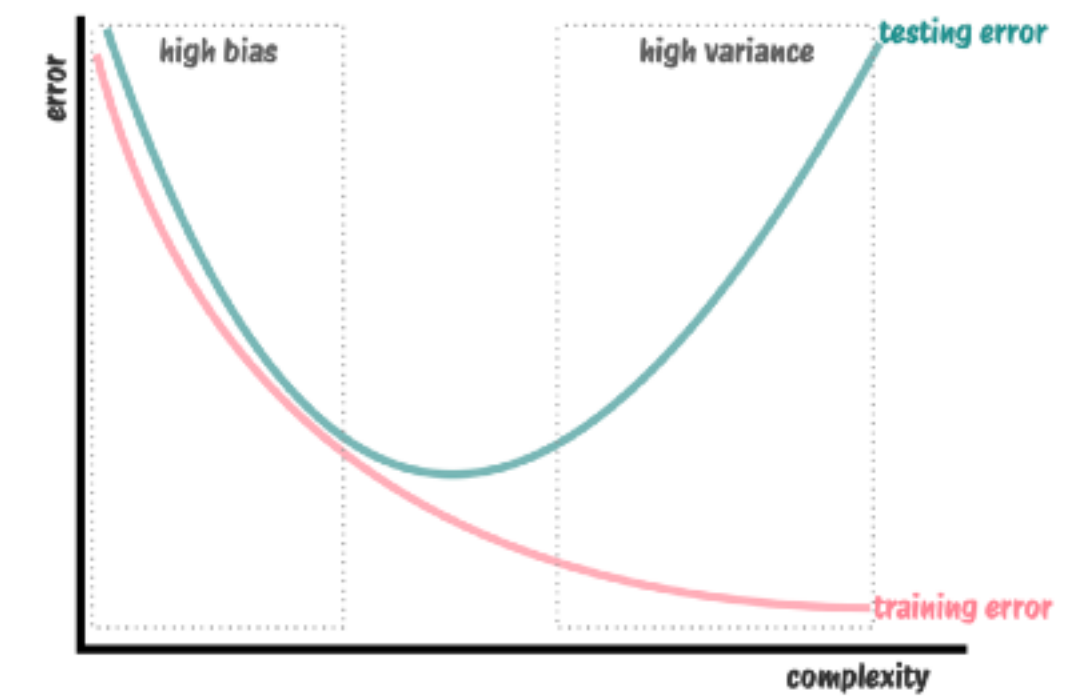


# Bias Variance Trade-Off



# Formalizing Bias Variance Trade-Off



Expected **test MSE**

$$\underbrace{E \left( y_0 - \hat{f}(x_0) \right)^2}_{\text{expected MSE at } x_0 \text{ if we repeatedly estimated } f(x) \text{ with different training sets}} = \text{Var}(\hat{f}(x_0)) + \left[ \text{bias}(\hat{f}(x_0)) \right]^2 + \underbrace{\text{Var}(\epsilon)}_{\text{irreducible error}}$$

expected MSE at  $x_0$  if we repeatedly estimated  $f(x)$  with different training sets

irreducible error