Linear Regression Cont

R^2: coefficient of determination

↳ extent to which a mathematical model explains the variance

obs $y_i \rightarrow$ var $\propto \sum_{i=1}^{N} (y_i - \bar{y})^2$

$f(x_i) \rightarrow$ model of y

deviation of model $\propto \sum_{i=1}^{N} (y_i - f(x_i))^2$

$R^2 \rightarrow 1$ for perfect model

$$R^2 = 1 - \frac{\sum_{i=1}^{N} (y_i - f(x_i))^2}{\sum (y_i - \bar{y})^2}$$

50 year T trend example

$\overline{T}_1 = 5.5 \pm 0.3°C \quad N = 25$

$\overline{T}_2 = 5.7 \pm 0.3°C \quad N = 25$

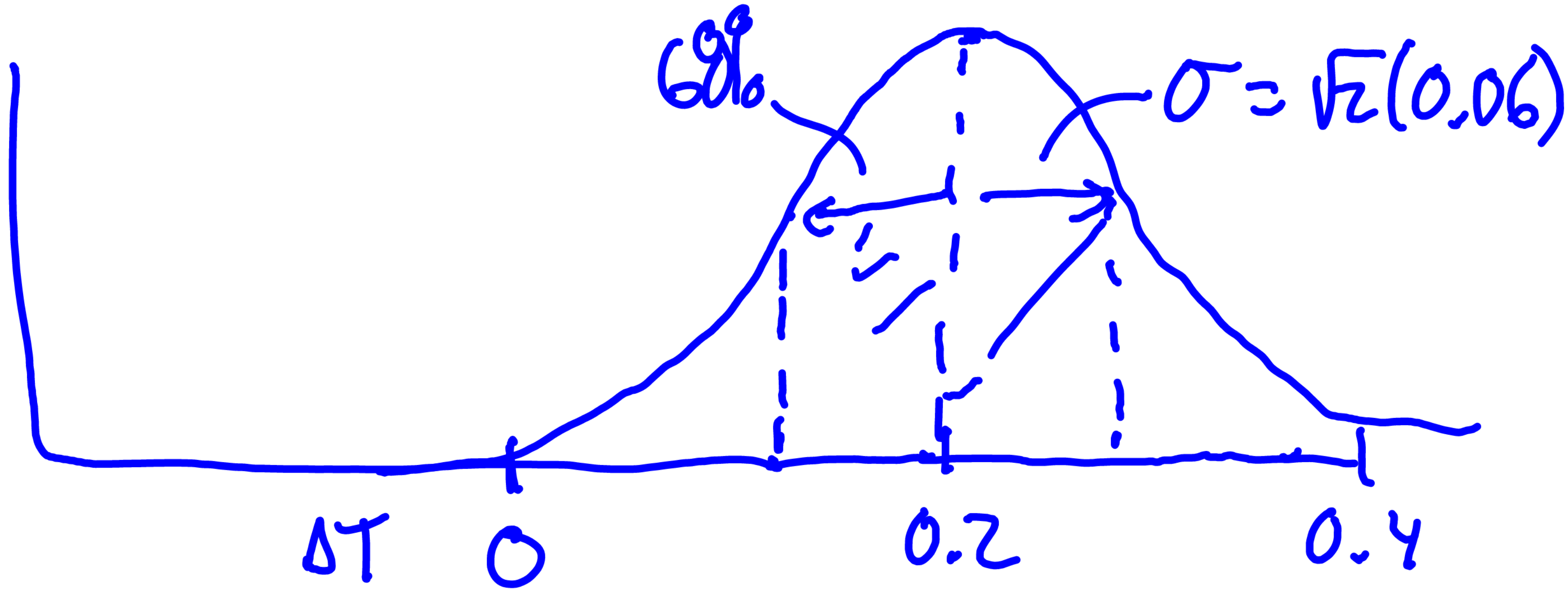
$\Delta T = \overline{T}_2 - \overline{T}_1 = 0.2°C$

what is the uncertainty in ΔT?

$$\sigma_{\Delta T}^2 = \sigma_{\overline{T}_2}^2 \left(\frac{\partial \Delta T}{\partial \overline{T}_2}\right)^2 + \sigma_{\overline{T}_1}^2 \left(\frac{\partial \Delta T}{\partial \overline{T}_1}\right)^2$$

$$= \sigma_{\overline{T}_2}^2 + \sigma_{\overline{T}_1}^2$$

$$= \left(\frac{\sigma_2}{\sqrt{N}}\right)^2 + \left(\frac{\sigma_1}{\sqrt{N}}\right)^2 \rightarrow \sigma_{\Delta T} = \sqrt{2}(0.06)$$



$$V_s = A V_a + B$$

$$\sigma^2 = \sigma_A^2 \left(\frac{\partial V_s}{\partial A}\right)^2 + \sigma_{Va}^2 \left(\frac{\partial V_s}{\partial V_a}\right)^2 + \sigma_B^2 \left(\frac{\partial V_s}{\partial B}\right)^2$$

$$\sigma_A^2 \overline{V_a}^2 + \sigma_{Va}^2 A^2 + \sigma_B^2$$