$(1-\alpha)100\%$ **Confidence Intervals**

Hypothesis Testing w/ critical value α

$$\bar{X}_n \pm t_{\alpha/2}\frac{S_n}{\sqrt{n}}$$

$$[L_n = \bar{X}_n - t_{\alpha/2}\frac{S_n}{\sqrt{n}}, \quad R_n = \bar{X}_n + t_{\alpha/2}\frac{S_n}{\sqrt{n}}$$

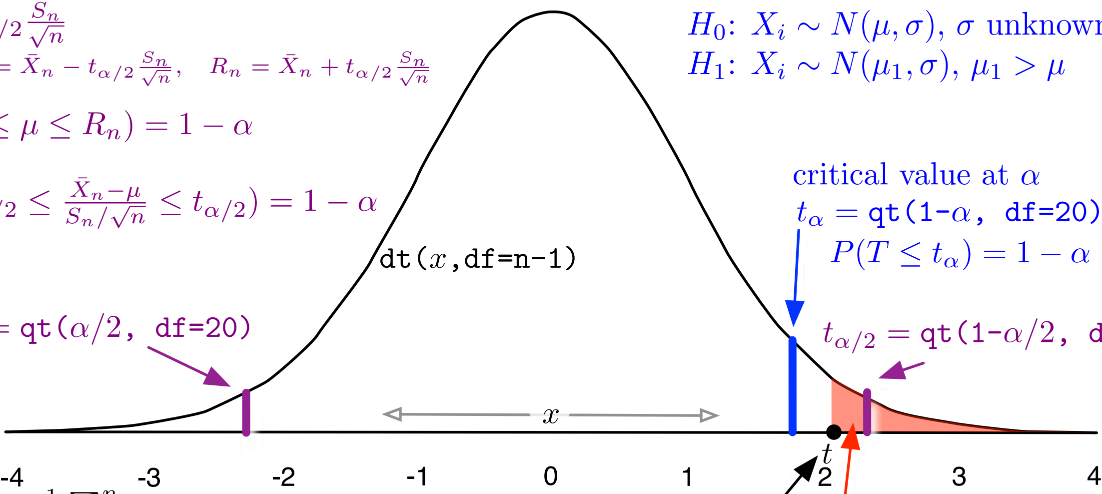
$$Pr(L_n \leq \mu \leq R_n) = 1-\alpha$$

$$\Longleftrightarrow$$

$$Pr(-t_{\alpha/2} \leq \frac{\bar{X}_n - \mu}{S_n/\sqrt{n}} \leq t_{\alpha/2}) = 1-\alpha$$

H_0: $X_i \sim N(\mu, \sigma)$, σ unknown

H_1: $X_i \sim N(\mu_1, \sigma)$, $\mu_1 > \mu$



random variables

$$\bar{X}_n = \frac{1}{n}\sum_{i=1}^{n} X_i$$

$$S_n^2 = \frac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X}_n)^2$$

$$T = \frac{\bar{X}_n - \mu}{S_n/\sqrt{n}} \sim \text{t-dist}(\text{df} = n-1)$$

realization of data

$$t = \frac{\bar{x}_n - \mu}{s_n/\sqrt{n}}$$

p-value

p = 1 - pt(t, df = 20)

$\Pr(T \leq t) = 1 - p$