$$E = z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

$$E = z_{\alpha/2}\sqrt{\frac{pq}{n}} = z_{\alpha/2}\sqrt{\frac{\frac{x}{n}\left(1-\frac{x}{n}\right)}{n}}$$

Large sample

↓

Normal or no, works

↓

CLT

$$z = \left(\frac{\bar{x}-\mu}{\sigma/\sqrt{n}}\right)$$

↘ σ unknown

↓

s

Small sample

(n small, σ unknown)

⇒ not normal = OH FUCK

⇓

t distribution

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

⇓

(n-1) degrees of freedom

$z_{0.05} = 1.645$

95th percentile ⇒ $t_{0.05} = 1.860$

↳ $\frac{5}{100}$

same, a t curve bell is more spread out

95th percentile, t, (n-1) = 8 ⇒ 1.860

⇓

5th percentile ⇒ -1.860

5% chance of t value being below -1.860

90% b/w -1.860 & 1.860

$$E = \left(t_{\alpha/2,\, n-1}\right)\left(\frac{s}{\sqrt{n}}\right)$$

Confidence interval is still

$\bar{x} \pm E$