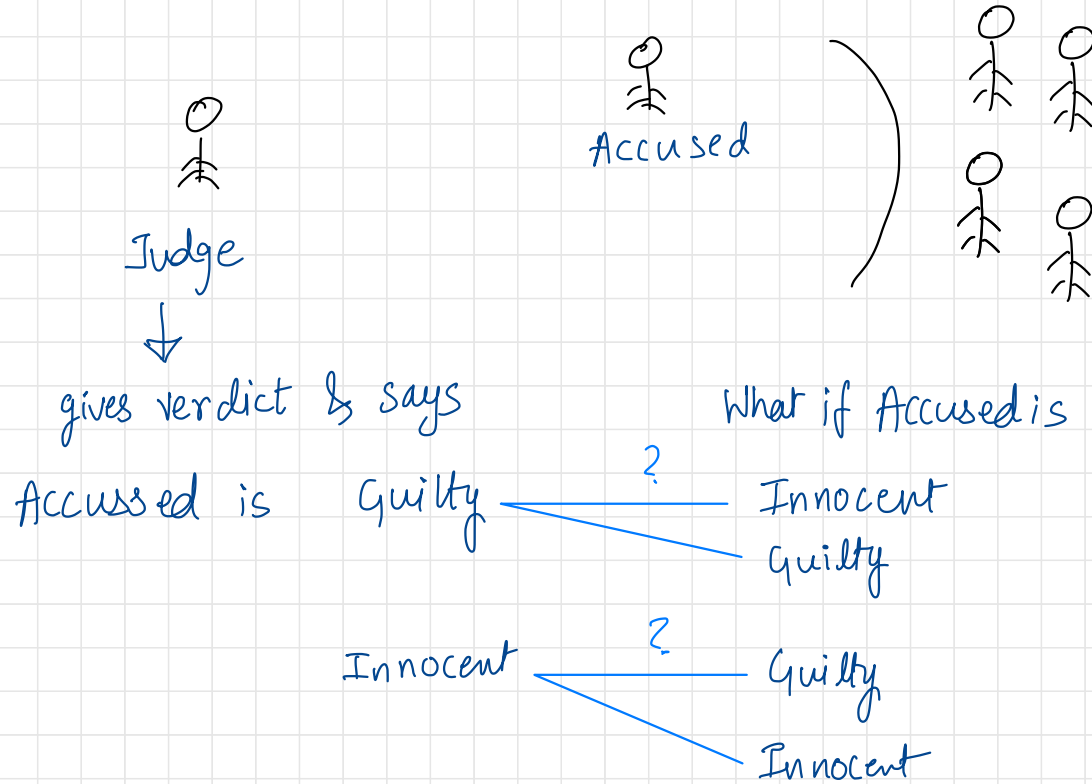


ERRORS in HYPOTHESIS TESTING



Accused is (in Reality)

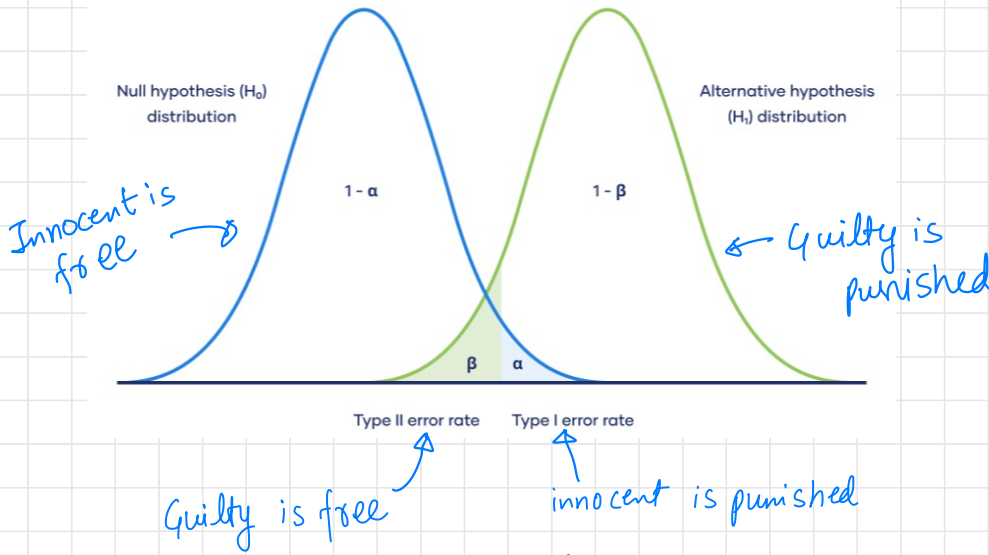
		innocent		Guilty	
Judge Says →	innocent	NO ERROR $1 - \alpha$	In favor of Accused (TYPE II) β		
	Guilty	Against Accused (TYPE I) α	NO ERROR $1 - \beta$		

Acc. to Presumption of Innocence, the person is innocent until proven guilty. That means Judge must find the evidence which convince him "Beyond a Reasonable Doubt"

i.e. $\Pr\left(\frac{\text{Judge says Guilty}}{\text{Person is innocent}}\right)$ should be Less ||

Hypothesis Testing is Analogous to this Setup!

Probability of Making Type I & Type II Error



H_0 : by default, Accused is innocent

H_1 : Accused is Guilty

Accused is (in Reality)

	innocent	Guilty
innocent	NO ERROR $1 - \alpha$	In favor of Accused (TYPE II) β
Judge Says → Guilty	Against Accused (TYPE I) α	NO ERROR $1 - \beta$

→ We say H_0 is true (accept H_0)
 until we find strong evidence
 against it.

→ otherwise we accept H_1 &
 Reject H_0

$$\alpha = \Pr\left(\frac{\text{Reject } H_0}{H_0 \text{ is True}}\right) \approx \text{Cond}^n \text{ Prob.}$$

if $\alpha \downarrow$ smaller, then more
 evidence is require to reject H_0 .

Decision
 based
 on
 Sample

Conclusions
 from
 observed
 data

H_0 : Null Hypothesis
 (Neutral / Status-quo)

Truth about Population

Reality

	(H_0 is True)	(H_0 is False)
Reject H_0	Type-I error (Alpha, α) - Reject a True Null Hypothesis. → False-positive conclusion	Correct Conclusion 😊 ($1 - \beta$)
Do not Reject H_0	Correct Conclusion 😊 ($1 - \alpha$)	Type-II error (Beta, β) - Do not reject a False Null Hypothesis → False-Negative conclusion

$$\alpha + (1 - \alpha) = 1$$

$$(1 - \beta) + \beta = 1$$

