Hypothesis Testing.

Statistical Hypothesis.
A claim about an observation.

Claim: The population average is 25

Looking at trees on campus, the population average height is 25m.

Null Hypothesis
Alternative hypothesis.

Null hypothesis, is what you will conduct a test on. The test will result in either Rejecting null hypothesis or Failing to reject the null hypothesis.

When you reject the null hypothesis, you are claiming that there is evidence against it and evidence to support the alternative hypothesis.

Real World.

Null Hypothesis. is the null, nothing value nothing changes, no relationship, no difference.

Alternatin Hypothesis: The opposite of the null hypothesis.

Does smoking habit have an effect on the likelihood of having premature infants?

H_0: There is no relationship between smoking habit and likelihood of premature infant.

H_a: There is a relationship b/w smoking ... premature infants.

Math.

H_0: $p_{smoking} - p_{Nonsmoking} = 0$

H_a: $p_{smoking} - p_{Nonsmoking} \neq 0$

HT tests against the null hypothesis

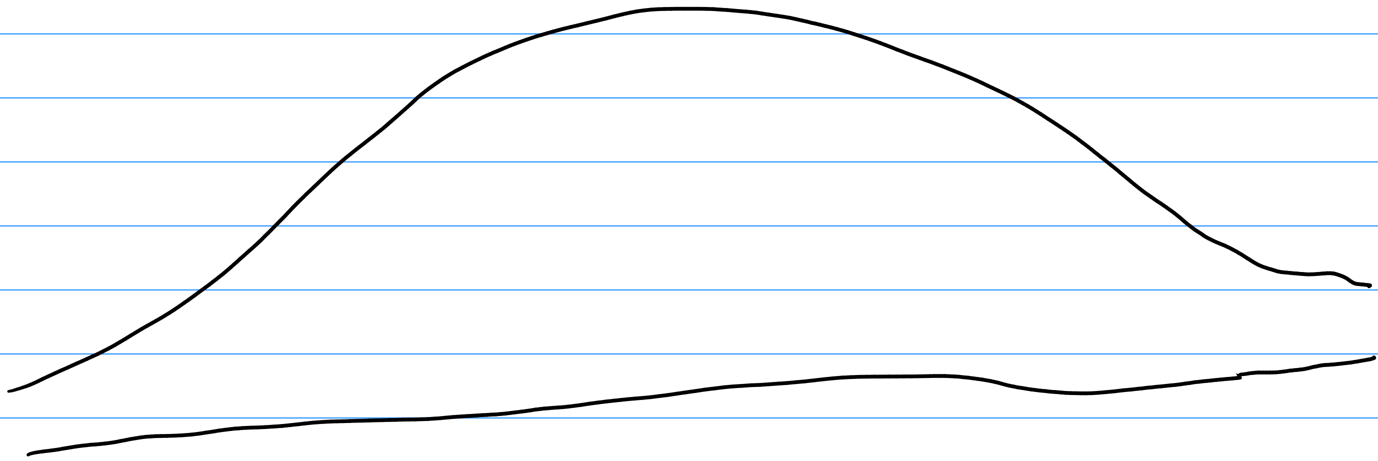
We assume that the null hypothesis is true.

Let $X = \{X_1, \ldots, X_n\}$

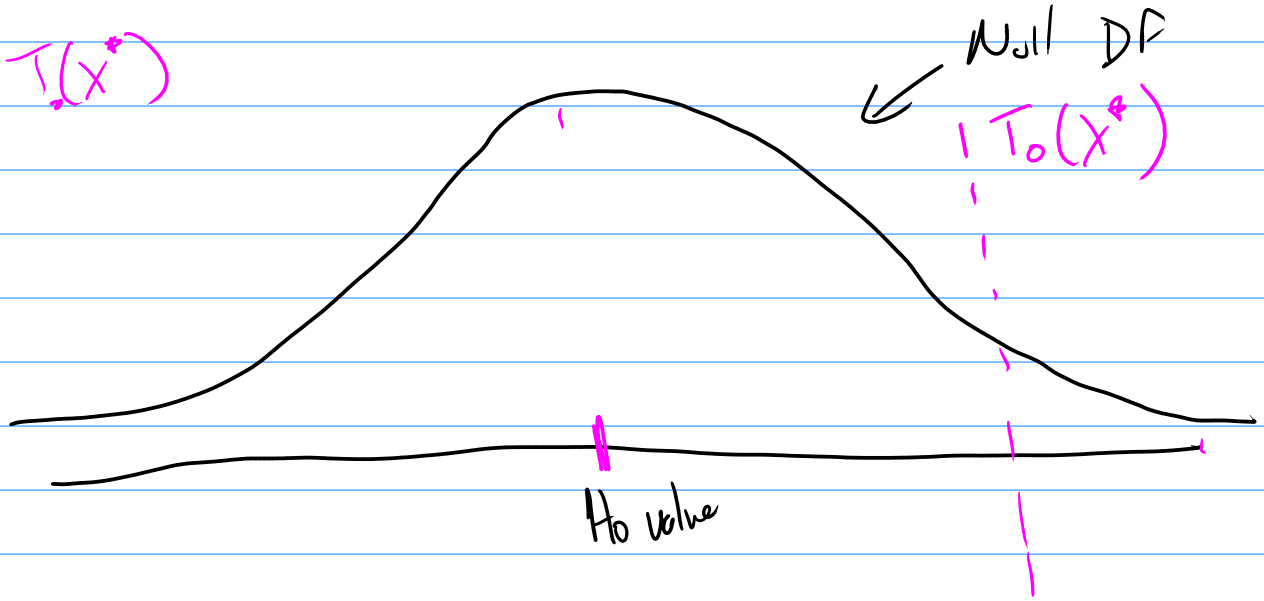
Let $T_0(X)$ be a statistic based on the data, and incoporates the information about the null hypothesis.

$T_0(X)$ has a distribution which incoporates the data based on the null hypothesis. This distribution is called the Null Distribution.

$T_0(x) \sim F$



Collect data call X^*



How far away does $T_0(x^*)$ have to be from H_0 value to be concluded as different from H_0 value?

We calculate a p-value, first.

	H_a	
①	$p_1 - p_2 \neq 0$	$2 \cdot P(T_0(x) > T_0(x^*))$ (p-value; RV; number)

p-value: The probability of observing our data test statistic ($T_0(x^*)$) or something more extreme, given that the null hyp. is true.

p-value = 0.8

p-value = 10^{-8}

p-value = 0.15

Significance levels: The probability of rejecting the H_0, given that it is true.

α = a number between 0 and 1 which indicates an acceptable risk of being wrong. $\alpha = 0.05$

Reject H_0

There is significant evidence to reject the null hypothesis and support the alternative hypothesis.

Fail to Reject H_0

There is not sig. evidence to reject H_0.

Fail to reject H_0.

There is no significant relationship b/w smoking and premature infants ($p =$ (1-α)100% CI).

Reject H_0

There is a significant relationship between smoking and premature infants. (p 95% CI).

Smoking expected mothers have higher rates of having premature infants compared to non smoki...

Type I Error: is the probability of rejecting H_0 given that it is true.
α

Type II Error: The probability of failing to reject H_0, given that the alternative is true. β

Power: is the Probability of rejecting H_0 given the H_a is true
Power $= 1 - \beta$

$n \to \infty$
Power $\to 1$