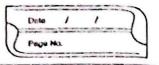
## Hypothesis Tosting



Setting UP Hypiotlesse Summary : Logic of Hypothesis Tection

Example 1: James Bond and Madini Taste Test Statisticians illustrate trapothesis testing through early like R. Fisher's lady tosting tea story. A similar chample is James Bond's Relied that martinis should be staken, mot stirge

· An experiment is designed where Bond is given 16 task Lests and must identify it a martini was traken or

· The selection mothod is randomized by Hipping a fair in Bond consectly identifies 13 out of 16 drinks.

The question is: Was Bord Just luck, as does be topyly distingui staken from stired martinis? to test his, the Biremial distribution is used to about the probability of guessing connectly 23 or more times

out of 16 if he is just guessing. · Probability = 0.0106 (1.06%)

· Since this probability is very low, it suggests
that Bond's perfusionance is unlikely due to chance alore

o This does not prove that Band can distinguish bothern martinis, but it provider strong evidence



Example 2: Physicians! Reactions to patient weight

A study examined whether physicians spend was the with obese patients. - Randomly scheded physicians were given identical patient. · closts ) expet: . Half son an obese potientis dast · Holf saw an grerage weight patients doct · 33 physicians viewed are rage - weight postient clarks. . 38 physicians vigod obese fatient chasts. · Mean time spont with obese pertients: 24.7 minutes.

· Mean time spont with average-weight patients: 31.4 minutes.

Difference: 17 · P; Harenco: 6.7 min ytes The study asks: Is this difference due to physicans' bias, or Just random dance? · Random assignment does not quanto Hat all other Soctors leg physicianic ager experience) are perfectly balanced. To test wetter the observed 6.7 minute difference is de to chance, statistical methods calculate to possability Probability = 0.0057 (0.571) Sice this packability is long long it suggests that

physicians: decisions wore influenced by partient neight ratter than sondom Harce

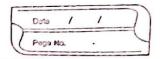


Surmary: Understanding probability values in Hypotheis Testing Key loncept . Probability Value (P-1010) The probability value (p-19he) represents the probability of obtaining a costain out come accuming the mull hypothesis is tope. It door not sepasent the probability that the hull typothesis itself is tome They take anays I The prople tells us the probability of an outcome given a hypothesis and the probability that the hypothesis is tone It the puale is very low, we have evidence against the myll typoticis, but no do not compute the probality of the mull hypothesis being feller 3 Bayesian statistics allows soo computing the probability of an hypothesis, but it requires prior knowledge of the publity before data collection, making it difficult in very situations Summay: Understanding the Null Hypothesis in Hypothesis Testing Dodinition of the Null Hypothesis (Ho)

The null hypothesis states that any observed effect in a study is due to chance after than a sea) difference and attimishing or selationship ond server as the baseline assumption

Examples of the Null Hypotheris

2 Physicians' Radions Study . Recearchers tested whether physicians spent loss fine nith obese polionis



The mull hypothesis (Ho): The near time sport with obde patients is equal to the mean time sport with average - Loight patients.

Ple alternative hypothesis (H-1): The time gent is not equal (or specially Less for obose pertions)

Hospose > 21 areage

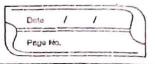
chance, the sesecurchers surjected the null hypothesis and whole that physicians spend less time with obose patients.

· Re null hypothesis: These is no selectionship between high shed
and college grades

the null hypothesis is rejected, suggesting a sol oclationship oxids in the population

· It testing whether someone can predict can flips better than dance the hull hypothesis states trut their according but random guessing. It = 0.5 3 Coin Hip exprisent

· Is their accuracy significantly exceeds 50%. The rull hypothesis is repected, suggesting they may have real predictive



Surnary: Type I and Type II Execus in Hypothesis Tosting Undestanding Type I and Type II Forcer In hypothesis theting, there goe the possible assure when nating decisions about then all hypothesis (Ho): Type I Excor (False Pocitive): Rejecting a tore null hypothesis. Example: In the Physicians' Reactions study researchers concluded that physicians spend less time with obese Horover, if no seal difference exists and the observed difference has die to chance, sejecting Ho would be a Type I gros The probability of a Type I over is called a (alpla), also Known as the significance bere Commonly set at 0.05 or 0.01) A loves a reduces Type I orrors, but inchardes the six at Type I covers 2 Type I Essas (False Negative): Failing to seject a false null hypotheris. Example: Suppose there is a seal difference in the the spat with obete patients, but the study doct not detect it.

This failure to seject the when it is false is a Type II apport The probability of a Type I cover is called B (Role).

The probability of connectly ejecting a forte mull hypothesis is 1-B) known as statistical panes.

Sumosy: One-Tailord us Two-Tailed Tests in Hypothesis Testing De vodesstanding one-toiled and two-tailed test

One-tailed test: Tasts it an effect is in one specific direction Two tailed test: Tests dos on object in eitler direction (og syndianty different from chand, whether higher or love o) 2) Example: Janes Bond ass Study
- Bonds poster-ance loosed 13 out at 16 times in distinguishing ha stinis. · One - tailed probability P = 0.0106 lonly considering extreme success.

- Into-tailed probability P = 0.0212 (considering both successand daylor extremely UR a two-tailed test it: clarico, in aitlex direction use a one-tailed test of we only care about whether he is botter than chance (not worse) 3) Null and a Herestice Hypothesus Alterative typotheses (HA) Tost Type Mill Hypothetes (Ho) Two- +16d JT = 015 JT 7 0.5 One-Hired 1 51 5 5 72705 4) then to we a one-Tailed vs Two-Jailed Fost

Va a one-tailed test when

we only one about one direction (eg a now day must be bitter

than pla cabo, not work) - An abbeit in the appearte chection would not nather (eg pedicting only improvement in performance)