Hypothesis Testing

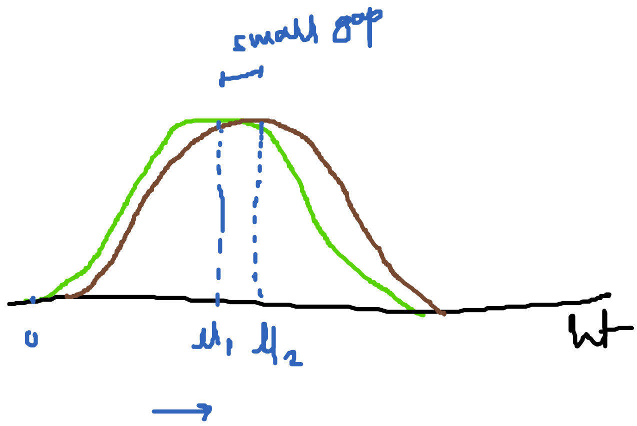
07 April 2022 19:04

heights

Sample size } = 50
population

	C1	C2
1	160	180
2	169	162
3	170	158
4	174	163
⋮		
50	168	182

Que. Is there a diff in heights of c1 and c2?



C1 =

C2 =

μ_1 = mean ht of c1

μ_2 = mean ht of c2

$\mu_2 > \mu_1$

Hypothesis testing.

1) choosing a test statistics :- (observation)

$$\mu_2 - \mu_1 = x$$

$\mu_2 = 175$ cm

$\mu_1 = 170$ cm

$x = 175 - 170$

$x = 5$ cm

2) Null hypothesis (H_0):

H_0:- an assumption.

H_0 :- diff in μ_2 & μ_1

3) Alternate hypothesis (H_a):-

H_a :- Inverse (H_0)

H_a :- no-diff in μ_2 & μ_1.

Proving by Contradiction.

trying to collect proof / evidence for which is correct.

ex. If we assume that our H_0 is True.
we prove that H_0 is incorrect.
accept H_a or reject H_0

ex. If we assume that our H_0 is True
we prove that H_0 is correct with high proba.
accept H_0 or reject H_a

P-value :-

$P(H_0 \text{ is true}) =$ p-value

What is the proba of observing $(\mu_2 - \mu_1) = x$ (5cm) if H_0 is True.

ex. if pvalue = 0.9 :
proba of seeing is 0.9 if H_0 is True.

ex: if pvalue
proba of scen is 0.9 if H_0 is True.

accept = H_0 reject = H_a

0.05 signifi

ex: if pvalue = 0.04 if H_0 is true.
my chances of getting a diff of scen is 04%

accept = H_a reject = H_0

Pvalue: - The proba of observing a diff (in our scenario) assuming the H_0 is True.

ex: H_0: f is not import.
H_a: f is important.

0.03
pvalue < 0.05
reject H_0:
accept H_a =

p-value: - The proba of observation assuming our H_0 is True.

ex. coin is biased or not

- biased towards heads: -
$P(H) > 0.5$

- not biased towards heads: -
$P(H) = 0.5$

st. flip a coin 5 times &

design expt. Flip a coin 5 times & we count no. of heads $= x$

Test statistics

perform expt.

f, f, f, f, f

H H H H H

So $x = 5$ - observation by experiment.

hi

$p(x = 5 \mid$ coin is not biased toward heads$) = p(\text{obs} \mid H_0)$

observation

Assumption H_0

$p(x=5 \mid H_0) = \frac{1}{2^5} = \frac{1}{32} = 0.031 = 3.1\%$

five heads in five flips.

coin is not biased

$p(H) = 0.5 = \frac{1}{2}$

f, f, f, f, f

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

HHHHH

HHHHT

HHHTT

So there is 3% chance of getting 5 heads in 5 flips, if the coin is not biased

H_0 = Reject

H_a = Accept

If $p(obs|H_0) = 0.03$

$= 3\%$

$3\% < 5\%$

when p value $< 5\%$

Reject = H_0

Accept = H_a.

expt. flip. 3.

$x = 3$

FFF

HHH

$$p(obs|H_0) = \frac{1}{2^3} = \frac{1}{8} = 12.5\% > 5\%$$

accept = H_0

Reject = H_a.

p value = $\underline{\underline{5\%}}$

significance level (α): alpha.

If pvalue $< \underline{\underline{5}}\%$.

when lives are at stake! -

α = can be changed (Business Analyst / Domain expertise)

= 1% medical

= 0.1%

generally taken as 0.05 or 5%

ecommerce :- money

Ps :- > 0.05 → Not stationary

< 0.05 → stationary

hi