HYPOTHESIS TESTING FRAMEWORK - 1

Terminologies Everywhere !!!

Conduct → 9:00 pm → 9:02 pm

↓ Revise

9:05/9.10 pm

↓

10:10 → Break 5 mins

10:15

↓

11:00/11:15 → Start doubt session.

→ Gdrive → link

ipynb
Scribble pdf
Datasets
→ pdf

→ .zipped → LectureNotes

---

1. Concept
   - 1st Repeat
   - 2nd Repeat ←

Assessments → ~~live class~~

Q1 ✓ — 50% ← 50%

Q2
Q3

Problem Solving Class

L1	Q1	-	- -	Qn
:	-	-		-
:	-			
		-		-
L12		-		

Attempted

Hypothesis Testing → most difficult module.

* Advanced distribution → Poisson, Exponential

Chi square
{Correlation} →
t test
KRUSKAL
ANOVA

* Feature Engineering

Cricket Series Example —> The captain always calls heads

1) 10 matches Series
   7 Tosses were won
   Is the Coin fair?

2) 100 matches Series
   70 Tosses were won
   Is the Coin fair?

3) 1000 matches Series
   700 Tosses were won
   Is the Coin fair?

	YES	NO
1)	30	14
2)	24	23
3)	8	17

We need a mathematical framework which will Quantify this??

Cricket Series Example

"Status Quo"

1) What is our default assumption?

H_0 It is a fair coin

2) When should we reject the assumption?

H_a When we have conclusive evidence to prove otherwise.

Judge in Court

"Innocent until proven guilty"

Assume that you are judging a murder case.

1) What is our default assumption?

H_0 Person is innocent.

2) When should we reject the assumption?

H_a When we have enough conclusive evidence to prove otherwise.

Machine Learning Model Deployment

ML algorithm is in production (legacy). You and your team have built a new model, and want to replace the legacy model.

1) What is our default assumption?

Ho performance old model = new model

2) When should we reject the assumption?

When we have enough conclusive evidence to prove otherwise.

Ha

Third Umpire

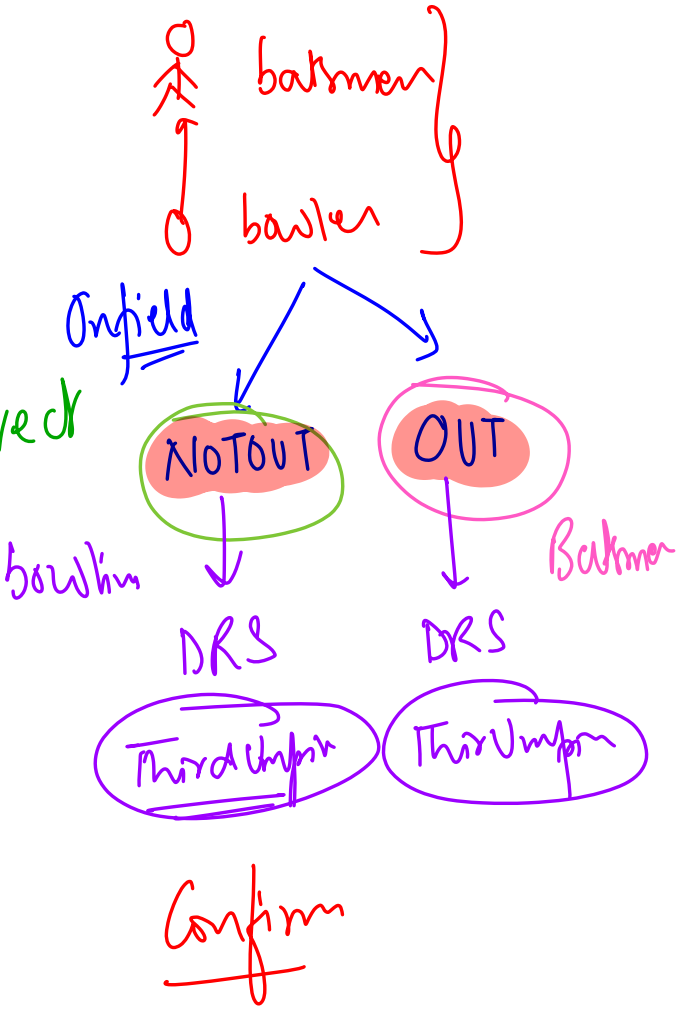
Suppose you are the third umpire.
The batsmen have taken a drs on being given out.

1) What is our default assumption?

Onfield umpire is correct

2) When should we reject the assumption?

When we have enough conclusive evidence to prove otherwise.



Fingerprint Sensor

We unlock our phones using a fingerprint scanner. A finger is placed on the scanner.

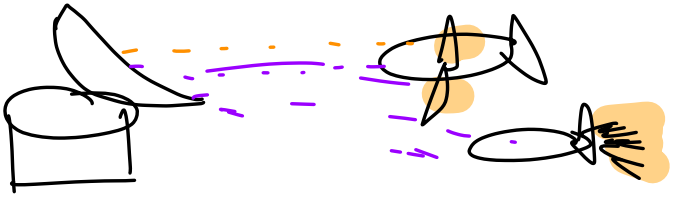
1) What is our default assumption?

H_0 fingerprint doesn't matches with the owner.

2) When should we reject the assumption?

H_a When we have enough conclusive evidence to prove otherwise.

Radar Example



A Radar has to detect a plane.

RADAR

1) What is our default assumption?

Ho Sky is clear, There is no enemy plan.

Default
There is an enemy plane.

2) When should we reject the assumption?

Ha Sky is not clear.

When we have enough conclusive evidence to prove otherwise.

Terminologies

H_0: NULL HYPOTHESIS

H_a: ALTERNATE HYPOTHESIS

When we have enough conclusive evidence to prove otherwise.

1. Coin is fair
2. Person is innocent
3. ML model old = new
4. Radar → sky is clear
5. Fingerprint → don't match
6. Third umpire is correct

Judge in Court

H_0: Person is innocent

When we have sufficient evidence to prove otherwise.

Data :

1. Person was carrying a knife. "he is a chef" X
2. There was blood on knife. "blood belonged to chidu" X
3. Blood group matches with the victim "Person is a friend"

Verdict :

4. Fingerprint & blood of dead person was found on T shirt
5. Eye witness "Eye witness lying"
6. CCTV FOOTAGE " DEEP FAKE "

Reject H_0

$P[\text{data} \mid H_0 \text{ is true}]$ → pvalue

data: evidences

H_0 is true: person is innocent.

pvalue → very low

pvalue

Probability of observing/seeing the data/evidence as extreme as was observed. under the assumption that H_0 is true

Deep Dive : Coin toss Example

Coin toss

Case 1 : 10 match series, 7 heads were observed. Would you believe that the coin is fair?

1) What is the random variable?

$X \rightarrow$ No. of heads

2) What is the distribution?

Binomial

H_0 : Coin is fair

H_a : Coin is biased.

3) What is the observed value?

7

$n = 10$

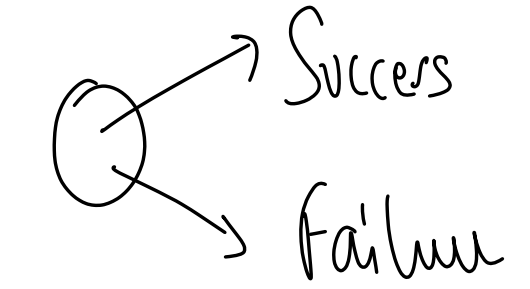
$k = 7$

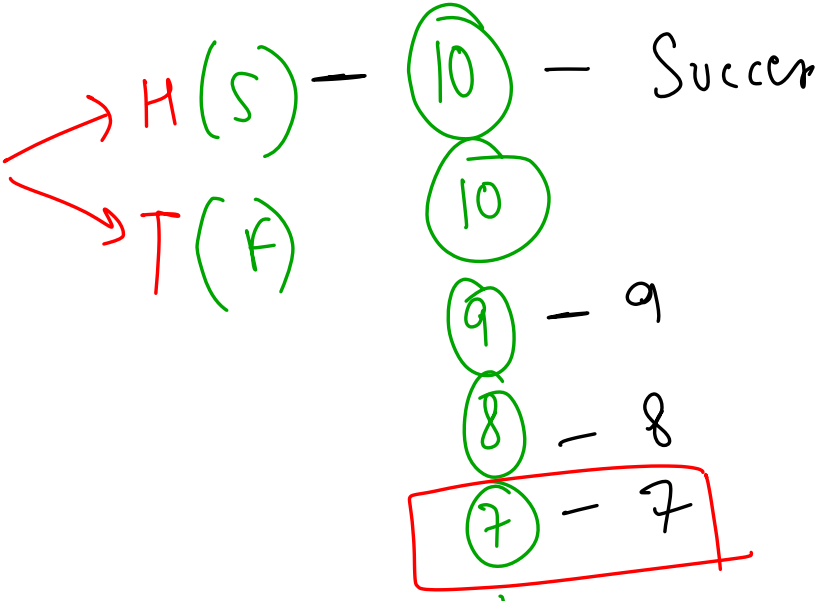
$p = 0.5$ (max)

4) What is probability of our observation assuming Ho is true?

$p = [0.1171)$

$${}^{n}C_{k}\, p^{k} (1-p)^{n-k}$$





Bernoulli trial

$$P[X=k] = {}^{n}C_{k}\,(p)^{k}\,(1-p)^{n-k}$$

$$= {}^{10}C_{7}\,(0.5)^{7}\,(1-0.5)^{3}$$