Probability Fundamentals

Monday, 24 January 2022 10:30

Probability: Mathematical formalisation describing uncertain event.

Statistics: the practice of Collecting and analysing Later

Central Questions:

- · why do we need this, is it useful,
 - · Make inference about uncertain events.
 - · Form the basis of information theory.
 - · Test the Strength of Statistical evidence.
- about uncertain (or Stockastic)
 events?
- How Can we mea sure uncertainty (or information)?

Example: ___ (a) Three differents lake have noon of light with

Slightly different results. What is
the true Speed Dikely to be?

(b) Two drugs are compared.

5 rut of 10 patients responded

lo treatment with drug A.

where as 7 rut 10 responded

-10 drug B. what do we Conclude

Probability Theory is the Calculus of uncertaint events

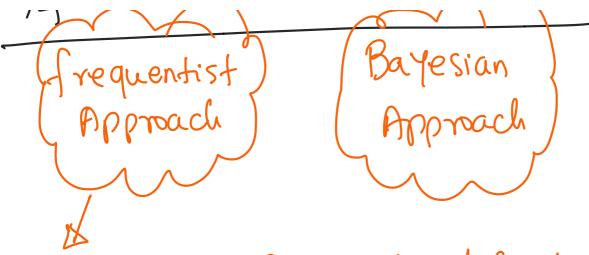
If enables one to infer Probabilities of interest based on a SSumptions and observations

Example

Probabily of getting 2 heads

When we toss a pair of coins is

Va.



The probability of an event is defined as its long run frequency in a repeated experiment.

Example if you roll afair die what is the probability of getting a G. Arg: 16

ifinite time Approach

Approach
P(b) -> 1/6

Example: There is a 50% Chances That
the arctic polar ice—cap will have
Method by 2100 "
it is not possible to define
a repeated experiment.

luterpretation of prob. Subjective to degree of belief is possible here. This type of interpretation is called Bayesian interpretation

What is Randomnen:?

* event is random when it is uncertain whether It is going to happen or not.

Inherent Uncertainty) >(A)

whethe a radioactive atom May decay within Some time interval.

lack of Knowledge

I may be uncertain about the number of legs my pet Contipede

Randon Sample

An opinion poll was based on telephone interviews of a vepresentative Sample of a quy voters.

The Foundations of Probability

3 Axioms

is a non-negative real number P(E) > 0 A E C D

2) The Certain event has unit probability.

 $P(\tilde{\Omega}) = 1$.

3) (Courtable) additivity: for disjoint event: Entz. Es... P(E, UEz U Ez ... UEn)= J. P(Ei).

1 =1

Complementary Rule: $P(\Sigma - E) = P(E) = 1 - P(E)$

Impossible Events: P(0)=0

If $E_1 \subseteq E_2$ (wen $P(E_1) \leq P(E_2)$) $\{2\} (\mathbb{C}) \{2, 4, 6\}$ $\{2\} (\mathbb{C}) \{2, 4, 6\}$ $\{3\} = \{1, 2, 3, 4, 6\}$ $\{6\} = \frac{3}{6} = \frac{1}{2}$ $\{6\} (\mathbb{C}_1) = \frac{1}{6}$ $\{7\} (\mathbb{C}_1) = \frac{1}{6}$

General Additive Rule:

P(E, UEZ) = P(E,)+P(Ez)-P(E, NEZ)

P(E, NEZ) = P(E,EZ)

Joint probability!