(Part 2)
29/12/20

PART 2

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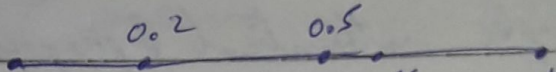
Probability

- Prediction of outcome (likelihood of an event occuring)

Event : specific outcome / combination of outcomes



20% = $\frac{1}{5}$ = 0.2

0 → absolute certainity of the event NOT occuring

1 → absolute certainity of event occuring

Definitions :-

A → event

P(A) → probability of A $\quad P(A) = \frac{\text{preffered (favourable)}}{\text{all (sample space)}}$

independent events

P(A and B) = P(A) . P(B)

Eg : P(ace of spade) = P(ace) . P(spade)

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Expected Values

- average outcome we expect if we run an experiment many times.

Ex: flipping a coin

trial : flip & record outcome

experiment → multiple trials

Ex: coin toss × 20 times = 20 outcomes

= 1 experiment with 20 trials

Experimental probabilities	vs	Theoretical (true) probabilities
• done when true probability is not known.		• approx equal to experimental probability
• easy to compute		• too many cases/conditions to take care of

$$P(A) = \frac{\text{successful trials}}{\text{all trials}}$$

Expected value of A = E(A) = outcome we expect to occur when we run an exp.

→ Categorical outcomes

$E(A) = P(A) \cdot n$.

Ex: drawing spade from 20 trials from a deck of cards

$P(A) = 0.25$

$n = 20$

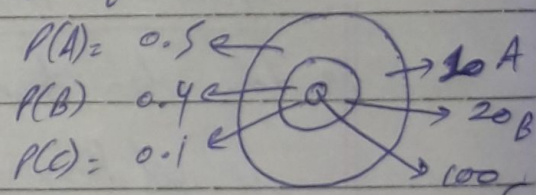
$E(A) = 0.25 \times 20 = 5$

We expect 5 spades in 20 trials. (no guarantee)

→ Numerical outcomes

$E(A) = \sum P(A) \cdot n(A) = \sum x_i f_i$

Ex:



$E(X) = A \cdot P(A) + B \cdot P(B) + C \cdot P(C)$

$= 0.5 \times 10 + 0.4 \times 20 + 0.1 \times 100$

$= 5 + 8 + 10 = 23$

- We can use expected values to make predictions about future based on past data.

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Frequency

$P(A)$ = sum of top numbers of 2 dice

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

→ 6 favourable outcomes

possible outcomes = 36

$$P(7) = \frac{6}{36} = \frac{1}{6}$$

$$E(A) = P(2)\cdot 2 + P(3)\cdot 3 + P(4)\cdot 4 + \cdots P(12)\cdot 12 = 7$$

$P(E(A)) = P(7) = \frac{1}{6}$ • most probable
• very unlikely

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Probability Frequency Distribution

- a collection of probabilities for each possible outcome

Sum (A_i)	Frequency (f_i)	Probability (x_i)
2	1	1/36
3	2	1/18
4	3	1/12
5	4	1/9
6	5	5/36
7	6	1/6
8	5	5/36
9	4	1/9
10	3	1/12
11	2	1/18
12	1	1/36