Probability & Statistics

L5

Discrete Probability space

- $p(a_k) = 1/n$ — Uniform distribution, $\Omega = \{a_1, \dots, a_n\}$
- $p(k) = \binom{n}{k} p^k (1-p)^{n-k}$, — Binomial distribution, $\Omega = \{0, 1, \dots, n\}$

p – prob. of success

$1-p$ – prob of failure.

Conditional Probability

Exp. Roll a dice twice. The prob of the event "sum of both rolls equals 5". Suppose we were told that the first roll was an even number.

Does this additional information makes the event "sum equal to 5" more likely? or does it even diminish the probability of the event?

— restricting the sample space.

$B \rightarrow$ sample space $\equiv$ the first roll is an even number.

A = Sum of the outcomes equal to 6

Then $P(A \cap B) = ?$

$A, B \in \mathcal{P}(\Omega)$ where Ω is the original sample space!

In both the cases $P(A) = \frac{1}{9}$, so the additional information does not change the probability.

A = Sum of outcomes equals to 6

$P(A) = 5/36$

$P(A \cap B) = 1/9$

Def^n: Let $(\Omega, \mathcal{A}, P)$ be a probability space. Given $A, B \in \mathcal{A}$ with $P(B) > 0$, the prob. of A under the condition B is defined by

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \cdot \left(\frac{\#(A \cap B)}{\#(B)} \right.$$

when P is uniform)