2-16-2021

Random Variables (Discrete)

Ex $S = \{HH, TT, HT, TH\}$

X = # of Tails

events	X
HH	0
HT	1
TH	1
TT	2

Probability Distribution

$P(X=0) = P(HH) = P(1/4)$
$P(X=1) = P(HT \cup TH) = P(1/2)$
$P(X=2) = P(TT) = 1/4$

① Possible values of X (x)

② What are the corresponding possibilities $P(X=x)$

* Discrete Random variables have a discrete position in the number line

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Probability Mass Function (pmf) requires

① $p(x) \geq 0$

② $\sum p(x) = 1$

Ex Fair Coin

Tails Lands = $1/2$ = $p(T)$

Heads Lands = $1/2$ = $p(H)$

$$p(x) = \begin{cases} 1/2 & \text{if } x = 0, 1 \\ 0, & \text{otherwise} \end{cases}$$

Ex Biased Coin

Tails Lands = α = $p(T)$

Heads Lands = $1 - p(T)$

α: # Tails

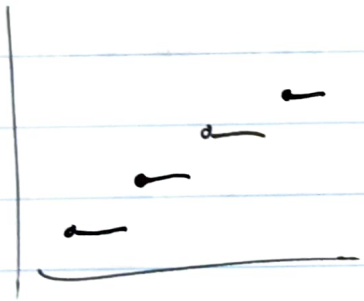
$$p(x) \begin{cases} \alpha, & x = 1 \\ 1-\alpha, & x = 0 \\ 0, & \text{otherwise} \end{cases}$$

Cumulative Probability

"Probability up to X" or
"Probability to the left of X"
is the right of the ~~probability~~ Cumulative probability

$$F(x) = P(X \leq x)$$

Example of Cumulative Probability as a Graph



$p(x)$ $\begin{cases} 0.1, & 0 \leq x \leq 1 \\ 0.2, & 1 \leq x < 2 \\ 0.3, & 2 < x < 3 \\ 0.4, & 3 \leq x < 4 \end{cases}$