Less variance → more stability
More Variance → less stability

Date

JOINT PMF.

The joint or PMFs of multiplerandom variables say in pairs X and Y are called as Joint distributions of X & Y.

While individual PMF of X and individual of Y are thus called as marginal distributions.

~x~

Consider a discrete Random variable, a PMF gives the probability of each possible value a random variable can have.

TOINT PMF gives probability of both X & Y taking specific values.

$$P(X=x, Y=Y)$$

eg: you toss two coins/dice

X = event when 2 occurs in one die

Y = event when 5 occurs in one die.

The probability when both 2 & 5 occurs P(2,5).

Marginal PMF

Now, when you have 2 random variable X & Y, the marginal probabilities/PMF of X or y is obtained by summing the joint prob of one over the other.

$P_X(x) \Rightarrow \Sigma_y (P X=x, Y=y)$ (summing over Y)

$P_Y(y) \Rightarrow \Sigma_x (P X=x, Y=y)$ Summing over X

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INDEPENDANCE OF RANDOM VARIABLES.

Now in the previous example X and Y were 2 different. Random variable which can be dependant or independant.

if $P(X=x, Y=y) = P_X(x) . P_Y(y)$

i.e joint PMF is the product of marginal PMF of X and Y then they are independant.

Example: Two fair six-sided dices are rolled. Let X represent the outcomes of the first dice and Y represent the outcome of the second die.

(i) Find Marginal PMF of X & Y.
(ii) Compute the joint PMF for each case where X=2 and Y=4.
(iii) Are X and Y independant? Prove it.

(i)
The marginal PMF of X $\to P_1(X), P_2(X), P_3(X), P_4(X), P_5(X), P_6(X) \Rightarrow \frac{1}{6}$ (equally likely for all as relative outcomes.

$X = \{1, 2, 3, 4, 5, 6\}$

Similarly PMF of Y $\Rightarrow \frac{1}{6}$

(ii) Joint Probability when $X=2$ & $Y=4$
$P(X=2, Y=4) \Rightarrow \frac{1}{6} \cdot \frac{1}{6} \Rightarrow 1/36$.