

Bivariate Discrete Cumulative Distribution Function

Data Science and A.I. Lecture Series

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PostNetwork Academy

• Two-Dimensional Joint Distribution Function

- The distribution function of the two-dimensional random variable (X, Y) for all real x and y is defined as:

$$F(x, y) = P(X \leq x, Y \leq y)$$

Joint Probability Table:

$X \backslash Y$	1	2
1	0.1	0.2
2	0.1	0.3
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Example 1: Joint and Marginal Distribution

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- $F(2,2) = P(X \leq 2, Y \leq 2)$

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- $F(3, 2) = P(X \leq 3, Y \leq 2)$

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- $F_X(3) = P(X \leq 3) = P(X = 1) + P(X = 2) + P(X = 3)$

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- $F_Y(1) = P(Y \leq 1) = P(X = 1, Y = 1) + P(X = 2, Y = 1) + P(X = 3, Y = 1)$

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- **Two-Dimensional Joint Distribution Function**

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Example 2: Joint Probability Distribution

Joint Probability Table:

$X \backslash Y$	0	1
0	$2/9$	$1/9$
1	$1/9$	$5/9$

- $F(0, 0) = P(X = 0, Y = 0) = \frac{2}{9}$

Example 2: Joint Probability Distribution

Joint Probability Table:

$X \backslash Y$	0	1
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Thank You!