3A Discrete RV

Contents

3ADisc	crerte RV
A.1	Intro
A.2	Example
A.3	PMF and CDF
A.4	Ex: Roll a Die Once
A.5	Ex: Roll a Die Twice
A.6	PMF and CDF
A.7	Ex: get CDF from pmf
A.8	Ex: get pmf from CDF

3A Discrerte RV

[ToC]

A.1 Intro

Random Variable is a function whose domain is a sample space, and whose range is a real numbers.

Discrete Random Variable is a r.v. whose range is a finite or countably infinite set.

A.2 Example

- 1. Throw a die: $\{1\} \to 1$
- 2. Throw two dice at once and add: $\{2,5\} \rightarrow 7$

A.3 PMF and CDF

• Probability Mass Function: (pmf) of a discrete RV is defined as

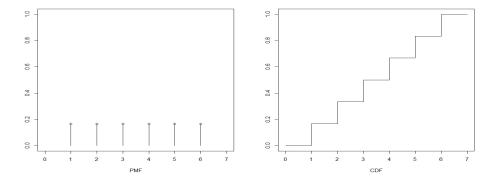
$$p(x) = P(X = x)$$

 \bullet Cumulative Distribution Function: (cdf) of a discrete random variable X is defined as

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

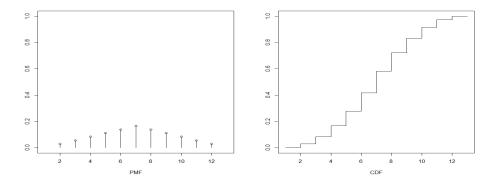
A.4 Ex: Roll a Die Once

	x	1	2	3	4	5	6
pmf	P(X=x)	1/6	1/6	1/6	1/6	1/6	1/6
CDF	$P(X \le x)$	1/6	2/6	3/6	4/6	5/6	$\frac{-6}{6}$



A.5 Ex: Roll a Die Twice

	x	2	3	4	5	6	7	8	9	10	11	12
pmf	P(X=x)	1/36	2/36	3/36	4/36	5/36	6/36	5/36	4/36	3/36	2/36	1/36
$\overline{\text{CDF}}$	$P(X \le x)$	1/36	3/36	6/36	10/36	15/36	21/36	26/36	30/36	33/36	35/36	36/36



A.6 PMF and CDF

- You can calculate CDF from PMF, or vice versa.
- CDF always start at 0, and end at 1.
- pmf at any point must be ≥ 0 .
- If you add all values of pmf, it must add up to 1.

A.7 Ex: get CDF from pmf

Given pmf:

$$p(x) = P(X = x) = \frac{i}{55}$$
 for $x = 1, ..., 10$

Cauculate:

$$F(4) = P(X \le 4)$$

$$P(2 \le X \le 4)$$

A.8 Ex: get pmf from CDF

Given the CDF:

$$F(1) = .2$$
, $F(2) = .35$, $F(3) = .60$, $F(4) = .90$, $F(5) = .95$, $F(6) = 1$

Calculate

$$P(2 \le X \le 5)$$

$$P(2 < X < 5)$$