Development statistics

S03 Discrete Distribution

Fujikawa, Kiyoshi
Nagoya University, GSID

Distribution

1. Discrete distribution
   - Binomial distribution
   - Poisson distribution
2. Continuous distribution
   - Uniform distribution
   - Normal distribution
   - T-distribution

Mean & variance of a discrete distribution

- Mean of a discrete distribution

$$\mu = \sum_n X(k)\,p(k)$$

- Continuous distribution

$$\sigma^2 = \sum_n (X(k) - \mu)^2\,p(k)$$

Bernoulli distribution (Coin throwing)

- 1 (success) with probability p (0.5)
- 0 (failure) with probability 1-p (0.5)

- Average

$$\mu = p*1 + (1-p)*0 = p = 0.5$$

- Variance

$$\sigma^2 = p*(1-p)^2 + (1-p)*(0-p)^2$$

$$= p(1-p) = 0.25$$

Binomial distribution

- Probability of “success or failure”
  - 1 (success) with probability p
  - 0 (failure) with probability 1-p
- Trial times : n
- Probability of total points “x”

$$P(x) = {}_n C_x \; p^x (1-p)^{n-x}$$

Binomial Distribution

- Binomial distribution
  = total of Bernoulli distribution
- Mean

$$\mu = 1^* p + 1^* p + \cdots = np$$

- Variance

$$\sigma^2 = 1^2 p + 1^2 p + \cdots = np(1-p)$$

Example of BD

- 10 time trial
- Obtained points
  - 1 with probability 0.5
  - 0 with probability 0.5

	Point	Probability
Obverse side	1	0.5
Reverse side	0	0.5

- Probability of total points “x”

$$\Pr(x) =_{10} C_x \, 0.5^x 0.5^{10-x}$$