

Week (4) Probability

Understand probability distributions, conditional probability and Bayes theorem.

Introduction to Probability Distributions

Distribution is the possible values a variable can take and how frequently they occur

Y the actual outcome of an event

y One of the possible outcomes

$P(y)$ the probability function

Recorded the frequency for each unique value and divide it by the total number of elements

two characteristics

mean, variance
 μ σ^2

two type of data

Population Sample

sample mean, sample variance
 \bar{X} s^2

Standard deviation

$$\sigma^2 = E((Y - \mu)^2) = E(Y^2) - \mu^2$$

σ, s

same unit as mean

Types of Probability distributions

finite number of outcomes

Discrete

Infinitely many outcomes

Continuous




$$X \sim N(\mu, \sigma^2)$$

variable Type

Discrete Distributions

- equiprobable Uniform
- True, False Bernoulli
- similar or several true in a row Binomial
- how usual frequency Poisson

Continuous Distributions

- Normal distributions 
- limited data Student's-T 
- Chi-Squared asymmetric and only of non-negative 
- exponential rapidly changing early on
- logistic distributions

Uniform Distributions

$$U(a, b) \quad X \sim U(3, 7)$$

Die example

$$P(1) = P(2) = P(3) = P(4) = P(5) = P(6)$$

each outcome is equally likely

Both the mean and the variance are uninterpretable

No predictive power

Binomial Distribution

 $B(n, p)$ n number of trials p probability of success in each one

$$X \sim B(10, 0.6)$$

$$\text{Bern}(p) = B(1, p)$$

guessing 1 question Bernoulli

guessing the entire quiz Binomial

To Be Continued