Introduction to Statistics Note

2024 Spring Semester

21 CST H3Art

Chapter 4: Probability: The Study of Randomness

4.1 Randomness

We call a phenomenon **random** if individual outcomes are **uncertain** but there is nonetheless a regular distribution of outcomes in a **large number of repetitions**.

The **probability** of any outcome of a chance process is the proportion of times the outcome would occur in a very long series of repetitions.

4.3 Random Variables

A numerical variable that describes the outcomes of a chance process is called a **random variable**.

The **probability distribution** of a random variable gives its possible values and their probabilities.

We **standardize** normal data by calculating **z-scores** so that any Normal curve $N(\mu, \sigma)$ can be transformed into the standard Normal curve $N(0, 1)$.

$$z = \frac{(x - \mu)}{\sigma}$$

4.4 Means and Variances of Random Variables

Draw independent observations at random from any population with finite mean μ. The **law of large numbers** says that, as the number of observations drawn increases, the sample mean of the observed values gets closer and closer to the mean μ of the population.