Statistics: Probability and Descriptive Statistics

Course Description

Statistical description and analysis are the foundations for data-driven analysis and prediction methods. This course introduces the fundamentals, beginning with a formal definition of probabilities and introduction to the concepts underlying Bayesian statistics.Random variables and probability density distributions are then discussed, as well as the concept of joint and marginal distributions. The importance of various discrete and continuous distributions and their applications is stressed.Characterizing distributions is an important aspect of describing the behavior of probability distributions. Students are familiarized with expectation values, variance, and covariance. The concepts of algebraic and central moments and moment-generating functions complement the characterization of probability distributions.Finally, this course focuses on important inequalities and limit theorems such as the law of large numbers or the central limit theorem.

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1. Joint Distributions
   1. Joint distributions
   2. Marginal distributions
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2. Expectation and Variance
   1. Expectation of a random variable, conditional expectations
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   3. Expectations and variances of important probability distributions
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3. Inequalities and Limit Theorems

5.1 Probability inequalities

5.2 Inequalities for expectations

1. The law of large numbers
2. Central limit theorem