Probability and Probability Distributions II

Unit 1: Standard Univariate Discrete Probability Distributions
1. Recall and explain the properties of the Binomial distribution
2. Calculate probabilities using the Binomial distribution
3. Analyze and interpret results based on the Binomial distribution
4. Apply the Poisson distribution to model rare events
5. Determine probabilities using the Poisson distribution
6. Compare and contrast the Geometric, Negative Binomial, Hypergeometric, and Uniform distributions
7. Calculate probabilities and expected values for these distributions

Unit 2: Standard Univariate Continuous Probability Distributions
1. Identify and describe the properties of the Rectangular distribution
2. Calculate probabilities using the Normal distribution
3. Apply the Central Limit Theorem to approximate probabilities
4. Explore the properties and applications of the Exponential distribution
5. Determine probabilities and expected values using the Cauchy distribution
6. Compare and contrast the Beta, Gamma, Lognormal, Logistic, Double Exponential, and Pareto distributions
7. Analyze limiting and approximation cases for these distributions

Unit 3: Standard Bivariate Probability Distributions
1. Define and describe the Trinomial distribution
2. Calculate joint probabilities and marginal distributions for the Bivariate Normal distribution
3. Interpret results and analyze correlations between variables
4. Apply properties of bivariate distributions to real-world scenarios

Unit 4: Probability Inequalities
1. Utilize the Markov inequality to estimate probabilities for non-negative random variables
2. Apply the Chebyshev inequality to bound probabilities in terms of standard deviations
3. Interpret the implications of these inequalities in practical situations

Overall, upon completing this course, students will be able to analyze, calculate, and interpret probabilities using a variety of discrete and continuous distributions, as well as bivariate distributions and inequalities. They will develop a strong understanding of the properties and applications of these fundamental probability concepts.

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