

- Probability
 - computing the probability of an event (permutations, combinations, union, intersection, etc.)
 - conditional probability (compute and interpret)
 - independence
 - Bayes' theorem
- Random Variables
 - discrete vs. continuous
 - pdf and cdf
 - calculating probability of events from the pdf and cdf
 - expected values
 - moment generating functions
 - multivariate versions of all of the above
 - conditional distributions and conditional expectations, $E[Y|X]$
 - covariance and correlation
 - independence
 - named distributions:
 - * Bernoulli, binomial, geometric, multinomial
 - * Poisson (including approximation to binomial, Poisson process)
 - * exponential, gamma, chi-square
 - * uniform
 - * Cauchy
 - * normal (including bivariate and multivariate, and the distribution of \bar{X} and S^2 , linear combinations of X_i 's)
 - * beta
 - * t
 - * F
 - transformations (cdf method, Jacobian, MGF method)
 - statistics, order statistics, random samples
 - convergence:
 - * in distribution
 - * in probability
 - * WLLN, SLLN
 - * MGF's, Slutsky's theorem

- Central limit theorem
- delta method
- exponential families
- location-scale families

- Inference

- maximum likelihood estimation
- method of moments
- unbiasedness, consistency
- confidence intervals (construction and interpretation)
- unbiased minimum variance estimators
- sufficiency, minimal sufficiency
- Rao-Blackwell Theorem
- completeness and the Lehmann-Scheffé Theorem
- asymptotic normality of MLEs

- Hypothesis Testing

- setting up hypotheses and tests
- calculating power and significance levels
- p -values
- relationship between confidence intervals and hypothesis tests
- one-sided and two-sided tests and confidence intervals
- chi-square test of goodness-of-fit
- Likelihood Ratio Tests