

ASDS - Applied Statistics with R

Fall 2018, YSU

Midterm 2 Material Coverage

Exam Time: December 27, ??? - ???

1 Parametric Statistics: Point Estimation

1. Convergence of a sequence of Random Variables

- 4 convergence types
- Relationship between the convergence types
- Examples
- The Weak and Strong LLN and CLT

2. Some well-known parametric distributions and their characteristics (CDF/PD(M)F, Expectation and Variance):

- Discrete:
 - $Bernoulli(p)$;
 - $Binom(n, p)$;
 - $Geometric(p)$;
 - $Poisson(\lambda)$;
- Continuous:
 - $Unif[a, b]$;
 - $Exp(\lambda)$;
 - $N(\mu, \sigma^2)$

3. Parametric Inference and Point Estimation

- Parametric Families of Distributions
- Point Estimation, Estimators and Estimates
- Properties of Estimators
 - Bias and Unbiasedness
 - Asymptotic Unbiasedness
 - Consistency, Strong Consistency, Weak Consistency
- MSE and Bias-Variance Decomposition of the MSE
- Comparison of Estimators
 - Efficiency
 - Fisher Information
 - Cramer-Rao Lower bound

2 Methods to Construct Good Estimators

1. Methods to Construct Point Estimators

- Maximum Likelihood Method (MLE)
- Properties of MLE
- Method of Moments (MME)

3 Interval Estimation

1. Confidence Intervals

- Definition of Confidence intervals
- Constructing Confidence Intervals using the Chebyshev Inequality
 - CI for Bernoulli Model
 - Sample size determination for the Bernoulli Model
- Constructing Confidence Intervals using Pivots
 - The idea of a Pivot
 - Quantiles of the Normal, t - and χ^2 -distributions
 - CI for the Mean of a Normal Distribution, Variance is known
 - CI for the Mean of a Normal Distribution, Variance is unknown
 - CI for the Variance of a Normal Distribution, Mean is known
 - CI for the Variance of a Normal Distribution, Mean is unknown
- Asymptotic Confidence Intervals using Pivots
 - Asymptotic CI for the Mean of a General Distribution
 - Asymptotic CI for Bernoulli model
- Prediction Intervals
 - Prediction Interval for the Normal Distribution Model