Course Title: Applied Statistics with R
Number of Credits: 6

Instructor's Name: Michael Poghosyan
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Instructor's Office Location: YSU MMF #207, #209, AUA PAB #336W
Instructor's Office Hours: by an appointment

Teaching Associate: ????
TA's email address:
TA's Office Hours: TBD
Problem Solving Sessions: TBD

Term/Year: Fall 2019

Course Description:

This course provides students with a general introduction to statistical modeling and inference, including topics such as descriptive statistics, estimation in parametric models, risk evaluation, maximum likelihood method and method of moments, Bayesian approach, confidence intervals, statistical hypotheses testing, multiple linear regression, least-squares estimation, significance of the coefficients, goodness-of-fit tests, and chi-squared test of independence. Students will develop basic skills in data modeling and gain proficiency in R software.

Required Materials:

Main Textbooks:

[Wasserman] All of Statistics: A Concise Course in Statistical Inference, *Larry Wasserman*, Springer Texts in Statistics, 2004

[Devore] Modern Mathematical Statistics with Applications (Second Edition), *Jay Devore, Kenneth N. Berk*, Springer, 2012

Additional reading:

[CasellaBerger] Statistical Inference (Second Edition), George Casella, Roger Berger, Duxbury, 2002

Software:
R , https://cran.r-project.org/ (freeware)

Schedule & Topics*:*

Week	Topic	Reading
Week 1	**Descriptive Statistics** Univariate Analysis	Devore, Ch 1
Week 2	**Descriptive Statistics** Univariate Analysis	Devore, Ch 1
Week 3	**Descriptive Statistics** – Univariate and Bivariate Analyses	Devore, Ch 1
Week 4	**Reminder on random variables and convergence:** – Quick review on Discrete and continuous random variables, their important characteristics – Types of convergence – CLT and LLN	Wasserman, Ch 2, Ch 5
Week 5	**Models, Statistical Inference and Learning** – statistical models: parametric vs non-parametric – statistical problems: estimation, confidence intervals and testing **Parametric Inference** - Parameter estimation	Wasserman, Ch 6
Week 6	**Parametric Inference** - Method of moments - Maximum likelihood estimator (MLE) - Consistency of the method of moments	Wasserman, Ch 9
Week 7	**Parametric Inference** - Consistency of the MLE - Asymptotic normality	Wasserman, Ch 9
Week 8	**Parametric Inference** - Bayesian Estimation	Wasserman, Ch 11, CasellaBerger, Ch 7
Week 9	**Parametric Inference** - Fisher information - Cramer-Rao bound	Wasserman, Ch 9
Week 10	**Confidence intervals (CI)** - CI based on the Tchebychev inequality - CI based on a pivotal quantity - The case of normal distribution	Wasserman, Ch 9
Week 11	**Hypotheses Testing** - Introduction to hypotheses testing - Testing simple hypotheses: Neyman-Pearson lemma	Wasserman, Ch 10

Week 12	**Hypotheses Testing** - Testing composite hypotheses: Wald test and likelihood ratio test	Wasserman, Ch 10
Week 13	**Linear regression** - Simple linear regression and least squares estimator (LSE) - Multiple regression	Wasserman, Ch 13
Week 14	**Linear regression** - Properties of the LSE in the general case - Properties of the LSE in the Gaussian case - Testing the significance of the coefficients - Coefficient of determination R^2	Wasserman, Ch 13
Week 15	**Goodness of fit tests** - Pearson's χ^2 Test for Multinomial Data - Pearson's χ^2 Test of independence - Kolmogorov-Smirnov test	Wasserman, Ch 10

Method of Evaluation

Midterm 1 (**M1**)	25 %
Midterm 2 (**M2**)	25 %
Final Exam (**F**)	40 %
Homework (**HW**)	10 %
Total	100 %

So the Grade Calculation Formula is:

Total=0.1* HW+0.25* (M1+M2) +0.4*F