Math 346-Probability and Statistics II-Fall 2013

Instructor: Mirjana Vuletic, Science 3-086, 617-287-7418, Mirjana.Vuletic<at>umb<dot>edu

Class Meetings: Every Tuesday and Thursday in Wheatley 1-055 from 4-5:15pm.

Office Hours: Drop in hours are on Monday 2:30-4:30pm in Science 3-086. For additional office hours please email me in advance to set up an appointment.

Course Description: Introduction to the fundamental ideas and techniques of statistical inference. The course demonstrates how and when to use statistical methods, explains the mathematical background behind them and illustrates them with case studies. Topics covered: the Central Limit Theorem, parameter estimation, confidence intervals, hypothesis testing, type I and II errors, power, significance level, p-value, likelihood ratio tests, t-test, paired and 2-population t-tests, goodness-of-fit tests, chi-square tests, contingency tables, exact tests, nonparametric tests, ANOVA and regression models. Software suitable for statistical analysis, e.g. R or Matlab, will be used to analyze real-world data.

Prerequisite: Math 141 and 345 or permission of the instructor.

Credits: 3


Weekly Plan:
Week 1: probability review: random varaibles, special distributions, expectation, variance, standard deviations, moments
Week 2: Central Limit Theorem, statistics vocabulary: population, sample, statistics: sample mean, sample variance, sample moments
Week 3: parameter estimation: maximum likelihood estimate, method of moments estimate
Week 4: parameter estimation properties: bias, efficiency, sufficiency
Week 5: confidence intervals
Week 6: introduction to hypothesis testing: hypotheses, type I and II errors, power, significance level
Week 7: generalized likelihood ration, Neyman-Pearson lemma
Week 8: statistical inference for normally distributed data: t and F-tests
Week 9: two-population sample problems: paired and two-population t-tests, two-population tests for binomial data
**Week 10:** goodness-of-fit tests, contingency tables, chi-square test, exact test  
**Week 11:** regression analysis: linear model, least square estimators and their properties  
**Week 12:** multiple linear regression, correlation coefficient,  
**Week 13:** nonparametric tests: sign test, Wilcoxon test  
**Week 14:** ANOVA: one-way analysis of variance, Tukey’s method

**Grading:**  
**Homework** will be assigned every week and due before the class on Tuesday. The late homework will not be accepted unless extension is recommended by the Dean’s Office or Health Center. Collaboration is allowed and encouraged, discussing problems and sharing ideas are OK, but you may not use other written solutions to see how to do a problem. You must write your solutions on your own without assistance.

Homework will be posted a week before it is due and graded homework can be picked up in class.

Some homework assignments will require use of Matlab. No previous knowledge of Matlab is required.

There will be one project at the end of the year.

**Midterm:** There will be two midterms. The dates will be determined at the beginning of the course.

**Final:** The final exam will be cumulative, meaning it will cover all the material of this course.

**Grading:** Your grade is based on homework (project counts as one hw) (30%), first midterm exam (20%), second midterm (20%) and final exam (30%).

**Student Conduct:**  
Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Code of Student Conduct as delineated in the University Catalog and Student Handbook. The Code is available online at: [http://www.umb.edu/student_services/student_rights/code_conduct.html](http://www.umb.edu/student_services/student_rights/code_conduct.html)

**Accommodations:**  
Section 504 of the Americans with Disabilities Act of 1990 offers guidelines for curriculum modifications and adaptations for students with documented disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center for Disability Services, Campus Center, UL Room 211, (617-287-7430). The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of Drop/Add period.