Quantitative Research Methods

Literature

According to the syllabus it is

- Agresti, Alan and Barbara Finlay (2009), Statistical methods for the social sciences (Fourth Edition), Pearson Education International, Pearson, Prentice Hall, Upper Saddle River, New Jersey.
- Moore, David S. and William I. Notz (2006), Statistics – Concepts and controversies (Sixth edition), W.H. Freeman and Company, New York.

but Agresti is now in the fifth edition (and single authored) and Moore and Notz is in the 10th edition. Basically any recent edition of the books will do. Agresti seems to have gone through more reorganization than Moore and Notz. References to M&N below works for either edition, references to A works for both the fourth and fifth editions. Some material from the fourth edition is missing from the fifth and is referenced as A&F.

There will also be some supplementary material handed out during the course.

Examination

The examination consists of two individual assignments. One shorter assignment (2.5 credits) due on April 19 and one more ambitious in the format of a short research report/journal article (5 credits) due on May 24 with (mandatory) oral presentations on May 30/31.

Outline of the course

We do not have all rooms yet, an updated schedule is available at
https://schema.oru.se/setup/jsp/Schema.jsp?startDatum=2023-02-01&intervallTyp=m&intervallAntal=6&resurser=k.2052-A52200%20KFM13-%2C

Part 1: Statistical Thinking

Date	Activity	Reading
Lecture 1 Feb 7, 13:15-15 P201	Introduction What is Statistics about? Randomness and variability	M&N ch 1-3, A ch 1.
Lecture 2 Feb 14, 13:15-15 P201	Descriptive statistics, data types Data ethics, Measurement, data types, statistical graphs, measures of location and variability	M&N ch 8, 10-13, 17-20, A&F ch 2-4.
Lab 1 Feb 15, 13:15-15 L112	Introduction to Stata, sampling distributions, descriptive statistics	
Lecture 3 Feb 21, 13:15-15 P105	Estimation Point and interval estimation, confidence interval for mean and proportion	M&N ch 21, A ch 5.1-5.4.
Lab 2 Feb 22, 15:15-17 L112	Managing data, estimation	
Lecture 4 Feb 28, 8:15-10 P103	Hypothesis testing The logic of hypothesis testing, tests for mean and proportion	M&N ch 22, A ch 6.
Lab 3 March 2, 13:15-15 L114	Managing data, estimation, hypothesis testing	
Lecture 5 March 8, 13:15-15 P105	Thinking about statistics -- What does it all mean?	M&N ch 4-7, 23. Additional readings will be provided in Blackboard.

Part 2: Analyzing Causal Relationships

Date	Activity	Reading
Lecture 6 March 14, 13:15-15 P105	Causal inference, describing relationships Randomized experiments, observational data, Statistical modelling, Scatter plots, correlation	M&N ch 5, 6, 14, A ch 3.5.
Lab 4 March 15, 13:15-15 L114	Describing relationships	
Lecture 7 March 21, 15:15-17 P105	Simple statistical models Comparison of groups, categorical data	M&N ch 24, A ch 7, 8 except starred sections.
Lab 5 March 22, 13:15-15 L114	Analyzing relationships	

Lecture 8 March 28, 15:15-17 P103	Linear Regression The linear regression model, interpretation and inference, model building and diagnostics	M&N ch 15, A ch 9-11, 14 except starred sections.
Lecture 9 April 11 TBA	Regression continued	
Lab 6 April 12, 13:15-17 L114	Regression	
April 19	Assignment 1 due	

Part 3: Statistical Analysis Methods

Social Science Track

Lecture 10 April 18 TBA	ANOVA One-way and Two-way ANOVA, relationship with regression	A ch 12-13 except starred sections.
Lecture 11 April 25 TBA	Nonparametric methods Sign test, Wilcoxon, Mann-Whitney, Spearman rank correlation	A 7.7, 8.5, (A&F 4th ed 8.6) , NCT ch 13 (in Blackboard)
Lab 7 April 26, 13:15-15 L114	ANOVA, non-parametrics	
Lecture 12 May 2 TBA	Factor analysis Introduction to factor analysis, interpretation, rotations, PCA	A&F ch 16.5 (4th ed) + additional material in Blackboard.
Lecture 13 May 9 TBA	Latent variables and unobservable constructs Latent (unobservable) constructs, observable indicator (discrete choice), many constructs (confirmatory FA, a hint of SEM)	A ch 15.1-15.3, A&F ch 16.6 + additional material in Blackboard.
Lab 8 May 10, 15:15-17 L114	Factor analysis, latent variables	
May 24	Assignment 2 due	
May 30/31 TBA	Seminar, presentation of assignment 2	

Computer Science Track

April 18 – May 29	Online lectures on data pre-processing, linear regression, linear classification, evaluation, clustering, neural networks, feature transformation, feature selection, bias-variance trade off, practical recommendations, and ensemble learning	Task: Self-study with study questions to hand in
May 29	Assignment 2 due	Task: Binary classification exercise
May 30	Seminar, presentation of assignment 2	Location: Online