The Hebrew University of Jerusalem

Syllabus

Regression and Statistical Models - 52571

Last update 19-04-2024

HU Credits: 6

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Statistics

Academic year: 2025

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: Mt. Scopus

Course/Module Coordinator: Dr. Asaf Weinstein

Coordinator Email: asaf.weinstein@mail.huji.ac.il

Coordinator Office Hours: Sundays 15:00-16:00

Teaching Staff:

Dr. Asaf Weinstein,
Mr. Niv Brosh

Course/Module description:
1. Simple and multiple linear regression
2. Analysis of variance
3. Random effects models

Course/Module aims:
To build foundations for statistical inference in some basic linear models

Learning outcomes - On successful completion of this module, students should be able to:
1. Understand the theory behind the methods studied
2. Apply the methods studied in the lectures
3. Understand analyses that use the methods studied in the lectures

Attendance requirements(%):
None

Teaching arrangement and method of instruction: Chalkboard, with occasional demonstration of computer analysis outputs. In addition, instructor course notes will update during the semester and will be available on the course website

Course/Module Content:
1. Simple linear regression, single explanatory variable. The least squares method
2. Multiple linear regression. Poperties of the least squares estimator and geometric interpretation. Projections
3. Probability background. Expectation of a random vector and covariance matrix of a random vector. The multivariate normal distribution
4. Statistical inference in multiple linear regression. Expectation and covariance of the least squares estimator, error variance estimation, the Gauss-Markov theorem, hypothesis testing and confidence interval for a single coefficient an for a linear combination
5. Practical aspects and diagnostics. Residual analysis, multicollinearity, influence metrics
6. Constructing a multiple linear regression model. Initial analysis, dummy variables, interactions, transformations, variable selection, goodness-of-fit measures

7. F-test for comparing two nested models
8. One-way and two-way analysis of variance
9. Random effects models
10. Logistic regression (if time permits)

Required Reading:
Coures notes

Additional Reading Material:
1. Weisberg, S. (1980). Applied Linear Regression
2. Freedman, D. A. (2009). Statistical models: theory and practice
3. Faraway, J. J. (2002). Practical regression and ANOVA using R
4. Ravishanker, N. & Dey, D. K. (2020). A first course in linear model theory
5. Searle, S.R., McCulloch, C.E. & Neuhaus, J.M. (2011).
6. Generalized, linear, and mixed models
7. Scheffe, H. (1999). The analysis of variance

Grading Scheme:
Written / Oral / Practical Exam 70 %
Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 10 %
Mid-terms exams 20 %

Additional information:
** must pass final exam to pass the course*

** Midterm is MAGEN, but mandatory.*

** Homework: every assignment will be graded 0 (fail), 7 (pass) or 10 (excellent), based on a randomly chosen question. Every student is allowed to skip one assignment without penalty.*