

Wollo University
College of Natural Science
Department of Statistics

Course Titles/Code: Statistical Computing II
(Stat2022)
Credit: 5 EtCTS
Credit hours: 3hrs (2hrs lect +3 hrs Laboratory)
Module title/code: Statistical Computing
(MStat2021)

Course Type: Core
Prerequisite(s):
Academic Year: 2019/ 2020
Year: II
Semester: II
Instructor's Name: Leykun Get.

Course description

Introduction to R; Simple manipulations; Objects; Data storage and Management; Probability distributions; Grouping, loops and conditional execution; Writing functions; Statistical models in R; Graphical procedures; Overview of the SAS language and simple procedures for graphing and data analysis.

Objectives

- To introduce the R language to students as environment to understand and explore statistics;
- To introduce SAS for statistical data analysis.

Learning outcomes

At the end of this course, students are expected to:

- load, manipulate, and use data in R,
- run basic models,
- perform matrix algebra in R,
- write simple functions and programs in R,
- program maximum likelihood estimators,
- carryout simulation for estimation and hypothesis test,
- install packages and use them for upper-level methods,
- draw graphs using the base and lattice graphics packages,
- use the R software for statistical computation and analysis,
- use resources about R to look-up more information about it.
- use SAS to carry out simple graphs and data analysis.

Course Outline

1. Introduction to R (5 lecture hours)

- 1.1. The R environment
- 1.2. Getting started with R and the online help system
- 1.3. Commands and execution
- 1.4. Simple manipulation
 - 1.4.1. Vectors; Generating sequences; ObjEtCTS
 - 1.4.2. Data storage and Management
 - 1.4.3. Arrays, Matrices, Lists, Data frames; Reading data

2. Probability and Sampling Distributions (6 lecture hours)

- 2.1 R as a set of statistical tables
- 2.2 Examining the distribution of a set of data
- 2.3 Simulating the Sample Distribution of the Mean
- 2.4 One and two sample tests

3. **Writing Functions (4 lecture hours)**
 - 3.1. Grouping, loops and conditional execution
 - 3.2. Writing functions
 - 3.3. Simple examples
 - 3.4. Binary operators
 - 3.5. More advanced examples
4. **Graphical procedures (4 lecture hours)**
 - 4.1. Plotting commands
 - 4.2. Graphics Parameters
5. **Statistical Models in R (9 lecture hours)**
 - 5.1. Regression
 - 5.2. ANOVA models
 - 5.3. Time Series models
6. **Introduction to SAS (4 lecture hours)**
 - 6.1. SAS Language
 - 6.2. Overview of SAS
 - 6.2.1. Accessing and Exiting SAS; Getting Help; Data Step; SAS Constants
 - 6.2.2. Variables, and Expressions; Input and Output
 - 6.2.3. SAS Procedures for Data Analysis PROC FREQ, PROC MEANS, PROC CORR, PROC REG
 - 6.2.4. SAS Procedures for Graphing PROC PLOT, PROC GPLOT, PROC CHART, PROC GCHART

Textbooks

1. Venables W. N., Smith D. M. and the R Development Core Team (2017). An Introduction to R, Version 3.4.3 (2017-11-30). (Available with software under the menu help- manuals -in pdf)
2. Venables W.N. and Ripley B. D (2002). Modern Applied Statistics (4th Edition). Springer, New York.
3. Base SAS (2006). Base SAS 9.1.3 Procedures Guide, Second Edition, volumes 1-4, SAS Publishing.

References

1. Dalgaard, P. (2002). Introductory Statistics with R. Springer-Verlag, New York
2. Rizzo M. L (2008). Statistical Computing with R. Chapman & Hall/CRC.
3. Maindonald, J. and Braum, J. (2003). Data Analysis and Graphics using R: an Example-based Approach. Cambridge University Press.
4. Fox, J. (2002). An R and S-PLUS Companion to Applied Regression. Sage Books.
5. Spector, P. (1994). An Introduction to S and S-PLUS. Duxbury Press.
6. Becker R. A., Chambers J. M. and. Wilks A. R (1988). The New S Language. Chapman & Hall, New York.
7. Chambers J. M. and Hastie T. J. eds. (1992). Statistical Models in S. Chapman & Hall, New York.
8. Chambers J. M. (1998). Programming with Data. A Guide to the S Language. Springer-Verlag.
9. R Project, "What is R?" (<http://www.r-project.org/about.html>).
10. Horton N. J., Brown E. R., and Qian L. (2004). Use of R as a Toolbox for Mathematical Statistics Exploration. The American Statistician, Vol. 58, No. 4
11. Base SAS 9.1.3 Procedures Guide (2nd Edition). Volumes 1-4, SAS publishing.

Teaching methods

Lecture; Reading Assignment; Practice of simulation and analysis using R and SAS software.
Discussions, demonstration and assignments.

Mode of Assessment and Evaluation

Tests /Practical tests	30%
Assignments and/or computer lab reports	30%
Final Exam (practical and written)	40%
Total	100%