

Department	VI – Informatics and Media / <i>Informatik und Medien</i>
Degree level	Master's
Degree program	Data Science / <i>Data Science</i>
Type of instruction	Seminar plus computer exercises
Credits	5
Availability	Winter semester
Hours/week	4

Module Number	M03
English/German Title	Statistical Computing / Statistical Computing
Credit Points	5 credits
Workload	150 hours: <ul style="list-style-type: none"> • Class attendance 3 h/w during the semester lecture period: 51 hours • Independent study: 99 hours
Subject Coverage	Subject-specific specialization
Learning Objectives / Outcomes	The students acquire statistical knowledge regarding the interplay between the processing of data-analysis questions, the application of statistical methods in suitable statistical software as well as the theoretical formulation of the methods employed. Students gain sound knowledge in statistical programming.
Prerequisites	Recommendation: Fundamentals of Mathematics in Bachelor's degree
Level	1st semester
Type of Module	Seminar plus computer exercises
Status	Required module
Semester when Offered	Winter semester
Method of Assessment / Type(s) of Examination	The method of assessment / type(s) of examination must be defined by the lecturer within the deadline determined in §19 (2) RSPO. Should the deadline pass without determination of the form of assessment in the module, the following method of assessment / type of examination applies: Examination 60%, exercises 40%. The examination must be passed to complete this module successfully.
Determination of the Grade	See study and examination regulations
Equivalent Modules	Modules of comparable contents
Contents	<p>The contents of this module's statistics are conveyed directly on the basis of its implementation in a suitable statistical programming environment such as the software of environment R (cf. www.r-project.org).</p> <p>Basics of Statistical Programming</p> <ul style="list-style-type: none"> • Elementary data types, vectors, matrices, data matrices, lists • Important operators, control structures, definition of functions • Reading and writing data records • Vector-oriented and matrix-oriented programming • Model formulation in R • Iterative algorithms optimization of single and multi-dimensional functions with the aid of optimization routines

	<p>Descriptive Statistics</p> <ul style="list-style-type: none"> • Data collection and data preparation, characteristic types • Descriptions of individual characteristics: absolute and relative frequency distribution, classical graphical representations and key figures (e. g. bar chart, box plot, histogram, position and scattering measurements such as mean value, median, mode, variance, interquartile distance, span) • Correlation of two or more characteristics: contingency tables and suitable key figures, correlation coefficients (Bravais-Pearson, Spearman), simple linear regression, graphical representations for correlations between two characteristics (e. g. multidimensional and stacked bar charts, scatter diagrams) <p>Concepts of Inductive Statistics</p> <ul style="list-style-type: none"> • Limit value records for statistics • Parameter and interval estimation • Statistical hypothesis tests • Application of hypothesis tests using concrete examples: interpretation of the results of independence tests in contingency tables, mean-value comparisons, significance of parameters in the linear regression model
Reading List	<p>Crawley, M.J.: The R Book. Wiley Fahrmeir, L.; Künstler, R.; Pigeot, I.; Tutz, G.: Statistik - Der Weg zur Datenanalyse. Springer Ligges, U: Programmieren mit R. Springer Matloff, N.: The Art of R Programming. No Starch Press Wollschläger, D.: Grundlagen der Datenanalyse mit R. Springer Zucchini, W.; Schlegel, A.; Nenadic, O.; Sperlich, S.: Statistik für Bachelor- und Masterstudenten. Springer</p>
Further Information	This module is offered in English.