Curriculum „Quantitative Methods“

Winter term 2023/2024

Note: This plan might be adjusted according to situation. In particular content of exercises and tutorials might be adjusted according to situation and need.

(25.7.2023, U. Berger)

Week	Lecture	Subject	Lect.
Week 1	*R-Kurs 1*	Getting started with R Intro to the data project	RR / KH
Week 1	Lect 1	**1 Intro & Describing data**: Types of data, summarising and visualising data	UB
Week 1	Lect 2	**1 Intro & Describing data**: Types of data, summarising and visualising data	UB
Week 1	Lect 3	**2 Theory of probabilities**: Probability, rules and Bayes' rule	UB
Week 1	Lect 4	**3.1 Theory of distributions and sampling**: Random variables and distributions, …	UB
Week 1	*Exercise 1*	(Intro to the data project) Maths, Types of data, visualising data	SB
Week 1	*Tutorial 1*	Types of data, types of stat. methods	JM
Week 2	*R-Kurs 2*	Descriptives: Mean & SD, median & quantiles, plots …	RR / KH
Week 2	*Tutorial 2*	Average and SD, median, modal, IQ; Probability, Bayes Rule	JM
Week 2	*Exercise 2*	Average and SD, median, modal, IQ, Boxplot; Probability, Bayes Rule	SB
Week 2	Lect 5	**3.1 Theory of distributions and sampling**: …, central limit theorem and sampling	UB
Week 2	Lect 6	**3.2 Theory of distributions:** Theoretical distributions (Normal, Binomial, Poisson)	UB
Week 2	Lect 7	**4.1 Principles of estimation:** The Likelihood Concept, ML Estimation for p, mu, sigma	UB
Week 3	*R-Kurs 3*	Constructing variables and random variables and plotting them, Histograms with NN	RR / KH
Week 3	*Tutorial 3*	Normal distribution table, distrib. of mean (CLT), Confidence intervals	JM
Week 3	*Exercise 3*	Normal distribution table, distrib. of mean (CLT), types of distributions	SB

Week	Lecture	Subject	Lect.
Week 3	Lect 8	**4.2 Principles of statistical analysis**: CI	UB
Week 3	Lect 9	**5 Principles of statistical analysis**: Hypothesis testing and p-values	UB
Week 3	Lect 10	**6 Comparing groups - continuous data** Parametric tests (t-tests, F-test)	UB
Week 4	*R-Kurs 4*	Confidence intervals (with explanation!)	RR / KH
Week 4	*Tutorial 4*	Confidence intervals and tests (p-value, hypotheses, T-test)	CY
Week 4	*Exercise 4*	Confidence intervals (interpretation, link to estimation)	SB
Week 4	Lect 11	**6 Comparing groups - continuous data** Parametric tests (t-tests, F-test)	UB
Week 4	Lect 12	**9 Comparing groups:** Non-parametric tests (Sign test, Wilcoxon, Mann-Whitney U test)	SB
Week 5	*R-Kurs 5*	Testing continuous data, (compare to CIs)	RR / KH
Week 5	*Tutorial 5*	Testing (p-value, hypotheses, T-test, F-test)	CY
Week 5	*Exercise 5*	Testing continuous data, (T-tests, F-test)	SB
Week 5	Lect 13	**7 Comparing groups - discrete data**: Z-test, CI for rates, Chi-Square test, Fischer Test, McNemar Test	UB
Week 6	*R-Kurs 6*	Testing discrete data (Chi²-test, z-test, McNemar), non-parametric tests Sample size (t test and z test) and multiple testing	RR / KH
Week 6	*Tutorial 6*	Testing discrete data (Chi²-test, z-test, McNemar), Sample size (t test and z test) and multiple testing	CY
Week 6	*Exercise 6*	Testing discrete data (Chi²-test, z-test, McNemar), Sample size (t test and z test) and multiple testing	SB
Week 6	Lect 14	**8 Comparing groups:** Sample size (t test and z test) and multiple testing	UB
Week 6	Lect 15	**10 Modelling:** Correlation (Pearson and Spearman)	UB
Week 6	Lect 16	**11 Modelling:** Simple and multiple linear regression, estimation and prediction	UB
Week 7	*R-Kurs 7*	Correlation (Linear Regression)	RR / KH
Week 7	*Tutorial 7*	Correlation Univariate Linear Regression (Link of R^2 and Corr)	CY

Week	Lecture	Subject	Lect.
Week 7	*Exercise 7*	Correlation, Linear Regression and model selection	SB
Week 7	Lect 17	**11 Modelling:** Simple and multiple linear regression, estimation and prediction	UB
Week 7	Lect 18	**12 Model Diagnosis:** R^2 and Goodness of Fit, Likelihood und Deviance, LR test, Wald-test, Criteria (AIC/BIC), Selection strategies	UB
Week 8	*R-Kurs 8*	Linear Regression and model selection	RR / KH
Week 8	*Tutorial 8*	Multiple Linear Regression and model selection	CY
Week 8	*Exercise 8*	Linear Regression and model selection	SB
Week 8	Lect 19	**13 Modelling:** Logistic Regression	UB
Week 8	Lect 20	**14 Modelling:** Generalised Linear Models, Poisson Regression	UB
Week 8	*Exercise 9*	Logistic Regression	SB
Week 8	*Tutorial 9*	Logistic Regression and Poisson Regression and GLM	CY
Week 8	*Tutorial 10*	Logistic Regression and GLM	CY
Week 9	*R-Kurs 9*	Logistic Regression	RR / KH
Week 9	*Exercise 10*	GLM, Logistic Regression	SB
Week 9	*Exercise 11*	**Repetition**	SB
Week 9	*Tutorial 11*	**Repetition**	CY
Week 10	*R-Kurs 10*	Wrap-up	RR / KH
Week 10	Lect +	**Repetition**	UB
Week 10	**Data Project**	**Deadline: 22.12.2023**	
10.1.2023	**QM-Exam**		**UB**