

1. Record Nr.	UNISA996466409003316
Autore	Kauermann Goran
Titolo	Statistical foundations, reasoning and inference : for science and data science / / by Goran Kauermann, Helmut Kuchenhoff, Christian Heumann
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-69827-0
Descrizione fisica	1 online resource (361 pages)
Collana	Springer series in statistics
Disciplina	519.5
Soggetti	Mathematical statistics Estadística matemàtica Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Preface -- Contents -- 1 Introduction -- 1.1 General Ideas -- 1.2 Databases, Samples and Biases -- 2 Background in Probability -- 2.1 Random Variables and Probability Models -- 2.1.1 Definitions of Probability -- 2.1.2 Independence, Conditional Probability, BayesTheorem -- 2.1.3 Random Variables -- 2.1.4 Common Distributions -- 2.1.5 Exponential Family Distributions -- 2.1.6 Random Vectors and Multivariate Distributions -- 2.2 Limit Theorems -- 2.3 Kullback-Leibler Divergence -- 2.4 Exercises -- 3 Parametric Statistical Models -- 3.1 Likelihood and Bayes -- 3.2 Parameter Estimation -- 3.2.1 Bayes Estimation -- 3.2.2 Maximum Likelihood Estimation -- 3.2.3 Method of Moments -- 3.2.4 Loss Function Approach -- 3.2.5 Kullback-Leibler Loss -- 3.3 Sufficiency and Consistency, Efficiency -- 3.3.1 Sufficiency -- 3.3.2 Consistency -- 3.3.3 Cramer-Rao Bound -- 3.4 Interval Estimates -- 3.4.1 Confidence Intervals -- 3.4.2 Credibility Interval -- 3.5 Exercises -- 4 Maximum Likelihood Inference -- 4.1 Score Function and Fisher Information -- 4.2 Asymptotic Normality -- 4.3 Numerical Calculation of ML Estimate -- 4.4 Likelihood-Ratio -- 4.5 Exercises -- 5 Bayesian Statistics -- 5.1 Bayesian Principles -- 5.2 Selecting a Prior Distribution -- 5.2.1 Jeffrey's Prior -- 5.2.2 Empirical Bayes -- 5.2.3 Hierarchical Prior -- 5.3

Integration Methods for the Posterior -- 5.3.1 Numerical Integration --
5.3.2 Laplace Approximation -- 5.3.3 Monte Carlo Approximation --
5.4 Markov Chain Monte Carlo (MCMC) -- 5.5 Variational Bayes -- 5.6
Exercises -- 6 Statistical Decisions -- 6.1 The Idea of Testing -- 6.2
Classical Tests -- 6.2.1 t-Test -- 6.2.2 Wald Test -- 6.2.3 Score Test
-- 6.2.4 Likelihood-Ratio Test -- 6.3 Power of a Test and Neyman-
Pearson Test -- 6.4 Goodness-of-Fit Tests -- 6.4.1 Chi-Squared
Goodness-of-Fit Test -- 6.4.2 Kolmogorov-Smirnov Test.
6.5 Tests on Independence -- 6.5.1 Chi-Squared Test of Independence
-- 6.5.2 Fisher's Exact Test -- 6.5.3 Correlation-Based Tests -- 6.6 p-
Value, Confidence Intervals and Test -- 6.6.1 The p-Value -- 6.6.2
Confidence Intervals and Tests -- 6.7 Bayes Factor -- 6.8 Multiple
Testing -- 6.9 Significance and Relevance -- 6.9.1 Significance in Large
Samples -- 6.9.2 Receiver Operating Characteristics -- 6.10 Exercises
-- 7 Regression -- 7.1 Linear Model -- 7.1.1 Simple Linear Model --
7.1.2 Multiple Linear Model -- 7.1.3 Bayesian Inference in the Linear
Model -- 7.2 Weighted Regression -- 7.3 Quantile Regression -- 7.4
Nonparametric Smooth Models -- 7.5 Generalised Linear Models -- 7.6
Case Study in Generalised Additive Models -- 7.7 Exercises -- 8
Bootstrapping -- 8.1 Nonparametric Bootstrap -- 8.1.1 Motivation --
8.1.2 Empirical Distribution Function and the Plug-In Principle -- 8.1.3
Bootstrap Estimate of a Standard Error -- 8.1.4 Bootstrap Estimate of a
Bias -- 8.2 Parametric Bootstrap -- 8.3 Bootstrap in Regression Models
-- 8.4 Theory and Extension of Bootstrapping -- 8.4.1 Theory of the
Bootstrap -- 8.4.2 Extensions of the Bootstrap -- 8.4.3 Subsampling
-- 8.5 Bootstrapping the Prediction Error -- 8.5.1 Prediction Error --
8.5.2 Cross Validation Estimate of the Prediction Error -- 8.5.3
Bootstrapping the Prediction Error -- 8.6 Bootstrap Confidence
Intervals and Hypothesis Testing -- 8.6.1 Bootstrap Confidence
Intervals -- 8.6.2 Testing -- 8.7 Sampling from Data -- 8.8 Exercises
-- 9 Model Selection and Model Averaging -- 9.1 Akaike Information
Criterion -- 9.1.1 Maximum Likelihood in Misspecified Models -- 9.1.2
Derivation of AIC -- 9.1.3 AIC for Model Comparison -- 9.1.4
Extensions and Modifications -- Bias-Corrected AIC -- The Bayesian
Information Criterion -- Deviance Information Criterion -- Cross
Validation -- 9.2 AIC/BIC Model Averaging.
9.3 Inference After Model Selection -- 9.4 Model Selection with Lasso
-- 9.5 The Bayesian Model Selection -- 9.6 Exercises -- 10 Multivariate
and Extreme Value Distributions -- 10.1 Multivariate Normal
Distribution -- 10.1.1 Parameterisation -- 10.1.2 Graphical Models --
10.1.3 Principal Component Analysis -- 10.2 Copulas -- 10.2.1 Copula
Construction -- 10.2.2 Common Copula Models -- Gaussian and
Elliptical Copulas -- Archimedean Copula -- Pair Copula -- 10.2.3 Tail
Dependence -- 10.3 Statistics of Extremes -- 10.4 Exercises -- 11
Missing and Deficient Data -- 11.1 Missing Data -- 11.1.1 Missing
Data Mechanisms -- 11.1.2 EM Algorithm -- 11.1.3 Multiple
Imputation -- 11.1.4 Censored Observations -- 11.1.5 Omitting
Variables (Simpson's Paradox) -- 11.2 Biased Data -- 11.3 Quality
Versus Quantity -- 11.4 Measurement and Measurement Error --
11.4.1 Theory of Measurement -- 11.4.2 Effect of Measurement Error
in Regression -- 11.4.3 Correction for Measurement Error in
LinearRegression -- 11.4.4 General Strategies for Measurement Error
Correction -- 11.5 Exercises -- 12 Experiments and Causality -- 12.1
Design of Experiments -- 12.1.1 Experiment Versus Observational Data
-- 12.1.2 ANOVA -- 12.1.3 Block Designs -- 12.1.4 More Complex
Designs -- 12.2 Instrumental Variables -- 12.3 Propensity Score
Matching -- 12.4 Directed Acyclic Graphs (DAGs) -- 12.5 Exercises --
References -- Index.
