

| | |
|-------------------------|--|
| 1. Record Nr. | UNINA9910633928903321 |
| Autore | Alvo Mayer |
| Titolo | Statistical inference and machine learning for big data // Mayer Alvo |
| Pubbl/distr/stampa | Cham, Switzerland : , : Springer, , [2022] ©2022 |
| ISBN | 9783031067846 9783031067839 |
| Descrizione fisica | 1 online resource (442 pages) |
| Collana | Springer series in the data sciences |
| Disciplina | 005.7 |
| Soggetti | Big data Machine learning Mathematical statistics Dades massives Aprentatge automàtic 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 -- Acknowledgments -- Contents -- List of Acronyms -- List of Nomenclatures -- List of Figures -- List of Tables -- I. Introduction to Big Data -- 1. Examples of Big Data -- 1.1. Multivariate Data -- 1.2. Categorical Data -- 1.3. Environmental Data -- 1.4. Genetic Data -- 1.5. Time Series Data -- 1.6. Ranking Data -- 1.7. Social Network Data -- 1.8. Symbolic Data -- 1.9. Image Data -- II. Statistical Inference for Big Data -- 2. Basic Concepts in Probability -- 2.1. Pearson System of Distributions -- 2.2. Modes of Convergence -- 2.3. Multivariate Central Limit Theorem -- 2.4. Markov Chains -- 3. Basic Concepts in Statistics -- 3.1. Parametric Estimation -- 3.2. Hypothesis Testing -- 3.3. Classical Bayesian Statistics -- 4. Multivariate Methods -- 4.1. Matrix Algebra -- 4.2. Multivariate Analysis as a Generalization of Univariate Analysis -- 4.2.1. The General Linear Model -- 4.2.2. One Sample Problem -- 4.2.3. Two- Sample Problem -- 4.3. Structure in Multivariate Data Analysis -- 4.3.1. |

Principal Component Analysis -- 4.3.2. Factor Analysis -- 4.3.3.
Canonical Correlation -- 4.3.4. Linear Discriminant Analysis -- 4.3.5.
Multidimensional Scaling -- 4.3.6. Copula Methods -- 5.
Nonparametric Statistics -- 5.1. Goodness-of-Fit Tests -- 5.2. Linear
Rank Statistics -- 5.3. U Statistics -- 5.4. Hoeffding's Combinatorial
Central Limit Theorem -- 5.5. Nonparametric Tests -- 5.5.1. One-
Sample Tests of Location -- 5.5.2. Confidence Interval for the Median
-- 5.5.3. Wilcoxon Signed Rank Test -- 5.6. Multi-Sample Tests --
5.6.1. Two-Sample Tests for Location -- 5.6.2. Multi-Sample Test for
Location -- 5.6.3. Tests for Dispersion -- 5.7. Compatibility -- 5.8.
Tests for Ordered Alternatives -- 5.9. A Unified Theory of Hypothesis
Testing -- 5.9.1. Umbrella Alternatives -- 5.9.2. Tests for Trend in
Proportions -- 5.10. Randomized Block Designs.
5.11. Density Estimation -- 5.11.1. Univariate Kernel Density
Estimation -- 5.11.2. The Rank Transform -- 5.11.3. Multivariate
Kernel Density Estimation -- 5.12. Spatial Data Analysis -- 5.12.1.
Spatial Prediction -- 5.12.2. Point Poisson Kriging of Areal Data --
5.13. Efficiency -- 5.13.1. Pitman Efficiency -- 5.13.2. Application of
Le Cam's Lemmas -- 5.14. Permutation Methods -- 6. Exponential
Tilting and Its Applications -- 6.1. Neyman Smooth Tests -- 6.2.
Smooth Models for Discrete Distributions -- 6.3. Rejection Sampling --
6.4. Tweedie's Formula: Univariate Case -- 6.5. Tweedie's Formula:
Multivariate Case -- 6.6. The Saddlepoint Approximation and Notions
of Information -- 7. Counting Data Analysis -- 7.1. Inference for
Generalized Linear Models -- 7.2. Inference for Contingency Tables --
7.3. Two-Way Ordered Classifications -- 7.4. Survival Analysis -- 7.4.1.
Kaplan-Meier Estimator -- 7.4.2. Modeling Survival Data -- 8. Time
Series Methods -- 8.1. Classical Methods of Analysis -- 8.2. State
Space Modeling -- 9. Estimating Equations -- 9.1. Composite
Likelihood -- 9.2. Empirical Likelihood -- 9.2.1. Application to One-
Sample Ranking Problems -- 9.2.2. Application to Two-Sample Ranking
Problems -- 10. Symbolic Data Analysis -- 10.1. Introduction -- 10.2.
Some Examples -- 10.3. Interval Data -- 10.3.1. Frequency -- 10.3.2.
Sample Mean and Sample Variance -- 10.3.3. Realization In SODAS --
10.4. Multi-nominal Data -- 10.4.1. Frequency -- 10.5. Symbolic
Regression -- 10.5.1. Symbolic Regression for Interval Data -- 10.5.2.
Symbolic Regression for Modal Data -- 10.5.3. Symbolic Regression in
SODAS -- 10.6. Cluster Analysis -- 10.7. Factor Analysis -- 10.8.
Factorial Discriminant Analysis -- 10.9. Application to Parkinson's
Disease -- 10.9.1. Data Processing -- 10.9.2. Result Analysis --
10.9.2.1. Viewer -- 10.9.2.2. Descriptive Statistics.
10.9.2.3. Symbolic Regression Analysis -- 10.9.2.4. Symbolic
Clustering -- 10.9.2.5. Principal Component Analysis -- 10.9.3.
Comparison with Classical Method -- 10.10. Application to
Cardiovascular Disease Analysis -- 10.10.1. Results of the Analysis --
10.10.2. Comparison with the Classical Method -- III. Machine Learning
for Big Data -- 11. Tools for Machine Learning -- 11.1. Regression
Models -- 11.2. Simple Linear Regression -- 11.2.1. Least Squares
Method -- 11.2.2. Statistical Inference on Regression Coefficients --
11.2.3. Verifying the Assumptions on the Error Terms -- 11.3. Multiple
Linear Regression -- 11.3.1. Multiple Linear Regression Model --
11.3.2. Normal Equations -- 11.3.3. Statistical Inference on Regression
Coefficients -- 11.3.4. Model Fit Evaluation -- 11.4. Regression in
Machine Learning -- 11.4.1. Optimization for Linear Regression in
Machine Learning -- 11.4.1.1. Gradient Descent -- 11.4.1.2. Feature
Standardization -- 11.4.1.3. Computing Cost on a Test Set -- 11.5.
Classification Models -- 11.5.1. Logistic Regression -- 11.5.1.1.
Optimization with Maximal Likelihood for Logistic Regression --

11.5.1.2. Statistical Inference -- 11.5.2. Logistic Regression for Binary Classification -- 11.5.2.1. Kullback-Leibler Divergence -- 11.5.3. Logistic Regression with Multiple Response Classes -- 11.5.4. Regularization for Regression Models in Machine Learning -- 11.5.4.1. Ridge Regression -- 11.5.4.2. Lasso Regression -- 11.5.4.3. The Choice of Regularization Method -- 11.5.5. Support Vector Machines (SVM) -- 11.5.5.1. Introduction -- 11.5.5.2. Finding the Optimal Hyperplane -- 11.5.5.3. SVM for Nonlinearly Separable Data Sets -- 11.5.5.4. Illustrating SVM -- 12. Neural Networks -- 12.1. Feed-Forward Networks -- 12.1.1. Motivation -- 12.1.2. Introduction to Neural Networks -- 12.1.3. Building a Deep Feed-Forward Network. 12.1.4. Learning in Deep Networks -- 12.1.4.1. Quantitative Model -- 12.1.4.2. Binary Classification Model -- 12.1.5. Generalization -- 12.1.5.1. A Machine Learning Approach to Generalization -- 12.2. Recurrent Neural Networks -- 12.2.1. Building a Recurrent Neural Network -- 12.2.2. Learning in Recurrent Networks -- 12.2.3. Most Common Design Structures of RNNs -- 12.2.4. Deep RNN -- 12.2.5. Bidirectional RNN -- 12.2.6. Long-Term Dependencies and LSTM RNN -- 12.2.7. Reduction for Exploding Gradients -- 12.3. Convolution Neural Networks -- 12.3.1. Convolution Operator for Arrays -- 12.3.1.1. Properties of the Convolution Operator -- 12.3.2. Convolution Layers -- 12.3.3. Pooling Layers -- 12.4. Text Analytics -- 12.4.1. Introduction -- 12.4.2. General Architecture -- IV. Computational Methods for Statistical Inference -- 13. Bayesian Computation Methods -- 13.1. Data Augmentation Methods -- 13.2. Metropolis-Hastings Algorithm -- 13.3. Gibbs Sampling -- 13.4. EM Algorithm -- 13.4.1. Application to Ranking -- 13.4.2. Extension to Several Populations -- 13.5. Variational Bayesian Methods -- 13.5.1. Optimization of the Variational Distribution -- 13.6. Bayesian Nonparametric Methods -- 13.6.1. Dirichlet Prior -- 13.6.2. The Poisson-Dirichlet Prior -- 13.6.3. Simulation of Bayesian Posterior Distributions -- 13.6.4. Other Applications -- Bibliography -- Index.
