

1. Record Nr.	UNISA996503552003316
Autore	Rotondi Alberto
Titolo	Probability, statistics and simulation : with application programs written in R // Alberto Rotondi, Paolo Pedroni, and Antonio Pievatolo
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2022] ©2022
ISBN	3-031-09429-8
Descrizione fisica	1 online resource (643 pages)
Collana	Unitext ; ; v.139
Disciplina	519.50285
Soggetti	Mathematical statistics R (Computer program language) Estadística matemàtica R (Llenguatge de programació) 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 -- How to Use the Text -- Contents -- About the Authors -- 1 Probability -- 1.1 Chance, Chaos and Determinism -- 1.2 Some Basic Terms -- 1.3 The Concept of Probability -- 1.4 Axiomatic Probability -- 1.5 Repeated Trials -- 1.6 Elements of Combinatorial Analysis -- 1.7 Bayes' Theorem -- 1.8 Learning Algorithms -- 1.9 Problems -- 2 Representation of Random Phenomena -- 2.1 Introduction -- 2.2 Random Variables -- 2.3 Cumulative or Distribution Function -- 2.4 Data Representation -- 2.5 Discrete Random Variables -- 2.6 Binomial Distribution -- 2.7 Continuous Random Variables -- 2.8 Mean, Sum of Squares, Variance, Standard Deviation and Quantiles -- 2.9 Operators -- 2.10 Simple Random Sample -- 2.11 Convergence Criteria -- 2.12 Problems -- 3 Basic Probability Theory -- 3.1 Introduction -- 3.2 Properties of the Binomial Distribution -- 3.3 Poisson Distribution -- 3.4 Normal or Gaussian Density -- 3.5 The Three-Sigma Law and the Standard Gaussian Density -- 3.6 Central Limit Theorem and Universality of the Gaussian Curve -- 3.7 Poisson Stochastic Processes -- 3.8 2 Density -- 3.9 Uniform Density -- 3.10 Chebyshev's Inequality -- 3.11 How to Use Probability Calculus -- 3.12

Problems -- 4 Multivariate Probability Theory -- 4.1 Introduction --
4.2 Multivariate Statistical Distributions -- 4.3 Covariance and
Correlation -- 4.4 Two-Dimensional Gaussian Distribution -- 4.5 The
General Multidimensional Case -- 4.6 Multivariate Probability Regions
-- 4.7 Multinomial Distribution -- 4.8 Problems -- 5 Functions of
Random Variables -- 5.1 Introduction -- 5.2 Functions of a Random
Variable -- 5.3 Functions of Several Random Variables -- 5.4 Mean and
Variance Transformation -- 5.5 Means and Variances for n Variables --
5.6 Problems -- 6 Basic Statistics: Parameter Estimation -- 6.1
Introduction -- 6.2 Confidence Intervals.
6.3 Confidence Intervals with Pivotal Variables -- 6.4 Mention of the
Bayesian Approach -- 6.5 Some Notations -- 6.6 Probability Estimation
-- 6.7 Probability Estimation from Large Samples -- 6.8 Poissonian
Interval Estimation -- 6.9 Mean Estimation from Large Samples -- 6.10
Variance Estimation from Large Samples -- 6.11 Mean and Variance
Estimation for Gaussian Samples -- 6.12 How to Use the Estimation
Theory -- 6.13 Estimates from a Finite Population -- 6.14 Histogram
Analysis -- 6.15 Estimation of the Correlation -- 6.16 Problems -- 7
Basic Statistics: Hypothesis Testing -- 7.1 Testing One Hypothesis --
7.2 The Gaussian z-Test -- 7.3 Student's t-Test -- 7.4 Chi-Square Test
-- 7.5 Compatibility Check Between Sample and Population -- 7.6
Hypothesis Testing with Contingency Tables -- 7.7 Multiple Tests --
7.8 Snedecor's F-Test -- 7.9 Analysis of Variance (ANOVA) -- 7.10
Two-Way ANOVA -- 7.11 Problems -- 8 Monte Carlo Methods -- 8.1
Introduction -- 8.2 What Is Monte Carlo? -- 8.3 Mathematical Aspects
-- 8.4 Generation of Discrete Random Variables -- 8.5 Generation of
Continuous Random Variables -- 8.6 Linear Search Method -- 8.7
Rejection Method -- 8.8 Particular Random Generation Methods -- 8.9
Monte Carlo Analysis of Distributions -- 8.10 Evaluation of Confidence
Intervals -- 8.11 Simulation of Counting Experiments -- 8.12 Non-
parametric Bootstrap -- 8.13 Hypothesis Test with Simulated Data --
8.14 Problems -- 9 Applications of Monte Carlo Methods -- 9.1
Introduction -- 9.2 Study of Diffusion Phenomena -- 9.3 Simulation of
Stochastic Processes -- 9.4 Number of Workers in a Plant: Synchronous
Simulation -- 9.5 Number of Workers in a Plant: Asynchronous
Simulation -- 9.6 Kolmogorov-Smirnov Test -- 9.7 Metropolis
Algorithm -- 9.8 Ising Model -- 9.9 Definite Integral Calculation --
9.10 Importance Sampling -- 9.11 Stratified Sampling.
9.12 Multidimensional Integrals -- 9.13 Problems -- 10 Statistical
Inference and Likelihood -- 10.1 Introduction -- 10.2 Maximum
Likelihood (ML) Method -- 10.3 Estimator Properties -- 10.4 Theorems
on Estimators -- 10.5 Confidence Intervals -- 10.6 Least Squares
Method and Maximum Likelihood -- 10.7 Best Fit of Densities to Data
and Histograms -- 10.8 Weighted Mean -- 10.9 Test of Hypotheses --
10.10 One- or Two-Sample Tests -- 10.11 Most Powerful Tests --
10.12 Test Functions -- 10.13 Sequential Tests -- 10.14 Problems --
11 Least Squares -- 11.1 Introduction -- 11.2 No Errors on Predictors
-- 11.3 Errors in Predictors -- 11.4 Least Squares Regression Lines:
Unweighted Case -- 11.5 Unweighted Linear Least Squares -- 11.6
Weighted Linear Least Squares -- 11.7 Properties of Least Squares
Estimates -- 11.8 Model Testing and Search for Functional Forms --
11.9 Search for Correlations -- 11.10 Fit Strategies -- 11.11 Nonlinear
Least Squares -- 11.12 Problems -- 12 Experimental Data Analysis --
12.1 Introduction -- 12.2 Terminology -- 12.3 Constant and Variable
Physical Quantities -- 12.4 Instrumental Sensitivity and Accuracy --
12.5 Measurement Uncertainty -- 12.6 Treatment of Systematic Effects
-- 12.7 Best Fit with Offset Systematic Errors -- 12.8 Best Fit with Scale
Systematic Errors -- 12.9 Indirect Measurements and Error Propagation

-- 12.10 Measurement Types -- 12.11 $M(0, 0,)$ Measurements --
12.12 $M(0, , 0)$ Measurements -- 12.13 $M(0, ,)$ Measurements
-- 12.14 $M(f, 0, 0)$ Measurements -- 12.15 $M(f, , 0), M(f, 0,)$
and $M(f, ,)$ Measurements -- 12.16 A Case Study: Millikan's
Experiments -- 12.17 Some Remarks on the Scientific Method -- 12.18
Problems -- A Table of Symbols -- B R Software -- C Moment-
Generating Functions -- D Solutions of Problems -- E Tables -- E.1
Integral of the Gaussian Density.
E.2 Quantiles of the Student's Density -- E.3 Integrals of the Reduced
 χ^2 Density -- E.4 Quantile Values of the Non-Reduced χ^2 Density -- E.
5 Quantiles of the F Density -- Bibliography -- Index.
