An Introduction To Applied Geostatistics

Few books on statistical data analysis in the natural sciences are written at a level that a non-statistician will easily understand. This is a book written in colloquial language, avoiding mathematical formulae as much as possible, trying to explain statistical methods using examples and graphics instead. To use the book efficiently, readers should have some computer experience. The book starts with the simplest of statistical concepts and carries readers forward to a deeper and more extensive understanding of the use of statistics in environmental sciences. The book concerns the application of statistical and other computer methods to the management, analysis and display of spatial data. These data are characterised by including locations (geographic coordinates), which leads to the necessity of using maps to display the data and the results of the statistical methods. Although the book uses examples from applied geochemistry, and a large geochemical survey in particular, the principles and ideas equally well apply to other natural sciences, e.g., environmental sciences, pedology, hydrology, geography, forestry, ecology, and health sciences/epidemiology. The book is unique because it supplies direct access to software solutions (based on R, the Open Source version of the S-language for statistics) for applied environmental statistics. For all graphics and tables presented in the book, the R-scripts are provided in the form of executable R-scripts. In addition, a graphical user interface for R, called DAS+R, was developed for convenient, fast and interactive data analysis. Statistical Data Analysis Explained: Applied Environmental Statistics with R provides, on an accompanying website, the software to undertake all the procedures discussed, and the data employed for their description in the book.
Geostatistics for Engineers and Earth Scientists
Geocomputation with R is for people who want to analyze, visualize and model geographic data with open source software. It is based on R, a statistical programming language that has powerful data processing, visualization, and geospatial capabilities. The book equips you with the knowledge and skills to tackle a wide range of issues manifested in geographic data, including those with scientific, societal, and environmental implications. This book will interest people from many backgrounds, especially Geographic Information Systems (GIS) users interested in applying their domain-specific knowledge in a powerful open source language for data science, and R users interested in extending their skills to handle spatial data. The book is divided into three parts: (I) Foundations, aimed at getting you up-to-speed with geographic data in R, (II) extensions, which covers advanced techniques, and (III) applications to real-world problems. The chapters cover progressively more advanced topics, with early chapters providing strong foundations on which the later chapters build. Part I describes the nature of spatial datasets in R and methods for manipulating them. It also covers geographic data import/export and transforming coordinate reference systems. Part II represents methods that build on these foundations. It covers advanced map making (including web mapping), "bridges" to GIS, sharing reproducible code, and how to do cross-validation in the presence of spatial autocorrelation. Part III applies the knowledge gained to tackle real-world problems, including representing and modeling transport systems, finding optimal locations for stores or services, and ecological modeling. Exercises at the end of each chapter give you the skills needed to tackle a range of geospatial problems. Solutions for each chapter and supplementary materials providing extended examples are available at https://geocompr.github.io/geocompkg/articles/. Dr. Robin Lovelace is a University Academic Fellow at the University of Leeds, where he has taught R for geographic research over many years, with a focus on transport systems. Dr. Jakub Nowosad is an Assistant Professor in the Department of Geoinformation at the Adam Mickiewicz

University in Poznan, where his focus is on the analysis of large datasets to understand environmental processes. Dr. Jannes Muenchow is a Postdoctoral Researcher in the GIScience Department at the University of Jena, where he develops and teaches a range of geographic methods, with a focus on ecological modeling, statistical geocomputing, and predictive mapping. All three are active developers and work on a number of R packages, including stplanr, sabre, and RQGIS.

An introduction to geostatistics stressing the multivariate aspects for scientists, engineers and statisticians. The book presents a brief review of statistical concepts, a detailed introduction to linear geostatistics, and an account of three basic methods of multivariate analysis. Applications from very different areas of science, as well as exercises with solutions, are provided to help convey the general ideas. In this second edition, the chapters regarding normal kriging and cokriging have been restructured and the section on non-stationary geostatistics has been entirely rewritten.

Model-based Geostatistics

Geostatistics for Engineers and Earth Scientists

Applied Geostatistics with SGeMS

Theory and Applications for Geographic Information Science and Technology

Basic Steps in Geostatistics: The Variogram and Kriging

An Introduction to Statistical Learning

Earth science is becoming increasingly quantitative in the digital age. Quantification of geoscience and engineering problems underpins many of the applications of big data and artificial intelligence. This book presents quantitative geosciences in three parts. Part 1 presents data analytics using probability, statistical and machine-learning methods. Part 2 covers reservoir characterization using several geoscience disciplines: including geology, geophysics, petrophysics and geostatistics. Part 3 treats reservoir modeling, resource evaluation and uncertainty analysis using integrated geoscience, engineering and geostatistical methods. As the petroleum industry is heading towards operating oil fields digitally, a multidisciplinary skillset is a must for geoscientists who need to use data analytics to resolve inconsistencies in various sources of data, model reservoir properties, evaluate uncertainties, and quantify risk for decision making. This book intends to serve as a bridge for advancing the multidisciplinary integration for digital fields. The goal is to move beyond using quantitative methods individually to an integrated descriptive-quantitative analysis. In big data, everything tells us something, but nothing tells us everything. This book emphasizes the integrated, multidisciplinary solutions for practical problems in resource evaluation and field development.

Handbook of Probabilistic Models carefully examines the application of advanced probabilistic models in conventional engineering fields. In this comprehensive handbook, practitioners, researchers and scientists will find detailed explanations of technical concepts, applications of the proposed methods, and the respective scientific approaches needed to solve the problem. This book provides an interdisciplinary approach that creates advanced probabilistic models for engineering fields, ranging from conventional fields of mechanical engineering and civil engineering, to electronics, electrical, earth sciences, climate, agriculture, water resource, mathematical sciences and computer sciences. Specific topics covered include minimax probability machine regression, stochastic finite element method, relevance vector machine, logistic regression, Monte Carlo simulations, random matrix, Gaussian process regression, Kalman filter, stochastic optimization, maximum likelihood, Bayesian inference, Bayesian

update, kriging, copula-statistical models, and more. Explains the application of advanced probabilistic models encompassing multidisciplinary research Applies probabilistic modeling to emerging areas in engineering Provides an interdisciplinary approach to probabilistic models and their applications, thus solving a wide range of practical problems

This second edition is extensively revised throughout with expanded discussion of modeling fundamentals and coverage of advances in model calibration and uncertainty analysis that are revolutionizing the science of groundwater modeling. The text is intended for undergraduate and graduate level courses in applied groundwater modeling and as a comprehensive reference for environmental consultants and scientists/engineers in industry and governmental agencies. Explains how to formulate a conceptual model of a groundwater system and translate it into a numerical model Demonstrates how modeling concepts, including boundary conditions, are implemented in two groundwater flow codes-- MODFLOW (for finite differences) and FEFLOW (for finite elements) Discusses particle tracking methods and codes for flowpath analysis and advective transport of contaminants Summarizes parameter estimation and uncertainty analysis approaches using the code PEST to illustrate how concepts are implemented Discusses modeling ethics and preparation of the modeling report Includes Boxes that amplify and supplement topics covered in the text Each chapter presents lists of common modeling errors and problem sets that illustrate concepts Understanding spatial statistics requires tools from applied and mathematical statistics, linear model theory, regression, time series, and stochastic processes. It also requires a mindset that focuses on the unique characteristics of spatial data and the development of specialized analytical tools designed explicitly for spatial data analysis. Statistical Methods for Spatial Data Analysis answers the demand for a text that incorporates all of these factors by presenting a balanced exposition that explores both the theoretical foundations of the field of spatial statistics as well as practical methods for the analysis of spatial data. This book is a comprehensive and illustrative treatment of basic statistical theory and methods for spatial data analysis, employing a model-based and frequentist approach that emphasizes the spatial domain. It introduces essential tools and approaches including: measures of autocorrelation and their role in data analysis; the background and theoretical framework supporting random fields; the analysis of mapped spatial point patterns; estimation and modeling of the covariance function and semivariogram; a comprehensive treatment of spatial analysis in the spectral domain; and spatial prediction and kriging. The volume also delivers a thorough analysis of spatial regression, providing a detailed development of linear models with uncorrelated errors, linear models with spatially-correlated errors and generalized linear mixed models for spatial data. It succinctly discusses Bayesian hierarchical models and concludes with reviews on simulating random fields, non-stationary covariance, and spatio-temporal processes. Additional material on the CRC Press website supplements the content of this book. The site provides data sets used as examples in the text, software code that can be used to implement many of the principal methods described and illustrated, and updates to the text itself.

Geostatistics for Compositional Data with R

Geostatistics Explained

Geostatistics with Data of Different Support Applied to Mining Engineering

Multivariate Geostatistics

Stochastic Modeling and Geostatistics
An Introduction with Applications

The Stanford Geostatistical Modeling Software (SGeMS) is an open-source computer package for solving problems involving spatially related variables. It provides geostatistics practitioners with a user-friendly interface, an interactive 3-D visualization, and a wide selection of algorithms. This practical book provides a step-by-step guide to using SGeMS algorithms. It explains the underlying theory, demonstrates their implementation, discusses their potential limitations, and helps the user make an informed decision about the choice of one algorithm over another. Users can complete complex tasks using the embedded scripting language, and new algorithms can be developed and integrated through the SGeMS plug-in mechanism. SGeMS was the first software to provide algorithms for multiple-point statistics, and the book presents a discussion of the corresponding theory and applications. Incorporating the full SGeMS software (now available from www.cambridge.org/9781107403246), this book is a useful user-guide for Earth Science graduates and researchers, as well as practitioners of environmental mining and petroleum engineering.

In this introductory text the authors demonstrate how simple statistical methods can be used to analyze earth science data. In clear language, they explain how various forms of the estimation method called kriging can be employed for specific problems. The book highlights an instructive case study of a simulated deposit. This model helps students develop an understanding of how statistical tools work in real situations, and serves as a tutorial guide to help the reader through what may be their first independent geostatistical study. Though the authors have avoided mathematical formalism, the presentation is not simplistic and readers should be familiar with basic calculus and be able to find the minimum of a function by using the first derivative.

This volume contains 40 selected full-text contributions from the Sixth European Conference on Geostatistics for Environmental Applications, geoENV IV, held in Rhodes, Greece, October 25-26, 2006. The objective of the editors was to compile a set of papers from which the reader could perceive how geostatistics is applied within the environmental sciences. A few selected theoretical contributions are also included.

Applied Mineral Inventory Estimation presents a comprehensive applied approach to the estimation of mineral resources/reserves with particular emphasis on the geological basis of such estimations, the need for and maintenance of a high quality assay data base, the practical use of a comprehensive

exploratory data evaluation, and the importance of a
comprehensive geostatistical approach to the estimation
methodology. Practical problems and real data are used
throughout as illustrations: each chapter ends with a summary of
practical concerns, a number of practical exercises and a short
list of references for supplementary study. This textbook is
suitable for any university or mining school that offers senior
undergraduate and graduate student courses on mineral
resource/reserve estimation. It will also be valuable for
professional mining engineers, geological engineers and
geologists working with mineral exploration and mining
companies.
Geostatistics for Environmental Scientists
Mineral Resource Estimation
Fundamentals of Geostatistics in Five Lessons
Statistical Methods for Spatial Data Analysis
Applied Groundwater Modeling
Theory of Spatial Statistics

This book explains the integration of data of different support in Geostatistics.
There is a common misconception in the mining industry that the data used for
estimation/simulation should have the same size or support. However, Geostatis
provides the tools to integrate several types of information that may have diffe
support. This book aims to explain these geostatistical tools and provides sever
examples of applications. The book is directed for a broad audience, including
engineers, geologists, and students in the area of Geostatistics.
The contributions in this book were presented at the Fourth International
Geostatistics Congress held in Tróia, Portugal, in September 1992. They provide
comprehensive account of the current state of the art of geostatistics, includir
recent theoretical developments and new applications. In particular, readers wil
find descriptions and applications of the more recent methods of stochastic
simulation together with data integration techniques applied to the modelling o
hydrocabon reservoirs. In other fields there are stationary and non-stationary
geostatistical applications to geology, climatology, pollution control, soil scienc
hydrology and human sciences. The papers also provide an insight into new tren
in geostatistics particularly the increasing interaction with many other scientifi
disciplines. This book is a significant reference work for practitioners of geosta
both in academia and industry.
Model-based Geostatistics for Global Public Health: Methods and Applications
provides an introductory account of model-based geostatistics, its implementat
open-source software and its application in public health research. In the public
health problems that are the focus of this book, the authors describe and expla
pattern of spatial variation in a health outcome or exposure measurement of
interest. Model-based geostatistics uses explicit probability models and establis
principles of statistical inference to address questions of this kind. Features:

Presents state-of-the-art methods in model-based geostatistics. Discusses the application these methods some of the most challenging global public health problems including disease mapping, exposure mapping and environmental epidemiology. Describes exploratory methods for analysing geostatistical data, including: diagnostic checking of residuals standard linear and generalized linear models; variogram analysis; Gaussian process models and geostatistical design issues. Includes a range of more complex geostatistical problems where researc ongoing. All of the results in the book are reproducible using publicly available R code and data-sets, as well as a dedicated R package. This book has been writt be accessible not only to statisticians but also to students and researchers in public health sciences. The Authors Peter Diggle is Distinguished University Professor of Statistics in the Faculty of Health and Medicine, Lancaster Univers He also holds honorary positions at the Johns Hopkins University School of Pub Health, Columbia University International Research Institute for Climate and Society, and Yale University School of Public Health. His research involves the development of statistical methods for analyzing spatial and longitudinal data a their applications in the biomedical and health sciences. Dr Emanuele Giorgi is a Lecturer in Biostatistics and member of the CHICAS research group at Lancaste University, where he formerly obtained a PhD in Statistics and Epidemiology in 2015. His research interests involve the development of novel geostatistical me for disease mapping, with a special focus on malaria and other tropical diseases 2018, Dr Giorgi was awarded the Royal Statistical Society Research Prize "for outstanding published contribution at the interface of statistics and epidemiolo He is also the lead developer of PrevMap, an R package where all the methodol found in this book has been implemented.

This volume shows how sophisticated spatial statistical and computational met apply to a range of problems of increasing importance for applications in scienc and technology. It introduces topics of current interest in spatial and computat statistics, which should be accessible to postgraduate students as well as to experienced statistical researchers.

Applied Stochastic Hydrogeology
Applied Mining Geology
Simulation of Flow and Advective Transport
Volume 1 & 2
A User's Guide

A reader-friendly introduction to geostatistics for students and researchers struggling with statistics. Using simple, clear explanations for introductory and advanced material, it demystifies complex concepts and makes formulas and statistical tests easy to apply. Beginning with a critical evaluation of experimental and sampling design, the book moves on to explain essential concepts of probability, statistical significance and type 1 and type 2 error. An accessible graphical explanation of analysis of variance (ANOVA) leads onto advanced ANOVA designs, correlation and regression, and non-parametric tests including chi-square. Finally, it introduces the essentials of multivariate techniques, multi-dimensional scaling and

cluster analysis, analysis of sequences and concepts of spatial analysis. Illustrated with wide-ranging examples from topics across the Earth and environmental sciences, Geostatistics Explained can be used for undergraduate courses or for self-study and reference. Worked examples at the end of each chapter reinforce a clear understanding of the statistical tests and their applications.

This volume is the first book-length treatment of model-based geostatistics. The text is expository, emphasizing statistical methods and applications rather than the underlying mathematical theory. Analyses of datasets from a range of scientific contexts feature prominently, and simulations are used to illustrate theoretical results. Readers can reproduce most of the computational results in the book by using the authors' software package, geoR, whose usage is illustrated in a computation section at the end of each chapter. The book assumes a working knowledge of classical and Bayesian methods of inference, linear models, and generalized linear models.

Mineral resource estimation has changed considerably in the past 25 years: geostatistical techniques have become commonplace and continue to evolve; computational horsepower has revolutionized all facets of numerical modeling; mining and processing operations are often larger; and uncertainty quantification is becoming standard practice. Recent books focus on historical methods or details of geostatistical theory. So there is a growing need to collect and synthesize the practice of modern mineral resource estimation into a book for undergraduate students, beginning graduate students, and young geologists and engineers. It is especially fruitful that this book is written by authors with years of relevant experience performing mineral resource estimation and with years of relevant teaching experience. This comprehensive textbook and reference fills this need.

This successful text has been extensively revised to cover new algorithms and applications.
Methods and Applications
Geostatistics with Applications in Earth Sciences
A Concise Introduction
Geostatistics Tróia '92
Introduction to Geostatistics
Applied Environmental Statistics with R
This brief will provide a bridge in succinct form between the geostatistics textbooks and the computer manuals for `push-button' practice. It is becoming increasingly important for practitioners, especially neophytes, to understand what underlies modern geostatistics and the currently available software so that they can choose sensibly and draw correct conclusions from their analysis and mapping. The brief will contain some theory, but only that needed for practitioners to understand the essential steps in analyses. It will guide readers sequentially through the stages of properly designed sampling, exploratory data analysis, variography (computing the variogram and modelling it), followed by ordinary kriging and finally mapping kriged estimates and their errors. There will be short section on trend and universal kriging. Other types of kriging will be mentioned so that readers can delve further in the substantive literature to tackle more complex tasks.
An Introduction to Statistical Learning provides an accessible overview of the field of statistical learning, an essential toolset for making sense of the vast and complex data sets that have emerged in fields ranging from biology to finance to marketing to astrophysics in the past twenty years. This book presents some of the most important modeling and prediction techniques, along with relevant applications. Topics include linear regression, classification, resampling methods, shrinkage approaches, tree-based methods, support vector machines, clustering, and more. Color graphics and real-world examples are used to illustrate the methods presented. Since the goal of this

textbook is to facilitate the use of these statistical learning techniques by practitioners in science, industry, and other fields, each chapter contains a tutorial on implementing the analyses and methods presented in R, an extremely popular open source statistical software platform. Two of the authors co-wrote The Elements of Statistical Learning (Hastie, Tibshirani and Friedman, 2nd edition 2009), a popular reference book for statistics and machine learning researchers. An Introduction to Statistical Learning covers many of the same topics, but at a level accessible to a much broader audience. This book is targeted at statisticians and non-statisticians alike who wish to use cutting-edge statistical learning techniques to analyze their data. The text assumes only a previous course in linear regression and no knowledge of matrix algebra.

This book provides a guided approach to the geostatistical modelling of compositional spatial data. These data are data in proportions, percentages or concentrations distributed in space which exhibit spatial correlation. The book can be divided into four blocks. The first block sets the framework and provides some background on compositional data analysis. Block two introduces compositional exploratory tools for both non-spatial and spatial aspects. Block three covers all necessary facets of multivariate spatial prediction for compositional data: variogram modelling, cokriging and validation. Finally, block four details strategies for simulation of compositional data, including transformations to multivariate normality, Gaussian cosimulation, multipoint simulation of compositional data, and common postprocessing techniques, valid for both Gaussian and multipoint methods. All methods are illustrated via applications to two types of data sets: one a large-scale geochemical survey, comprised of a full suite of geochemical variables, and the other from a mining context, where only the elements of greatest importance are considered. R codes are included for all aspects of the methodology, encapsulated in the R package "gmGeostats", available in CRAN.

The high-level language of R is recognized as one of the most powerful and flexible statistical software environments, and is rapidly becoming the standard setting for quantitative analysis, statistics and graphics. R provides free access to unrivalled coverage and cutting-edge applications, enabling the user to apply numerous statistical methods ranging from simple regression to time series or multivariate analysis. Building on the success of the author's bestselling Statistics: An Introduction using R, The R Book is packed with worked examples, providing an all inclusive guide to R, ideal for novice and more accomplished users alike. The book assumes no background in statistics or computing and introduces the advantages of the R environment, detailing its applications in a wide range of disciplines. Provides the first comprehensive reference manual for the R language, including practical guidance and full coverage of the graphics facilities. Introduces all the statistical models covered by R, beginning with simple classical tests such as chi-square and t-test. Proceeds to examine more advance methods, from regression and analysis of variance, through to generalized linear models, generalized mixed models, time series, spatial statistics, multivariate statistics and much more. The R Book is aimed at undergraduates, postgraduates and professionals in science, engineering and medicine. It is also ideal for students and professionals in statistics, economics, geography and the social sciences.

Applied Geostatistics
Solved Problems in Geostatistics
Spatial Statistics and Geostatistics
geoENV VI – Geostatistics for Environmental Applications
Geostatistical Reservoir Modeling
Statistical Data Analysis Explained

An Introduction to Applied GeostatisticsApplied Geostatistics
GIS and Geostatistical Techniques for Groundwater Science provides a detailed synthesis of the application of GIS and geostatistics in groundwater studies. As the book illustrates, GIS can be a powerful tool for developing solutions for water resource problems, assessing water quality, and managing water resources. Beginning with an introduction to the history of GIS and geostatistical techniques in groundwater studies, the book then describes various spatial techniques, including case studies for various applications, from quality assessment, to resource management. This book assembles the most up-to-date techniques in GIS and geostatistics as they relate to groundwater, one of our most important natural resources. Provides details on the application of GIS and statistics in groundwater studies Includes practical coverage of the use of spatial analysis techniques in groundwater science Bridges the gap between geostatistics and GIS as it relates to groundwater science and management Offers worldwide case studies to illustrate various techniques and applications in addressing groundwater issues This text fulfills a need for an advanced-level work covering both the theory and application of geostatistics. It covers the most important areas of geostatistical methodology, introducing tools for description, quantitative modeling of spatial continuity, spatial prediction, and assessment of local uncertainty and stochastic simulation. It also details the theoretical background underlying most GSLIB programs. The tools are applied to an environmental data set, but the book includes a general presentation of algorithms intended for students and practitioners in such diverse fields as soil science, mining, petroleum, remote sensing, hydrogeology, and the environmental sciences.
Geostatistics is expanding very fast: concept- and technique-wise. Keeping in view the importance of the subject, it was thought appropriate to bring out the second edition of this book. In this process, Chapter I has been expanded In Chapter 2, incorporating more details on sampling and sampling designs. a section on simulation has been introduced with emphasis on Monte-Carlo simulation with worked out examples. In Chapter 5, a procedure to compute variogram in the case of irregular grid has been outlined. Minor modifications have been made in all other chapters. A new chapter on Introduction to Advanced Geostatistics has been introduced with discussions on universal kriging, disjunctive kriging, conditional simulation and median polish kriging. Review Questions are given at the end of each chapter to facilitate a better understanding of the subject by the student/practitioner. The

software codes are put in a CD for convenience of the students/practitoner of geostatistics. A few additions have been made in the bibliography making it more exhaustive. This contains references to the concepts and methods presented, in-depth treatment of related topics and possible extensions. My grateful thanks are due to Dr. B.S. Saini, Principal, Guru Nanak Engg. College, Hyderabad for very helpful support. I hope that this edition will be a welcome one.

with Applications in R
The R Book
Applications in Hydrogeology
An Introductory Guide for Earth Scientists
Variowin
An Introduction to Applied Geostatistics

Geostatistics is essential for environmental scientists. Weather and climate vary from place to place, soil varies at every scale at which it is examined, and even man-made attributes - such as the distribution of pollution - vary. The techniques used in geostatistics are ideally suited to the needs of environmental scientists, who use them to make the best of sparse data for prediction, and top plan future surveys when resources are limited. Geostatistical technology has advanced much in the last few years and many of these developments are being incorporated into the practitioner's repertoire. This second edition describes these techniques for environmental scientists. Topics such as stochastic simulation, sampling, data screening, spatial covariances, the variogram and its modeling, and spatial prediction by kriging are described in rich detail. At each stage the underlying theory is fully explained, and the rationale behind the choices given, allowing the reader to appreciate the assumptions and constraints involved. Stochastic Subsurface Hydrogeology is the study of subsurface, geological heterogeneity, and its effects on flow and transport process, using probabilistic and geostatistical concepts. This book presents a rational, systematic approach for analyzing and modeling subsurface heterogeneity, and for modeling flow and transport in the subsurface, and for prediction and decision-making under uncertainty. The book covers the fundamentals and practical aspects of geostatistics and stochastic hydrogeology, coupling theoretical and practical aspects, with examples, case studies and guidelines for applications, and provides a summary and review of the major developments in these areas. Univariate description. Bivariate description. Spatial description. Data sets. Estimation. Random function models. Global estimation. Point estimation. Ordinary kriging. Block

kriging. Search strategy. Cross validation. Cokriging. Estimating a distribution. Change of support. Assessing uncertainty. Final thoughts.

1.1 Overview V ARIOWIN 2.2 is a collection of four WindowsTM programs - Prevar2D, Vari02D with PCF, Model, and Grid Display - that are used for spatial data analysis and variogram modeling of irregularly spaced data in two dimensions. Prevar2D builds a pair comparison file (PCF), that is, a binary file containing pairs of data sorted in terms of increasing distance. Pair comparison files can be built from subsets in order to reduce memory requirements. Vari02D with PCF is used for spatial data analysis of 2D data. It uses an ASCII data file and a binary pair comparison file produced by Prevar2D. Features implemented in Vari02D with PCF include: • the possibility to characterize the spatial continuity of one variable or the joined spatial continuity of two variables, • variogram surfaces for identifying directions of anisotropies, • directional variograms calculated along any direction, • several measures of spatial continuity. Not only the variogram but also the standardized variogram, the covariance, the correlogram, and the madogram are used to measure spatial continuity. • h-scatterplots to assess the meaning of these measures, • the identification and localization of pairs of data adversely affecting the measure of spatial continuity. Once identified, these pairs can be masked from the calculation interactively. • variogram clouds for identifying pairs of data values having the most influence on the measure of spatial continuity. Those pairs can also be located on the sample map.

Model-based Geostatistics for Global Public Health
Handbook of Probabilistic Models
Spatial Statistics and Computational Methods
Principles, Methods, and Case Studies, Vol. II, AAPG Computer Applications in Geology 5
GIS and Geostatistical Techniques for Groundwater Science
Applied Mineral Inventory Estimation

"Ideal for anyone who wishes to gain a practical understanding of spatial statistics and geostatistics. Difficult concepts are well explained and supported by excellent examples in R code, allowing readers to see how each of the methods is implemented in practice" - Professor Tao Cheng, University College London Focusing specifically on spatial statistics and including components for ArcGIS, R, SAS and WinBUGS, this book illustrates the use of basic spatial statistics and geostatistics, as well as the spatial filtering techniques used in all relevant programs and software. It explains and demonstrates techniques in: spatial sampling spatial autocorrelation local statistics spatial interpolation in two-dimensions advanced topics including Bayesian methods, Monte Carlo simulation, error and uncertainty. It is a systematic overview of the fundamental spatial statistical methods used by applied researchers in geography, environmental science, health and epidemiology, population and demography, and

planning. A companion website includes digital R code for implementing the analyses in specific chapters and relevant data sets to run the R codes.

This unique book presents a learn-by-doing introduction togeostatistics. Geostatistics provides the essential numerical tools foraddressing research problems that are encountered in fields ofstudy such as geology, engineering, and the earth sciences.Illustrating key methods through both theoretical and practicalexercises, Solved Problems in Geostatistics is a valuableand well-organized collection of worked-out problems that allow thereader to master the statistical techniques for modeling data inthe geological sciences. The book's scope of coverage begins with the elements fromstatistics and probability that form the foundation of mostgeostatistical methodologies, such as declustering, debiasingmethods, and Monte Carlo simulation. Next, the authors delve intothree fundamental areas in conventional geostatistics: covarianceand variogram functions; kriging; and Gaussian simulation. Finally,special topics are introduced through problems involving utilitytheory, loss functions, and multiple-point geostatistics. Each topic is treated in the same clearly organized format.First, an objective presents the main concepts that will beestablished in the section. Next, the background and assumptionsare outlined, supplying the comprehensive foundation that isnecessary to begin work on the problem. A solution plandemonstrates the steps and considerations that have to be takenwhen working with the exercise, and the solution allows the readerto check their work. Finally, a remarks section highlights theoverarching principles and noteworthy aspects of the problem. Additional exercises are available via a related Web site, whichalso includes data related to the book problems and softwareprograms that facilitate their resolution. Enforcing a trulyhands-on approach to the topic, Solved Problems inGeostatistics is an indispensable supplement for courses ongeostatistics and spatial statistics a the upper-undergraduate andgraduate levels.It also serves as an applied reference forpracticing professionals in the geosciences.

This book provides a detailed overview of the operational principles of modern mining geology, which are presented as a good mix of theory and practice, allowing use by a broad range of specialists, from students to lecturers and experienced geologists. The book includes comprehensive descriptions of mining geology techniques, including conventional methods and new approaches. The attributes presented in the book can be used as a reference and as a guide by mining industry specialists developing mining projects and for optimizing mining geology procedures. Applications of the methods are explained using case studies and are facilitated by the computer scripts added to the book as Electronic Supplementary Material.

Theory of Spatial Statistics: A Concise Introduction presents the most important models used in spatial statistics, including random fields and point processes, from a rigorous mathematical point of view and shows how to carry out statistical inference. It contains full proofs, real-life examples and theoretical exercises. Solutions to the latter are available in an appendix. Assuming maturity in probability and statistics, these concise lecture notes are self-contained and cover enough material for a semester course. They may also serve as a reference book for researchers. Features * Presents the mathematical foundations of spatial statistics. * Contains worked examples from mining, disease mapping, forestry, soil and environmental science, and criminology. * Gives pointers to the literature to facilitate further study. * Provides example code in R to encourage the student to experiment. * Offers exercises and their solutions to test and deepen understanding. The book is suitable for postgraduate and advanced undergraduate students in mathematics and statistics.

GSLIB

Geostatistical Software Library and User's Guide

Geostatistics for Natural Resources Evaluation

Geocomputation with R

Quantitative Geosciences: Data Analytics, Geostatistics, Reservoir Characterization and Modeling

Software for Spatial Data Analysis in 2D

This presents practical techniques for interpolation and estimation problems when an data from field observations.

Published in 2002, the first edition of Geostatistical Reservoir Modeling brought the of petroleum geostatistics into a coherent framework, focusing on tools, techniques, and guidance. It emphasized the interaction between geophysicists, geologists, and er and was received well by professionals, academics, and both graduate and undergradu students. In this revised second edition, Deutsch collaborates with co-author Michael provide an expanded (in coverage and format), full color illustrated, more comprehens treatment of the subject with a full update on the latest tools, methods, practice, an in the field of petroleum Geostatistics. Key geostatistical concepts such as integratio geologic data and concepts, scale considerations, and uncertainty models receive grea attention, and new comprehensive sections are provided on preliminary geological moc concepts, data inventory, conceptual model, problem formulation, large scale modeling multiple point-based simulation and event-based modeling. Geostatistical methods are extensively illustrated through enhanced schematics, work flows and examples with discussion on method capabilities and selection. For example, this expanded second ec includes extensive discussion on the process of moving from an inventory of data and concepts through conceptual model to problem formulation to solve practical reservo problems. A greater number of examples are included, with a set of practical geostati studies developed to illustrate the steps from data analysis and cleaning to post-proc and ranking. New methods, which have developed in the field since the publication of edition, are discussed, such as models for integration of diverse data sources, multiple based simulation, event-based simulation, spatial bootstrap and methods to summariz geostatistical realizations.