

Process Mining Springer

This book provides a practically applicable guide to the methodologies and technologies for the application of interactive process mining paradigm. Case studies are presented where this paradigm has been successfully applied in emergency medicine, surgery processes, human behavior modelling, strokes and outpatients' services, enabling the reader to develop a deep understanding of how to apply process mining technologies in healthcare to support them in inferring new knowledge from past actions, and providing accurate and personalized knowledge to improve their future clinical decision-making. Interactive Process Mining in Healthcare comprehensively covers how machine learning algorithms can be utilized to create real scientific evidence to improve daily healthcare protocols, and is a valuable resource for a variety of health professionals seeking to develop new methods to improve their clinical decision-making.

This book is written as a practical field manual to effective. Each geologist has to develop his/her own techniques and will ultimately be judged on results, not the process by which these results and reference for students in Applied Geology were reached. In mineral exploration, the only courses of universities and colleges. The book 'right' way of doing anything is the way that aims to outline some of the practical skills that locates ore in the quickest and most cost-effective manner. It is preferable, however, for an individual to develop his/her own method of operation book, rather than as a text on geological or ore deposit theory. procedures which experience has shown to work An explorationist is a professional who search well and which are generally accepted in industry as good exploration practice. es for ore bodies in a scientific and structured way. Although an awkward and artificial term, The chapters of the book approximately follow this is the only available word to describe the low the steps which a typical exploration professional would go through. In Chapter 1, the and define economic mineralization.

LNBIP 99 and LNBIP 100 together constitute the thoroughly refereed proceedings of 12 international workshops held in Clermont-Ferrand, France, in conjunction with the 9th International Conference on Business Process Management, BPM 2011, in August 2011. The 12 workshops focused on Business Process Design (BPD 2011), Business Process Intelligence (BPI 2011), Business Process Management and Social Software (BPMS2 2011), Cross-Enterprise Collaboration (CEC 2011), Empirical Research in Business Process Management (ER-BPM 2011), Event-Driven Business Process Management (edBPM 2011), Process Model Collections (PMC 2011), Process-Aware Logistics Systems (PALS 2011), Process-Oriented Systems in Healthcare (ProHealth 2011), Reuse in Business Process Management (rBPM 2011), Traceability and Compliance of Semi-Structured Processes (TC4SP 2011), and Workflow Security Audit and Certification (WfSAC 2011). In addition, the proceedings also include the Process Mining Manifesto (as an Open Access Paper), which has been jointly developed by more than 70 scientists, consultants, software vendors, and end-users. LNBIP 99 contains the revised and extended papers from BPD 2011, BPI 2011 (including the

Process Mining Manifesto), BPMS2 2011, CEC 2011, ER-BPM 2011, and edBPM 2011.

This textbook covers the entire Business Process Management (BPM) lifecycle, from process identification to process monitoring, covering along the way process modelling, analysis, redesign and automation. Concepts, methods and tools from business management, computer science and industrial engineering are blended into one comprehensive and inter-disciplinary approach. The presentation is illustrated using the BPMN industry standard defined by the Object Management Group and widely endorsed by practitioners and vendors worldwide. In addition to explaining the relevant conceptual background, the book provides dozens of examples, more than 230 exercises – many with solutions – and numerous suggestions for further reading. This second edition includes extended and completely revised chapters on process identification, process discovery, qualitative process analysis, process redesign, process automation and process monitoring. A new chapter on BPM as an enterprise capability has been added, which expands the scope of the book to encompass topics such as the strategic alignment and governance of BPM initiatives. The textbook is the result of many years of combined teaching experience of the authors, both at the undergraduate and graduate levels as well as in the context of professional training. Students and professionals from both business management and computer science will benefit from the step-by-step style of the textbook and its focus on fundamental concepts and proven methods. Lecturers will appreciate the class-tested format and the additional teaching material available on the accompanying website.

This book starts with an introduction to process modeling and process paradigms, then explains how to query and analyze process models, and how to analyze the process execution data. In this way, readers receive a comprehensive overview of what is needed to identify, understand and improve business processes. The book chiefly focuses on concepts, techniques and methods. It covers a large body of knowledge on process analytics – including process data querying, analysis, matching and correlating process data and models – to help practitioners and researchers understand the underlying concepts, problems, methods, tools and techniques involved in modern process analytics. Following an introduction to basic business process and process analytics concepts, it describes the state of the art in this area before examining different analytics techniques in detail. In this regard, the book covers analytics over different levels of process abstractions, from process execution data and methods for linking and correlating process execution data, to inferring process models, querying process execution data and process models, and scalable process data analytics methods. In addition, it provides a review of commercial process analytics tools and their practical applications. The book is intended for a broad readership interested in business process management and process analytics. It provides researchers with an introduction to these fields by comprehensively classifying the current state of research, by describing in-depth techniques and methods, and by highlighting future research directions. Lecturers will find a wealth of material to choose from for a variety of courses, ranging from undergraduate courses in business process management to graduate courses in business process analytics. Lastly, it offers professionals a reference guide to the state of the art in commercial tools and techniques, complemented by many real-world use case scenarios.

What are the possibilities for process mining in hospitals? In this book the authors provide an answer to this question by presenting a healthcare reference model that outlines all the different classes of data that are potentially available for process mining in healthcare and the relationships between them. Subsequently, based on this reference model, they explain the application opportunities for process mining in this domain and discuss the various kinds of analyses that can be performed. They focus on organizational healthcare processes rather than medical treatment processes. The combination of event data and process mining techniques allows them to analyze the operational processes within a hospital based on facts, thus providing a solid basis for managing and improving processes within hospitals. To this end, they also explicitly elaborate on data quality issues that are relevant for the data aspects of the healthcare reference model. This book mainly targets advanced professionals involved in areas related to business process management, business intelligence, data mining, and business process redesign for healthcare systems as well as graduate students specializing in healthcare information systems and process analysis.

"Intelligent Data Mining – Techniques and Applications" is an organized edited collection of contributed chapters covering basic knowledge for intelligent systems and data mining, applications in economic and management, industrial engineering and other related industrial applications. The main objective of this book is to gather a number of peer-reviewed high quality contributions in the relevant topic areas. The focus is especially on those chapters that provide theoretical/analytical solutions to the problems of real interest in intelligent techniques possibly combined with other traditional tools, for data mining and the corresponding applications to engineers and managers of different industrial sectors. Academic and applied researchers and research students working on data mining can also directly benefit from this book. The main goal of this book is to explain the core ideas of process mining, and to demonstrate how they can be implemented using just some basic tools that are available to any computer scientist or data scientist. It describes how to analyze event logs in order to discover the behavior of real-world business processes. The end result can often be visualized as a graph, and the book explains how to use Python and Graphviz to render these graphs intuitively. Overall, it enables the reader to implement process mining techniques on his or her own, independently of any specific process mining tool. An introduction to two popular process mining tools, namely Disco and ProM, is also provided. In this second edition the code snippets have been updated to Python 3, and some smaller errors have been corrected. The book will be especially valuable for self-study or as a precursor to a more advanced text. Practitioners and students will be able to follow along on their own, even if they have no prior knowledge of the topic. After reading this book, they will be able to more confidently proceed to the research literature if needed.

Lying at the crucible of Central Europe, the Silesian village of Kupferberg suffered the violence of the Thirty Years War, the Napoleonic Wars, and World War I. After Stalin's post-World War II redrawing of Poland's borders, Kupferberg became Miedzianka, a town settled by displaced persons from all over Poland and a new center of the Eastern Bloc's uranium-mining industry. Decades of neglect and environmental degradation led to the town being declared uninhabitable, and the population was evacuated. Today, it exists only in ruins, with barely a hundred people living on the unstable ground above its collapsing mines. In this collection of unsparing and insightful reportage, the renowned journalist, photographer, and architecture

critic Filip Springer rediscovers this tiny town's history. Digging beyond the village's mythic foundations and the great wars and world leaders that shaped it, Springer catalogs the lost human elements: the long-departed tailor and deceased shopkeeper; the parties, now silenced, that used to fill the streets with shouts and laughter; and the once-beautiful cemetery, with gravestones upended by tractors and human bones scattered by dogs. In Miedzianka, Springer sees a microcosm of European history, and a powerful narrative of how the ghosts of the past continue to haunt us in the present day.

More and more information about business processes is recorded by information systems in the form of so-called "event logs". Despite the omnipresence of such data, most organizations diagnose problems based on fiction rather than facts. Process mining is an emerging discipline based on process model-driven approaches and data mining. It not only allows organizations to fully benefit from the information stored in their systems, but it can also be used to check the conformance of processes, detect bottlenecks, and predict execution problems. Wil van der Aalst delivers the first book on process mining. It aims to be self-contained while covering the entire process mining spectrum from process discovery to operational support. In Part I, the author provides the basics of business process modeling and data mining necessary to understand the remainder of the book. Part II focuses on process discovery as the most important process mining task. Part III moves beyond discovering the control flow of processes and highlights conformance checking, and organizational and time perspectives. Part IV guides the reader in successfully applying process mining in practice, including an introduction to the widely used open-source tool ProM. Finally, Part V takes a step back, reflecting on the material presented and the key open challenges. Overall, this book provides a comprehensive overview of the state of the art in process mining. It is intended for business process analysts, business consultants, process managers, graduate students, and BPM researchers.

An introduction to the modeling of business information systems, with processes formally modeled using Petri nets. This comprehensive introduction to modeling business-information systems focuses on business processes. It describes and demonstrates the formal modeling of processes in terms of Petri nets, using a well-established theory for capturing and analyzing models with concurrency. The precise semantics of this formal method offers a distinct advantage for modeling processes over the industrial modeling languages found in other books on the subject. Moreover, the simplicity and expressiveness of the Petri nets concept make it an ideal language for explaining foundational concepts and constructing exercises. After an overview of business information systems, the book introduces the modeling of processes in terms of classical Petri nets. This is then extended with data, time, and hierarchy to model all aspects of a process. Finally, the book explores analysis of Petri net models to detect design flaws and errors in the design process. The text, accessible to a broad audience of professionals and students, keeps technicalities to a minimum and offers numerous examples to illustrate the concepts covered. Exercises at different levels of difficulty make the book ideal for independent study or classroom use.

Process Mining Data Science in Action Springer

Liu has written a comprehensive text on Web mining, which consists of two parts. The first part covers the data mining and machine learning foundations, where all the essential concepts and algorithms of data mining and machine learning are presented. The second part covers the key topics of Web mining, where Web crawling, search, social network analysis, structured data extraction, information integration, opinion mining and sentiment analysis, Web usage mining, query log mining, computational advertising, and recommender systems are all treated both in breadth and in depth. His book thus brings all the related concepts and algorithms together to form an authoritative and coherent text. The book offers a rich blend of theory and practice. It is suitable for students, researchers and practitioners interested in Web mining and data mining both as a learning text and as a reference book. Professors can readily use it for

classes on data mining, Web mining, and text mining. Additional teaching materials such as lecture slides, datasets, and implemented algorithms are available online.

Bayesian and Frequentist Regression Methods provides a modern account of both Bayesian and frequentist methods of regression analysis. Many texts cover one or the other of the approaches, but this is the most comprehensive combination of Bayesian and frequentist methods that exists in one place. The two philosophical approaches to regression methodology are featured here as complementary techniques, with theory and data analysis providing supplementary components of the discussion. In particular, methods are illustrated using a variety of data sets. The majority of the data sets are drawn from biostatistics but the techniques are generalizable to a wide range of other disciplines.

This book constitutes revised selected papers from the International Workshops held at the Second International Conference on Process Mining, ICPM 2020, which took place during October 4-9, 2020. The conference was planned to take place in Padua, Italy, but had to be held online due to the COVID-19 pandemic. The conference focuses on the area of process mining research and practice, including theory, algorithmic challenges, and applications. The co-located workshops provided a forum for novel research ideas. The 29 papers included in this volume were carefully reviewed and selected from 59 submissions. They stem from the following workshops: 1st International Workshop on Event Data and Behavioral Analytics (EDBA) 1st International Workshop on Leveraging Machine Learning in Process Mining (ML4PM) 1st International Workshop on Streaming Analytics for Process Mining (SA4PM'20) 5th International Workshop on Process Querying, Manipulation, and Intelligence (PQMI) 3rd International Workshop on Process-Oriented Data Science for Healthcare (PODS4H) 1st International Workshop on Trust and Privacy in Process Analytics (TPPA)

During the past decade there has been an explosion in computation and information technology. With it have come vast amounts of data in a variety of fields such as medicine, biology, finance, and marketing. The challenge of understanding these data has led to the development of new tools in the field of statistics, and spawned new areas such as data mining, machine learning, and bioinformatics. Many of these tools have common underpinnings but are often expressed with different terminology. This book describes the important ideas in these areas in a common conceptual framework. While the approach is statistical, the emphasis is on concepts rather than mathematics. Many examples are given, with a liberal use of color graphics. It should be a valuable resource for statisticians and anyone interested in data mining in science or industry. The book's coverage is broad, from supervised learning (prediction) to unsupervised learning. The many topics include neural networks, support vector machines, classification trees and boosting---the first comprehensive treatment of this topic in any book. This major new edition features many topics not covered in the original, including graphical models, random forests, ensemble methods, least angle regression & path algorithms for the lasso, non-negative matrix factorization, and spectral clustering. There is also a chapter on methods for "wide" data (p bigger than n), including multiple testing and false discovery rates. Trevor Hastie, Robert Tibshirani, and Jerome Friedman are professors of statistics at Stanford University. They are prominent researchers in this area: Hastie and Tibshirani developed generalized additive models and wrote a popular book of that title. Hastie co-developed much of the statistical modeling software and environment in R/S-PLUS and invented principal curves and surfaces. Tibshirani proposed the lasso and is co-author of the very successful *An Introduction to the Bootstrap*. Friedman is the co-inventor of many data-mining tools including CART, MARS, projection pursuit and gradient boosting.

This book constitutes the refereed proceedings of the First International Conference on Data Warehousing and Knowledge Discovery, DaWaK'99, held in Florence, Italy in August/September 1999. The 31 revised full papers and nine short papers presented

were carefully reviewed and selected from 88 submissions. The book is divided in topical sections on data warehouse design; online analytical processing; view synthesis, selection, and optimization; multidimensional databases; knowledge discovery; association rules; indexing and object similarities; generalized association rules and data and web mining; time series data bases; data mining applications and data analysis.

There is broad interest in feature extraction, construction, and selection among practitioners from statistics, pattern recognition, and data mining to machine learning. Data preprocessing is an essential step in the knowledge discovery process for real-world applications. This book compiles contributions from many leading and active researchers in this growing field and paints a picture of the state-of-art techniques that can boost the capabilities of many existing data mining tools. The objective of this collection is to increase the awareness of the data mining community about the research of feature extraction, construction and selection, which are currently conducted mainly in isolation. This book is part of our endeavor to produce a contemporary overview of modern solutions, to create synergy among these seemingly different branches, and to pave the way for developing meta-systems and novel approaches. Even with today's advanced computer technologies, discovering knowledge from data can still be fiendishly hard due to the characteristics of the computer generated data. Feature extraction, construction and selection are a set of techniques that transform and simplify data so as to make data mining tasks easier. Feature construction and selection can be viewed as two sides of the representation problem.

Neoliberalism is easily one of the most powerful discourses to emerge within the social sciences in the last two decades, and the number of scholars who write about this dynamic and unfolding process of socio-spatial transformation is astonishing. Even more surprising though is that there has, until now, not been an attempt to provide a wide-ranging volume that engages with the multiple registers in which neoliberalism has evolved. The Routledge Handbook of Neoliberalism seeks to offer a comprehensive overview of the phenomenon of neoliberalism by examining the range of ways that it has been theorized, promoted, critiqued, and put into practice in a variety of geographical locations and institutional frameworks. With contributions from over 50 leading authors working at institutions around the world the volumes seven sections will offer a systematic overview of neoliberalism's origins, political implications, social tensions, spaces, natures and environments, and aftermaths in addressing ongoing and emerging debates. The volume aims to provide the first comprehensive overview of the field and to advance the established and emergent debates in a field that has grown exponentially over the past two decades, coinciding with the meteoric rise of neoliberalism as a hegemonic ideology, state form, policy and program, and governmentality. It includes a substantive introductory chapter and will serve as an invaluable resource for undergraduates, graduate students, and professional scholars alike.

Data Mining Methods for Knowledge Discovery provides an introduction to the data mining methods that are frequently used in the process of knowledge discovery. This book first elaborates on the fundamentals of each of the data mining methods: rough sets, Bayesian analysis, fuzzy sets, genetic algorithms, machine learning, neural

networks, and preprocessing techniques. The book then goes on to thoroughly discuss these methods in the setting of the overall process of knowledge discovery. Numerous illustrative examples and experimental findings are also included. Each chapter comes with an extensive bibliography. *Data Mining Methods for Knowledge Discovery* is intended for senior undergraduate and graduate students, as well as a broad audience of professionals in computer and information sciences, medical informatics, and business information systems.

This book constitutes the proceedings of the 14th European Conference on Technology Enhanced Learning, EC-TEL 2019, held in Delft, The Netherlands, in September 2019. The 41 research papers and 50 demo and poster papers presented in this volume were carefully reviewed and selected from 149 submissions. The contributions reflect the debate around the role of and challenges for cutting-edge 21st century meaningful technologies and advances such as artificial intelligence and robots, augmented reality and ubiquitous computing technologies and at the same time connecting them to different pedagogical approaches, types of learning settings, and application domains that can benefit from such technologies.

This book offers a comprehensive introduction to workflow management, the management of business processes with information technology. By defining, analyzing, and redesigning an organization's resources and operations, workflow management systems ensure that the right information reaches the right person or computer application at the right time. The book provides a basic overview of workflow terminology and organization, as well as detailed coverage of workflow modeling with Petri nets. Because Petri nets make definitions easier to understand for nonexperts, they facilitate communication between designers and users. The book includes a chapter of case studies, review exercises, and a glossary. A special Web site developed by the authors, www.workflowcourse.com, features animation, interactive examples, lecture materials, exercises and solutions, relevant links, and other valuable resources for the classroom.

This open access book comprehensively covers the fundamentals of clinical data science, focusing on data collection, modelling and clinical applications. Topics covered in the first section on data collection include: data sources, data at scale (big data), data stewardship (FAIR data) and related privacy concerns. Aspects of predictive modelling using techniques such as classification, regression or clustering, and prediction model validation will be covered in the second section. The third section covers aspects of (mobile) clinical decision support systems, operational excellence and value-based healthcare. *Fundamentals of Clinical Data Science* is an essential resource for healthcare professionals and IT consultants intending to develop and refine their skills in personalized medicine, using solutions based on large datasets from electronic health records or telemonitoring programmes. The book's promise is "no math, no code" and will explain the topics in a style that is optimized for a healthcare audience. Process mining techniques can be used to discover, analyze and improve real processes, by extracting models from observed behavior. The aim of this book is conformance checking, one of the main areas of process mining. In conformance checking, existing process models are compared with actual observations of the process in order to assess their quality. Conformance checking techniques are a way to visualize the differences between assumed process represented in the model and the

real process in the event log, pinpointing possible problems to address, and the business process management results that rely on these models. This book combines both application and research perspectives. It provides concrete use cases that illustrate the problems addressed by the techniques in the book, but at the same time, it contains complete conceptualization and formalization of the problem and the techniques, and through evaluations on the quality and the performance of the proposed techniques. Hence, this book brings the opportunity for business analysts willing to improve their organization processes, and also data scientists interested on the topic of process-oriented data science.

This book produces convincing evidence that exploiting the potential of space could help solve many environmental and social issues affecting our planet, such as pollution, overcrowding, resource depletion and conflicts, economic inequality, social unrest, economic instability and unemployment. It also touches on the legal problems that will be encountered with the implementation of the new technologies and new laws that will need to be enacted and new organizations that will need to be formed to deal with these changes. This proposition for a space economy is not science fiction, but well within the remit of current or under development technologies. Numerous technologies are described and put together to form a coherent and feasible road map that, if implemented, could lead humankind towards a brighter future.

This book constitutes the proceedings of the 15th International Conference on Research Challenges in Information Sciences, RCIS 2021, which was planned to take place in Limassol, Cyprus, but had to change to an online event due to the COVID-19 pandemic. The conference took place virtually during May 11-14, 2021. It focused on the special theme "Information Science and Global Crisis". The scope of RCIS is summarized by the thematic areas of information systems and their engineering; user-oriented approaches; data and information management; business process management; domain-specific information systems engineering; data science; information infrastructures, and reflective research and practice. The 29 full papers and 6 work-in-progress papers presented in this volume were carefully reviewed and selected from 99 submissions. They were organized in topical sections named: Business and Industrial Processes, Information Security and Risk Management, Data and Information Management, Domain-specific Information Systems Engineering, User-Centered Approaches, Data Science and Decision Support, and Information Systems and Their Engineering. The volume also contains 13 poster and demo papers, and 4 doctoral consortium papers. In addition, two-page summaries of tutorials and research project papers can be found in the back matter.

After a brief presentation of the state of the art of process-mining techniques, Andrea Burratin proposes different scenarios for the deployment of process-mining projects, and in particular a characterization of companies in terms of their process awareness. The approaches proposed in this book belong to two different computational paradigms: first to classic "batch process mining," and second to more recent "online process mining." The book encompasses a revised version of the author's PhD thesis, which won the "Best Process Mining Dissertation Award" in 2014, awarded by the IEEE Task Force on Process Mining.

Suitable for self study Use real examples and real data sets that will be familiar to the audience Introduction to the bootstrap is included – this is a modern method missing in

many other books

Applied Predictive Modeling covers the overall predictive modeling process, beginning with the crucial steps of data preprocessing, data splitting and foundations of model tuning. The text then provides intuitive explanations of numerous common and modern regression and classification techniques, always with an emphasis on illustrating and solving real data problems. The text illustrates all parts of the modeling process through many hands-on, real-life examples, and every chapter contains extensive R code for each step of the process. This multi-purpose text can be used as an introduction to predictive models and the overall modeling process, a practitioner's reference handbook, or as a text for advanced undergraduate or graduate level predictive modeling courses. To that end, each chapter contains problem sets to help solidify the covered concepts and uses data available in the book's R package. This text is intended for a broad audience as both an introduction to predictive models as well as a guide to applying them. Non-mathematical readers will appreciate the intuitive explanations of the techniques while an emphasis on problem-solving with real data across a wide variety of applications will aid practitioners who wish to extend their expertise. Readers should have knowledge of basic statistical ideas, such as correlation and linear regression analysis. While the text is biased against complex equations, a mathematical background is needed for advanced topics.

While Robotic Process Automation (RPA) has been around for about 20 years, it has hit an inflection point because of the convergence of cloud computing, big data and AI. This book shows you how to leverage RPA effectively in your company to automate repetitive and rules-based processes, such as scheduling, inputting/transferring data, cut and paste, filling out forms, and search. Using practical aspects of implementing the technology (based on case studies and industry best practices), you'll see how companies have been able to realize substantial ROI (Return On Investment) with their implementations, such as by lessening the need for hiring or outsourcing. By understanding the core concepts of RPA, you'll also see that the technology significantly increases compliance – leading to fewer issues with regulations – and minimizes costly errors. RPA software revenues have recently soared by over 60 percent, which is the fastest ramp in the tech industry, and they are expected to exceed \$1 billion by the end of 2019. It is generally seamless with legacy IT environments, making it easier for companies to pursue a strategy of digital transformation and can even be a gateway to AI. The Robotic Process Automation Handbook puts everything you need to know into one place to be a part of this wave. What You'll Learn Develop the right strategy and plan Deal with resistance and fears from employees Take an in-depth look at the leading RPA systems, including where they are most effective, the risks and the costs Evaluate an RPA system Who This Book Is For IT specialists and managers at mid-to-large companies

This is the second edition of Wil van der Aalst's seminal book on process mining, which now discusses the field also in the broader context of data science and big data approaches. It includes several additions and updates, e.g. on inductive mining techniques, the notion of alignments, a considerably expanded section on software tools and a completely new chapter of process mining in the large. It is self-contained, while at the same time covering the entire process-mining spectrum from process discovery to predictive analytics. After a general introduction to data science and

process mining in Part I, Part II provides the basics of business process modeling and data mining necessary to understand the remainder of the book. Next, Part III focuses on process discovery as the most important process mining task, while Part IV moves beyond discovering the control flow of processes, highlighting conformance checking, and organizational and time perspectives. Part V offers a guide to successfully applying process mining in practice, including an introduction to the widely used open-source tool ProM and several commercial products. Lastly, Part VI takes a step back, reflecting on the material presented and the key open challenges. Overall, this book provides a comprehensive overview of the state of the art in process mining. It is intended for business process analysts, business consultants, process managers, graduate students, and BPM researchers.

Now available in paperback. This book provides a comprehensive account of survey sampling theory and methodology which will be suitable for students and researchers across a variety of disciplines. A central theme is to show how statistical modeling is a vital component of the sampling process and in the choice of estimation technique. Statistical modeling has strongly influenced sampling theory in recent years and has clarified many issues related to the uses of auxiliary information in surveys. This is the first textbook that systematically extends traditional sampling theory with the aid of a modern model assisted outlook. The central ideas of sampling theory are developed from the unifying perspective of unequal probability sampling. The book covers classical topics as well as areas where significant new developments have taken place notably domain estimation, variance estimation, methods for handling nonresponse, models for measurement error, and the analysis of survey data. The authors have taken care to presuppose nothing more on the part of the reader than a first course in statistical inference and regression analysis. Throughout, the emphasis is on statistical ideas rather than advanced mathematics. Each chapter concludes with a range of exercises incorporating the analysis of data from actual finite populations. As a result, all those concerned with survey methodology or engaged in survey sampling will find this an invaluable and up-to-date coverage of the subject.

This book describes process mining use cases and business impact along the value chain, from corporate to local applications, representing the state of the art in domain know-how. Providing a set of industrial case studies and best practices, it complements academic publications on the topic. Further the book reveals the challenges and failures in order to offer readers practical insights and guidance on how to avoid the pitfalls and ensure successful operational deployment. The book is divided into three parts: Part I provides an introduction to the topic from fundamental principles to key success factors, and an overview of operational use cases. As a holistic description of process mining in a business environment, this part is particularly useful for readers not yet familiar with the topic. Part II presents detailed use cases written by contributors from a variety of functions and industries. Lastly, Part III provides a brief overview of the future of process mining, both from academic and operational perspectives. Based on a solid academic foundation, process mining has received increasing interest from operational businesses, with many companies already reaping the benefits. As the first book to present an overview of successful industrial applications, it is of particular interest to professionals who want to learn more about the possibilities and opportunities this new technology offers. It is also a valuable resource for researchers looking for empirical results when considering requirements for enhancements and further developments.

Many texts are excellent sources of knowledge about individual statistical tools, but the art of data analysis is about choosing and using multiple tools. Instead of presenting isolated

techniques, this text emphasizes problem solving strategies that address the many issues arising when developing multivariable models using real data and not standard textbook examples. It includes imputation methods for dealing with missing data effectively, methods for dealing with nonlinear relationships and for making the estimation of transformations a formal part of the modeling process, methods for dealing with "too many variables to analyze and not enough observations," and powerful model validation techniques based on the bootstrap. This text realistically deals with model uncertainty and its effects on inference to achieve "safe data mining".

The main goal of this book is to explain the core ideas of process mining, and to demonstrate how they can be implemented using just some basic tools that are available to any computer scientist or data scientist. It describes how to analyze event logs in order to discover the behavior of real-world business processes. The end result can often be visualized as a graph, and the book explains how to use Python and Graphviz to render these graphs intuitively. Overall, it enables the reader to implement process mining techniques on his or her own, independently of any specific process mining tool. An introduction to two popular process mining tools, namely Disco and ProM, is also provided. The book will be especially valuable for self-study or as a precursor to a more advanced text. Practitioners and students will be able to follow along on their own, even if they have no prior knowledge of the topic. After reading this book, they will be able to more confidently proceed to the research literature if needed.

This book constitutes the proceedings of the 13th European Conference on Technology Enhanced Learning, EC-TEL 2018, held in Leeds, UK, in September 2018. The 42 full and short papers, 7 demo papers, and 23 poster papers presented in this volume were carefully reviewed and selected from 142 submissions. This year, the European Conference on Technology-Enhanced Learning (EC-TEL) will engage researchers, practitioners, educational developers, entrepreneurs and policy makers in a joint discussion on how to put science, technology and practice at the service of learning to embrace these challenges on the topic: Lifelong technology enhanced learning: Dealing with the complexity of 21st century challenges. Chapter "" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

This book highlights recent developments in multidimensional data visualization, presenting both new methods and modifications on classic techniques. Throughout the book, various applications of multidimensional data visualization are presented including its uses in social sciences (economy, education, politics, psychology), environmetrics, and medicine (ophthalmology, sport medicine, pharmacology, sleep medicine). The book provides recent research results in optimization-based visualization. Evolutionary algorithms and a two-level optimization method, based on combinatorial optimization and quadratic programming, are analyzed in detail. The performance of these algorithms and the development of parallel versions are discussed. The utilization of new visualization techniques to improve the capabilities of artificial neural networks (self-organizing maps, feed-forward networks) is also discussed. The book includes over 100 detailed images presenting examples of the many different visualization techniques that the book presents. This book is intended for scientists and researchers in any field of study where complex and multidimensional data must be represented visually.

This book offers state-of-the-art research and development outcomes on methodologies, techniques, approaches and successful applications in domain driven, actionable knowledge discovery. It bridges the gap between business expectations and research output.

This book analyses state-of-the-art techniques in business process management as drivers of advanced entrepreneurship, financial management, supply chain management, and sustainability management. The role of management in a rapidly-changing environment and the use of innovative methods and techniques to address and solve key management

problems are also explored.

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