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Book Reviews

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In *Book Reviews*, we review an extensive and diverse range of books. They cover theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. However, we do not review software. To submit a book for review, please send it to me at the above address. Although we cannot review all books because of space limitations, we do list all books that we receive.

We commission all book reviews and do not accept unsolicited reviews. To become a reviewer, please send me your name, address, and specific areas of expertise. We encourage readers to suggest books for review or to ask publishers to send copies of such books.

The authors or editors of books we review in this issue are Antonio Conejo, Enrique Castillo, Roberto Minguez, Raquel Garcia-Bertrand, Randolph W. Hall, Thomas L. Saaty, Luis G. Vargas, Antony Unwin, Martin Theus, and Heike Hofmann.

Conejo, Antonio, Enrique Castillo, Roberto Minguez, Raquel Garcia-Bertrand. 2006. *Decomposition Techniques in Mathematical Programming: Engineering and Service Applications.* Springer, New York. 541 pp. $99.00.

Decomposition is a key concept in literature that addresses large-scale problems. These are among the most important research problems in mathematical programming. Because universities seek to familiarize students with real-world problems, they provide courses that include techniques for solving these problems; therefore, they require textbooks, such as *Decomposition Techniques in Mathematical Programming: Engineering and Service Applications*, that address these techniques.

Let us compare two linear-programming problems with the same number of variables and constraints. Assume that the first problem has a general structure (i.e., the coefficient matrix is not unique) and the second problem has a block structure. The term *block structure* means that variables are grouped into sets that do not intersect, and have equality/inequality constraints defined, i.e., the original problem can be reduced to several problems of lower dimensionality. Theoretical analysis and practical experience show that the total solution time of several problems is usually much shorter than the solution time of one general problem with a dimensionality equal to the total dimensionality of the set of smaller problems. Real-life problems with block structures are not common; however, there are many problems with a semi-block structure, where either few constraints involve variables of several blocks or few variables appear in many constraints. The authors of *Decomposition Techniques in Mathematical Programming: Engineering and Service Applications* call these cases "problems with complicating constraints" and "problems with complicating variables," respectively. The book focuses on techniques to solve problems, which have complicated constraints and variables, more efficiently than solving them by using general techniques. These techniques are called *decomposition techniques* because they are based on iterative solutions of auxiliary problems that are composed of blocks of the original problem.

Part I of the book introduces the reader to the problem formulation by explaining the models of linear, nonlinear, and mixed-integer programming problems related to design and operation, e.g., manufacturing operation in a transnational company, engineering design of a breakwater, capacity-expansion planning, etc. The material teaches the reader how to formulate mathematical programming problems by means of defining objective and constraint functions. This relatively large section is useful to students who are oriented to taking a practical approach. Another advantage is the detailed analysis of the structure and properties of a mathematical programming problem that make it prone to decomposition. Although linear-programming problems that are solvable using contemporary software can be very large (e.g., contain hundreds of thousands of variables and equality/inequality constraints), the dimensionality should not be exploited. On the contrary, it is important to be able to avoid solving large-dimension problems even when the problem can be solved by a general (although slow) algorithm.

The main part of the book (Part II, Decomposition Techniques, 130 pages) starts with a discussion of classical Danzig-Wolf and Benders decomposition methods for linear-programming problems. The Danzig-Wolf method addresses problems with complicating (many) constraints; the Benders method addresses problems with complicating (many) variables. In both cases, the method consists of the repeated application of simplex algorithms to solve the master problem and the subproblems whose dimensionality is defined by the dimensionality of blocks in the original problem. A special chapter is devoted to duality—a classical theme in mathematical programming in which relations between two closely related (dual) problems are considered. The book builds various general algorithms of linear and nonlinear programming using results of duality theory. Duality is also an important concept for sensitivity analysis. The authors of this book apply duality theory to analyze some decomposition algorithms for nonlinear programming. They introduce several standard decomposition methods for nonlinear and mixed-integer problems; more specifically, they develop these methods using various versions of Lagrangian relaxation and linearization. Part II of the book ends with a chapter on a decomposition method in which a problem is decomposed using reduction to a bilevel optimization problem.

Part III (60 pages) is devoted to local sensitivity analysis, a theme that is very important to various applications. In general, even small changes to the input data can substantially affect the solution of the mathematical programming problem. An objective of sensitivity analysis is to answer the question of how the solution depends upon variations in model data, e.g., in coefficients of the objective function of a linear-programming problem. To analyze the sensitivity of the objective function, the book uses the standard duality theory approach. It presents the corresponding formulas for linear and nonlinear cases. It briefly introduces a general method developed in Fiacco (1983) to demonstrate sensitivity analysis with respect to all parameters of the model. Formulas of sensitivities are derived for several particular cases and examples. Sensitivity analysis is very important in applications but the book presents a general introduction to sensitivity analysis without relating it to decomposition techniques.

Two sections of the book contain technical material—detailed descriptions of several applications and computer codes of some algorithms considered in previous chapters. The computer codes are implemented in GAMS, a special programming language that is oriented to mathematical programming problems. The problems discussed include optimal wall and bridge crane design (with costs minimized subject to safety and reliability constraints), and several problems addressing optimal electric-energy supply through a network. Part VI, the final section of the book, includes solutions to selected exercises.

Mathematical programming is one of the main techniques used in theoretical and applied operations research (OR). Therefore, new monographs and textbooks on mathematical programming are of great interest to the OR community. This book is primarily oriented to the students in science and engineering. However, its material and style of presentation also make it suitable for students of business management, OR, and applied economics. It includes few basic theorems to present mathematical justification of the methods discussed. It teaches principally by using clarifying, illustrative, and computational examples and applications. The book continues the didactic concept that Williams (1999) started in his popular textbook; four editions were published between the years 1978 and 1999. Three of the book's coauthors are also coauthors of the book by Castillo et al. (2002), which is devoted to mathematical programming techniques for problems of general structure. *Decomposition Techniques in Mathematical Programming: Engineering and Service Applications* is very similar to the textbook by Castillo et al. (2002), not only in its general approach but also in the choice of sample problems and programming languages selected for practical application. The background required to understand the book's material is moderate—elements of linear algebra, calculus, and basic mathematical programming. I think that this book would be valuable in the libraries of all institutions that teach advanced mathematical-programming courses that include topics on large-scale problems and decomposition techniques; a lecturer will find well-prepared sample problems for practical assignments and course work.

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Hall, Randolph W., ed. 2006. *Patient Flow: Reducing Delay in Healthcare Delivery*. Springer, New York. 458 pp. $129.00.

This book, which contains 15 papers on the operational aspects of health-care delivery, was written by doctors, nurses, industrial engineers, and operations research professionals from the United States, Canada, Spain, and the Netherlands. The editor, Randolph Hall, is the vice provost for research advancement and a professor in the Daniel J. Epstein Department of Industrial and Systems Engineering at the University of Southern California.

Those of us who are deeply interested in the application of management principles and technologies to health-care delivery will be delighted to receive this book. Not only will it serve to illustrate some outstanding, recent applications of operations research methodologies to health-care issues, but it will also serve to alert health administrators worldwide that a science has grown up to solve the operational problems in health-care delivery, and that they should be using it in their organizations.

The particular focus of the papers in this book is the reduction or elimination of delays. The authors of the first paper, *Modeling Patient Flows Through the Healthcare System*, set the tone for the rest of the papers by saying, "Our supposition is that much of the delay accepted by the public is both unnecessary and costly" (p. 3). I would say the authors could have safely stated that sentence as a known fact, rather than as a supposition. The science of queuing theory tells us that when utilization of a service facility is even moderately high (approximately 70 to 80 percent), the waiting time for service is often more than five times the duration of the service itself. In addition, in many health-care situations, waiting time translates into increased suffering for the patient, and reduced treatment quality. For the health-care providers, it translates into a need for additional procedures and treatments, and additional space, staff, and facilities to accommodate the waiting, all with their attendant costs.

The collection of papers contains in-depth studies of various health-care processes as they exist today, and offers many practical solutions to improve these processes. For example, the fine paper by Michael Williams, *Hospitals and Clinical Facilities, Processes and Design for Patient Flow*, focuses on hospital emergency departments (EDs). However, he points out that the malaise in ED operations also extends to hospital operations as a whole. Ultimately, the problem can be reduced to capacity management—how well and by what methods are capacity requirements forecast, to what extent are capacity requirements satisfied, and how well is patient flow managed given the existing capacity. He gives a number of solutions for capacity management and patient-flow management, all of which are intensely practical in the sense that they have been successfully implemented in one or more hospitals.

For example, he discusses the structure and benefits of clinical decision units (CDUs). He defines a CDU as a unit of 8 to 12 beds for patients who require more therapy but not necessarily an inpatient bed. A typical class of CDU admission would be to rule out cardiac chest pain. Another might be for asthma therapy. As inpatients, these patients would use a hospital bed for anywhere from 24 to 48 hours; however, using a CDU, they could be discharged in an average of 14 hours.

Williams suggests other useful ideas including the rapid admission unit (RAU) and discharge lounge. His paper also contains a number of ideas from the disciplines of industrial engineering and operations research to improve communications, bed control, and general throughput and efficiency.

The paper by Emilio Cerda and his colleagues, *Waiting Lists for Surgery*, is also noteworthy. Many European countries have national health systems in which the waiting times for surgeries such as hip replacement, cataract, varicose veins, hysterectomy, and inguinal hernia range from 70 days to more than 270 days. Cerda and his colleagues describe a mathematical programming model that they developed to reduce the waiting times for specific surgeries in a hospital in Madrid, Spain; they show impressive improvements in reducing these waiting times. At the end of their paper, they cite several references that describe other operations research techniques that have been used to tackle this problem. For example, Worthington (1987) describes the use of queuing theory; Wisniewski (1997) describes the use of simulation techniques; and O'Neal and Dexter (2004) describe the use of data envelopment analysis (DEA).

One paper, *Rapid Distribution of Medical Supplies*, by Maged Dessouky and his colleagues, does not quite support the main title of the book—*Patient Flow*. However, it does support the subtitle, *Reducing Delay in Healthcare Delivery*. The paper addresses the design of an efficient pharmaceutical supply chain; in particular, it deals with the questions of the location of pharmaceutical warehouses and the routing of vehicles in response to a large-scale medical emergency. The authors illustrate their approaches by applying them to a hypothetical anthrax emergency in Los Angeles County. Anthrax is an acute infectious disease caused by a bacterium. Some readers may recall that malicious distribution of anthrax spores through the U.S. Postal System caused 22 cases of anthrax infection and five deaths in 2001. A larger attack could create a severe medical emergency for which a well-planned and responsive supply chain for medicines would be crucial. Dessouky and his colleagues give an extensive review of the literature on facility-location problems and vehicle-routing problems. Both are extensively studied in the operations research literature with particular reference to health-services management (Goldberg et al. 1990, Rubin 1983).

While it is impossible to cover all the other equally excellent papers in the book, I should make at least a passing reference to the last paper, *Managing a Patient Flow Improvement Program*, by David Belson. It covers the highlights of implementation of patient flow, the main theme of this book, nicely.

This fine book is part of a growing list of books that drive home the point that operations research and industrial engineering techniques are indispensable in the efficient design and operation of health-service distribution systems. My own beginning involvement in the application of these techniques in the health field goes back to the 1960s. The questions that I asked then, I also ask now: Why do we need such huge hospitals and the huge pharmaceutical industry to keep human beings healthy? Did nature make some design mistakes in creating man the way he is? As a society and a civilization, can we obviate some of our medical problems by living differently? Are we on a needless treadmill, creating our own medical problems, and then trying to use high technology to solve them? If my fellow industrial engineers and operations researchers could spend more time and energy on obviating health problems (as they have frequently done so brilliantly in industry and commerce), rather than on solving them after they have been created, a whole new genre of books would be written; the world would be a very different place.

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Saaty, Thomas L., Luis G. Vargas. 2006. *Decision Making with the Analytic Network Process: Economic, Political, Social and Technological Applications with Benefits, Opportunities, Costs and Risks*. Springer, New York. 278 pp. $99.00.

Saaty first introduced the theory of the analytic network process (ANP) in Chapter 8 of his 1990 book, *Multicriteria Decision Making: The Analytic Hierarchy Process*. In 1996, he followed it with *The Analytic Network Process: Decision Making with Dependence and Feedback*, which he revised in 2001 to include benefits, opportunities, costs, and risks (BOCR). Finally, in 2005, he wrote *Theory and Applications of the Analytic Network Process*, which included negative priorities and different formulas for synthesis (Saaty 1990, 2001, 2005).

Many see the ANP, which allows the user to input both judgments and facts to a decision-making process using a ratio scale to evaluate the relationships that exist between various factors, as the most comprehensive framework used in decision making today. It can be used to decipher an innumerable number of problems that governments, society, or major corporations face. This book addresses the application of network structures with dependence and feedback in making decisions. It is a collection of selected applications of the ANP to economic, social and political sciences, and technological design. The book shows the universal applicability of this model in a wide range of areas.

Chapter 1 introduces the basic ANP theory. It briefly explains the supermatrix of a feedback system, BOCR and their merit ratings, group decision making, and other related issues using figures, tables, and examples. Chapters 2 through 12 vividly demonstrate real-world problems. In Chapter 2, the authors forecasted the resurgence of the US economy in 2001 without using a traditional macroeconomic forecasting technique. According to most economists, the economy rebounded approximately eight months later, thus proving the validity of the study.

Chapter 3 deals with financial-crisis forecasting. It delves into statisticians' desires to develop an accurate forecasting model to determine when a financial crisis may develop in a particular country. Using data from the banking crisis of the early 1990s in the United States, the authors were able to "predict" when a crisis had the best chance of occurring. Their results mirrored the actual events of the period, thus proving the method's accuracy. Chapter 4 focuses on outsourcing a firm's application-development group. Through various interviews, questionnaires, and historical data, the authors weighted many factors against each other based on three alternatives: (1) outsource all application development work, (2) outsource the design and programming phases, and (3) do not outsource any application-development work.

Chapter 5 explores the best potential use for the Artic National Wildlife Refuge (ANWR), an Alaskan land. The first layer of the hierarchy was "drill or not drill in ANWR." As a second stage, they selected the strategic criteria of general public opinion, international politics, and the amount of oil available. From these criteria, they designed a BOCR model to help further break down each of the elements economically, politically, and socially. In each level of the BOCR model, they considered factors such as local (Alaskan) work force, the effect on property values, return on investment, political power, worldwide commodity-market stability, cultural effects, and others. Their findings are on par with a poll of native Alaskans looking at the same issue.

Chapter 6 illustrates a case involving the Ford Explorer. Following a monumental setback—the Firestone tire fiasco—what action should Ford take? The four possible alternatives included (1) discontinuing the Explorer model, (2) redesigning it, (3) maintaining the Explorer model (without dropping Firestone), and (4) maintaining the Explorer using a different tire distributor. To analyze the situation, the authors choose to examine the economic, political, and social effects of each decision on shareholders, various tire suppliers, the competition, public image, and the resources currently available. Finally, they performed a sensitivity analysis using cost as a primary variable because it would be one of Ford's primary concerns. They also considered the risks of success or failure. The study concluded that the best result would be to redesign the model using a new tire manufacturer.

Chapter 7 covers a Pennsylvania high-speed maglev train project. To decide whether this rail system would be beneficial for Pittsburgh, the authors constructed a BOCR. The alternatives included

(1) accept a federal grant (if awarded) and begin construction on the maglev train, (2) let the construction begin at another location and wait to see if it was beneficial, or (3) reject the project, at least for the foreseeable future. They analyzed the political, economic, and social benefits on the following clusters: stakeholders, employment, business development, and positive time elements (commuter time and worker productivity). After weighing these elements against the BOCR model, they performed a sensitivity analysis. When they placed a greater emphasis on benefits and opportunities, they showed that the project should definitely be implemented. However, when they emphasized cost and risks (i.e., they gave these factors a collective weight of 30 percent or greater), they showed that the project should not be implemented. No decision has yet been made on the project; however, these results will most likely affect the eventual decision.

Chapter 8 discusses US energy security. Control criteria focused on political, societal, economic, technological, and environmental elements as well as national security. The authors divided these areas into subcriteria including sense of well-being and international political benefits, plus many factors that are too numerous to list. They performed sensitivity analysis on these factors and found that an *energy-independence emphasis* was best when they gave benefits/opportunities or costs/risks the greatest weight. This is obvious because it would theoretically provide the best benefits with minimal cost. No matter what areas they emphasized, the *comparative-advantage approach* was always shown as the worst choice. It had the highest cost and provided the least in terms of benefits and opportunities.

Chapter 9 highlights a paramount issue—stabilizing the US social security program for the long term. They set up an ANP model to determine the best course of action. A BOCR model set up the strategic criteria of achieving program stability, adequate means for participants, and a sense of fairness. There were originally 14 alternatives, which were reduced to five. These included (1) raising the withholding ceiling (currently at $90,000), (2) raising the retirement age because of increasing life expectancy, (3) privatizing all or part of social security, (4) decreasing the benefits paid, or (5) keeping the system as it is without modification. Further control criteria focused on the political, social, and economic ramifications of these decisions. After rating each of the BOCR elements against each of the strategic criteria and performing a sensitivity analysis, they found that raising the ceiling would provide the highest benefits; privatization would have the highest prospect for success, although it would incur the greatest costs because of the need to convert the social security system. Reducing benefits would yield the highest risks because such a move would be extremely unpopular. Putting all of these factors into perspective, raising either the ceiling or the retirement age (or perhaps a combination of the two) would give the best theoretical solution. Time will tell what Congress decides to do.

Chapter 10 looks at the most hopeful outcome for the Middle East conflict. To set up the problem, the authors created a hierarchy considering the following criteria: Middle East peace, international politics, and human well-being. They then performed an analysis using the BOCR model. When they did a sensitivity analysis that specifically concentrated on benefits/opportunities, *economic assistance* was chosen as the optimal choice; *enforcing and supervising peace talks* was the second-best option. Under a cost and risk analysis, *economic assistance* is also seen as the best possible outcome. As we can clearly see, providing assistance in a nonmilitaristic fashion will allow the region the best possible chance to prosper without the loss of life. As of yet, the US government has not come to believe so; in time, it hopefully will.

Chapter 11 examines the conflict between China and Taiwan. Based on the synthesized results, one clearly sees that *peaceful unification* is the ideal scenario among all the alternatives; the *status quo* alternative is second. The other two alternatives (*independence of Taiwan* and *China's armed takeover of Taiwan*) fall far behind as the overall result. This provides the favorable conclusion that war is never a desired option for China and Taiwan.

Chapter 12 analyzes the US response to the North Korean nuclear threat. The current US policy toward North Korea has not been successful in eliminating the nuclear threat so far. To resolve the problem, the United States may need to take a more active role in dealing with North Korea. After weighting all of the factors, it appears that the best option is to negotiate using both the threat of sanctions and the offering of incentives. Politicians would do well to consider this study.

Finally, Peniwati, a researcher who wrote about AHP and multicriteria decision making (MCDM), has tried to identify criteria for evaluating group decision-making methods in Chapter 13. The author has brought many criteria and many methods under one umbrella. This is a good start toward a goal of establishing a set of standard criteria to evaluate the MCDM methods in the future.

This book gives numerous examples of potential uses for the ANP and its many variations. In many of these examples, the solution parallels actual real-world outcomes, thus proving the validity of the model. The key of the ANP is its ability to allow countless factors to be infused into the decision-making process. In doing so, ample time and consideration can be given to every possible factor, no matter how minute. The ANP's ability to conform to different criteria and types of decision makes it a truly universal tool.

In addition, the availability of the SuperDecisions software (2006), the personal computer implementation of the ANP, makes this book a wonderful practice guide for decision makers, consultants, and teachers and students in business and engineering schools. We expect that more applications will become available.

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Unwin, Antony, Martin Theus, Heike Hofmann. 2006. *Graphics of Large Datasets: Visualizing a Million*. Springer, New York. 271 pp. $84.95.

Large data sets have become commonplace. Consequently, effectively tackling issues that arise because of the immensity of these data sets is a significant challenge in statistics and computing. *Graphics of Large Datasets: Visualizing a Million*, which Unwin, Theus, and Hofmann edited, is concerned with *data visualization*—an effective approach to analysis of large data sets. Because of its intuitive appeal, visualization has become an important approach for undertaking both exploratory analysis and interpretation of detailed analysis of data sets. Researchers from diverse disciplines including statistics, data mining, machine learning, operations research, and others are showing interest. This has led to differences of opinions on the connotation and the subject matter of data visualization. However, at a broad level, *data visualization* is a term that is used primarily to describe graphic representations of data and related issues. The authors say that data visualization is the best universal term because the overall aim is always to visualize the information in the data.

Important questions that normally arise are: What does large mean? and When can a data set be called a "large" data set? The definition of large tends to change over time depending on data storage, the analysis that can be performed, and the time required for the analysis. In the introductory chapter, the authors provide a historical account of how largeness has been defined over the years. There is also an interesting discussion on the effects of largeness from multiple perspectives, namely, storage, quality of data stored, complexity of the data set, speed of operations, analysis, and displays of results of the analysis. The introductory chapter thus sets the stage for the remainder of the book. The remaining 10 chapters, which are grouped into basics and applications, have been written from a statistical standpoint rather than one of informational visualization or data mining. Because leading experts wrote each of the chapters, the book provides significant insights.

Bar charts, histograms, spine plots, mosaic plots, box plots, scatter plots, and parallel coordinate plots are a few of the standard statistical plots that are most frequently used in data visualization. The second chapter defines and discusses these standard statistical graphics. The remaining two chapters in the basics section address two important issues, namely, scaling-up graphics to deal with large data sets and interactive methods that improve the capability of graphics for discovering information in large data sets. Discussing each issue separately is advantageous because it allows the reader to focus on the issue without getting lost in the details of the graphics. In general, area plots can be scaled-up with minor changes; however, point plots such as scatter plots need substantial modifications because they plot every data point.

For mosaic plots, the challenge of large data sets lies in the numerous categories and with variables with skew marginal distributions. The fifth chapter discusses useful mechanisms such as sorting and redmarking. The sixth and seventh chapters deal with plots for visualizing multivariate continuous data, namely, rotating plots and parallel coordinates. As the data sets become increasingly massive, the challenge becomes viewing interactive, real-time displays on small computer monitors that are crowded with information. In their chapter on rotating plots, Cook and Miller discuss the strategy of preprocessing of multivariate real-valued data into projections that are displayed as scatter plots. Interaction in the form of dynamic selection and display of a small subset of the full data set as real-time graphics is achieved by an indexing of the projections that was created in the data-preprocessing step. The chapter on parallel coordinates has an interesting example using an automobile data set, wherein the authors demonstrate how the use of new interpolations reveals relationships between variables that are implicit in the data.

Trees and networks are two graphical structures that are useful in the analysis of many real-life data sets such as telephone traffic, Internet, trade transactions, bank customers, and others. For studying large network structures that contain more than one million nodes, exploratory and presentation tools that can provide an overview, the ability to focus on details, and filtering are needed. The eighth chapter, which Graham Wills authors, describes a set of techniques for very large graphs. The emphasis is on exploration and discovery with a substantial discussion of interactivity. However, the highlight of the chapter is an example of using NicheWorks, a visualization tool, to identify an international calling fraud scheme. The chapter on trees shows how trees, which have traditionally been depicted as hierarchical structures, can also be viewed from other aspects. The behavior and scalability of several alternative visualization methods such as scatter plots, fluctuation diagrams, tree maps, and spine plots of leaves of large data sets are discussed.

Analysis of Internet-traffic data needs novel and creative visualization ideas to handle the large volume of data, time scales, connectivity, and inadequacy of traditional queuing-theory models, which are based on an assumption of a Poisson arrival of connections. The penultimate chapter on transactions discusses some challenging visualization problems that arise during the analysis of Internet transactions. Standard mice and elephant plots are discussed. Random sampling is inadequate in uncovering interesting data trends. The authors propose and demonstrate the efficacy of biased sampling methods such as windowed biased sampling and Box-Cox biased sampling. These generate samples that give a better visual impression of the nature of the complex population. Further, the utility of quantile-window sampling for focusing on the structure of various subgroups of the mice and elephant plots that are similar in duration is highlighted.

When confronted with a large data set, analysts would like to have a systematic approach that would guide them in both exploratory and detailed analysis of the data set. In the final chapter, the authors, Unwin, Theus, and Hofmann, outline an approach for the systematic analysis of a large real-life data set from scratch. Written in an engaging style with numerous graphics, the practical utility of this chapter cannot be overemphasized. From the view of comprehensiveness, the book has a few limitations. One major drawback is the absence of coverage of advances made in data visualization in the field of data mining. The book also does not touch upon issues involved in using visualization to interpret results of data mining and statistical techniques such as association rules, clustering algorithms, etc. Future editions of the book can address these issues.

Nevertheless, this book will prove to be a significant asset as an introduction to the visualization of very large data sets. The extensive use of examples, which accompany high-quality diagrams and graphics with discussions on the latest visualization software, enhances the book's readability and appeal.

The chief attractions of the book are its focus and clarity while dealing with a diverse range of topics and its simplicity of presentation. Practitioners can use this book to gain a quick overview of the field. Academics can use it as a reference and as a text for a course on data visualization while complementing it with additional journal articles. Thus, we can safely say that we recommend the book to anyone interested in the field of data visualization.

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Books Received for Review

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