



Book Selection

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Edited by J Chilcott

D Jones and M Tamiz: *Practical Goal Programming*, 1st edn (Hardcover)

U Narayan Bhat: *An Introduction to Queueing Theory: Modelling and Analysis in Applications* (Hardcover)

NF Maaser: *Decision-Making in Committees: Game-Theoretic Analysis*, 1st edn (Papercover)

F Magoulés, J Pan, K-A Tan, A Kumar: *Introduction to Grid Computing* (Hardcover)

Practical Goal Programming

D Jones and M Tamiz

Springer, 2010, XIV, 238pp., £90.00

ISBN: 978-1441957702

Goal programming is one of the most well-established and versatile mathematical programming methodologies and is particularly suitable for multi-criteria decision making and multi-objective optimization. Although many books have been published on this topic, most of those published recently are edited collections of research articles. The book 'Practical Goal Programming' co-authored by Jones and Tamiz is a valuable and welcomed addition to this literature. The book provides a very good presentation of the main concepts, principles, techniques and even a brief historical account of goal programming.

Jones and Tamiz are experts in the field with an excellent track record of research work on goal programming. They have written many scientific articles and edited several books on goal programming and its applications. The book provides a very effective introduction to the fundamentals of traditional goal programming, but it also gives an insight into more recent developments like the hybridization of this and other techniques like fuzzy logic, data envelopment analysis and simulation. The book is written in a concise manner, making it very suitable for readers wanting an insightful overview of goal programming and how it can be applied for modelling, optimization and decision making. The book also includes a couple of chapters with case studies describing the application of goal programming to real-world scenarios in health care and portfolio selection.

The main concepts are concisely defined and illustrated in Chapter 1, including lexicographic programming and the Chebyshev approach. Chapter 1 also discusses the link

between goal programming and multi-criteria decision making. Chapter 2 is quite brief but gives a good introduction to several fundamentals of goal programming such as establishing priorities and weights between goals, and the various types of variables and goals, that is, integer, fuzzy, non-linear and so on.

The core of the goal programming methodology is the subject of Chapter 3, which assumes that data about the problem and the decision-making process are well known. The book would have benefitted by providing a summary of the issues arising in the gap between the concepts in Chapters 1–2 and the actual method in Chapter 3. The importance of setting goals in a sound manner considering interactions with the decision-maker, sensitivity analysis and other techniques is also discussed in Chapter 3. Various ways to formulate goal programming such as lexicographic, weighted, Chebyshev and preferential weights approaches are also explained briefly but clearly. A nice feature of Chapter 3 is the set of exercises covering realistic operational scenarios such as production, distribution and scheduling among others.

Chapter 4 is intended to provide an insight into more advanced aspects of goal programming such as non-linearity, integrality, discontinuity, extended lexicographic techniques and so on. Although most of this chapter is dedicated to an extended lexicographic formulation intended to be a more general framework for goal programming, the chapter also covers the interesting topic of meta-goals as a technique to deal with preferences from the decision makers. Chapter 5 provides an illustration of some practical aspects of formulating, solving and analysing goal programming models using the object-oriented programming language Lingo and Excel solver. The chapter also discusses very briefly issues to be considered when solving goal programming variants that include non-linearity, fuzzy aspects, integrality and meta-goals. Chapter 5 also points the reader to a number of software

packages that have been developed to solve goal programming problems, but it notes that most of these tools are academic instead of commercial enterprises.

Chapter 6 covers briefly the principles for detecting Pareto efficiency and if necessary recovering it in goal programming formulations. Chapter 7 is mainly a pointer to some works in the literature that combine goal programming with other techniques from multi-criteria decision making, artificial intelligence and soft computing. The chapter does not go into any detail and therefore it is basically an overview. The exception is the discussion on combining goal programming and simulation where some suggestions are outlined in more detail.

The last two chapters of the book are case studies. Chapter 8 describes the application of goal programming and simulation to a planning problem in health care, specifically the planning of resources in a hospital emergency department. The case study in Chapter 9 describes the application of goal programming variants like lexicographic, Chebyshev, fuzzy goals and two-phased approaches to the problem of portfolio selection.

In summary, the book *Practical Goal Programming* by Jones and Tamiz gives a concise yet comprehensive introduction to the fundamentals of goal programming, one of the most well-established techniques in mathematical programming and multi-criteria decision making. The book would be a useful and enjoyable read for those new to goal programming. However, readers familiar with this technique would also find the book a very valuable resource that combines fundamentals with an insight into more recent developments in the combination of goal programming with other techniques.

University of Nottingham

D Landa-Silva

An Introduction to Queuing Theory: Modelling and Analysis in Applications

U Narayan Bhat

Springer, 2008, XII, 268pp., £44.99

ISBN: 978-0817647247

This book is devoted to queueing theory starting from basic concepts of stochastic processes up to queueing networks and renewal process models for queueing systems. A particular attribute of the book is that it only assumes an elementary knowledge in probability theory or Markov chains. It can be used by application-oriented professionals who deal with the modelling and analysis of queueing systems or can be used as an introductory course for queueing theory for students who did not have stochastic processes background.

The book consists of twelve chapters and three appendices. The first three chapters provide background

material for the reader. The first chapter gives the reader to an historical account of queueing theory in the last 100 years, while Chapter 2 provides the necessary material on probability distributions models and the steps to build these models. In Chapter 3, the author reviews some concepts in stochastic processes, which will be used later as a foundation for the analysis of queueing networks, namely, point, regenerative and renewal processes and Markov processes.

In Chapter 4, simple Markovian queueing models are introduced, including the general Birth-and-Death queueing model, M/M/1 queue and all its variants where the arrival or the service processes are exponentially distributed. In Chapter 5, the author extends the Markov models to present imbedded Markov chain models for the M/G/1 and G/M/1 queues. The second extension of Markov models is covered in Chapter 6, where the author discusses queues with bulk arrivals or bulk service and queues with priority disciplines.

Queueing networks are discussed in Chapter 7, where different network configurations are considered starting from tandem queues and the well-known Jackson networks. A particular feature is that this book is one of a few general queueing theory books to include a discussion of blocking in queueing networks. Renewal process models for queueing systems are studied in Chapter 8.

What really makes this book of value to the professional is the focus on application methods in the last three chapters. Chapter 10 provides a description of statistical inference tools for queueing models and Chapter 11 discusses some typical decision problems, for example performance measures for decision making, and design and control in decision making. The last chapter describes computational tools used in modelling and analysis of stochastic models. The appendices provide some fundamental background for the reader in Poisson processes, Markov Processes and some important transforms.

This book is an introductory book in queueing theory and its use in modelling and analysis in applications. The audience of the book is expected to have a basic understanding of calculus and probability theory. It can be very helpful for researchers working in computer science, operations research and industrial engineering. This is a clear and well-written book with sufficient numerical examples to help enhance the understanding of the reader.

University of Waterloo

E Almehdawe

Decision-Making in Committees: Game-Theoretic Analysis—Lecture Notes in Economics and Mathematical Systems

NF Maaser

Springer-Verlag GmbH, 2010, 126pp., £62.99

ISBN: 978-3642041525

Decision-Making in Committees uses game-theoretic concepts and models to address the issue of political decision-making processes. It looks particularly at cases where members of a committee represent groups of different sizes. Two examples that are given particular attention are the EU Council of Ministers and the US Electoral College. An important issue is the evaluation of the voting power of each player and several *power indices* are used. These are functions that assign a real-valued n-dimensional vector to an n-player game, in this case representing a given voting rule. This vector can be interpreted as the distribution of voting power. There are interesting references (p 19) to the affinity of simple games and power indices to 'certain phenomena in non-animate nature' including electrical engineering and connections between weighted majority games and Boolean algebra.

The first chapter 'Games and Political Decisions' introduces some basic concepts and fundamental results including Black's (1958) *Median Voting Theorem* and some of its very limited multi-dimensional analogues. Examples are given where the set of feasible alternative can be described as a subset of a Euclidean space of one or many dimensions, and a practical justification is offered for this, in terms of how people experience and describe political attitudes. In practice, it gives an 'intuitive geometric interpretation' (p 15) of several of the concepts such as agenda setting and is used diagrammatically at several points in the text.

The second chapter 'Committees as Representative Institutions' looks at two-tiered government systems (such as the US and EU). In each of these cases, some form of weighted voting is used in representative bodies (the Electoral College and the Council of Ministers, respectively) in order to give fair representation to states and nations. The constituent parts vary greatly in size but each state or nation is regarded as voting *en bloc*. The weighting cannot be simply in proportion to population, as this would give larger members *disproportionate* power. Generally, this is well explained, with both analytic arguments and simulation results. In particular, Penrose's 'square root rule', followed approximately by the Treaty of Nice, is explored in depth. Its use particularly in the EU context is strongly criticized. However, the rationale for the current weighting in the US Electoral College (close to a linear function of population) is not given such a thorough examination.

Chapter 3, 'Robust Equal Representation', conducts a 'sensitivity analysis' on the square root rule. It concludes that if realistic assumptions are made concerning the heterogeneity of constituencies and supermajority rules then an alternative, the 'Shapley-Shubik linear rule' is optimal except in a small class of cases.

The final chapter concerns situations where lobbyists seek to influence decision making in a committee by offering material incentives to members. This is possibly

more relevant to everyday politics than the earlier chapters. The influence of lobbyists is formally modelled as a game in three stages: the formation of coalitions among the lobbyists, the offer of contributions by these coalitions to the legislators and the decision by the legislature. Several questions are explored such as the important role of the agenda-setter and the inbuilt advantage of the *status quo* position, particularly in the EU. However, the obvious ethical issues are given little attention: perhaps formal restrictions on lobbying could have been incorporated into the model.

The book would suit researchers in such fields as political science, economics or sociology, but it does demand a strong mathematical background. Academically, it is accurate and thoroughly referenced. Unfortunately, the book leaves open the question as to whether the 'two-tiered' decision-making government system considered is itself inherently flawed. Developments in electronic democracy make the content even more pertinent, but that is a topic for further investigation. One minor drawback is the lack of an index, which is problematic for a reviewer. The price tag of £62.99 makes this a text for the research group or university library.

Birmingham City University

F McGonigal

Introduction to Grid Computing

F Magoulés, J Pan, K-A Tan and A Kumar
CRC Press, 27 March 2009, 334pp., £52.95
ISBN 13: 978-1420074062

The book comprises eight chapters and three appendices that take the reader from the basics of grid computing through the details of the components of computational grids to architectural details of current grid projects. The book finishes off with two chapters on grid computing applications.

The first chapter of the book gives an introduction to grid computing and the concept of high-throughput computing, where performance is measured in terms of the amount of work delivered over a period of time. It also provides an introduction to the concept of virtual organizations. The chapter provides a bird's-eye view of the grid architecture and implementation and describes some grid open standards such as web service, OGSA, OGSi, WSRF and OGSA-DAI. The chapter ends with an overview of some of the American, European and Asian grid projects.

In Chapter 2, the author discusses data management, covering requirements and functionalities, metadata, replication and effective data transfer. Two important aspects of grid systems are covered in Chapter 3: Scheduling of

jobs and resource discovery and grid monitoring. Independent and dependent task scheduling, fault tolerance strategies, grid workflow management, specification languages and information system components are all discussed.

Security in grid computing is the topic of Chapter 4. Existing security technologies such as the Public Key Infrastructure and emerging security technologies such as WS-Security and OGSA are discussed, and the authors introduce the concept of proxy certificates that are used for single sign-in and credential delegation. To illustrate how proxy certificates work on a grid, the authors provide an example of credential delegation over a network.

Chapter 5 is concerned with grid middleware and portals. Several middleware applications are categorized and discussed such as UNICOR, which is a basic functional grid middleware; Condor, which is a high-throughput computing middleware and NetSolve, which is a GridRPC-based grid middleware. Architectural overview of grid projects is presented in Chapter 6. Key features such as security, data management, information services and job scheduling in several grid projects are discussed and presented in tabular format. The last section of the chapter presents some key application areas in grid computing.

Some examples on the use of grid computing in real life applications are provided. Monte Carlo applications in

computational finance and computational mechanics are discussed in Chapter 7, while Chapter 8 demonstrates the solution of partial differential equations in heat transfer and computational finance. C++ code listings in Globus and gLite are provided to illustrate some aspects of the above applications. The book has three appendices that are dedicated to the installation and operation of Globus and gLite. A glossary of grid computing terminology is also provided.

The book is well written and presented. The information in the book is suitable to a wide audience. It gives the right amount of coverage of grid computing in a very neat and understandable way. I would highly recommend this book to undergraduate students from different science and engineering backgrounds who are interested in working in high-throughput computing. In fact I would recommend this book, at least the first chapter, to A-level college students and GCSE students in their final year in school to fire up their imagination about this dynamic and interesting field and encourage students to pursue it further at university level.

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