

## BOOK REVIEWS

EDITED BY PIOTR CHOLDA

### TIME SERIES ANALYSIS AND FORECASTING BY EXAMPLE

SOREN BISGAARD AND MURAT KULAHCI,  
WILEY, 2011, ISBN 978-0-470-54064-0, HARDCOVER, 392 PAGES

REVIEWER: PIOTR ZURANIEWSKI

Virtually any time series related book will be confronted with the question: is this one better than Box and Jenkins (and Reinsel since the 1994 edition), or perhaps Hamilton or Brockwell and Davis or some other standard textbook dealing with the topic being of great interest for both practitioners and more theory-oriented readers. So what is an answer for 'Time Series Analysis and Forecasting by Example' by Bisgaard and Kulahci? Obviously, it depends on the audience. This is possibly not a primary choice for the readers with a strong background in mathematics. The theoretical aspects of the presented subjects are merely touched and there are essentially no theorems, not to mention the proofs. As a consequence, this is not a book for someone who wants to get a deep understanding

on why a given method works, what are its limitations and where they come from. That was, however, not the authors' intention. Instead, their goal is to present some concepts of time series analysis as well as the process of a model building relying more on intuition and, as the title promises, case-study approach. If one is new to the subject and is looking for some step-by-step data analysis procedures and also agrees to take certain recipes for granted, then that book can be recommended as a good introductory text. As such, it will cover only some topics in time series analysis, leaving out for a further reading a number of important subjects like: Fourier analysis, nonlinear models, heavy-tailed distributions or long-range-dependent models just to name a few. The aspect which in more 'practice-oriented' book is especially warmly welcomed by the reviewer is a strongly pronounced need for a model verification. It is really a pity that at times even in some papers published in the decent journals there is lack of any type of goodness-of-fit discussion. Fortunately,

the book's authors not only conclude each analysis example with such a summary (thus building awareness of the reader that it is an integral phase of a modeling process) but often justify an introduction of a more complex model only after demonstrating a misfit of the simpler one.

A brief overview of the contents follows: Chapter 1 is about general concepts in classical time series analysis (like autocorrelation, stationarity, or linearity) and explains them in an intuitive way. In Chapter 2 an overview of visualization techniques is presented. As 'plot your data' is most often the first recommendation, it is worth to know some principles of the graphs construction, as well as hints on what should be avoided. Note, however, that especially in the tele-traffic context, where a sample size can easily be of order of hundreds of thousands, some of the presented methods may not be directly applicable. More details about two key concepts, i.e., stationarity and invertibility of linear models are provided in Chapter 3 and a discussion is con-

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tinued in Chapter 4, where some methods to detect non-stationarity are presented. How to deal with seasonal effects in analyzed data is a focal point of Chapter 5. Several aspects of an 'optimal' model selection procedure are highlighted in Chapter 6 with the main conclusion that the task is not trivial and should not be reduced just to comparison of some popular numerical criteria. Chapter 7 briefly discusses some additional complications which may appear while modeling data (trends and missing values among them) but still in a univariate framework, while in Chapters 8 and 9 multivariate models are considered. In two appendices, datasets used in examples and exercises are listed.

To conclude: the readers new to the linear time series analysis who want to get an intuition-based introduction to this subject will find this book valuable. More advanced audience, especially the ones looking for more formal presentation of the topic, will probably prefer some other positions.

## ORDER STATISTICS IN WIRELESS COMMUNICATIONS: DIVERSITY, ADAPTATION, AND SCHEDULING IN MIMO AND OFDM SYSTEMS

HONG-CHUAN YANG AND MOHAMED-SLIM ALOUINI, CAMBRIDGE UNIVERSITY PRESS, 2011, ISBN 978-0-521-19925-4, HARDCOVER, 256 PAGES

REVIEWER: PRZEMYSŁAW PAWELCZAK

Novel mathematical tools are constantly required to analyze increasingly complex communication system components, in particular adaptive transceivers, multiuser scheduling and (virtual) MIMO. One of such promising tools is the theory of order statistics and monographs that summarize recent advances in this mathematical domain are highly desired. One of such books is the one written by H.-C. Yang and M.-S. Alouini. In a compact form it presents a set of important results on the performance of wireless systems listed above. The focus of the monograph is to derive closed-form expressions for SNR statistics and accompanying performance metrics including bit error rate.

The book is composed of seven chapters, each of them is summarized with a related reference list. In Chapter 1, the reader is briefly introduced to the topic of order statistics, giving an outline to the whole structure of the book. Chapter 2 is a brief opening into digital communications over fading channels.

Statistical fading channel models are discussed, together with very brief recapitulation of a theory of digital wireless communications. A separate section is devoted to diversity combining techniques. Chapter 3 familiarizes the reader with the theory of distributions of order statistics. Examples are given to ease understanding of more complex material. Chapter 4 discusses advanced diversity techniques in great detail.

Mainly, generalized selection combining (with sub-classes) and generalized switch and examine combining (with sub-classes). All these results are drawn from the theory of order statistics given in Chapter 3. Then, Chapter 5 discusses adaptive transmission and reception techniques. Results on the methods such as output-threshold maximum ratio combining, minimum selection/output-threshold generalized selection

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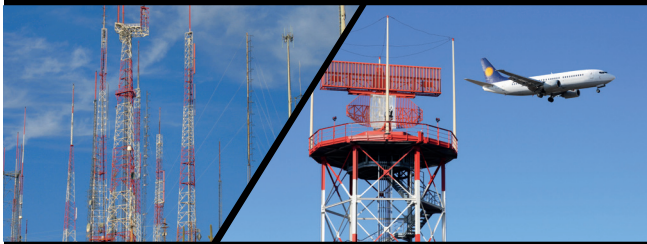
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combining or RAKE finger management are presented. Chapter 6 deals with multiuser scheduling. Some close form performance analysis expressions on multiuser selection diversity, and generalized, on-off and switched multiuser parallel scheduling are given. Finally, Chapter 7 discusses results on Multiuser MIMO systems considering order statistics. The following MIMO techniques are discussed: zero forcing beam forming and random unitary beam forming (with flavors).

The book is very short (only 256 pages) and the reader familiar with other physical layer performance analysis tools (but not familiar with the topic of order statistics) will read it with ease. On the other hand, for readers who are new to physical layer performance analysis this monograph might be hard to grasp. In essence, this is an advanced course on a selected topic and the reader must be acquainted with advanced algebra to understand it fully. Since it is a monograph, this book summarizes recent findings of both authors with many references to their earlier publications. The chapters keep discussion on subjects that are well covered by other books (e.g. receiver design) to the minimum. On the other hand, chapters dealing with the main topic of the book, that is order statistics and its application to MIMO and OFDM system analysis, are elaborated in a great detail. Unfortunately, the book does not finish with any conclusions, which would summarize the findings. Also, a set of exercises at the end of each chapter would be of great help. Additionally, it would make the book even more valuable if certain steps of the derivation were considered. But on the other hand, if one looks for a certain performance expression for the system of interest, this book will give an instant answer. In summary, this work will be a great source of inspiration to researchers, wishing to gain knowledge on the powerful statistical theory of order statistics with the applications to MIMO and OFDM systems analysis.

### GAME THEORY IN WIRELESS AND COMMUNICATION NETWORKS:

#### THEORY, MODELS, AND APPLICATIONS

ZHU HAN, DUSIT NIYATO, WALID SAAD, TAMER BASAR, AND ARE HJØRUNGNES, CAMBRIDGE UNIVERSITY PRESS, 2011, ISBN 978-0-521-19696-3, HARDCOVER, 554 PAGES

REVIEWER: SAHAR HOTEIT AND STEFANO SECCI

The widespread deployment and limited channel capacity of wireless networks are motivating the definition of novel communications control techniques. The behavior of a wireless device commonly affects communication capabilities of a collaborating device. As evidenced by the authors, the exponential growth of the Internet has pushed forward network management issues. In this context, principles of the game theory find a great field of application. Game theory is by definition a discipline aimed at modeling situations in which decision makers (players) are to make specific actions that have mutual and possibly conflicting consequences. In communications environments such as wireless networks, the wireless devices as well as the operators and network equipment can be modeled as players of a game.

The book by Han, Niyato, Saad, Basar, and Hjørungnes, is a homogeneous collection of contributions in the field, preceded by a comprehensive introduction to the various game theory facets. The effort devoted to maintain the same notation across the chapters is commendable. The book has an easy-to-follow and organized structure that enables readers to have a correct and comprehensive idea about the principles of game theory as well as their application to different problems arising in networks. Despite the focus is essentially on wireless

networks, an attention is also paid to higher-layer network issues, as for instance interconnection models and pricing among Internet carriers.

The book is organized in two main parts of equal size, besides the introduction. After a brief survey on historical steps of game theory, the authors provide an overview about wireless networks and channel models as well as recent standards. This part of the book interestingly points to the basic characteristics of wireless communications in a synthetic and effective way. Part I groups six chapters that broadly elaborate on different types of games that can be applied to specific problems in networking. Non-cooperative, Bayesian, learning, differential, evolutionary and cooperative games are presented in details, along with the necessary mathematical structures and possible solutions. A healthy number of examples are provided for each type of the game to enable understanding of utility and complexity of game modeling. Each approach is supplemented with examples of its application to wireless networking cases. Part II adopts another point of view. Instead of describing a game type and listing possible applications as in the previous part, here, different technology contexts are presented first, and then game-theoretic solutions are described. The focus is on: mobile cellular networks, wireless local area networks, multi-hop networks and cognitive radio networks. The modeled issues mainly concern admission, power and rate control, resource allocation, and spectrum sharing. A final chapter, devoted to Internet problems, gives a flavor of game theory applications wider networking scope, with a particular focus on a pricing policy among providers (unfortunately ignoring Internet routing games, quite relevant here).

A wireless system engineer may rise the following question: ‘are you really asking me to implement a spectrum sharing policy inspired by a game?’ An objective of this book is to provide the reader with the knowledge to answer with a firm ‘yes.’ The ‘game’ reference should not be superficially taken as a joke, since so important advances to many fields, such as economics and social sciences, have been reached thanks to consideration of game theory principles in practical problems. This book is a source of theoretic background on game theory and wireless network technologies with many real and convincing application examples. The book is logically fluid, without an overwhelming load of formalism and axiomatic approaches that are, too often, offered by books on game theory aimed at engineers. We are convinced that the work will become a reference book for graduate students and network engineers interested in the design of future communication network protocols.

**CONNECTED SERVICES: A GUIDE TO THE INTERNET TECHNOLOGIES SHAPING THE FUTURE OF MOBILE SERVICES AND OPERATORS**

PAUL GOLDING, WILEY, 2011, ISBN 978-0-470-97455-1, HARDCOVER, 330 PAGES

REVIEWER: ROBERT WÓJCIK

‘Connected Services’ by Paul Golding ventures into the world of technologies and applications that connect people. The book explores relationships between telcos and Web service providers from the perspective and with the experience of a person associated with both of the worlds.

The book is organized in ten chapters content-wise disjoint but well ordered. Usually, the author builds on the information conveyed in the previous chapters, however, there are several references to the subjects covered later in the book. In my opinion though, given the common grounds of the topics, that was unavoidable.

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Chapter 1 introduces the reader to the anticipated connected services. After giving the definition of such services at the very beginning, the author describes the significance of various types of platforms and supports it with easy to grasp examples. The chapter is a great introduction to the contents presented in the remainder. Chapter 2 explains the Web 2.0 ecosystem that is the foundation of today's WWW. The ecosystem is described starting from the used software stacks, through the general openness of the solutions, and finally to social computing. The author clearly explains why certain services or applications have attracted a lot of worldwide attention. In Chapter 3, the so called Web Operating System is explained. Some interesting insights and ideas for the developers and telcos on how to build the future Web are elaborated here. Chapters 4 and 5 focus on the necessity and opportunities related to processing large quantities of data efficiently. It is shown why almost all world-class ventures developed their own data processing techniques. It is also explained why companies such as Facebook, Twitter or Amazon not only need to process data, but also they need to do it in a real-time. Chapter 6 presents modern device platforms. The most significant part of it is the comparison between the two most dominant operating systems, i.e., iOS (Apple) and Android (Google). A reader can find very interesting subtle differences between these two, along with the reasoning behind them. In Chapter 7, the author describes the possibilities that lie before developers in combining both real and virtual worlds. The augmented reality is being made more powerful due to increasing number of various types of

sensors that are equipped on new mobile devices. Chapters 8 and 9 form a natural continuation to Chapter 4 as they introduce the technology which makes Big Data processing possible. Namely, cloud computing and its various types of provisioning are dealt with. These chapters are enriched with many examples to facilitate understanding the differences. The book ends with Chapter 10 which explores how telcos can benefit from Web start-ups. Key aspects that foster rapid development of many emerging applications are exposed. This part is a must-read for managerial staff in telcos.

The book aims at non-technical folks, however, without technical background certain parts might be difficult to understand. Nevertheless, even if the reader already knows the described technology she or he is still going to obtain some interesting behind-the-scene information. This is certainly not a handbook for students to learn from. It is rather targeted for professionals, i.e., software developers and telco managerial staff to obtain the views of the other side and, therefore, build a comprehensive image. Golding demonstrates his vast experience and knowledge of the presented topics of impressive range. It is very interesting to read his personal insights into some popular ideas. The work clarifies also common misconceptions (like 'iPhone before version 4 did not have multi-tasking'). I feel that the book's subtitle could have easily been 'Open API,' as this notion is the most vastly elaborated on. I have received incredible knowledge on why API's are so important, up to a point that I would not even consider creating any Web application without exposing its API. That is definitely one of the strongest messages of the book.

## Experimenting with Internet of Things in the city context



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Call open:	The call will be open for submissions from 1st October 2012
Call deadline:	The call closes 14th November 2012 at 17h00 (Brussels time)
Expected duration:	January 2013 to June 2013
Max. EC funding:	Up to 100,000 EURD
Submission language:	English
Call objective:	To expand the project's service, protocol and technology offering towards future IoT experimentation as well as the public in the context of the Smart City.

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