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Book Selection

Edited by U Aickelin

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Cellular Genetic Algorithms (Operations Research/ Computer Science Interfaces Series)

E Alba and B Dorronsoro

Springer-Verlag NY. 2008, 248pp. £61.50
ISBN: 0387776095

Although this is an authored book, its presentation style resembles very much that of an edited book made of a number of relatively independent chapters reporting on research experiments. Hence, those readers whose expectation is to have a text book on cellular genetic algorithms (cGA) might be somehow disappointed. The first three or four chapters give a nicely presented and effective introduction to evolutionary algorithms and the principles of cGA.

However, the rest of the book basically contains a series of chapters that report on computational experiments to test specific design features of cGA. For the best part of the book, each chapter resembles very much a summary of already published papers on a specific topic, perhaps with some updated computational results and sometimes on very different problems from chapter to chapter. It is intriguing that while some chapters consider both continuous and discrete problems, other chapters consider only problems of one of these types. Most chapters present a summative assessment of the algorithms' performance with less emphasis on analysing and discussing their internal working mechanisms, strengths and weaknesses. Although the experimental results offer an insight into the behaviour of cGA, one would expect that the book could offer a broader discussion on the rationale behind the design of these algorithms and their capabilities. Nevertheless, the book is an effective and accessible resource for readers relatively new to cGA. I am afraid that those readers already familiar with this technique would find the book less beneficial as it offers little more than a focused summary of research papers from the literature. Each of the final four chapters of the book focuses on a specific application of cGA and provides evidence of the suitability, effectiveness and maturity of this technique to tackle complex problems.

Chapter 1 is an introduction to evolutionary algorithms while Chapter 2 surveys the main recent developments in the design of cGA. Chapters 3 and 4 are computational studies to emphasize the benefits of structured populations (Chapter 3) and selection pressure (Chapter 4) on the performance of cGA. Then, Chapter 5 sets the scope and experimental methodology to be followed in Chapters 6–11 of the book. Each of the Chapters 6–11 offers an experimental study on a design aspect of cGA like adaptive populations, memetic operators, distributed and parallel implementations, Pareto optimization, hierarchical populations and mating strategies and software libraries. Finally, each of Chapters 12–15 in part IV of the book presents a case study of applications of cGA including function optimization, vehicle routing, networks design and bioinformatics. There is also an appendix that provides definitions and formulations of the benchmark problems used in the book.

University of Nottingham D Silva

The Management of Consumer Credit: Theory and Practice (Hardcover)

S Finlay

Palgrave Macmillan, 2008. 256pp. £61.75
ISBN: 0230013511

This useful monograph provides a comprehensive introduction to the consumer credit industry and its practices. It

largely eschews the mathematical side of practice, although the author provides a useful appendix that presents some of the mathematics behind predictive models of consumer behaviour, mostly scoring and segmentation models. He claims that reading it requires undergraduate Mathematics, but I could not find much beyond what would be known to someone with A-level Statistics, the most advanced concepts being the scalar product of two vectors and the notion of covariance. There is certainly nothing that would stretch the average reader of this journal. More advanced techniques for statistical forecasting, optimization, simulation and Markov models (for provisioning) are mentioned but no mathematics is presented.

The author provides a great deal of good practical advice, clearly based on his experience. For example, he questions the wisdom of separating the marketing and risk functions within a company, pointing to the potential disasters that can follow. The book is pleasingly up-to-date despite being written before the effects of the subprime fiasco were so plainly evident, again evincing the author's industry involvement. Page 41 has the wonderfully understated and prophetic: 'There is also a tendency to be driven by short term [sic] goals focused on recruiting large numbers of new customers quickly, without sufficient thought being given to more strategic objectives based on long term [sic] profitability'.

There are a few minor *faux pas*; for example, a slightly flawed explanation of the concept of net present value (NPV), which is said to be based on inflation rather than interest rates, and some confusion over the use of 'statistical techniques' and data mining. A glossary of terms and unexpanded abbreviations, such as APACS and IRB, would have been a useful addition to this text.

Highlights for me included a quite fascinating insight into the messages that fly around when one uses a credit card and a refreshingly concise explanation of the Basel II accord on capital adequacy.

The main defect of the writing is that it exhibits the appalling English that is woefully only too common among modern writers in the Business/IT space. These authors have yet to learn that 'data' is a plural noun and that the word 'behaviour' should seldom be pluralized. The liberal sprinkling of badly thought-out split infinitives brings the reader up short too often, sometimes forcing him to re-read the offending sentences several times. Then there is the use of the occasional barbarous non-word, such as 'ongoing'. In this book there is even a quite horrid spelling mistake on Page 1. But these brickbats should not detract from the evident worth of the book's content. Also, in other respects it is very well and very clearly written.

I think the book could be ideal as the basis for a module on credit management within a Business Studies curriculum or for an induction course for new entrants to the industry. In fact, I began to feel, from the style, that much of it may have originated as a slide show for just such training. It is the ideal introduction to the topic for the less mathematically minded or for students who will go on to study the mathematics later.

Trireme International Ltd I Graham

Applied Algebra: Codes, Ciphers and Discrete Algorithms (Hard Cover)

D W Hardy, F Richman and C L Walker

Chapman & Hall/CRC, 2009. 410pp. £44.99
ISBN: 1420071424

This book covers a significant amount of material on cryptography, error-control codes, number theory and finite fields. Cryptography is the study of data security and is of great importance in various applications such as banking and government. Error-control codes allow us to detect and correct information in such diverse areas as computer networks, retail, book publishing, etc. One of the most prominent examples of the important use of error-control codes is colour pictures obtained from space satellites. Such pictures would not be possible as they are corrupted on the way from the satellite to the receiver, but they were fully recovered due to the application of error-correcting codes. Modern cryptography and error-control codes are based on mathematics, especially algebra and number theory. The book describes a large number of theorems, algorithms and examples from algebra and number theory.

The material described in the book ranges from results discovered long time ago (such as Julius Caesar cipher and Chinese Reminder Theorem techniques known to the Chinese already in the first century A.D.) to recent advancements (such as Rabin's probabilistic primality test and RSA cipher by Rivest, Shamir and Adleman). Some of the material is quite simple such as elementary facts on numbers and polynomials, but some other material is highly nontrivial such as finite fields with nonprime number of elements, and Bose and Ray-Chaudhuri (BCH) and Reed–Solomon codes. What is remarkable about this book is that the authors managed to explain even difficult results in such a way that they are not that difficult to understand without spending many hours. This is achieved by including practically all necessary mathematics in the book when and where it is needed and by providing a large number of examples and exercises. Answers are given to odd-numbered exercises. In my view, the examples play the key role in making the material accessible to 'everyone' as many mathematical ideas and results are initially illustrated via examples and only later given as formal statements. At the same time, the authors do not avoid giving proofs and, thus, allow the interested reader to have a fairly deep understanding of the subject.

The book points out to the existence and great usefulness of computer algebra systems such as Maple, Mathematica, MuPAD and Axiom. The authors argue that such systems are as necessary to many scientists as calculators to many people. The authors give short historical notes on mathematicians who obtained important results mentioned in the book. The

notes are very interesting and I believe that including notes on modern researchers such as Rabin and the inventors of the RSA cipher would stress the fact that many results considered in the book were obtained quite recently.

The authors have planned the book as a textbook for students in mathematics and computer science. I believe that they definitely succeeded in their task. Moreover, I think that the book is useful to many other readers such as researchers in various areas of science and technology, where cryptography, error-control codes, number theory and/or finite fields are of interest. The book is well-written and I would recommend its purchase to any scientific library.

Royal Holloway G Gutin

Multi-agent Systems: Algorithmic, Game-theoretic, and Logical Foundations (Hardcover)

Y Shoman and K Leyton-Brown

Cambridge University Press, 2009. 496pp. £35.00
ISBN: 0521899435

This advanced textbook provides a comprehensive collection of theoretical developments in multi-agent systems, with a focus on aspects most relevant to computer science. The topics covered are distributed problem solving, non-cooperative game theory, multi-agent learning, social choice, mechanism design, auctions, cooperative game theory and modal logics of knowledge and belief. For each topic, basic concepts are introduced, examples are given, proofs of some results are presented and algorithmic considerations are examined.

The early topics, up to and including multi-agent learning, are clearly and carefully presented, with interesting motivating examples. The selection of proofs that has been presented is slightly peculiar—seven pages have been devoted to proving the existence of Nash equilibria from first principles, which is rather abstract, whereas the omitted proofs of several results later in this section could provide real insight into the problems relevant to multi-agent systems. However excellent referencing will allow an interested reader to follow up any results that are not proved in the book.

The chapters on social choice, mechanism design, auctions and cooperative game theory are more dense, and slightly less well motivated, than the early chapters, although still clear and presented with interesting examples. They do provide a complete snapshot of the state of play in this important area of research, but will be especially useful for a reader who has some knowledge of the topic but wishes to read some more. The book finishes with chapters discussing logics of knowledge and belief. Unfortunately these final chapters introduce a lot of additional notation, and a completely new level of abstraction, without providing sufficient assistance to the reader.

Overall, this is an excellent volume summarizing current theoretical results for multi-agent systems. It is the first book I have read that brings together the relevant mathematical results from such a wide variety of underlying disciplines. The writing is very clear, and the production standard is excellent. I particularly liked the marginal notes flagging the introduction of each concept (such as 'Nash equilibrium' printed in the margin where this concept is first discussed) and the useful 'History and references' section at the end of each chapter, both of which greatly enhance the usefulness as a reference manual.

It will therefore be an invaluable reference manual for graduate students and researchers working on these topics. A practitioner will be provided with an overview of the techniques and a useful summary of the available theory; it will not however tell a practitioner how to use multi-agent systems, as it focuses almost exclusively on the underlying theory. The price is appropriate for a volume of this type, especially as the book serves both to educate the reader and to serve as a reference manual.

University of Bristol D Leslie

System Control and Rough Paths (Oxford Mathematical Monographs)

T Lyons and Z Qian

Oxford University Press, 2005. 216pp. £53.00
ISBN: 0198506481

Terry J. Lyons is Wallis Professor of Mathematics, belonging to the Mathematical Institute of the Oxford University. In that institution, the Stochastic Analysis Group is also integrated by Professor Qian (among others), being both co-authors of this book. As Terry Lyons said, its approach is that of a pure mathematician, but its research has desirable consequences for numerical methods, sound compression, finance and filtering, among others.

The classical Calculus is used to describe systems with a local interaction. The simplest may be the case of a control problem without feedback. The child of Calculus, Differential Equations, express the relationship between a controlling process x and a response y. But in many contexts, the controls are highly oscillatory and not adequately modelled by classical tools. Itô showed us how to develop a theory of differential equations to allow the external influence to be modelled by a Brownian motion or a semi-martingale. This development may be theoretical, but with many practical applications.

Stochastic analysis is a branch of Probability Theory dealing with operations on stochastic processes. So, it is related to a process involving a randomly determined sequence of observations. Its focus is to develop a theory of integration for integrals of stochastic processes with respect to stochastic processes. This is used to model and analyse systems that behave randomly, for instance, in Physics or Ecology. In the last few years, such techniques have been used in financial mathematics. The Brownian motion is the most basic process, lying at the heart of stochastic analysis. The theory of rough paths considers the relationship

between the control and the response, and identifies natural metrics making this function uniformly continuous, and well-defined on the completion. The completions of the smooth paths in these metrics are called rough paths. The stochastic analysis may be also understood as the analysis of a function defined on the Wiener space. As the Wiener space is infinite-dimensional, it requires a special calculus, the so-called Malliavin Calculus, further improved with Itô results, giving the Itô–Malliavin calculus. Some of the technical tools to describe such theory are: the Wiener process, the Ornstein–Ullenbeck process, and also the Sobolev spaces.

Systems evolve and interact, sometimes in a continuous way; in such cases, differential equations can be used to provide models for the reaction of the controlled system to external stimuli or forcing. If the forcing is not smooth, one cannot use classical calculus. The theory of rough paths provides an adequate mathematical extension of Newtonian calculus, allowing one to model the responses of systems subject to more wildly oscillating stimuli. This book defines rough paths as the completion of the piecewise smooth paths under a p-variation rough path metric. Mathematicians often study random movements by means of differential equations. In general, these equations may be very complicated, with many unknown variables, perhaps including noise. The rough path analysis may accurately describe their evolutions. A key perspective is that the net information can be described by its signature.

The approach is well structured, and allows us to analyse a control in terms of a sequence of coefficients, the signature of the control. It is recently proved [Lyons, Hambly] that such 'signature' completely characterizes the control, up to the appropriate null sets. All these have generated new open problems. The book is very concise, dense and nevertheless, it remains clear. For these reasons, it may be very useful not only for researchers, but also for graduate students interested in the current ways to solve infinite-dimensional problems in Probability Calculus, and as a workbench on Random Processes. It may be difficult to understand without a solid mathematical background on Probability Theory and Mathematical Analysis, but a very extensive Bibliography is provided, including both classical references and new research papers. So, in conclusion, I consider this a good book.

Departamento de Matemáticas Fundamentales A Garrido

Acceptance Sampling Quality in Control (Statistics: A Series of Textbooks and Monographs) (Hardcover)

E G Schilling and D V Neubauer

Taylor & Francis, 2008. 700pp. £72.99
ISBN: 1584889527

Acceptance Sampling in Quality Control (the book) is an excellent textbook for senior undergraduate and graduate students who are studying and doing research in acceptance sampling. It covers all major research achievements and essential tools in this field. It is also a wonderful handbook for all professionals in quality control.

The book is concisely written. Chapter 1 for example discusses all essentials of control charts (background, formulas and steps to build chart charts) in two and a half pages. On the other hand, the book is very comprehensive. In Chapter 3, it covers all major probability distribution functions, so is much more comprehensive than most of the textbooks currently available. The book introduces other statistical topics, such as confidence intervals, risks, quality levels and so on. It makes the readers aware that sampling tests are not an isolated topic. It concerns itself with other statistical issues as well. Thus, by reading this book, the readers will be motivated to integrate all statistics knowledge all together.

The book includes every major standard or table in quality control, such as MIL-STD-xxx, H-108, etc. It is the most complete collection of standards the reviewer has ever seen. The reviewer would think that the book is a good reference for military personnel, too.

There are a couple of suggestions this reviewer would like to make. Firstly, the probability examples: Chapter 1, page 12, the authors mentioned some typical probability examples. A deck of cards is used to illustrate the probability problem. Cards and dice have been used in other textbooks for the same purpose for so many years. If the authors could use some other items (instead of cards or dice) to illustrate the probability theories, the readers would feel more 'refreshed' about this book.

Secondly, acceptance sampling for lean manufacturing environment: Lean manufacturing concepts have become more and more popular worldwide. In lean manufacturing environment, the production process has a small batch size, making it more challenging for acceptance sampling to decide whether to accept or reject a lot. More discussions should have been made to discuss this particular manufacturing scenario. Literature review related to this specific topic should have been done as well. How to address the acceptance sampling issues under lean manufacturing environment will be very useful for the professionals from manufacturing industry. If the book could address this issue in the future editions, the book will certainly become more popular.

Thirdly, the producer and customer risk: in Chapter 4, the authors introduced acceptance sampling at producer's risk and customer's risk. It is known that it is difficult to satisfy both the producer's and customer's interests at the same time. However, this conflict could be addressed, according to the reviewer's point of view. If the authors could include some of the research findings in this respect, the readers would feel more satisfied with Chapter 4.

To sum up, the book is a good textbook and handbook for all professionals involved in quality control. The reviewer would like to recommend the book to his colleges, students and friends in manufacturing and operation management areas.

Oregon Institute of Technology W Sun

Manufacturing Strategy 3e: Texts and Cases (Paperback)

A Hill and T Hill

Palgrave Macmillan, 2008. 352pp. £37.99
ISBN: 023052091X

The current edition has been structured into 11 main chapters, which incorporates a range of subjects; from international comparisons, to principles of operations strategy, processes, product focus, supply chain and supporting processes for operations and finally but not least to performance measurement.

At first glance, the excellent structure and simplicity of the layout becomes apparent. The ease of the layout and structure of the book allows the reader to gain easy access to its content. The content outline has been divided into two sections, which allows the reader to glance over the book's overall subject coverage in the form of short contents that leads later to a more detailed content. Each chapter begins with a summary and underlines the importance of the subject issue. In the end the authors supply a reflection on the chapter that underlines the critical issues at hand. In the final section of each chapter discussion questions and an up-to-date reference and notes are supplied.

The first chapter on International Comparisons details the UK's manufacturing operations and its changes in the last 30 years. The authors guide step-by-step the reader through the changes in the area of manufacturing that underlines the clear strategic shift driven by the statistical outputs from OECD, US Department of Labor, UK Department of Trade and Industry and others. After having set the manufacturing environmental context, the second chapter introduces the principles and concepts for operations. The third chapter uses a well-established model of order qualifiers and winners and explains both the importance of manufacturing operations strategy and steps towards its successful implementation. The section following, Operations Strategy Methodology, includes models and approaches aspects to consider when analysing markets and how to determine the winners and qualifiers and develop a relevant operations strategy so that the inherent competitive risks could be mitigated. The next chapters allow the reader to look the processes and the products not just from the technical/engineering lenses, but also by using market as the common dominator translates these stages into business strategy. The focus chapter concepts have been explored with the help of several strategies and in-depth case studies—to raise the understanding that operations need to maintain focus as a strategic decision.

The section on 'Supply Chain Management' enhances the understanding of 'make or buy' decisions investigating the associated strategic operations behaviour in supply chains. The final section concludes with very important subjects covering from accounting to finance, and to performance measurement in the operational context. Although one of the longest chapters in this book, when compared to the richness of the subject areas, an even richer picture could have been provided—given the range of interest groups. In looking overall at the rich scope of this book, the restriction and limitation of this subject area comes not as a surprise. Another good feature of this book is that it includes a comprehensive set of up-to-date models, frameworks and a rich indication to further references and excellent cases, which presents on its own a great source of information and value. Although it would have been also beneficial to include the quantitative techniques for operations, however considering the strategic underpinning element, the overall weighing of other subjects is understandable.

Overall, this is a well written and an excellent reference book for postgraduate students, academics and managers in the area of manufacturing strategy and operations who would mostly benefit from widely applicable cases across many industrial sectors as diverse as printing, automotive, aerospace and consumer goods and the utilization of manufacturing operations strategy frameworks.

University of Brighton O Bak

Sustainability Indicators: Measuring the Immeasurable? (Paperback)

S Bell and S Morse

Earthscan Publications Ltd, 2008. 240pp. £18.99
ISBN: 1844072991

It might be expected that a text on Sustainability Indicators would be able to provide a short, sharp definition of sustainability to set the scene for the rest of the book. However, the first chapter instead sets out very nicely the fact that there is a lack of a concrete definition of sustainability, particularly among those that use the term extensively.

Within the rest of Part I of the book, the authors set out descriptions of sustainability, sustainability indicators and the types of systems that might have sustainability indicators. Part II is a more challenging description of a range of concepts, moving the reader from indicators within a clearly measurable framework to indicators within systems, to viewpoints on systems and scenario development. The final chapter of this section introduces a methodology (in a very loose sense of the word) for undertaking systemic sustainability analysis. The final part looks at areas for development within the methodology and the need for reflection.

The style of the book is accessible, with extensive use of diagrams, information boxes and real-world examples, but for the academically inclined, it is also exceptionally well backed up with references and a list of acronyms and abbreviations. The major project case study, Plan Bleu, is also referenced, but as is the way with live websites, the full website references take the reader to apologies that the page is missing or a link is broken. The Plan Bleu website is easily explored and navigated however, either in the original French or in

English, to provide the required understanding of the wider project.

Given the ubiquitous nature of sustainability requirements in all things currently, and particularly in the public sector in the UK, this book provides tremendous food for thought. While the opening cases are more focused on environmental examples, such as river systems in Wales, or anchovy fishing off the South American coastline, later examples refer to more socially and economically focused systems such as cities and communities. Some of the best quotations and examples come from the Norwich 21 project, and for those working with Local Area Agreements and Neighbourhood Renewal schemes, the importance of these cannot be overstated.

The discussion on stakeholders and how to engage them in participation is interesting, but to my mind, the global focus including village communities in the Third World may be ambitious for those readers, who find this difficult in industrialized parts of Great Britain. Although the title would make the book appealing to those working across the world in environmental projects, there is also much to draw in those working in the UK who are constantly challenged to engage with communities of interest. The requirement to operate in a sustainable manner in any public sector contract currently, from practical waste disposal to evaluation of post-16 education systems, emphasizes the lack of understanding by procuring organizations and the ubiquitous use of the word sustainable as synonymous with good practice or ability to keep the activity going once funding is withdrawn.

The Imagine process for systemic sustainability analysis is thought provoking and should be replicable in a wide variety of situations. Indeed the authors request that anyone that tries it out, should contact them to help them refine the model, understand any limitations or constraints in practice and in breadth of applicability, and enrich the case evidence of how it may be used.

Despite the book drawing on materials offered by the Open University, to my mind, this book is more targeted at the practitioner, albeit one with the luxury of taking a day or so out to research the best way of building the measurement of sustainability into a project from the outset. Indeed in broader terms, anyone needing to set evaluation frameworks would find much of interest and assistance in this work. As such, it should appeal to those working in the public sector on projects, or as consultants to the public sector on projects. Post-graduate, post-experience students will also find much of value in this book, not least the summary of important concepts and methods, such as soft systems methodology, cybernetics, logframes and learning organizations.

Plantagenet Consulting Ltd J Holland