

Probability in the Engineering and Informational Sciences

Editor: SHELDON M ROSS, *Professor of Industrial Engineering and Operations Research, University of California, Berkeley*

Background

Recent years have seen a vast increase in research on the application of probability to a variety of fields in the physical, engineering, biological, behavioural, economic and management sciences. Stochastic modelling has been part of the biosciences accepted methodology for many years, but physical scientists and engineers have been much more reluctant to admit the possibility of randomness in their disciplines. However, as systems of such complexity have developed in, for example, computer science and telecommunications that purely deterministic analyses are no longer feasible, there has been a related growth in research on stochastic models in the physical and engineering sciences. **Probability in the Engineering and Information Sciences** has developed to fill the gap in the existing literature by publishing original research in this subject area.

Aims and Scope

PEIS is a wide ranging quarterly journal focusing on the many uses of probability. The primary focus of the journal is on stochastic modelling in the physical and engineering sciences, with particular emphasis on queueing theory, reliability theory, inventory theory, simulations, stochastic control theory and probabilistic networks and graphs; but papers on analytic properties and related disciplines are also published, as well as more general papers on applied and computational probability, if appropriate.

Recent Articles include...

Reliabilities of Double-Loop Networks

F. K. Hwang and Wen-Ching Winnie Li

Chi-Square Goodness of Fit: A Failure Rate Perspective

Mark Brown and Marcia H. Flicker

A Simple Numerical Approach for Infinite-State Markov Chains

Henk C. Tijms and Michel C. T. Van de Coevering

Stochastically Minimizing Total Delay of Jobs Subject to Random Deadlines

Susan H. Xu

Renewal Networks: Connectivity and Reachability on a Time Interval

Charles J. Colbourn and Michael V. Lomonosov

On the Optimality of Trunk Reservation in Overflow Processes

Vien Nguyen

Subscriptions

Volume 6 in 1992; published in January, April, July and October. £143 for institutions; £49 for individuals; delivery by airmail £13 per year extra. ISSN 0269-9648.

Write for more information and a free sample copy to Journals Marketing Dept., Cambridge University Press, The Edinburgh Building, Cambridge CB2 2RU, UK, or FAX 0223 315052.



CAMBRIDGE
UNIVERSITY PRESS

A NEW journal in the applications of categorical, algebraic and geometric methods in Computer Science

Mathematical Structures in Computer Science

Why a new journal?

Mathematical Structures in Computer Science (MSCS) is a new journal of excellence in theoretical computer science which focuses on the application of ideas from the structural side of mathematics and mathematical logic to computer science. The journal aims to bridge the gap between theoretical contributions and software design, publishing original papers or broad surveys with original perspectives in all areas of computing, provided that ideas or results from algebra, geometry or category theory form a basis for the work. MSCS is distinct from existing titles in that it specialises in the art of applying mathematics of genuine interest and general applicability to computer science; its objective is to promote the useful application of high level mathematics to language design and software implementation. The journal will increase the circulation of new results in this fast growing area.

Editor-in-Chief

G Longo, *LIENS-DMI, Ecole Normale Supérieure, 45 rue d'Ulm, 75005 Paris (email: longo@dmi.ens.fr)*

Associate Editors

P L Curien, *LIENS-DMI, Ecole Normale Supérieure, 45 rue d'Ulm, 75005 Paris (email: curien@dmi.ens.fr)*

A M Pitts, *Computer Laboratory, University of Cambridge, Pembroke St, Cambridge*

Essential reading for:

- Mathematicians with interests in computer science
- Theoretical computer scientists
- Computer scientists working in language development or formal methods

Recent articles

From Petri Nets to Linear Logic
NARCISIO MARTI-OLIET & JOSE MESEGUER

Impredicative Calculi of Dependent Types
THOMAS STREICHER

Operations on Records
LUCA CARDELLI & JOHN C MITCHELL

Predicate Transformer Semantics
ERNIE MANES

Declarative Continuations:
An Investigation of Duality in Programming
ANDRZEJ FILINSKI

A Category-theoretic Account of Program Modules
EUGENIO MOGGI

What is Functional Programming?
R F C WALTERS

Subscription information

Mathematical Structures in Computer Science, Volume 3: March, June, September and December 1993: £105/\$185. Delivery by airmail £16.00 per year extra (dollar price includes airfreight to New York). ISSN 0960-1295

Send your order to Journals Marketing Department, Cambridge University Press, FREE-POST*, The Edinburgh Building, Cambridge CB2 1BR, England TEL: +44 (0)223 325806, FAX +44 (0)223 315052 *no postage stamp necessary if posted in UK

In US, Canada & Mexico write to: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA



**CAMBRIDGE
UNIVERSITY PRESS**

London Mathematical Society Publications from Cambridge

The BULLETIN of the LMS

Editors: John D S Jones and John H Rawnsley
Mathematics Institute, University of Warwick

The BULLETIN, which was founded in 1969, joined the older established JOURNAL and PROCEEDINGS to complete the trio of important mathematical periodicals.

The BULLETIN publishes important short research articles as quickly as possible, with coverage extending across the whole of pure mathematics together with some more applied areas of analysis and theoretical computing.

The six issues a year also carry authoritative surveys and research-expository articles. The Book Reviews section containing authoritative reviews of a comprehensive selection of books in applied mathematics and statistics as well as pure mathematics.

The BULLETIN is published six times a year in January, March, etc., one volume per year. (Volume 24 in 1992) ISSN 0024-6093. Subscriptions £122.

The JOURNAL of the LMS

Editors in Chief: I N BAKER and G D JAMES, *Department of Pure Mathematics, Imperial College, London SW7*

The JOURNAL is one of the main publications of the London Mathematical Society. It is published six times a year in two volumes and tends to publish longer papers than the BULLETIN (normally in the range of 7 - 17 pages each) covering all areas of pure mathematics, from number theory to functional analysis, from finite simple groups to the mathematical foundations of quantum theory, from logic and topos theory to the topology of Lie groups.

The JOURNAL is published six times a year in February, April, etc., in two volumes. (Volumes 45 & 46 in 1992) ISSN 0024-6107. Subscriptions £252.

Book Series... Your library can now make sure that it receives all future volumes by setting up a 'continuation order' which works in a similar way to a journal subscription and enables libraries to 'subscribe' to a series and thereby receive all new series volumes immediately on publication.

LMS Lecture Note Series

Lecture notes and refereed conference proceedings of the highest quality (each volume c. £20 paperback, about 10 volumes per year). This series has established itself as a valuable source of information for professional mathematicians and research workers in all areas of mathematics.

LMS Student Texts

Textbooks for senior undergraduate and graduate students (each volume c. £10 paperback, c. £25 hardback, about 4 volumes a year). This series performs the unique function of offering introductions to areas in which there is an absence of well-established and standardised exposition, thus providing students access to new and exciting ideas as they emerge.

Send for further information and free sample copies to Journals Marketing Dept., Cambridge University Press, The Edinburgh Building, Cambridge CB2 2RU, UK, or fax 0223 315052



**CAMBRIDGE
UNIVERSITY PRESS**

European Journal of Applied Mathematics

Aims and Objectives

Increasingly research workers in science and industry pose their problems in mathematical and computational terms. Such activity leads to a need for new mathematical analysis at a high level. This is particularly true in physical applied mathematics as can be seen from current developments in areas such as materials science, electronics, aerodynamics, or environmental modelling.

European Journal of Applied Mathematics (EJAM) is a new journal for original work in those areas of mathematics for which an understanding of the application requires the use of innovative and interesting mathematical ideas. It focuses on areas of mathematics inspired by real world applications, at the same time fostering the development of theoretical methods with broad areas of applicability.

EJAM is distinct from existing titles in that it specialises in the art of applying mathematics of genuine interest and general applicability to real problems. Particular emphasis is attached to the exposition of high level mathematics, both rigorous and heuristic, in terms comprehensible to all mathematically-minded applied scientists.

Editors

Although the journal is primarily based in Europe, the journal's editors and editorial board work at centres of excellence throughout the world and have the highest reputations in this field of study. EJAM is edited by: Dr J. R. Ockendon, assisted by Dr S. D. Howison, Mathematical Institute, University of Oxford, 24-29, St Giles, Oxford OX1 3LB, UK., (email=ejam@uk.ac.ox.vax)

Subscription

Volume 4 in 1993; published in March, June, September and December. £96; £54 for members of SIAM, ECMI, GAMM, SMAI and the LMS; delivery by airmail £13 per year extra. ISSN 0956-7925. Volumes 1 & 2 are still available. Write, telephone or fax for details.

Recent & Forthcoming Articles

A self-similar solution to the focusing problem for the porous medium equation *D. Aronson & J. Gravelau*

On a self-similar solution for the decay of turbulent bursts *S. P. Hastings & L. A. Peletier*

Nonclassical symmetry reductions and exact solutions of the Zabolotskaya-Khokhlov equation *P. A. Clarkson & S. Hood*

Laminates and microstructure *P. Pedregal*

On the generalised pantograph functional-differential equation *A. Iserles*

The propagation of turbulent bursts *S. Kamin & J-L Vazquez*

See for yourself ...

Please send me a free sample copy of European Journal of Applied Mathematics

Name _____

Address _____

Send this coupon to: Journals Marketing Department, Cambridge University Press, FREEPOST*, The Edinburgh Building, Cambridge CB2 1BR, UK (No postage stamp necessary if posted in the UK, OR, fax +44 (0)223 315052

In US, Canada & Mexico, write to Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, USA



CAMBRIDGE
UNIVERSITY PRESS

50840

Instructions for Authors

Editorial policy The journal welcomes submissions in any of the areas of Combinatorics, Probability, or Computer Science, not just those dealing explicitly with relations between the three. Its scope covers combinatorics in a broad sense, including classical and algebraic graph theory, probabilistic methods, random structures, combinatorial probability and limit theorems for random combinatorial structures; and the theory of algorithms, including complexity theory, randomised algorithms, probabilistic analysis of algorithms, computational learning theory and optimisation.

Submission of manuscripts Papers may be submitted to any member of the Editorial Board. Three copies should be sent accompanied by the author's address, telephone and fax number, and if possible, an electronic mailing address. The publisher encourages submission of manuscripts written in LaTeX, Plain TeX or AMS TeX; papers written in LaTeX may be submitted electronically by sending a file to cpc@pmms.cam.ac.uk; this file should, if possible, include all line figures. Authors using LaTeX may wish to use the `cpc` style file which can be obtained **on acceptance of their paper** from the editors, otherwise they are requested to use 'article style'. Authors may send discs (Apple Mac or PC) containing the TeX source code plus any macros and other relevant details to the editorial office. These should correspond exactly to the hardcopy manuscript accepted for publication. Discs will not be returned. The publisher reserves the right to typeset any article by conventional means if the author's TeX code presents problems in production.

Submission of a paper is taken to imply that it has not been previously published and that it is not being considered for publication elsewhere. Upon acceptance of a paper, the author will be asked to transfer copyright to the publisher.

Layout of conventional manuscripts Papers should be typewritten in **double spacing throughout**, on one side of the paper. Please avoid footnotes if possible. Papers should begin with an abstract of not more than 300 words and should end with a brief concluding section.

Illustrations Figures should be drawn in indian ink on good quality white paper or produced by computer to comparable quality. Wherever possible they will be reproduced with the author's original lettering. Originals of figures should not be sent until the paper has been accepted. A list of captions should be attached separately.

References References should be listed in alphabetical order at the end of the main text. Please include the article title in the reference, which should be in the order: author's surname, initials; year in parentheses; article title; journal name abbreviated in accordance with the *World List of Scientific Periodicals* (4th edn); volume number; inclusive page numbers. For books and conference proceedings, place of publication and publisher (and Editor(s) if appropriate) should be included. In the text, references should be cited as [1].

Proof Reading Typographical or factual errors only may be changed at proof stage. The publisher reserves the right to charge authors for correction of non-typographical errors.

Offprints 50 offprints of each article will be supplied free to each first named author. Extra offprints may be purchased from the publisher if ordered at proof stage.



Combinatorics, Probability & Computing

CONTENTS

| | |
|---|-----|
| Point Selections and Weak ϵ -Nets for Convex Hulls NOGA ALON, IMRE BÁRÁNY, ZOLTÁN FÜREDI AND DANIEL J. KLEITMAN | 189 |
| On the Diameter of Random Cayley Graphs of the Symmetric Group L. BABAI AND G. L. HETYEI | 201 |
| A Characterisation of Strict Matching Matroids VICTOR BRYANT | 209 |
| Duality for Random Sequential Adsorption on a Lattice Y. FAN AND J. K. PERCUS | 219 |
| Cycles in a Uniform Graph Process JERZY JAWORSKI AND TOMASZ ŁUCZAK | 223 |
| Complete Subgraphs of r -partite Graphs GUOPING JIN | 241 |
| Maximum Waiting Times are Asymptotically Independent TAMÁS F. MÓRI | 251 |
| The Strongly Connected Components of 1-in, 1-out B. REED AND COLIN McDIARMID | 265 |
| Duality in Polymatroids and Set Functions GEOFF WHITTLE | 275 |

© Cambridge University Press 1992

Cambridge University Press

The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011-4211, USA
10 Stamford Road, Oakleigh, Victoria 3166, Australia

Printed in Great Britain by the University Press, Cambridge