



# COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE

## AUTHOR INFORMATION PACK

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### DESCRIPTION

To encourage the development of formal **computing methods**, and their application in biomedical research and medical practice, by illustration of fundamental principles in **biomedical informatics** research; to stimulate basic research into application software design; to report the state of research of **biomedical information processing** projects; to report new computer methodologies applied in biomedical areas; the eventual distribution of demonstrable software to avoid duplication of effort; to provide a forum for discussion and improvement of existing software; to optimize contact between national organizations and regional user groups by promoting an international exchange of information on formal methods, standards and software in biomedicine.

*Computer Methods and Programs in Biomedicine* covers computing methodology and **software systems** derived from computing science for implementation in all aspects of biomedical research and medical practice. It is designed to serve: biochemists; biologists; geneticists; immunologists; neuroscientists; pharmacologists; toxicologists; clinicians; epidemiologists; psychiatrists; psychologists; cardiologists; chemists; (radio)physicists; computer scientists; programmers and systems analysts; biomedical, clinical, electrical and other engineers; teachers of medical informatics and users of educational software.

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### **INTRODUCTION**

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### **Field of Interest**

The application of computer science methodology and software to the full range of theoretical and clinical biomedical specialties, including: Biochemistry; Biophysics; Molecular biology; Genetics; Immunology; Microbiology; Cardiology; Neurophysiology; Radiotherapy; Pharmacology; Clinical psychology; Psychophysiology and social medicine; Biomedical informatics; Biostatistics; Biomedical mathematics and cybernetics; Biomedical, clinical and electrical engineering; Clinical decision support; Hospital information systems; Process control; Medical imaging; Ambulatory monitoring.

### **Contents**

*In Focus Papers* These include: state of research papers on ongoing projects; future trends; software applications; computer-aided instruction in the laboratory and clinical practice; evolving hardware and software technology and its influence on health application design; developments in the science of biomedical computing, and areas listed under 'Section I. Methodology' below

#### *Section I. Methodology*

Papers on methodology in established and maturing areas such as: (1) artificial intelligence; (2) man/machine interaction and interfaces (e.g., CAI, CAL, CAD/CAM, Decision support systems and voice-computer interaction); (3) database management; (4) biomedical modelling and simulation; (5) signal analysis; (6) image processing; (7) biosignal-based electronic prosthesis; (8) computer control of laboratory machines and devices; (9) computer communication networks; (10) computer architecture/software interaction, may be structured as follows:

1. *Introduction.* A discussion of the research or clinical issues underlying a project's design, the need for the methodology / system, and any pilot studies done to demonstrate the demand for, or feasibility of, such a methodology / system.

2 *Background.* This should be divided into two subtopics: a discussion of prior work by the authors that led to the current design decisions; and an analysis of related work in the literature. An acknowledgment, analysis and integration of lessons from related work by others is crucial.

3. *Design considerations.* A discussion of the principle design, performance and implementation goals, against which the success of the methodology / system should be assessed.

4. *Description of method / system.* A description of the theoretical basis of the computational method. A technical exposition of the overall architecture, the pertinent data structures, control mechanisms, etc. and a brief description of the hardware used, is required.

5. *Status report.* A description of the current status of the implementation, informal indicators of the strengths and weaknesses of the methodology / system, and examples of its current level of performance are required.

6. *Lessons learned.* An analysis of the key insights gained from the work to date, focusing on the statement of general principles that can contribute to the knowledge in the field. The statement of such lessons must be well supported by examples. The emphasis should be on the statement of principles in such a form that they will be of use to other investigators in the field.

7. *Mode of availability of software.* The availability of demonstration/application software is a preferential criterion for acceptance.

8. *Future plans.* A discussion of how the research to date, and the lessons learned, have led to a specification of future research goals, and possible revisions in the design and implementation of the method / system.

9. *References.* A listing of literature consulted in order of citation in the text, according to the standard abbreviations and form described under 'Manuscript preparation' below.

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In addition to papers describing software related to the methodology section above, papers on biomedical computer applications, original from the point of view of theoretical or technological approach, or describing the adaptation of existing software to the solution of specific problems, may be considered. No restrictions are made on the use of computer languages; the description and exchange of software widely applied in biomedical research and medical practice is considered of most importance. Papers on programs intended for Section II should cover the following items: (i) Introduction; (ii) Computational methods and theory; (iii) System or program description, preferably with structograms, or block diagrams and flow charts; (iv) Samples of typical system or program runs; (v) Hardware and software specifications; (vi) Mode of availability of the system or program; clear information is required; (vii) Listing of literature in order of citation in the text; (viii) Appendix expanding, when necessary, material in the text.

## *Section III. Experiences with methods, systems and programs - Reader's forum*

Evaluation of methods and software applications, comments on existing computer applications published in related books or journals, and discussions of practical problems related to biomedical computing are invited from users. Cross evaluations of specific hardware and software, and letters to the Editor, are welcome.

Authors of methodological papers and systems and programs papers are encouraged to make their code or software programs available to others, in the first case in form of demonstration code, and in the second case as usable applications with suitable user interface.

## *International news*

International conferences, regional symposia and workshops are announced and reported. Newsletters from biomedical informatics associations are abstracted.

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[2] W. Strunk Jr., E.B. White, *The Elements of Style*, fourth ed., Longman, New York, 2000.

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[3] G.R. Mettam, L.B. Adams, How to prepare an electronic version of your article, in: B.S. Jones, R.Z. Smith (Eds.), *Introduction to the Electronic Age*, E-Publishing Inc., New York, 2009, pp. 281–304.

Reference to a website:

[4] Cancer Research UK, Cancer statistics reports for the UK. <http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/>, 2003 (accessed 13.03.03).

Reference to a dataset:

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[4] R.B. Barlow, Line-fitting by least-squares: Expressions solved by iteration, in *Biodata Handling with Microcomputers*, Chap. 4 (Elsevier-Biosoft, Cambridge UK, 1983).

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