

Data Mining in Biomedical Imaging, Signaling, and Systems

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Data mining can help pinpoint hidden information in medical data and accurately differentiate pathological from normal data. It can help to extract hidden features from patient groups and disease states and can aid in automated decision making. **Data Mining in Biomedical Imaging, Signaling, and Systems** provides an in-depth examination of the biomedical and clinical applications of data mining. It supplies examples of frequently encountered heterogeneous data modalities and details the applicability of data mining approaches used to address the computational challenges in analyzing complex data.

The book details feature extraction techniques and covers several critical feature descriptors. As machine learning is employed in many diagnostic applications, it covers the fundamentals, evaluation measures, and challenges of supervised and unsupervised learning methods. Both feature extraction and supervised learning are discussed as they apply to seizure-related patterns in epilepsy patients. Other specific disorders are also examined with regard to the value of data mining for refining clinical diagnoses, including depression and recurring migraines. The diagnosis and grading of the world's fourth most serious health threat, depression, and analysis of acoustic properties that can distinguish depressed speech from normal are also described. Although a migraine is a complex neurological disorder, the text demonstrates how metabonomics can be effectively applied to clinical practice.

The authors review alignment-based clustering approaches, techniques for automatic analysis of biofilm images, and applications of medical text mining, including text classification applied to medical reports. The identification and classification of two life-threatening heart abnormalities, arrhythmia and ischemia, are addressed, and a unique segmentation method for mining a 3-D imaging biomarker, exemplified by evaluation of osteoarthritis, is also presented. Given the widespread deployment of complex biomedical systems, the authors discuss system-engineering principles in a proposal for a design of reliable systems. This comprehensive volume demonstrates the broad scope of uses for data mining and includes detailed strategies and methodologies for analyzing data from biomedical images, signals, and systems.

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Editorial Review

About the Author

Sumeet Dua, PhD, is currently an Upchurch endowed associate professor and the coordinator of IT research at Louisiana Tech University, Ruston. He also serves as adjunct faculty to the School of Medicine, Louisiana State University, Health Sciences Center in New Orleans. His areas of expertise include data mining, image processing, computational decision support, pattern recognition, data warehousing, biomedical informatics, and heterogeneous distributed data integration. The National Science Foundation (NSF), the National Institutes of Health (NIH), the Air Force Research Laboratory (AFRL), the Air Force Office of Sponsored Research, (AFOSR), and the Louisiana Board of Regents (LA-BoR) have funded his research. He frequently serves as a study section member (expert panelist) for the NIH's Center for Scientific Review and has served as a panelist for the NSF/Computing in Science in Engineering (CISE) Directorate. Dr. Dua has chaired several conference sessions in the area of data mining and bioinformatics, and is the program chair for the 5th International Conference on Information Systems, Technology, and Management (ICISTM-2011). He has given over 26 invited talks on data mining and bioinformatics at international academic and industry arenas, advised over 25 graduate theses, and currently advises several students in this field. Dr. Dua is acoinventor of two issued U.S. patents, has co-authored over 50 publications and book chapters, and is an author /editor of 4 books in data mining and bioinformatics.

Dr. Dua has received the Engineering and Science Foundation Award for Faculty Excellence (2006) and the Faculty Research Recognition Award (2007); he has been recognized as a Distinguished Researcher (2004-2010) by the Louisiana Biomedical Research Network (sponsored by NIH) and has won the Oustanding Poster Award at the NIH/National Cancer Institute (NCI) caBIG-NCRI Informatics Joint Conference; Biomedical Informatics without Borders: From Collaboration to Implementation. Dr. Dua is a senior member of the IEEE Computer Society, a senior member of the Association for Computing Machinery (ACM), and a member of SPIE and the American Association for Advancement of Science.

Rajendra Acharya U., PhD, DEng, is a visiting faculty member at the Ngee Ann Polytechnic, Singapore; an associate faculty member at the Singapore Institute of Management (SIM) University, Singapore; and an adjunct faculty at the Manipal Institute of Technology, Manipal, India. He received his PhD from the National Institute of Technology, Karnataka, Surathkal, India, and his DEng from the Chiba University, Japan. He has published more than 120 papers in international journals (94), international conference proceedings (30), and books (9), and has an H-index of 12.

Currently, Dr. Acharya U. is on the editorial board of the following journals: *Journal of Medical Imaging and Health Informatics*, *Open Access Medical Informatics Journal*, *Open Assess Artificial Intelligence Journal*, *Journal of Biomedical Nanotechnology*, *Journal of Mechanics in Medicine and Biology*, and *Biomedical Imaging and Intervention Journal*. He served as the guest editor for many journals, and is a senior IEEE member and a fellow of IETE.

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