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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