Chapter 14
Bio–Inspired Algorithms for Medical Data Analysis

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ABSTRACT

Medical data mining has great potential for exploring the hidden patterns in the data sets of the medical domain. These patterns can be utilized for clinical diagnosis. Bio-inspired algorithms is a new field of research. Its main advantage is knitting together subfields related to the topics of connectionism, social behavior, and emergence. Briefly put, it is the use of computers to model living phenomena and simultaneously the study of life to improve the usage of computers. In this chapter, the authors present an application of four bio-inspired algorithms and meta heuristics for classification of seven different real medical data sets. Two of these algorithms are based on similarity calculation between training and test data while the other two are based on random generation of population to construct classification rules. The results showed a very good efficiency of bio-inspired algorithms for supervised classification of medical data.

INTRODUCTION

Modern medicine generates almost daily, huge amounts of heterogeneous data. For example, medical data may contain SPECT images, signals like ECG, clinical information like temperature, cholesterol levels, etc., as well as the physician's interpretation. Those who deal with such data understand that there is a widening gap between data collection and data comprehension. Computerized techniques are needed to help humans address this problem. This volume is devoted to the relatively young and growing field of medical data mining and knowledge discovery. As more and more medical procedures employ imaging as a preferred diagnostic tool, there is a need to develop methods for efficient mining in databases of images. Other significant features are security and confidentiality concerns. Moreover, the physician's

interpretation of images, signals, or other technical data, is written in unstructured English which is very difficult to mine.

Health care organizations are struggling to find new ways to cut healthcare utilization and costs while improving quality and outcomes. Predictive models that have been developed to predict global utilization for a healthcare organization cannot be used to predict the behavior of individuals. On the other hand, massive amounts of healthcare data are available in databases that can be used for exploring patterns and therefore knowledge discovery. Diversity and complexity of the healthcare data requires attention to the use of statistical methods. By nature, healthcare data are multivariate, making the analysis difficult as well as interesting.

Vast quantities of data are generated through the health care process. While technological advancements in the form of computer-based patient record software and personal computer hardware are making the collection of and access to health care data more manageable, few tools exist to evaluate and analyze this clinical data after it has been captured and stored. Evaluation of stored clinical data may lead to the discovery of trends and patterns hidden within the data that could significantly enhance our understanding of disease progression and management. Techniques are needed to search large quantities of clinical data for these patterns and relationships. Past efforts in this area have been limited primarily to epidemiological studies on administrative and claims databases. These data sources lack the richness of information that is available in databases comprised of actual clinical data.

In this study, we propose application of bio inspired algorithms in one of the major real life issues, medical data analysis. We have applied four bio-inspired algorithms on seven different medical datasets, the organization of the chapter was given as following: next section we give some related works to our study, then we presented the cases studied, where we give idea about the seven datasets used in experiments then we explain the four algorithms applied for classification of those datasets, and we defined measures used for evaluation, after that we discuss the obtained results. Finally, we give major conclusions.

Related Works to Medical Datasets

Predicting the outcome of a disease is one of the most interesting and challenging tasks where to develop data mining applications. In this section, we will present some related Work who used medical datasets:

Cancer Classification

Breast cancer is one of the leading cancers for women when compared to all other cancers. (Chaurasia, 2014) is a study that is made to investigate the performance of different classification techniques. This study analyses the breast Cancer data available from the Wisconsin dataset from UCI machine learning with the aim of developing accurate prediction models for breast cancer using data mining techniques.

The Disease Prediction plays an important role in data mining. Several techniques of data mining are used to predict different types of diseases. This research paper analyzes how data mining techniques are used for predicting different types of diseases it reviewed also the

research papers which mainly concentrated on predicting heart disease, Diabetes and Breast cancer . (Vijiyarani, 2013)

Lung Cancer is a disease of uncontrolled cell growth in tissues of the lung. Detection of Lung Cancer in its early stage is the key of its cure. In this paper we will use some techniques are essential to the task of medical image mining, Lung Field Segmentation, Data Processing, Feature Extraction, Classification

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