Chapter 36
Parallel and Distributed Population Based Feature Selection Framework for Health Monitoring

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ABSTRACT

Smart health monitoring systems have become the subject of an extensive research during the past decades due to their role in improving the quality of health care services. With the increase of heterogeneous data produced by these systems, traditional data preprocessing methods are not able to extract relevant information. Indeed, feature selection is a key phase to preprocess data, it aims to select a relevant feature subset to reach better classification results with an affordable computational cost. In this study, we provide an overview of existing feature selection methods especially those used in the context of Bigdata, pointing out their advantages and drawbacks. Then, we propose a parallel population based feature selection framework for health monitoring.

INTRODUCTION

Each year, a great number of human deaths are caused by diseases. Therefore, an efficient patient monitoring system aims to enhance life quality of patients and determine their health conditions. It also allows doctors to detect critically ill patients in a short period of time and at the right time. In addition, it reduces hospitalization and provides patient health conditions at any time leading to a better decision making.

Health monitoring systems can be categorized into wearable health monitoring systems, mobile health monitoring systems and remote health monitoring systems (Baig & Gholamhosseini, 2013).

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On the one hand, remote health monitoring systems (RHMS) represent those with remote access or systems which can receive data from a remote location. They can be used either in hospitals or at home. On the other hand, mobile health monitoring systems (MHMS) employ mobile phones, personal digital assistants (PDAs), and pocket personal computer (PC) based systems as a processing tool. Wearable health monitoring systems (WHMS) use wearable devices or biosensors that can be worn by patients. They are used to track daily patient actions, capture patients measure's such as blood pressure, glucose level, heart rate.

Different kinds of health monitoring systems exist in the literature such as SMARTDIAB and ANGELAH.

SMARTDIAB (Mougiakakou, Bartsocas, Bozas & Nikita, 2010) is a health monitoring system to track patients with type 1 diabetes. It is composed of two units, patient unit and patient management unit. The patient unit collects measures of patient such as glucose levels, insulin intake, diet, and physical activity. On the other side, advanced technologies to process patient's data are used allowing medical staff to monitor patient health's and to recommend the best treatment for him.

ANGELAH (Tarik, Dario, Mohsen, & Hammadi, 2009): is an elderly health monitoring system, it performs using three phases: the response management tier, the monitoring and assistance tier, and the group Collaboration tier.

These tiers have multiple functionalities, for instance, they ensure the regulation of the whole sensors and actuators in the patient home's, then they combine all sensors information. In addition, they play also an important role to prevent and alert the surveillance center if the patient is in a critical situation. Once messages of alert are received, a group of medical professionals is formed to assist the patient.

In such systems, several kinds of data are collected with a large number of irrelevant, redundant information that must be discarded. Indeed, feature selection is a crucial preprocessing task. It consists of reducing the dimensionality of the feature space by selecting relevant features due to their impact on the classification process while eliminating the redundant and irrelevant features to reach good classification results.

In general, each feature selection algorithm can be classified into filters or wrapper methods shown in Figure 1 (Huan & Lei, 2005). Hybrid method is another type of feature selection method which combines filter and wrapper approachs. Filter methods are independent from any learning algorithm, they use a specific criterion related to general characteristics of the training data to arrange all features, then retain

Figure 1. Wrapper feature selection method