Chapter 57
Impact of Swarm Intelligence Techniques in Diabetes Disease Risk Prediction

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ABSTRACT

Diabetes has affected over 246 million people worldwide and by 2025 it is expected to rise to over 380 million. With the rise of information technology and its continued advent into the medical and healthcare sector, different symptoms of diabetes are being documented. The techniques inspired from the distributed collective behavior of social colonies have shown worth and excellence in dealing with complex optimization problems and are becoming more popular nowadays. It can be used as an effective problem solving tool for identifying diabetes disease risks. This paper aims at finding solutions to diagnose the disease by analyzing the patterns found in data through various swarm optimization techniques by employing Support Vector Machines and Naïve Bayes algorithms. It proposes a quicker and more efficient technique of diagnosing the disease, leading to timely treatment of the patients.

INTRODUCTION

Diabetes is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells don't respond to the insulin that is produced. This high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). There are 3 major types of DM, "Type I DM", which results from the body's failure to produce insulin, and currently requires the person to inject insulin or wear an insulin pump. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM). The second type of DM is called "Type II DM" which results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with an absolute insulin deficiency. This type also named as "Non-insulin dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes". Finally, "gestational diabetes" occurs when pregnant women without a previous diagnosis of diabetes develop a high blood glucose level, It may precede development of type I DM. Other forms of DM include congenital diabetes, which is due to genetic defects of insulin secretion, cystic fibrosis-related diabetes, steroid diabetes induced by high doses of glucocorticoids, and several forms of monogenic diabetes (Kurt George et.al) All types of DM have something in common. Normally, your body breaks down the sugars and carbohydrates you eat into a special sugar called glucose. Glucose fuels the cells in your body. But the cells need insulin, a hormone, in your bloodstream in order to take in the glucose and use it for energy. All types of DM have been treatable since insulin became available in 1921. Both type I & II are chronic conditions that cannot be cured. Pancreas transplants have been tried with limited success in type I DM, gastric bypass surgery has been successful in many with morbid obesity and type II DM. Gestational DM usually resolves after delivery (Keech et al.). Untreated DM can cause many complications. Acute complications include diabetic ketoacidosis and non ketotic hyperosmolarcoma. Series long term complications include cardiovascular disease, chronic renal failure, and diabetic retinopathy. Adequate treatment of the disease is very important, as well as blood pressure control and lifestyle factors such as stopping smoking and maintaining a healthy body weight. Since the cells can't take in the glucose, it builds up in your blood. High levels of blood glucose can damage the tiny blood vessels in your kidneys, heart, eyes or nervous system. that's why diabetes can eventually cause heart disease, stroke, kidney disease, blindness and nerve damage to nerves in the feet (especially if left untreated) ("Setting in diabetes mellitus care," 2003; Jaakko Tuomilehto et al., 2001). The aim of this paper is to develop a classification algorithm for DM diagnosis and treatment using a hybrid algorithm consists of Modified-PSO algorithm and LS-SVM classifier.

The two main types of diabetes are described below:

Type 1: Though there are only about 10% of diabetes patients have this form of diabetes, recently, there has been a rise in the number of cases of this type in the United States. The disease manifest as an autoimmune disease occurring at a very young age of below 20 years hence also called juvenile-onset diabetes. In this type of diabetes, the pancreatic cells that produce insulin have been destroyed by the defence system of the body. Injections of insulin along with frequent blood tests and dietary restrictions have to be followed by patients suffering from Type 1 diabetes.

Type 2: This type accounts for almost 90% of the diabetes cases and commonly called the adult-onset diabetes or the non-insulin dependent diabetes. In this case the various organs of the body become insulin resistant, and this increases the demand for insulin. At this point, pancreas doesn't make the required amount of insulin. To keep this type of diabetes at bay, the patients have to follow a

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