Literature Review on Diabetes Detection using Machine Learning∗

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INTRODUCTION

Diabetes Mellitus (DM) is one of the most prevalent diseases in the entire world. According to the World Health Organization (WHO), the number people affected by DM increased from 200 million to 830 million from 1990 to 2022 [1]. DM, if not treated correctly, can cause various health complications including but not limited to: blindness, amputations, heart attacks and kidney failure [1].

DM can take on different forms, most commonly, type 1 and type 2. Type 1 results from your body not producing insulin due to the fact that your immune system attacks the cells responsible for making insulin. Insulin is essential for our lives since it is the thing that regulates glucose in our body, the very thing that gives us energy to do our daily tasks. Type 2 results from your body not using the insulin produced properly or your pancreas can not make enough of it [2].

The deadly complications and worldwide spread of DM serves as our motivation in using machine learning techniques in order to detect diabetes in people who were not previously diagnosed and even predict if a person will develop DM or not. Treatment of DM can decrease the risk of eye disease, kidney disease, and nerve disease by 40%, and reduce the risk of heart diseases and strokes by up to 50% [3]. Treatment is a matter of life or death for many individuals with the disease, making our work of great importance.

LITERATURE REVIEW

In Ioannis Kavakiotis’s systematic review of machine learning in Diabetes research, genetic background and environmental factors were used to train common classification algorithms like Support Vector Machines (SVMs), Artificial Neural Networks (ANN) and Decision Trees (DT) to identify if a person has DM [4]. The study showed that SVMs produced the best classification results, up to 80% accuracy. However, the authors were wary of the datasets that were used in the training of these algorithms. This is due to the fact that the dimensionality and the ratio of instances to features could produce varying results that perform poorly on other datasets. Moreover, Machine learning algorithms were used in predicting a personalised treatment plan for a patient diagnosed with DM. This was partially calculated using the patients blood glucose levels and the amount of insulin in their blood [4].  
  
Another paper that used machine learning to diagnose DM used principal component analysis (PCA) and adaptive neuro-fuzzy inference system (ANFIS) to create an expert system that does this task [5]. PCA was used for dimensionality reduction of the features and ANFIS was used to set the weights of a Tagaki-Sugeno-Kang fuzzy rule-based system. The author, however, used the accuracy and specificity as measures for how good the system was without relying on the precision and recall, giving dubious results for the rule-based system.  
  
There was a paper that compared various machine learning techniques in detecting diabetes in patients. It used AdaBoost, logistic regression, KNN and a Perceptron and various other techniques [6]. However, the paper only used a dataset containing 800 rows and 10 features, which is highly likely to produce a subpar classifier. This was illustrated when the authors used an external dataset to test their classifiers. Even though, on average, the models scored around 77%, in regards to the importance of correctly diagnosing patients, this accuracy is definitely not good enough to be deployed to real life situation.

KEYWORDS

Insert keyword text, Insert keyword text, Insert keyword text, Insert keyword text

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1 Insert Heading Level 1

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Conference Name:ACM Woodstock conference

Conference Short Name:WOODSTOCK’18

Conference Location:El Paso, Texas USA

ISBN:978-1-4503-0000-0/18/06

Year:2018

Date:June

Copyright Year:2018

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DOI:10.1145/1234567890

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Price:$15.00