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A Machine Learning Approach for Blood Glucose Level Prediction Using a LSTM Network

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Abstract

Diabetes is a chronic disease characterized by the elevation of glucose in blood resulting in multiple organ failure in the body. There are three types of diabetes: type 1, type 2, and gestational diabetes. Type 1 diabetes (T1D) is an autoimmune disease where insulin-producing cells are destroyed. World Health Organization latest reports indicate T1D prevalence is increasing worldwide with approximately one million new cases annually. Consequently, numerous models to predict blood glucose levels have been proposed, some of which are based on Recurrent Neural Networks (RNNs). The study presented here proposes the training of a machine learning model to predict future glucose levels with high precision using the OhioT1DM database and a Long Short-Term Memory (LSTM) network. Three variations of the dataset were used; the first one with original unprocessed data, another processed with linear interpolation, and a last one processed with a time series method. The datasets obtained were split into time prediction horizons (PH) of 5, 30, and 60 min and then fed into the proposed model. From the three variations of datasets, the one processed with time series obtained the highest prediction accuracy, followed by the one processed with linear interpolation. This study will open new ways for addressing healthcare issues related to glucose forecasting in diabetic patients, helping to avoid concomitant complications such as severe episodes of hyperglycemia. © 2022, Springer Nature Switzerland AG.

Author keywords

Blood glucose level prediction; Linear interpolation; Long short-term memory; Machine learning; Time series

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