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BIOMEDICAL ENGINEERING RESEARCH

AI in Health and Nutrition

Data Driven Diabetes Management

Course Project 3: Blood glucose prediction with deep learning

Title	**Blood glucose prediction with deep learning**
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Course: Data Driven Diabetes Management
Master of Science in Biomedical Engineering

1. Scope of the Project

Time series forecasting for blood glucose (BG) values provides valuable information for improving the insulin management for individuals suffering from type 1 diabetes (T1D). However, due to the complex human organism, accurate prediction of future glucose is a challenging task. To address those challenges, we make benefit of recent advances in deep learning (RNN, Transformer etc), especially from the field of time series forecasting. For the time step *i*, the network will take as input the *k* past BG values and is used to predict the future BG at time step *i*+*n*, where *n* is the prediction horizon (PH).

2. Data

You will be working with recorded data from 12 different individuals with T1D. The data was released in the OhiaT1DM [1] dataset. You will have access to information such as continuous glucose monitoring (CGM), Blood glucose values obtained through self-monitoring by the patient (finger stick), basal insulin rate, bolus injection, the self-reported time and type of a meal, plus the patient's carbohydrate estimate for the meal and more. The measurements are provided at intervals of minutes.

3. Experiment

You will develop deep learning models on your choice for the BG prediction similar to [2]. You can try different models, optimize and compare the results for different prediction horizon

1. Report

We encourage you to include the following sections in your report:

- Introduction: This section should include a brief presentation of the project's aims, objectives, and its clinical importance. You should briefly explain your basic approach and your main conclusions. If needed add a figure.
- Related work: This section should highlight previous work related to your problem and should put your work in a broader context.
- Methods: Here you describe the method/s you implemented in detail.
- Data and Experiment setup: Data description, preprocessing. Add a table with characteristics of the data, or an example of the data available for a specific individual, before and after any pre-processing. Describe your benchmarks.
- Results: Present the results of your analyses (use graphs and/or tables). Comment on these results: are they statistically significant? Are there interesting trends?
- Discussion: Highlight how your results relate to your original question formulation. Do they support your hypothesis? Discuss limitations with your analyses and how they might motivate future research directions.

References

[1] Zhu, Taiyu, et al. "Edge-Based Temporal Fusion Transformer for Multi-Horizon Blood Glucose Prediction." *2023 IEEE International Symposium on Circuits and Systems (ISCAS)*. IEEE, 2023.

[2] *http://smarthealth.cs.ohio.edu/bglp/OhioT1DM-dataset-paper.pdf*