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CLASSIFICATION, MODELING AND PREDICTION OF GLYCEMIA IN DIABETIC PATIENTS BY EVOLUTIONARY AND HEURISTIC COMPUTATION FROM CONTINUOUS GLUCOSE MONITORING, CARBOHYDRATES AND INSULIN RECORDS

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Background and Aims

Maintaining a good control of Diabetes is critical to avoid long and short-term complications. Diabetic patients need to decide the appropriate insulin injection, and be able to estimate the level of glucose they will have after a meal. Evolutionary Computation and Machine learning have shown promising results in previous works. Several techniques are applied to make predictions for horizons of 30, 60, 90 and 120 minutes.

Methods

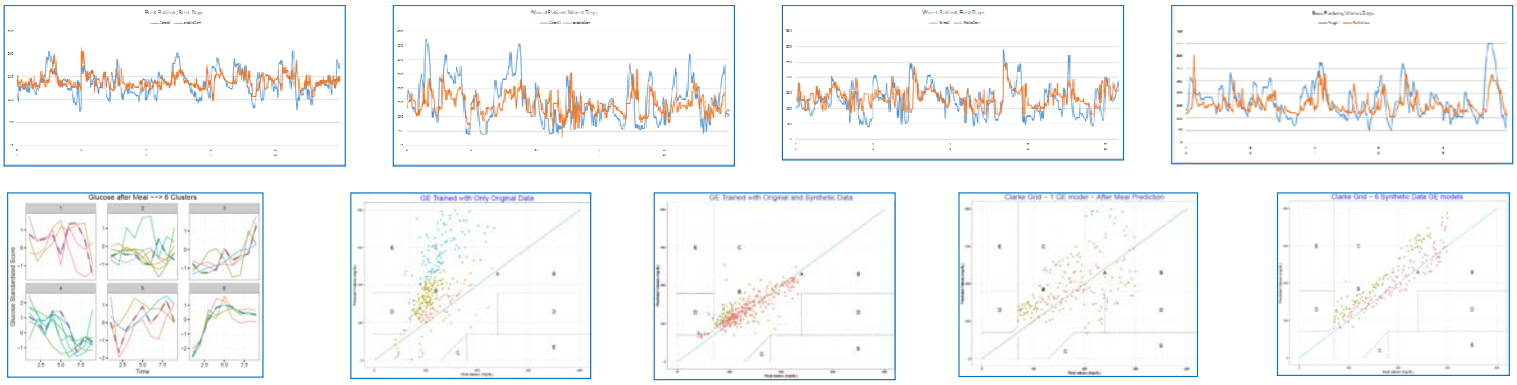
The predictors were trained and tested using real data of 10 patients from a Public Hospital of Spain.
Data was collected by continuous glucose monitoring systems, the estimated number of carbohydrates, and insulin administration for each meal. We compare:

(1) Non-linear regression with Fixed Model structure (FM),
(2) Identification of prognosis models by symbolic regression using Genetic Programming (GP)
(3) Prognosis by K-Nearest-Neighbor time series search (kNN), and
(4) Identification of prediction models by Grammatical Evolution (GE).

Preprocessing of data was also applied to allow symbolic regression evaluation.

Results

Results are expressed as the correlation of original glucose values and glucose estimations calculated by models identified by FM as well as GP, and kNN, which are very good for short-term predictions. We obtained also the scatter plot of predictions using GP, for which the best estimation (in terms of correlation) was identified.



Conclusion

We need to advance in the proposed strategies, with special efforts in GE. In addition, we are working with more input variables into the patients' data such as information about the meals, stress levels, activities, and the number of sleeping hours. We are also studying statistical techniques to improve the variety and quality of the input data

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