Diabetic Patient Monitoring and Management using Machine Learning

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Background

A continuous glucose monitoring (CGM) system is a device that logs glucose levels. Medtronic has provided CGM data for 93 patients along with FitBit activity metrics.

Overview

The scope of the project is to develop a back-end platform based on data analytics and data science algorithms for predicting the continuous glucose levels of diabetic patients, provide patients with insight and recommendations, and display to each patient in real time.
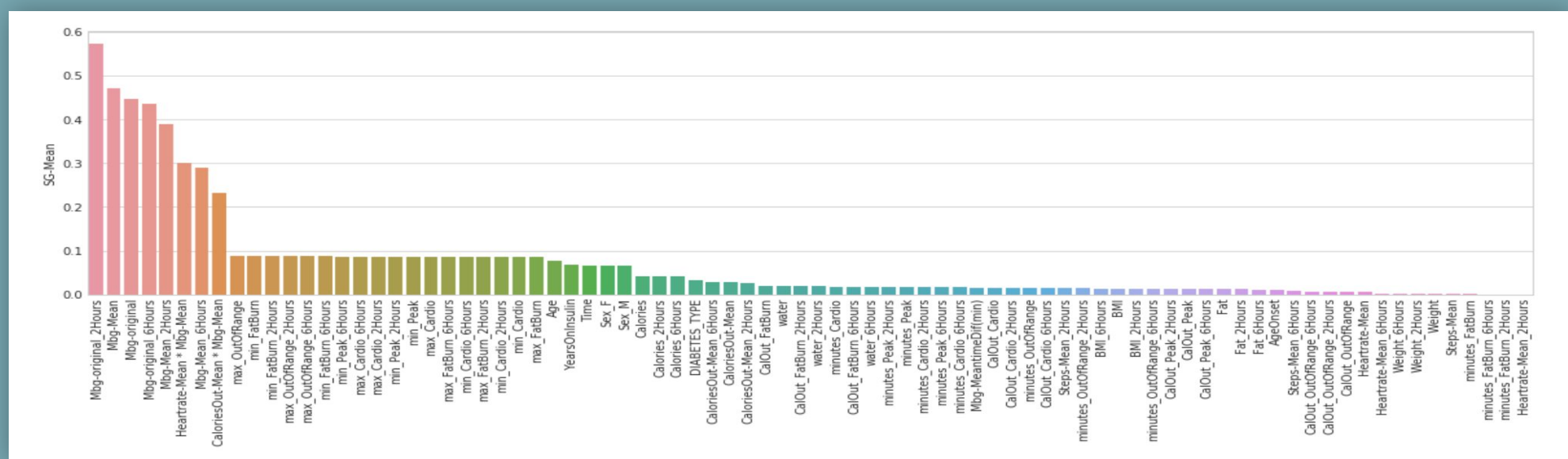
Real Time Data

➢ Microservices architecture provides scalability to allow for dynamic growth for accommodating higher throughput of incoming patient data.
➢ All modules run on cloud based virtual machines
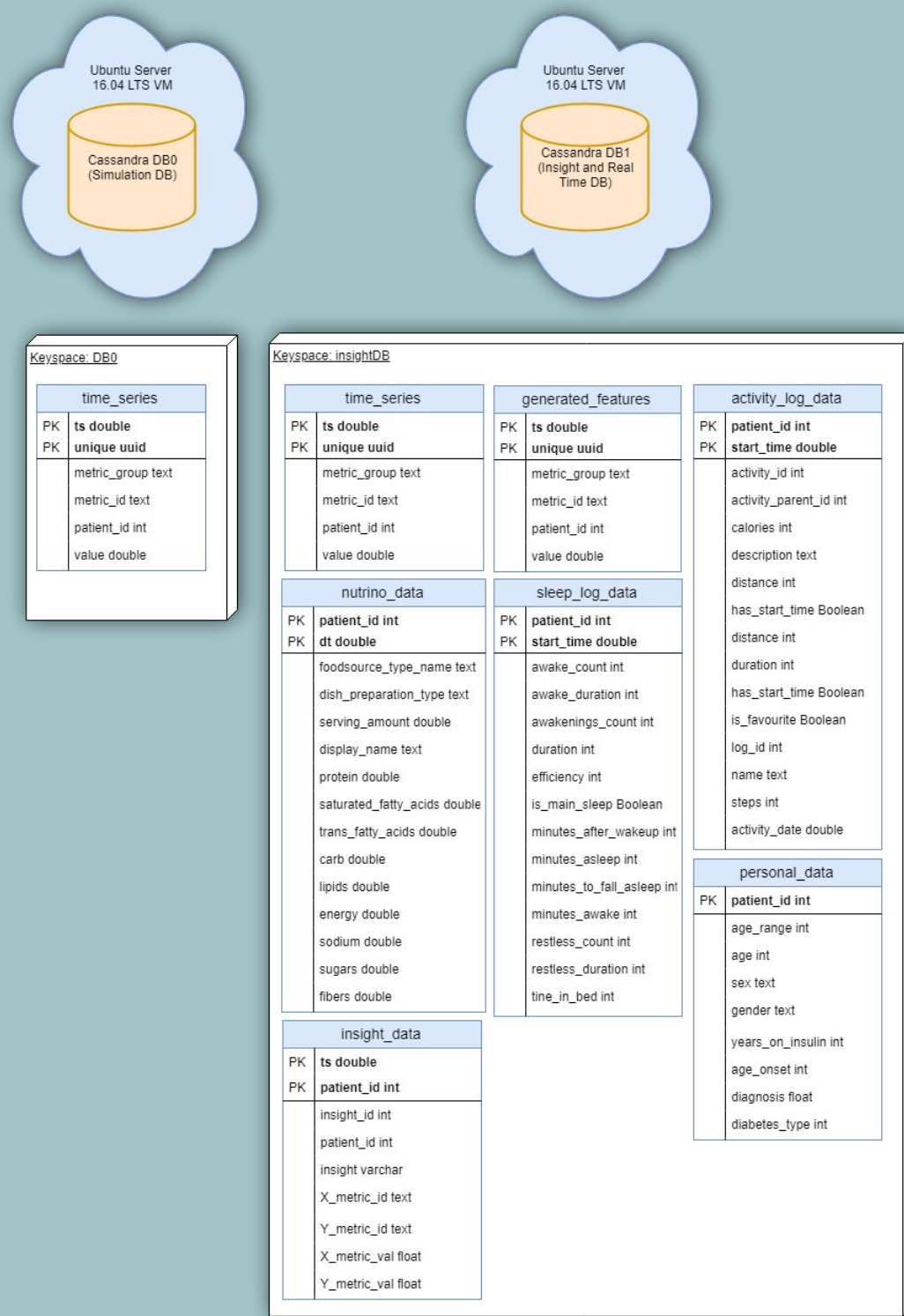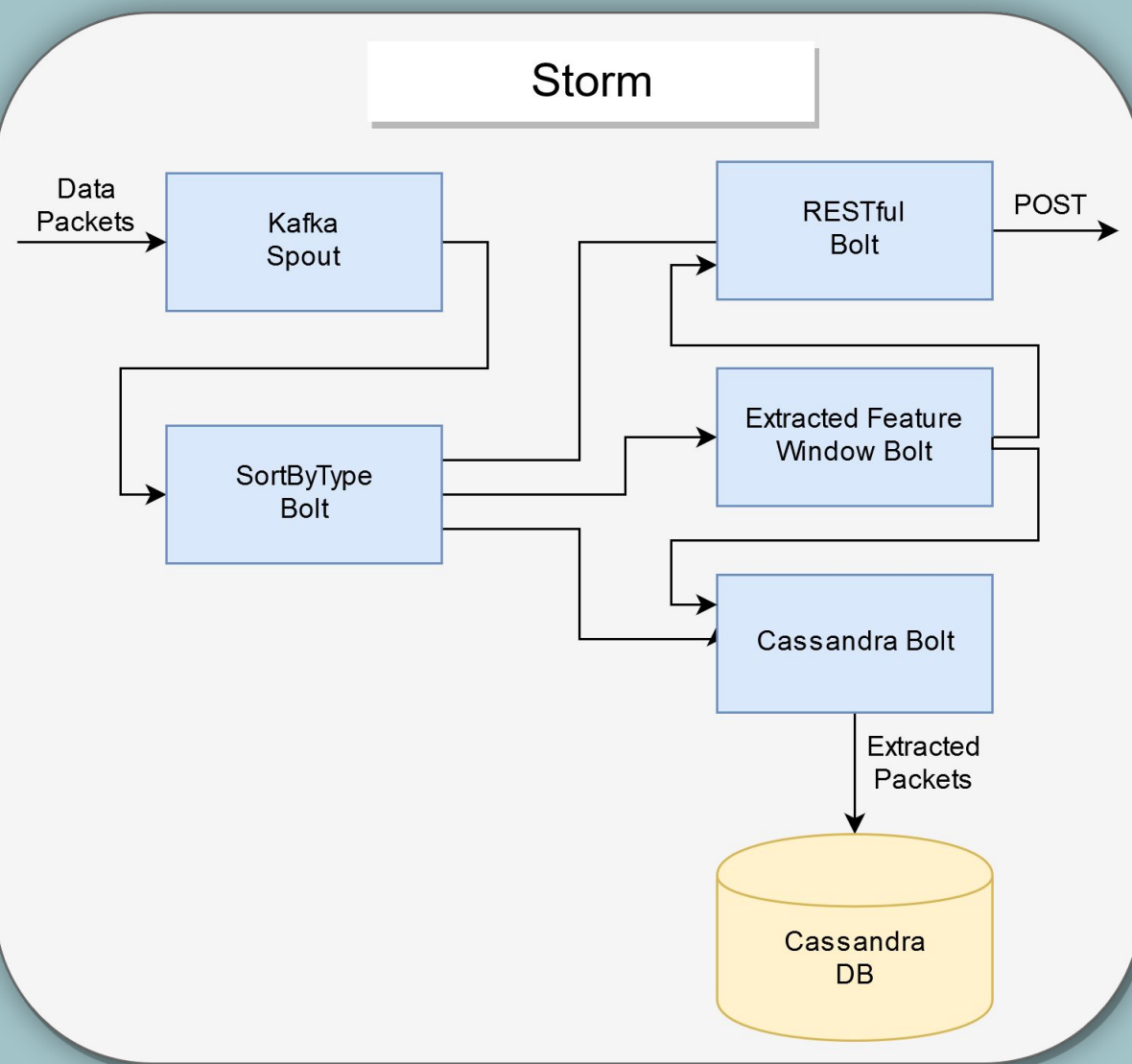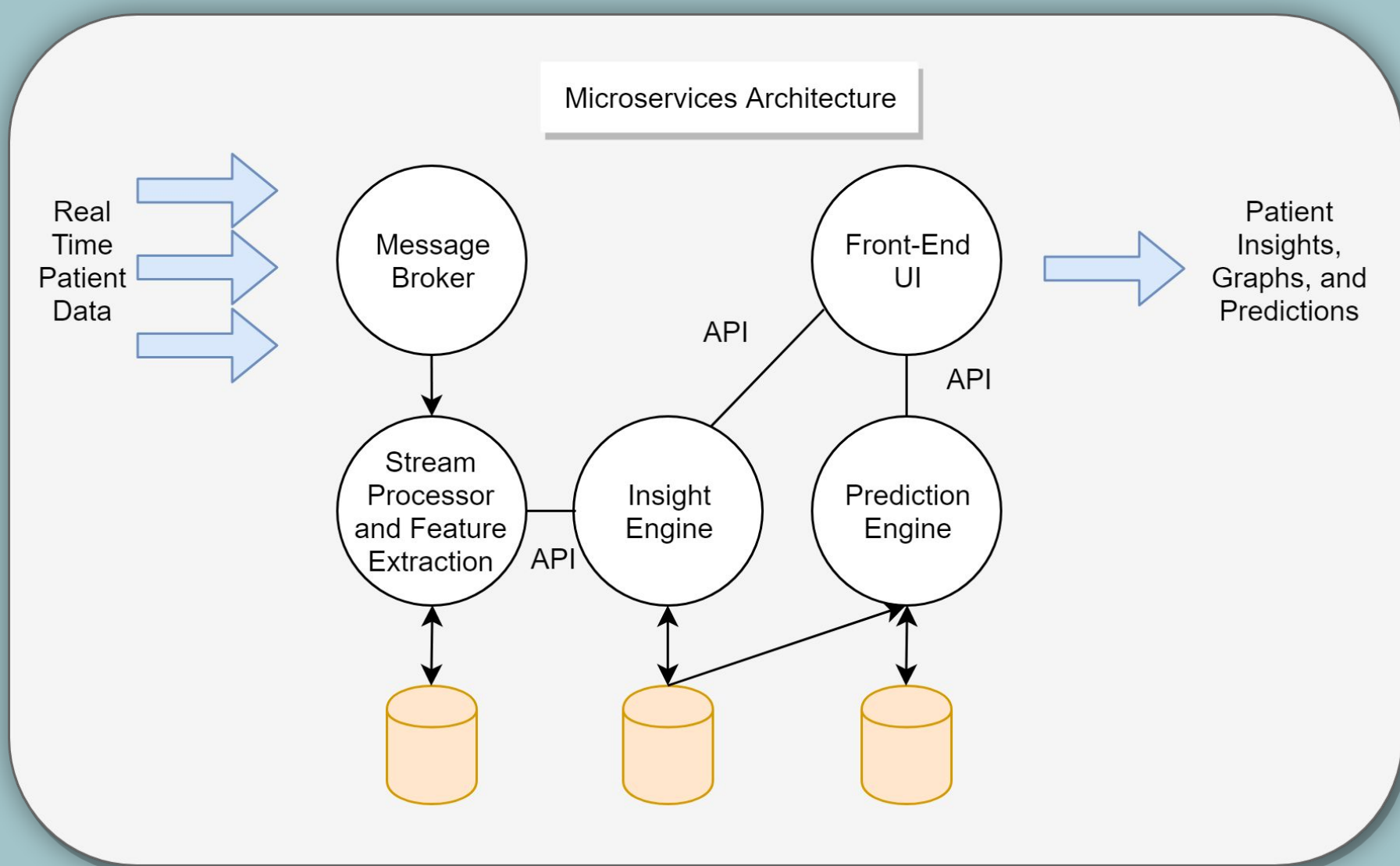
Prediction Engine

➢ Data preprocessing and missing value imputation, feature extraction, feature selection, and dimensionality reduction
➢ Predictive analytics based on machine learning algorithms including: Random Forest and Neural Network.

SG-Mean	1.000000
Mbg-original_2Hours	0.573131
Mbg-Mean	0.470087
Mbg-original	0.446929
Mbg-original_6Hours	0.436470
Mbg-Mean_2Hours	0.389976
Heartrate-Mean * Mbg-Mean	0.301580
Mbg-Mean_6Hours	0.289647
CaloriesOut-Mean * Mbg-Mean	0.232987
max_OutOfRange	0.087895
min_FatBurn	0.087895
min_FatBurn_2Hours	0.087892
max_OutOfRange_2Hours	0.087892
max_OutOfRange_6Hours	0.087883
min_FatBurn_6Hours	0.087883
min_Peak_6Hours	0.086007
max_Cardio_6Hours	0.086007
max_Cardio_2Hours	0.086006
min_Peak_2Hours	0.086006
min_Peak	0.086005
max_Cardio	0.086005
max_FatBurn_6Hours	0.085413
min_Cardio_6Hours	0.085413
max_FatBurn_2Hours	0.085410
min_Cardio_2Hours	0.085410

Machine Learning Algorithm	MAPE
Random Forest Regressor	27.9%
MLPRegressor	29.6%
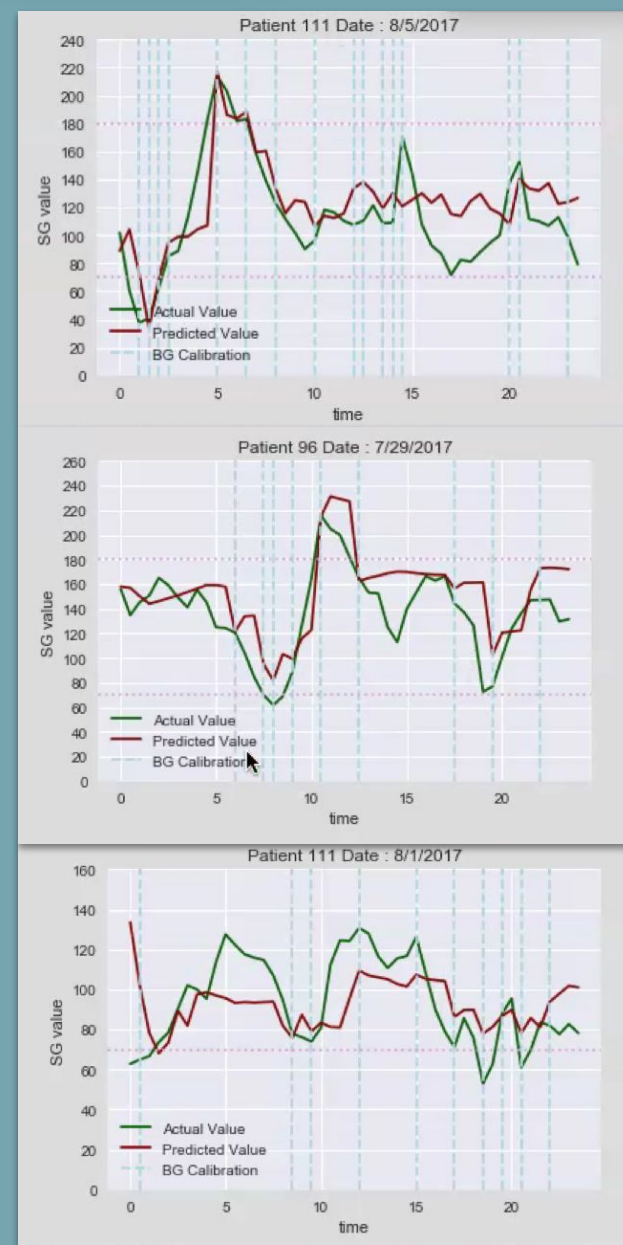
Insight Engine

➢ Takes in Sensor Glucose data, Fitbit data, and nutritional data as JSON objects
➢ Processes the data, creating insights and recommendations for each individual patient
➢ Insights are displayed as a suggestion, accompanied with a graph, helping each patient monitor sugar levels better.

Hi, having at least 6.5 hours of sleep overnight, your Hyper Duration will be reduced by 30%!

Hi, having at least 2156 calories out a day, your Hyper Duration will be reduced by 30%!

Hi, when taking at least 4609 steps a day, your Hyper Duration will be reduced by 30%!