**Title: Machine Learning Experiments with Noninvasive Sensors for Hypoglycemia Detection**

**Problem Statement**. A non-invasive wearable physiological sensors was used to leverage data using the Support vector machines methods for detecting the type 1 diabetes (T1D) via selecting features heart rate, galvanic skin response, and skin and air temperatures. Also, using smart phone monitors meals, sleep and exercise. The data was consolidated and displayed via custom built graphical software, which allowed us to visualize and discuss it. This helps to identify visual patterns in the fitness band data corresponding to hypoglycemia observed in the CGM data.

**Definitions:** *Hypoglycemia* is defined by low blood glucose levels, typically below 70 mg/dl.

*Continuous glucose monitoring*, *CGM* systems, available by prescription, provide blood glucose readings every 5 minutes, in real time.

**Challenges: 1.** There isnoise, or inaccuracy, in the readings as well; frequent calibration with finger sticks is required.

1. The dataset was small and skewed toward non-hypoglycemic events
2. All of the data was acquired from a single patient
3. Only features acquired from the physiological sensor band were used
4. Data was acquired while the patient led his normal, everyday life

**Title:** **Real-Time Non-Invasive Detection and Classification of Diabetes Using Modified Convolution Neural Network**

**Problem Statement:** Exhaled human breath is composed of Acetone, which act as promising bio-markers differentiating diseased individuals from healthy subjects’ levels exhibiting a good correlation to blood glucose levels. Breath acetone concentration is found to remain elevated in diabetic patients. Breath analysis is effective non-invasive diagnostic tool to detect diabetes that can be repeated frequently without risks. Breath signals required for data analysis is measured using an array of metal oxide semiconductor (MOS) gas sensors. This facilitates to identify and classify on real-time raw breath signals obtained from the MOS sensors by adapting a modified CNN algorithm thereby predicting diabetes. In this model the raw data signals from the gas sensors are fed into the input layer. These raw signals are filtered by the convolution layer and sub-sampled by the max-pooling layers thus obtaining a reduced optimal feature set. These initial layers of the CNN architecture represent the feature extraction mechanism while the fully connected layers represent the classification mechanism.

**Definitions: *Convolutional neural network*** *CNN*, a variation of a back-propagation neural network, replicates an animal visual cortex system which learns and recognizes specific features and patterns in a visual image. This algorithm achieves significant reduction in pre-processing data and eliminates the need for separate feature extraction techniques by automatically learning and extracting features from raw signal data.

***Acetone,*** volatile organic compounds present in the exhaled human breath.

**Challenges: 1.** Need to ask the subject to blow air in the MOS sensors

2. Moisture content in breath samples and also increase the patient data sets to cover a wider population group.