# Scope of the Project

Time series forecasting for blood glucose (BG) values provides valuable information for improving the insulin management for patients with type 1 diabetes (PwT1D). Reliable BG forecasting holds the potential to improve the automated meal announcement and possible insulin treatment (bolus dose, and basal rate) adjustments. Further, certain events could trigger alarms to inform the patient with respect to risks of potential future hypo- or hyperglycemia. However, the problem complexity, the related uncertainties, as well as the inter- and intra-patient variabilities, makes challenging the accurate prediction of future glucose concentrations. To address these challenges, we make benefit of recent advances in deep learning and reinforcement learning. A natural way of handling sequential data is to use a Recurrent Neural Network (RNN) and its derivatives such as Long-Short-Term-Memory units (LSTM) [1], Transformers [2] or deep reinforcement learning [3].

# Data

You will be working with recorded data from 12 different PwT1D. The data was released in the OhiaT1DM dataset [4]. You will have access to information such as continuous glucose monitoring (CGM), BG 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.

# Experiment

You will have to make yourself familiar with the state of the art of BG prediction within the framework of AI. Due to missing values inside the data, post-processing is required. You are free to choose one of the three mentioned methods above (RNNs/LSTMs, Transformers, or deep reinforcement learning) to develop a robust and patient individualized BG prediction model.

# References

1. Sepp Hochreiter, Jürgen Schmidhuber; Long Short-Term Memory. Neural Comput 1997; 9 (8): 1735–1780. doi: <https://doi.org/10.1162/neco.1997.9.8.1735>
2. Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N. Gomez, Lukasz Kaiser, & Illia Polosukhin (2017). Attention Is All You Need. CoRR, abs/1706.03762.
3. [Timothy P. Lillicrap, Jonathan J. Hunt, Alexander Pritzel, Nicolas Heess, Tom Erez, Yuval Tassa, David Silver, and Daan Wierstra, Continuous control with deep reinforcement learning, CoRR abs/1509.02971 (2015).](https://arxiv.org/abs/1509.02971)
4. <http://smarthealth.cs.ohio.edu/bglp/OhioT1DM-dataset-paper.pdf>