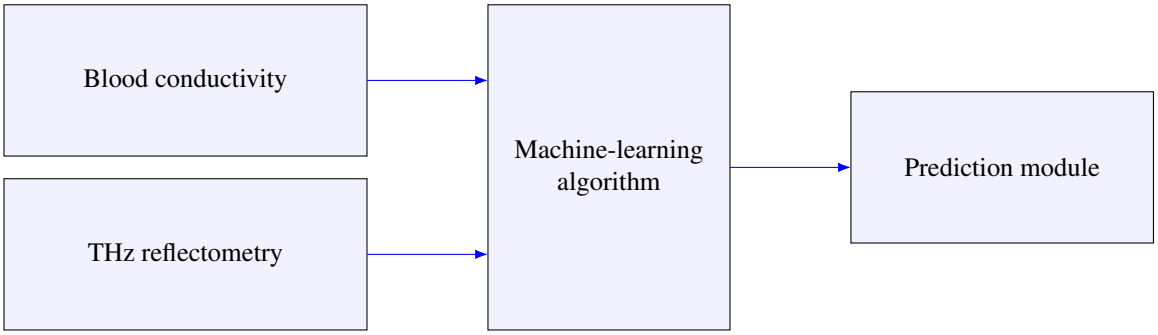
Master Thesis

Research-related and Interesting

Non-Invasive Glucose Content Detection: Enhancing Reflectometry through Multi-Spectral Analysis and Machine Learning Algorithms



The material properties of blood, specifically its permittivity and conductivity, are influenced by changes in glucose content and this characteristic makes them a suitable platform for non-invasive detection of glucose levels. In the THz regime (0.1 THz-2 THz), the permittivity of blood exhibits a clear increase as the glucose level rises. However, the corresponding changes in conductivity are more complex and do not follow a simple pattern of increase or decrease with glucose content. These variations in material properties have a direct impact on the reflected power from a layered structure, including a layer with high blood content. Consequently, the reflected power demonstrates corresponding changes in response to glucose variations. However, as the dispersive conductivity of blood plays a determining role in the reflected power spectra, the resulting variations in the reflected power spectra are intricate and exhibit non-trivial interdependencies. Therefore, accurately determining blood glucose content through reflectometry requires the implementation of a sophisticated multi-spectral detection technique based on artificial neural network algorithms

The current master project will deal with the machine-learning approach namely the artificial neural network to accurately predict the glucose content based on THz reflectometry. Given the complexity of the reflected power spectra, the machine learning algorithm will either utilize multi-spectral data or define and employ a novel parameter based on the overall behavior of the reflected power spectra. Furthermore, to enhance the accuracy of the machine learning output, various types of noise, such as white, brownian, and pink noise, will be added to the reflected power spectra.

Got curious? simply contact us for an informal meeting discussing the topic or send a thesis request per email to us.

Requirements:	Knowledge of electromagnetic field theory, interest in modeling of electromagnetic systems and bioelectromagnetics, knowledge of machine-learning algorithms is preferred.
Character of the project:	30% Theory / 70% Programming
We offer:	An interesting master project at the edge of science in a friendly research environment.
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