University of Basel

Department of
Biomedical Engineering

University of Basel, Department of Biomedical Engineering, Hegenheimermattweg 167c, 4123 Allschwil

Master of Science – Biomedical Engineering

Thesis Proposal: Predicting the timing of foot events during walking

Gait analysis is utilised to inform clinical decisions to improve capacity to walk in people with disabilities. Gait events, when the feet touch or leave the ground, divide the walking pattern into gait cycles. Any biomechanical signal recorded or computed is analysed based on the cycles. Hence the importance of the accurate timings of gait events.

These events are typically set from force plates. Deep neural network based on long short-term memory (LSTM) layers have been trained to predict the timing of gait events. However, the LSTM-based models trained in a certain clinical context (technological and type of patients) often result in poor performance when applied to data from a different clinical context.

The objective of this project will be to apply transfer learning to improve the applicability and precision of existing LSTM models. The idea is to fine tune the models to detect gait events in new patients for which we can collect at least a few real events. The master's thesis project will have three components: 1- review existing LSTM models and convert these into a format suitable for further use, 2- develop a pipeline (matlab or python) to extract real events from multiple files, augment this real data, re-train the last layer of the model, to predict new events, and 3- evaluate the performance of such fine tuning compared to the out-the-box predictions.

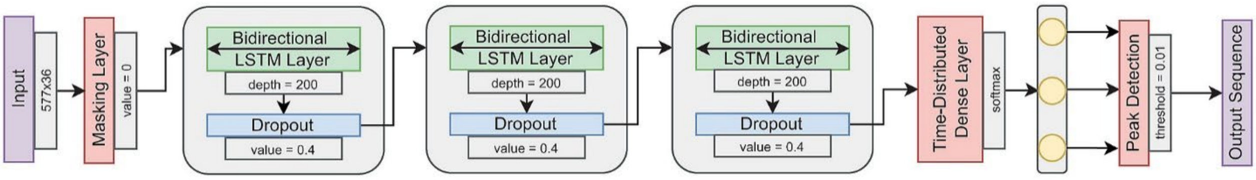

Image from: Dumphart et al. 2023

Nature of the Thesis

Programming: 60%,

Analysis: 20%,

Documentation: 20%

Specific Requirements

Programming with Matlab or python, experience with a deep machine learning framework

Supervisor / Contact

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