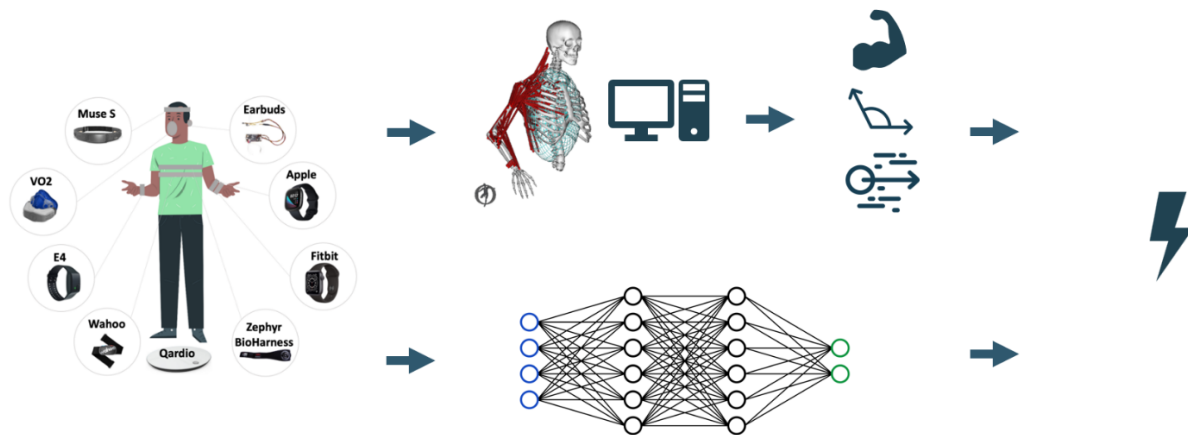


Master thesis

Benchmarking Energy Expenditure Estimation: AI vs. Metabolic Cost Models

In clinical and sports science applications, the accurate estimation of energy expenditure (EE) is critical for evaluating physical performance, rehabilitation progress, and overall health. Traditionally, EE has been estimated through metabolic cost models based on joint kinematics and musculoskeletal dynamics. However, recent advances in AI particularly in machine learning and deep learning have opened new possibilities for estimating EE more directly from wearable sensor data, such as inertial measurement units (IMUs) and heart rate monitors. These data-driven approaches present an exciting opportunity for real-time, real-world application. Building on this progress, this thesis aims to benchmark and evaluate different methods for estimating energy expenditure from movement data.



Example Tasks

- Develop and evaluate machine learning and deep learning models for EE estimation
- Compare metabolic energy models with AI-based approaches for EE estimation
- Analyze sensor data from IMUs and heart rate monitors
- Visualize and interpret estimation results for meaningful insight

Requirements

- Strong interest in movement science, biomechanics, and AI
- Experience in machine learning and deep learning (especially with time-series data)
- Basic knowledge of biomechanics or willingness to learn

Begin: TBD

End: TBD