



## Wearable-based Gait Analysis System

### Description:

Intelligent systems for geriatric assessment in the home environment can continuously evaluate established movement tests and provide information about the mobility and quality of life of older people. Through the use of smartphones, smartwatches and comparable ubiquitous wearable sensors, corresponding data can now be collected unobtrusively and integrated into everyday life [1].

Gait parameters are analysed using inertial measurement units (IMUs). By means of the recorded data, fine granular statements (e.g. gait symmetry, gait variability) can be made about the change in the gait pattern [2].

Our research group has large data sets (up to 250 subjects) that are suitable for training and evaluation of corresponding analysis procedures.

This thesis can be designed with respect to the following topics:

- System to automate established movement tests (e.g. five times sit-to-stand).
- Implement novel approaches such as hybrid deep learning models and transformers [3] for a technical assessment tool for physical performance
- Develop a mechanism to transfer extracted gait parameters into clinical information systems.

For the data analysis, different approaches will be applied, in particular, the suitability of established Deep Learning methods for time series such as RNNs, LSTMs, and hybrid models with attention to the above-mentioned tasks will be assessed.

In case of a student research project or similar, a connecting thesis is possible.

**Keywords:** Data processing system, AI in medicine, transformer, attention-based neural networks, gait analysis, Transformer, LSTM, Attention-based Neural Networks.

**Start:** Immediately or by arrangement.

[1] Muhammad Adeel Nisar. Rank Pooling Approach for Wearable Sensor-Based ADLs Recognition, *Sensors* 2020 (<https://www.mdpi.com/1424-8220/20/12/3463>)

[2] Ashish Vaswani, et al. Attention Is All You Need, 2017 (<https://arxiv.org/abs/1706.03762>)

[3] Sandra Hellmers, et al. Activity Scores of Older Adults based on Inertial Measurement Unit Data in Everyday Life, 2022 (<https://www.scitepress.org/Papers/2020/90955/90955.pdf>)

If you are interested and have any questions about this topic, please feel free to **book an appointment** via: <https://calendly.com/fudickar/>



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Further thesis topics at: [move.ulü.de](https://move.ulü.de)