



Classification and Assessment of Activities of Daily Living (ADLs)

Description:

Intelligent support systems for recognizing activities of daily living (ADLs) can help older people live independently longer and thus improve their quality of life. Recently, many machine learning approaches for human activity recognition (HAR) have been proposed. Through the use of smartphones, smartwatches, and comparable ubiquitous wearable sensors, relevant data can now be collected in an unobtrusive manner and integrated into everyday life.

Activities of daily living are analysed using Inertial Measurement Units (IMUs). Based on these data, different activities (such as walking, climbing stairs, getting up from a chair or an armchair and sitting down, as well as activities of daily living such as brushing teeth, cleaning the room, preparing food, and washing hands) will be detected and analysed.

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:

- Detect atomic as well as complex activities like ADLs
- Implement novel approaches such as hybrid deep learning models and Transformer [2] for a technical assessment tool for physical performance

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, Activities of Daily Living (ADLs), Human Activity Recognition (HAR), LSTM, AI in medicine, transformer, 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