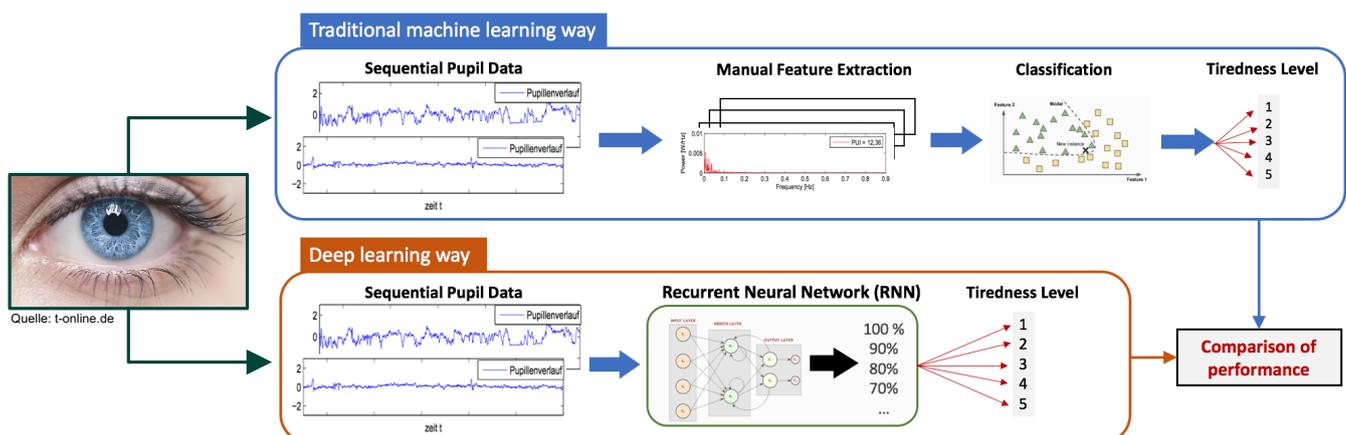




# Machine Learning and Deep Learning for Sequential Data

Pattern recognition with deep learning techniques to predict and label time series data from physiological measurement systems like an eye tracker

The Laboratory of Lighting Technology is currently working on a method to determine the tiredness level of a person in real time. In future, the system will be used in the automotive sector or even as a part of a novel intelligent interior lighting system. The time characteristic behaviour of the pupil can be used as a physiological parameter for marking the tiredness level. In our current measurement system the pupil diameter is tracked with various high quality eye-tracking systems. With a test arrangement, training and test data can be recorded to correlate the pupil diameter with the tiredness of a subject.



Classical machine learning is mostly used to classify independent, identically distributed data. For this purpose, features must be extracted with processing techniques to use classification methods. Deep neural techniques like Convolutional Neural Networks (CNN) can be used to recognize patterns in data features without extracting them manually. These neural networks are severely limited when it comes to time series data because they are traditionally designed feedforward. To get the tiredness level of a subject, the pupil diameter has to be evaluated as a time sequence because the diameters over time are strongly correlated.

In this work you will use Recurrent Neural Networks (RNN) to recognize patterns on sequential pupil data. RNNs have connection points backwards in the network and are able to handle time series data. Furthermore it is possible to compare the performance of RNNs with traditional manually feature extracting techniques.

The specific task and the scope of the work can be adapted to the wishes and the professional preferences of the students. With an excellent to very good job, it is possible to publish the results or even work on the project as a student assistant.

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