

Technology offer: Automatic sleep stage classification based on polysomnographic records

Project Status

- Method ready for use
- Tested with hundreds of datasets

Benefits

- Fully automatic offline classification
- Outstanding accuracy of more than 90%
- For even higher accuracy: Expert-aided partially automated version also available
- Time-saving and improved therapy recommendation
- Only two standard EEG signals needed

Patents

- Two German priority patent applications filed in March-2019 and Oct-2020
- [DE102019107666A](#)
- DE102020125743
- Promising search report

Offer

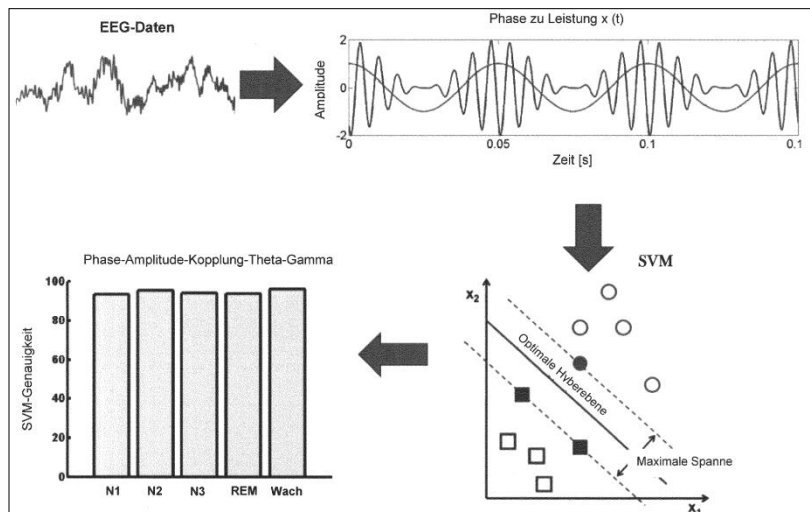
- The technology can be licensed or assigned
- Collaborations regarding further development welcome

Scientists from University Medical Center Mainz (Germany) have successfully developed a new method for fully automatic sleep stage classification with very high accuracy.

The evaluation of polysomnographic records can be very time-consuming due to the large amount of data. A specialist can easily spend about 40-80 minutes for the visual classification of the sleep stages of such a record of a sole night. Furthermore, the quality of the classification depends on the experience of the specialist. By using the new approach the visual classification of sleep stages could become obsolete, which could save even more than an hour per patient. In addition, results can be easily compared, the diagnosis of sleep disorders can be improved and standardized. A more precise diagnosis is crucial for optimal therapy recommendations

Using only two surface electroencephalogram (EEG) signals Prof. Dr. Gouveris and a team of researchers found out their new approach delivers outstanding accuracy of more than 90% for each of the five sleep stages with a fully automated offline classification. No other system is known achieving such a high accuracy by using only two specific sources of brain activity .

The method divides recorded EEG data into predefined time intervals of preferably 30 seconds, afterwards advanced mathematical cross-frequency coupling methods are applied. Using the cross-frequency coupling method, a support vector machine is able to correctly classify comparable data with a high degree of certainty. Among the different cross-frequency coupling methods, a phase-to-amplitude method has proven to be particularly useful.



Schematic representation of the procedure for sleep stage classification based on polysomnographic records using EEG data and a cross-frequency coupling method

If necessary, the method is able to extend the analysis to other data on body functions like heart activity, respiratory airflow, breathing sounds, eye movement patterns or electrical muscle activity. In addition, the invented method still allows for manual input and manual modifications in case a medical expert wants to further improve the classifications. If required, a partially automated expert-aided process is also available.

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