



HNO-Klinik

Waldstr. 1 91054 Erlangen

Master thesis for students in: Medical Engineering / Medizintechnik

**Hals-Nasen-Ohren-Klinik
Kopf- und Halschirurgie**
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Evaluating Speech Recognition in Noise by Analysis of EEG signals using Machine Learning Techniques

Background:

This is a research project by the ENT department of the University Hospital Erlangen within the division of Audiology (Prof. Hoppe) and Phoniatics (Prof. Döllinger).

Our brain is able to discriminate speech even in very noisy situation. This “cocktail-party-listening” is important for communication. It is assumed that the auditory system analyze the incoming auditory stream and extracts the relevant speech information. Interestingly, this works even in situations where the noise level is far above the level of the speech signal. This auditory processing task is related with electrical signals that can be measured with electrodes mounted on the head (electroencephalography, EEG). The aim of this project is to predict the speech intelligibility of single subjects by analyzing EEG signals during listening to speech in noise.

Within the thesis an existing data set of EEG measurements obtained in different listening situations will be used to predict the individual speech intelligibility. The data set consists of EEG signals and related speech in noise signals of a group of normal hearing listeners.

Machine learning techniques will be applied to determine significant features describing intelligibility of the speech, and their dependency on the signal to noise ratio, being the **goal of the MS thesis**.

Work packages:

(1) Preprocessing of the data. (2) Computation of quality: parameters describing quality of EEG. (3) Different machine learning methods will be investigated and compared regarding their potential for classification. (4) Perform feature selection to identify parameters in the EEG with the most significant importance.

The **hypothesis** of the study is that even noisy speech is encoded in the EEG depending on the intelligibility.

Requirements:

- Knowledge in machine learning methods
- Experience with Python / Matlab
- Interest in interdisciplinary work and research
- Thesis can be written in German or English

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