

## Spectral Analysis of EEG signals for Auditory Attention Decoding

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The ability of humans to focus attention on a certain speaker among multiple speakers is termed as the cocktail party effect. The method to infer the attention is commonly referred as the Auditory Attention Decoding (AAD). The aim of this study was to infer spectral characteristics of the EEG signal in Auditory Attention Decoding. Unlike many other studies, we did not make use of clean speech instead the concurrent speakers were presented through two loud-speakers. Nine normal hearing native German speakers took part in the study where they concentrated their attention on one of the two stories while their EEG was recorded. The stories were presented simultaneously through two loud-speakers placed at +45° and -45° azimuth at a distance of one meter from the subject.

The mean AAD accuracy using four electrodes placed around the ear (72%) was found to be close to that of using twelve electrodes placed over-the-scalp (75%). The mean decoding accuracy was found to be highest in the frequency region between 2-8 Hz which is a combination of delta (1-4 Hz) and theta (4-8 Hz) bands. As expected, the mean accuracy of alpha band (8-15 Hz) was found to be around 50% as the alpha activity entrain the ignored speech rather than attended speech. On further analysis, we found the accuracy in the frequency region 2-5 Hz to be high which is a consequence of the cortical activity entraining the syllabic rate (in case of spoken German, the syllabic rate is between 5-6 Hz). To further enhance the decoding efficiency, we implemented independent component analysis (ICA) which raised the accuracy to 80%.