Project Title: Decoding Speech Perception in Noise Using MEG and Multimodal Biomedical Data

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Project categories:
Medical Image Analysis & Computing, Magnetoencalography(MEG)
Auditory Neuroscience

Project Description:
Among all sensory modalities, hearing plays a vital role in how humans perceive and interact with their surroundings—supporting both environmental awareness and social communication. However, understanding speech in noisy environments remains one of the most challenging auditory tasks, even for individuals with normal hearing. This project aims to identify the key neural and cognitive factors that determine hearing perception in noisy conditions by analysing how the brain processes and separates target speech from background sounds.

Datasets
The dataset comprises multimodal biomedical recordings collected from older adult participants with a range of hearing abilities, including both normal-hearing individuals and those with hearing loss. In some cases, participants may also exhibit signs of “hidden” hearing deficits that are not captured by standard audiometric tests.

For each subject, the dataset includes individual audiograms, speech-in-noise thresholds (signal-to-noise ratio, SNR), and magnetoencephalography (MEG) recordings acquired simultaneously with ocular motor activity. During MEG acquisition, participants performed a speech perception task in which they were asked to attend to speech coming from a specific spatial direction (left or right). The target direction was cued a few hundred milliseconds before stimulus onset, and the speech material consisted of randomly selected sentences with various speakers under noisy conditions.

The key tasks are:
- Analyze multimodal biomedical data, including MEG recordings and individual audiograms, to investigate the key features that influence speech perception in noisy environments
- Identify auditory and neural predictors that determine individual differences in effective speech recognition under noisy conditions
- Utilize ocular motor activity to explore potential cognitive and attentional factors involved in listening effort and spatial focus

Project requirements:
- Pre-processing and analysis of MEG data using SPM or related neuroimaging software
- Programming experience in medical image computing and data analysis
- Understanding of auditory neuroscience or sensory perception research is preferred