Background and Overview

- Near Infrared Spectroscopy (NIRS) can be used to measure blood oxygenation changes in the scalp, which are indicators of brain activity.
- Hyperscanning refers to measuring the brain activity in two or more individuals simultaneously.
- The NIRS Lab at USU uses a NIRS system to perform language and learning studies, but did not have tools to analyze data in a Hyperscan setting.
- This software is meant to provide a tool for viewing and analyzing NIRS-hyperscan data.
- Having the proper tools may help in the research of language development and communicative disorders.

The Data

- Brain Activity was measured in two participants simultaneously (called Hyperscanning).
- Pairs of participants were each presented a similar image, and described their image to each other to identify differences.
- Trials were around 10 minutes, with 24 channels each, sampled at 10 Hz.

Analysis Methods

- Spectrogram - Data across individuals and channels are displayed in a spectrogram so frequency content can be viewed.
- Windowed Correlation Comparison - Windowed data from two paired individuals is compared at varying time lags. This shows where the signals are similar, and if there is a clear time lag.
- Model fitting - A linear system was fitted between windowed portions of one participant’s data and the other paired participant’s data. A new system fit was implemented along the time series, to view change in transfer characteristics over time.

Software Structure

- Software was organized into four modules, as shown above.
- Implementation was done using MATLAB.

Results

- Timeseries Comparison:
- Frequency Comparison:

Conclusions

- Tool is useful in viewing hyperscan data in ways that was not possible with the NIRS lab’s existing software.
- Viewing ability is still limited by the number of dimensions of the data (24 channels and 9 trials gives many potential comparisons).
- Understanding brain activity in social situations could aid in treating and diagnosing communicative disorders.
- At this point more capability may be needed for any real conclusions about relationships in data.

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