

SpectraVis: A web app for analyzing dynamic, task-related neural correlation / coherence networks

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Summary: Analysis of task-driven functional networks in the brain is becoming common, but as technology improves and we are able to simultaneously record from more sensors, the dimensionality of the networks can make analysis unwieldy and hard to interpret. This is particularly problematic with networks, which scale quadratically with the number of sensors and can vary over time, frequency, within and between brain regions, and over different spatial scales. While statistical techniques and strong hypothesis are important tools for reducing dimensionality and increasing interpretability, an often neglected tool is visualization.

Visualizations allow us to quickly make multiple, simultaneous comparisons and to ease the cognitive burden on our working memory by efficiently encoding properties of the data into features salient to the human visual perceptual system. Visualizations can be enhanced by adding interactivity — allowing the user to quickly make complex comparisons on demand.

Here we present an interactive web-based visualization application, SpectraVis, that allows the user to: examine pre-computed task-driven function networks over time and frequency, compare individual and associative measures on electrode pairs (e.g. spectra and coherences), compare different measures of association (e.g. cross-correlation vs. coherence, binary vs. weighted networks), and filter for both intra- and inter-node networks. We demonstrate its capabilities on an electrocorticography (ECOG) dataset during an out-loud speech reading task. We believe this application is of general interest to the COSYNE audience because: 1) Visualization is an essential tool for understanding these datasets at all stages of analysis and current practices in visualization of neuroscience network are limited in their ability to reflect this richness and complexity 2) SpectraVis is open-sourced under the GPL 2.0 public license and therefore open to use and development by the community.

Detail:

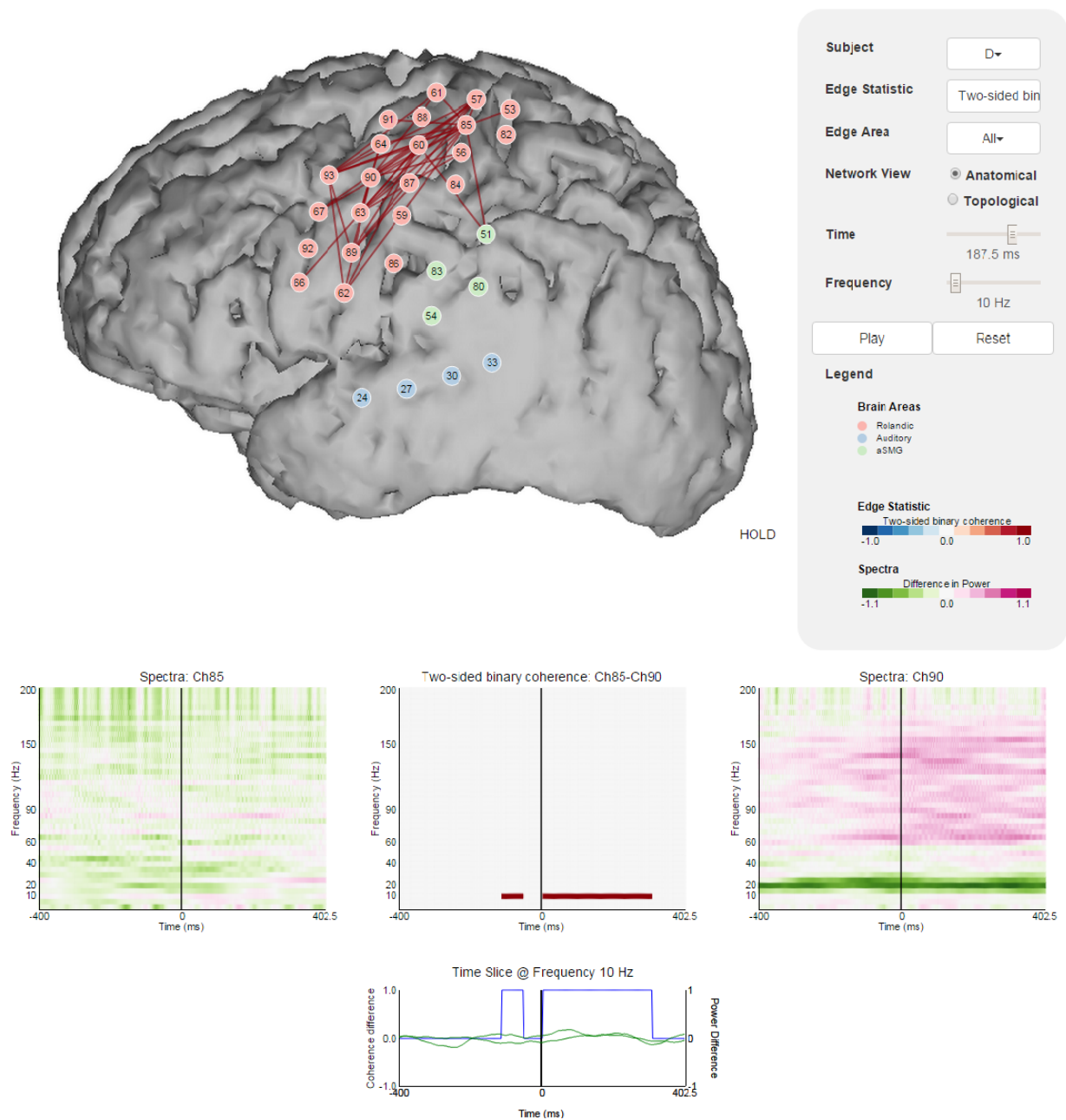


Figure 1: