

**TITLE: Bayesian Hierarchical Autoregressive Parametric Estimation with Application to the Analysis of Multilevel Electroencephalogram Signals**

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**ABSTRACT:** Estimating the spectral content of electroencephalogram signals is a common approach to characterizing how the brain responds to external stimuli. In clinical studies, electroencephalogram signals are collected over multiple subjects and their spectra are computed using either Fourier-based or parametric approaches. A common analysis entails comparing the spectra of a wide-sense stationary data window after the stimulus onset to the spectra before. However, conventional approaches to analyzing these data do not account for between subject variability and could in turn provide inaccurate inferences. This work develops a Bayesian hierarchical auto-regressive modeling framework to estimate subject-level and population-level spectra. Our formulation provides a principled approach for constructing cohort-level estimates, which can be used to assess the extent to which a new subject is consistent with a cohort-level response. We validate our framework in simulation and apply it to the analysis of electroencephalogram signals from ten healthy volunteers undergoing propofol-mediated anesthesia.

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Josefina Correa is a PhD candidate at MIT's Interdisciplinary Doctoral Program in Statistics and is advised by Professor Emery N. Brown. Her research entails developing statistical signal processing algorithms for analyzing large-scale neural recordings. She is also a S.M. candidate at MIT's Center for Computational Science and Engineering, where she is developing novel algorithms for real-time biomarker estimation from electroencephalograph signals under anesthesia.

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