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CONTROL ID: 3387601
PRESENTER: Tingting Zhang
PRESENTER (INSTITUTION ONLY): University of Virginia
TITLE: The evolution of the directional brain network throughout seizure development
ABSTRACT BODY:
Abstract Body: The human brain is a directional network system in which neural units (neurons, neuronal populations, or regions) are network nodes. The directional influence from one neural unit to another is referred to as directional connectivity or effective connectivity. A seizure is a directional network phenomenon, as abnormal neuronal activity starts from the seizure onset zone (SOZ) and propagates to otherwise healthy brain regions at seizure onset. We develop a new model for the high-dimensional directional brain network and use the model to track the evolution of the brain network of epileptic patients throughout seizure development. The analysis results enhance the understanding of the fundamental brain mechanism involved in seizure events.
AUTHORS/INSTITUTIONS: Y. Wang, T. Zhang, Statistics, University of Virginia, Charlottesville, Virginia, UNITED STATES|G. Yan, Public Health Sciences, University of Virginia, Charlottesville, Virginia, UNITED STATES|S. Tanabe, Psychology, University of Virginia, Charlottesville, Virginia, UNITED STATES|M. Quigg, Neurology, University of Virginia, Charlottesville, Virginia, UNITED STATES|

CONTROL ID: 3402218
PRESENTER: Yi Shen
PRESENTER (INSTITUTION ONLY): University of Waterloo
TITLE: Random topology in the soft-thresholded Gaussian model
ABSTRACT BODY:
Abstract Body: The soft-thresholded Gaussian model has been developed in biostatistics with applications in brain imaging. It has a Bayesian structure, and hence requires a rule to choose an appropriate prior. This often means choosing the height of the threshold according to known information, for example, the number of active areas, which corresponds to the number of connected components of the excursion set above the threshold. In this talk we discuss the recent results that we obtained concerning the distribution of such a number. More precisely, we show that for certain Gaussian random fields, when the threshold tends to infinity and the searching area expands with a matching speed, both the location of the excursion sets and the location of the local maxima above the threshold will converge weakly to a Poisson point process. Moreover, when the threshold is high but not tending to infinity, the distribution of these locations can be satisfactorily approximated by a Poisson process plus a correction term. This work provides theoretical support to predict the number of active areas in the brain when using a particular threshold.
AUTHORS/INSTITUTIONS: P. Marriott, W. Qi, Y. Shen, Statistics and Actuarial Science, University of Waterloo, Waterloo, Ontario, CANADA|J. Kang, Biostatistics, University of Michigan, Ann Arbor, Michigan, UNITED STATES|

CONTROL ID: 3407119

PRESENTER: Matt P. Wand

PRESENTER (INSTITUTION ONLY): University of Technology Sydney

TITLE: Streamlined variational inference for random effects models

ABSTRACT BODY:

Abstract Body: Variational inference offers fast approximate inference for graphical models arising in computer science and statistics. However, for model containing random effects, direct application of variational inference principles is not sufficient for fast inference due to the sizes of the relevant design matrices. We explain how the notion of matrix algebraic streamlining is crucial for making variational inference practical for models containing very high numbers of random effects. Both nested higher level and crossed random effect structures are discussed.

AUTHORS/INSTITUTIONS: M.P. Wand, University of Technology Sydney, Ultimo, New South Wales, AUSTRALIA|

CONTROL ID: 3469631

PRESENTER: Bhramar Mukherjee

PRESENTER (INSTITUTION ONLY): University of Michigan

TITLE: Bayesian Methods for High Dimensional Mediation Analysis

ABSTRACT BODY:

Abstract Body: Causal mediation analysis aims to examine the role of a mediator or a group of mediators that lie in the pathway between an exposure and an outcome. Recent biomedical studies often involve a large number of potential mediators based on high-throughput technologies. Most of the current analytic methods focus on settings with one or a moderate number of multiple mediators. In this talk, I will discuss Bayesian methods that can handle high-dimensional mediators and perform efficient selection of active mediators. Built on the counterfactual framework, we first introduce a Bayesian inference method with continuous shrinkage priors. The mixture prior specification allows for penalization of regression coefficients from the two key models (outcome-exposure and mediator-exposure models) in high-dimensional mediation analysis. However, this approach does not directly penalize the contribution of each mediator to the global indirect effect, which is the product of coefficients from these models, for mediator selection. Therefore, we improve upon the above method by proposing a four-component Gaussian mixture prior. By jointly modeling the two parameters that for each mediator, the proposed methods enable penalization on their product in a targeted way. Resultant inference can take into account the four-component composite structure underlying a mediation analysis. We show through simulations that the proposed methods improve both selection and estimation accuracy compared to other existing methods. We applied our methods on two ongoing epidemiologic studies: the Multi-Ethnic Study of Atherosclerosis (MESA) and the LIFECODES birth cohort. The identified active mediators in both studies reveal important biological pathways for understanding disease mechanisms. This is joint work with Yanyi Song, Jian Kang, Xiang Zhou and Min Zhang at the University of Michigan.

AUTHORS/INSTITUTIONS: B. Mukherjee, Y. Song, J. Kang, X. Zhou, M. Zhang, Biostatistics, University of Michigan, Ann Arbor, Michigan, UNITED STATES|