McGill | Department of Epidemiology, Biostatistics and Occupational Health

Biostatistics Seminars

Fall 2017

SPECIAL SEMINAR


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Department of Biostatistics
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# Bayesian Variable Selection for Multi-Dimensional Semiparametric Regression Models

Wednesday, December 6, 2017
2:00 pm – 3:00 pm
Purvis Hall, 1020 Pine Ave. West, Room 25

ALL ARE WELCOME


**Abstract**:
Humans are routinely exposed to mixtures of chemical and other environmental factors, making the quantification of health effects associated with environmental mixtures a critical goal for establishing environmental policy sufficiently protective of human health. The quantification of the effects of exposure to an environmental mixture poses several statistical challenges. It is often the case that exposure to multiple pollutants interact with each other to affect an outcome. Further, the exposure-response relationship between an outcome and some exposures, such as some metals, can exhibit complex, nonlinear forms, since some exposures can be beneficial and detrimental at different ranges of exposure. To estimate the health effects of complex mixtures we propose sparse tensor regression, which uses tensor products of marginal basis functions to approximate complex functions. We induce sparsity using multivariate spike and slab priors on the number of exposures that make up the tensor factorization. We allow the number of components required to estimate the health effects of multiple pollutants to be unknown and estimate it from the data. The proposed approach is interpretable, as we can use the posterior probabilities of inclusion to identify pollutants that interact with each other. We illustrate our approach's ability to estimate complex functions using simulated data, and apply our method to a study of the association between exposure to metal mixtures and neurodevelopment.


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**Bio:**
Joseph Antonelli is currently a postdoctoral fellow in the Department of Biostatistics at Harvard University. He is interested in developing statistical methods to address problems in environmental health and comparative effectiveness research. His current research projects involve the estimation of causal effects in high-dimensional settings, high-dimensional Bayesian models, and flexible models to estimate the joint effect of multiple exposures on health outcomes.

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