

Method Validation in functional MRI using Realistic Simulations

Organizer:

Pierre Bellec

CRIUGM/DIRO University of Montreal, Outremont, Québec

Advanced analytical tools play a central role in human brain mapping research. The validation of these tools, however, is particularly challenging in the absence of a ground truth. Sound method papers generally include some benchmark evaluations on simulated data, where the ground truth is known and different scenarios can be tested. If these simulations are based on simplistic assumptions, as is most often the case, such experiment holds more as a sanity check than an actual demonstration of validity.

Recently, fMRI simulations with realistic properties have started to emerge in the context of method validation. The results have sometimes been very surprising, challenging common practice in fMRI data analysis, such as the inflated family-wise error in cluster-based inference implemented in many popular packages (FSL, SPM, AFNI).

In this symposium, we will present a number of validation works, covering established methods (false-discovery rate and cluster-based inference in group general linear models) as well as emerging techniques (artifact reduction using independent component analysis). The simulation models themselves will cover a range of techniques (resampling of real data, linear mixture of real spatial component, multimodal computational model of brain connectivity). Importantly, each speaker will present works based on public software packages that can be used to implement these solutions.

Symposia Schedule:

8:00-8:15

Cluster Failure: Why fMRI Inferences for Spatial Extent Have Inflated False-Positive Rates

Anders Eklund, PhD, Linköping University, LINKÖPING, Sweden

8:15-8:30

Approaches to developing appropriate simulations and null models for dynamic connectivity in fMRI data

Vince Calhoun, The Mind Research Network & LBERI; Department of Electrical and Computer, Engineering, UNM, Albuquerque, NM, United States

8:30-8:45

fMRI bootstrap simulations for the validation of statistics on connectomes

Pierre Bellec, CRIUGM/DIRO University of Montreal, Outremont, Québec

8:45-9:00

Multimodal simulations based on realistic structural connectivity using the Virtual Brain Platform

Petra Ritter, Charité University Medicine Berlin, Berlin, Germany

9:00-9:15

Questions and Answers