UiO : University of Oslo

Department of Mathematics
Section of Statistics and Data Science

Seminar Series in Statistics and Data Science

09.04.2019, 14:15 @ Erling Sverdrups plass, Niels H. Abels hus, 8th floor

Aldo Solari: All-Resolutions Inference for Brain Imaging

Abstract: Most neuroimaging studies identify brain activation as clusters of contiguous supra-threshold voxels, with random field theory (RFT) providing error guarantees. However, cluster-based inference suffers from a 'spatial specificity paradox': the larger the cluster, the less we know about the exact location of activation. This is because the null hypothesis tested is 'no activation in the whole cluster' so the alternative is 'at least one voxel is active in the cluster'.

In order to solve this paradox we need to estimate the proportion of truly active voxels in each cluster. If this proportion is large, then there is no real paradox. If this proportion is small, we may want to 'drill down' to sub-clusters. However, this introduces a selective inference problem: we are not making inference on arbitrary voxels, but rather, voxels that belong to statistically significant clusters.

We propose an exploratory multiple testing approach, termed All-Resolutions Inference (ARI), to solve the spatial specificity paradox and allow inference on voxels within clusters. ARI provides estimates of the True Discovery Proportion (TDP), i.e. the proportion of truly active voxels. It can be applied to estimate the TDP of any user-specified region, even after looking at the data, without losing error control. This means that ARI provides statistical guarantees if selecting clusters and estimating TDP from the same data, and in particular if clusters are selected using RFT. It also means that one may create sub-clusters within significant clusters, and estimate TDP again, without losing error control. It also means that one may select clusters using the TDP itself, and if unsatisfied with results, re-select clusters using whichever criterion.

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Aldo Solari is Associate Professor of Statistics at the Department of Economics, Quantitative Methods and Management of the University of Milano-Bicocca (ITA). He got his Ph.D. in Statistics in 2007 at the Department of Statistical Sciences of the University of Padova (ITA). Since 2008 he collaborates with Jelle Goeman (Leiden University Medical Centre, NED). Since 2014 he is a member of NeuroMI – Milan Centre for Neuroscience.

Next seminar

23.04.2019 @ 14:15
Vegard Antun (University of Oslo)

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