Pattern Recognition for NeuroImaging

Full Day Course / 8:00-16:30

Organizers:

Christophe Phillips
University of Liège, Belgium

Janaina Mourao-Miranda
University College London, United Kingdom

The application of pattern recognition techniques to neuroimaging data has increased substantially in the last years leading to a large body of publications. Pattern recognition approaches consist of a whole family of tools coming from the "machine learning" community (at the border of statistics and engineering), which have been adapted to investigate neuroscience questions. Depending on the research question asked, experimental design and data modality, it is important that the experimenter knows which tools to use and how to draw reliable conclusions. The course will focus on subject and/or patient classification (for cognitive and clinical applications) but also on regression issues. The usual functional and structural MRI modalities will be covered but the presentations will also consider other types of data. Model validation and statistical inference are particularly crucial as these notions somewhat differ from the standard univariate statistics usually applied to analyze neuroimaging data (e.g. General Linear Model) and should thus be specifically addressed. After introducing the theoretical foundations of pattern recognition in neuroimaging, a few talks will address key validation and inference issues. Then the remaining talks will introduce more advanced methodological points as illustrated by specific applications and/or modalities. At the end of the course, the neuroscientist should have a global understanding of pattern recognition approaches, how to apply these tools to his/her own data to address new questions, and how to interpret the outcomes of these analyses as well as how to draw reliable conclusions.

Course Schedule:

8:00-8:45
Pattern recognition in neuroimaging: fundamentals
Janaina Mourao-Miranda, University College London, United Kingdom

8:45-9:30
Cross-validation : what, which and how?
Pradeep Reddy Raamana, Ph.D., Baycrest Health Sciences, Canada

9:30-10:15
A primer on permutation testing (not only) for MVPA
Carsten Allefeld, Bernstein Center and Charité – Universitätsmedizin, Berlin, Germany

10:15-10:35
Break

10:35-11:20
What can we say about weight maps from linear decoding models?
Jessica Schrouff, University College London, United Kingdom

11:20-12:05
What makes a good multivariate model for fMRI-based decoding ?
Bertrand Thirion, Parietal Team, INRIA/Neurospin Saclay, France

12:05-13:00
Lunch

13:00-13:45
Pattern recognition for clinical neuroimaging: questions, approaches, and validation
Ninon Burgos, Équipe Aramis, ICM, France

13:45-14:30
Learning and predicting with brain connectivity for clinical neuroscience
Jonas Richiardi, Lausanne University Hospital, Switzerland

14:30-14:50
Break

14:50-15:35
Supervised vs. unsupervised approaches in psychiatric neuroimaging
Valeria Kebets, National University of Singapore, Singapore

15:35-16:20
Deep learning approaches applied to neuro-imaging
Vince Calhoun, Mind/UNM, United States

16:20-16:30
Question and Answer