

Pattern Recognition for NeuroImaging

Organizers:

Christophe Phillips

University of Liège, Liège, Belgium

Janaina Mourao-Miranda, Ph.D.

Max Planck UCL Centre for Computational Psychiatry and Ageing Research, London, United Kingdom

The application of pattern recognition techniques to neuroimaging data has increased substantially over 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:

8:00-8:35

Pattern recognition fundamentals

Christophe Phillips, University of Liège, Liège, Belgium

8:35-9:05

Cross-validation to assess and tune decoders

Pradeep Reddy Raamana, Rotman Research Institute, Baycrest Health Sciences, Ontario, Canada

9:05-9:40

A primer on permutation testing (not only) for MVPA.

Carsten Alfeld, Charité – Universitätsmedizin Berlin, Berlin, Germany

9:40-10:15

Can we interpret weight maps in terms of cognitive/clinical neuroscience?

Jessica Schrouff, Stanford University, Palo Alto, CA, United States

10:15-10:30

Break

10:30-11:05

A new MVPA-er's guide to fMRI datasets

Jo Etzel, PhD, Washington University in St. Louis, Saint Louis, MO, United States

11:05-11:40

What makes a good multivariate model for fMRI-based decoding ?

Bertrand Thirion, Inria, Saclay, France

11:40-12:00

Questions and Answers

12:00-13:00

Lunch

13:00-13:35

Matching and Studying Multivariate Patterns across Individuals

Georg Langs, Medical University of Vienna, Vienna, Austria

13:35-14:05

Learning from multimodal data for disease prediction

Olivier Colliot, ICM, Paris, Paris

14:05-14:40

Pattern recognition and neuroimaging in psychiatry

Janaina Mourao-Miranda, Ph.D., Max Planck UCL Centre for Computational Psychiatry and Ageing Research, London, United Kingdom

14:40-15:00

Break

15:00-15:35

Deep learning approaches applied to Neuro-Imaging

Vince Calhoun, The Mind Research Network, Albuquerque, NM, United States

15:35-16:05

Interpretation of MVPA models

Moritz Grosse-Wentrup, Max Planck Institute for Intelligent Systems, Tuebingen, Germany

16:05-16:30

Question and Answer