

Pattern Recognition for NeuroImaging

Organizers:

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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 such as PET, EEG/MEG and network metrics. 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, 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

8:00-8:30

Pattern Recognition Fundamentals

Christophe Phillips, University of Liège, Liège, Belgium

8:30-9:00

Strategies to improve the interpretability of whole-brain predictive patterns

Janaina Mourão-Miranda, University College London, London, United Kingdom

9:00-9:30

A primer on permutation tests (not only) for MVPA

Carsten Alletfeld, Charité – Universitätsmedizin Berlin / Bernstein Center for Computational Neuroscience Berlin, Germany

9:30-10:00

Learning from multimodal data for disease prediction

Olivier Colliot, ARAMIS Lab, Paris, France

10:00-10:30

Break

10:30-11:00

Mapping Patterns Across Individuals: Decoupling Function from Anatomy

Georg Langs, Medical University of Vienna, Vienna, Austria

11:00-11:30

Decoding cognitive concepts, not experimental artifacts

Bertrand Thirion, inria, Saclay, France

11:30-12:00

Population receptive field modeling

Marcel van Gerven, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, Netherlands

12:00-13:00

Lunch

13:00-13:30

Introduction to machine learning with brain graphs

Jonas Richiardi, University of Geneva, Geneva, Switzerland

13:30-14:00

Feature representations for anatomical MRI

John Ashburner, UCL Institute of Neurology, London, United Kingdom

14:00-14:30

M/EEG Decoding

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

14:30-15:00

Machine learning and cognitive neuroimaging: new questions answered by new tools

Gael Varoquaux, INRIA, Gif-sur-Yvette

15:00-15:30

Break

15:30-16:00

Resources for practicing PR4NI -- pragmatic cursory overview

Yaroslav Halchenko, Dartmouth College, Hanover, NH, United States

16:00-16:30

Wrap Up and Discussion