Workshop: 30th August 2012
IHU-A-ICM

The systematic and automated analysis of the large functional brain databases of papers

Institut du cerveau et de la moelle épinière (ICM), Room 01-02
Hopital Salpétrière, Paris 13

The Workshop is an intensive program for docs, post-docs, researchers and clinicians, to promote innovative approaches to issues of systematic and automated analysis of large functional brain database of papers. The entrance is free.

Organized by : Habib Benali, Yves Burnod, Stéphane Lehéricy, Salma Mesmoudi.

Program

8h30 - 9h: Welcome

9h – 10h : Tal Yarkoni (Colorado University) :

Large-scale automated synthesis of functional MRI data using the Neurosynth framework

Large-scale automated The explosive growth of the human neuroimaging literature has led to major advances in understanding of human brain function, but has also made aggregation and synthesis of neuroimaging findings increasingly difficult. In this talk, I discuss some of the major challenges neuroimaging researchers face, and describe a novel brain mapping framework(Neurosynth) that uses text mining, meta-analysis and machine learning techniques to help address some of these challenges. The Neurosynth framework can be used to automatically conduct large-scale, high-quality neuroimaging meta-analyses, address long-standing inferential problems in the neuroimaging literature

(e.g., how to infer cognitive states from distributed activity patterns), and support 'decoding' of broad cognitive states from brain activity in both entire studies and individual human subjects. I illustrate these applications with concrete examples from several domains, and introduce a web interface that provides access to the data and tools (http://neurosynth.org), before concluding with a discussion of future directions and potential avenues for integration with other tools.

10h15 – 10h45: Roberto Toro (Pasteur, Paris) :

BrainSpell, an open-source project to classify the neuroimaging literature

A major success of the neuroimaging community is the widespread use of stereotaxic coordinates to report their results. Independently of the type of study, researchers have used (roughly) equivalent versions of the same space to report their findings. This has permitted the constitution of an enormous corpus of common knowledge covering many aspects of human cognition. The development of methodologies to mine this rich resource is therefore an important challenge. Recent efforts have made it possible to automatically extract stereotaxic coordinates from articles (NeuroSynth), as well as a to develop a detailed ontology to describe the tasks they use and their content (Cognitive Atlas). However, obtaining an accurate classification of the literature still requires a large amount of human decision making. Here I describe BrainSpell, a project to develop a web interface to crowdsource this effort. BrainSpell seeks to provide an intuitive tool to allow neuroimagers to participate into the classification of a large, growing, corpus of neuroimaging articles. All the data, as well as all the source code used by BrainSpell, will be made immediately and unrestrictedly available online to the community.

11h – 11h 15: Coffee Break

11h15 – 11h45: JeanPhilippe Cointet (I. Systèmes Complexes, Paris) :

Lexical extraction and mapping of cognitive tasks from scientific publication corpus

Automatic lexical extraction aims at detecting the key lexical entities that provide a reliable lexical description of a textual content within a larger corpus. Linguistic and statistical methods are used to automatically extract the most "pertinent" multi-terms defining the various topics a corpus of scientific publication refer to. We will present the results obtained when applied on the specific task of retrieving cognitive tasks from fMRI title & abstract publications dataset. Once the documents have been reduced into a lexical vector space, we will discuss how various measures may allow to derive semantic/functional networks of multi-terms. The visualization of those semantic networks produce maps reflecting the inner organization of cognitive tasks. Quantitative analysis of their structure may pave the way toward a more integrated understanding of brain organization.

12h – 13h: Lunch

13h – 14h: Cameron Craddock (Child Mind Institute, New York) :

The current state of resting state literature

Resting state researchers are faced with an increasing deluge of literature without a comprehensive index or sufficient automated tools to identify and review a subset of the

literature of interest. The Child Mind Institute (CMI) Librarian initiative has created and maintains a comprehensive, hand-vetted reference library of resting state literature that is tagged with descriptive labels to facilitate its systematic review. I will describe the methodology used to construct this index and additionally present the results of an initial bibliometric analysis of the resting state literature. Additionally I will discuss future CMI initiatives to construct a comprehensive database of the methods employed in resting state research to enable meta-analysis of the algorithms, tools, and parameters commonly utilized in the literature. All data generated through CMI Librarian are freely available online for unrestricted use.

14h15 – 14h45: Salma Mesmoudi and Claudia Cioli (MATRICE, Laboratoire d'Imagerie Fonctionnelle, I. Systèmes Complexes, Paris) .

Carma matrix: automatic analysis of papers to relate new studies with the current brain imaging knowledge.

A major problem faced by the neuroscientific and clinical community is to use the current knowledge distributed in thousands of papers to help interpreting their own results. We have used the Neurosynth framework and the CorText lexical analysis to derive automatically a large set of anatomo-functional reference points covering the whole cortical surface and forming local barycentric reference frames. Each reference point is double-labelled by an anatomical and a cognitive marker, expressing an acceptable consensus from the larger possible set of papers. We can then build the CARMA matrix (Cerebral Architecture for Multiple Acquisitions and adaptations) which can reveal both the combinatorial properties of referenced neural populations, and the relations between networks in which these neuronal populations are participating (anatomical connections, resting-state correlations, cognitive activations..). This CARMA matrix can serve as a tool to relate brain imaging follow-up studies of individual patients with the current scientific knowledge. "

15h – 15h15 : Coffee Break

15h15 - 16h15: Overall schedule and discussion :
Habib Benali, Yves Burnod, Stéphane Lehéricy