

Syllabus PSY 607 Sem Brain decoding (Winter 2015)

Meeting time: Thursdays 1-2:50pm.

Meeting place: LISB 217 (except Jan 8 LISB 234; Feb 12 & March 12: LISB TBA)

Instructor: Dasa Zeithamova Demircan
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Office hours: by appointment (drop-ins usually welcomed)

Description and objectives: In this seminar, we will explore advanced fMRI analysis techniques that provide novel insights into how information is learned and represented in the brain. We will warm-up with standard voxel-wise approach to fMRI analysis using general linear model and hypothesis testing. We will move up to multivariate analyses that consider information contained in a wider pattern of activation. We will cover multivoxel pattern analysis (MVPA) and pattern similarity analysis (PSA, aka representational similarity analysis—RSA) in depth to understand how they may provide additional insight into brain's representational content. We will also discuss methods for model-based fMRI, real-time fMRI, and assessing interregional-interactions. While this is not a hands-on class, you should gain a conceptual understanding of each technique to know when and how it may be useful to your own research question and how would you go about implementing it.

Pre-requisites: Graduate studies in psychology. Prior knowledge of statistics and basic fMRI principles are highly desirable.

Format: The course will use a seminar format. I will give brief conceptual tutorials on different techniques but the core of the course will be readings and discussions of articles that describe or utilize each method. Each class will evolve around one or two journal articles and students will take turns presenting the articles and leading discussion. Everyone will be expected to read the papers for each class, bring questions, and participate in the discussion. All students will also present a brief proposal of a novel experiment that uses the methods covered in the class to address a research question they are working on in their lab.

Expectations for students and assessment: Students are expected to do weekly readings, participate in the class discussion, and consider how the presented techniques may be applicable in their own research. These expectations will be formalized (and provide a basis for the final grade) as follows:

- Each week, read assigned article(s) prior to the class, email me 2 questions or comments for each article by midnight the prior Wednesday 10%
- Present one of the articles in the class 30%
- Lead discussion of one article (different than presented) 20%
- Participate in class discussion 10%
- Experiment proposal (presentation + up to 1 page write-up) 30%

Readings: There is no textbook, class is based on reading primary research articles and methods articles only. The articles currently listed in the syllabus are tentative and a subject to change. Readings for the next class will be finalized during the prior class and I will provide PDFs of all assigned articles (via Blackboard or email). If we read an article that is NOT an open source, the PDF will be provided for class-related purpose and should not be re-shared.

Experiment proposal: Propose a novel fMRI experiment that uses one or more methods discussed in the class to address a research question that you (or your lab) are currently pursuing using other methods. Each student will have a brief presentation (~10 min) of their proposal in the class and also email me a written description (1 page). Information to include in the presentation/write-up: brief background/intro, proposed experimental procedures, analysis strategy, expected outcomes. Given the brief format, focus on what new information you may gain by using the new-to-you method(s).

Tentative schedule

Jan 8 Introduction, Organization, Basic principles of fMRI data analysis
MEET AT LISB 234

Jan 15 Gold standard: Rapid event-related design, General linear model

Jan 22 Model-based fMRI

Jan 29 Multivoxel pattern analysis I

Feb 5 Multivoxel pattern analysis II

Feb 12 Pattern similarity analysis (aka Representational similarity analysis)
MEET AT LISB TBA

Feb 19 Pattern similarity analysis II

Feb 26 BOLD-based connectivity analysis

Mar 5 Topic of choice, Final presentations start

Mar 12 Final presentations
MEET AT LISB TBA