G8325 - Statistical methods in functional MRI

Place: SSW 903 (1255 Amsterdam, 9th floor)
Time: Thursday 2:00 – 4:00 PM

Course website: http://www.stat.columbia.edu/~martin/fMRI/Main.htm
Textbook: No text book. We will be using relevant journal articles.

Instructor: Martin Lindquist
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Prerequisites: Consent of instructor

Course Description: The course aims to introduce students to the interesting mathematical and statistical aspects of functional magnetic resonance imaging (fMRI). Each week we will discuss a new important statistical issue involved in fMRI. The lectures will start with general background about the statistical theory involved and followed by discussion about its application to fMRI. The class starts with a brief introduction to fMRI for students previously not familiar with this technique. Topics discussed in later weeks include: data collection, image reconstruction, experimental design, preprocessing to eliminate systematic noise, model fitting, time series models, the general linear model, multivariate techniques and connectivity. This topic is an innovative application of statistics to medicine which is currently experiencing exponential growth.

Office Hours: By appointment

Grading: The class meets weekly and students are encouraged to actively participate in the class by reading relevant papers and working on a number of small programming projects. The grade will depend on student attendance, projects and participation in the class.

Course overview: During the course of the semester we will cover the following topics:

September 7	Introduction to functional MRI
September 14	An introduction to k-space/ Image reconstruction
September 21	Image reconstruction/ Pre-processing
September 28	Signal and Noise
October 5	The General Linear Model – Part I
October 12	The General Linear Model – Part II
October 19	The Multiple Comparison Problem
October 26	Multi-level models
November 2	Bayesian Methods
November 9	Experimental Design (Guest lecturer: Tor Wager)
November 16	Multivariate Methods
November 23	**Thanksgiving Day**
November 30	Functional and effective connectivity
December 7	TBA