

Functional Magnetic Resonance Imaging

NEUROBIO 381 Fall 2002

Time and Place	Wednesdays, 3:30-6:30 PM in the BIAC laboratory (251 Bell). Computers for lab exercises are available in rooms 251 and 166.
Materials	The primary text is <i>Introduction to Functional Magnetic Resonance Imaging</i> , by Richard Buxton. Readings from this text will be assigned for most class sessions. Additional readings will be provided by the instructors. A more printable PDF copy of the syllabus may be found here .
Course Director	Scott Huettel, Ph.D. Departments of Psychiatry, Neurobiology, and Psychology Brain Imaging and Analysis Center (Bell 254D) email: scott.huettel@duke.edu phone: 681-9527
Office Hours	Bell Building, Room 254D Given the size of the class, office hours will be by appointment.

Course Information

This course is intended to provide a comprehensive and rigorous introduction to the technique of functional magnetic resonance imaging (fMRI). Students will learn the basic physics underlying MRI, the biological principles of fMRI, the principles of experimental design, the processing steps associated with data analysis, and the use of available software packages.

Each week's session will be composed of a lecture and laboratory. Each part will be led by one or more BIAC faculty members. Where possible, the laboratory topics will be flexible so that students with more experience can explore the issues covered in more detail.

As this is a graduate course, grades will reflect a certification of training, rather than a competition between students. Therefore, all grades can be raised to "E" by demonstrating understanding of the material. Grades will be based on participation in course sessions, completion of laboratory exercises, one take-home test at the middle of the semester, and a final practicum research project.

Auditors are welcome (and encouraged) to take the course, but regular attendance and participation is required. It is strongly recommended that auditors attend both the lecture and laboratory sessions, if possible, as they will be designed to complement each other.

Course Outline

Please note: you must have a BIAC login to access the readings. We apologize for the inconvenience. Also, additional readings and lecture notes will appear here as the semester progresses.

8/28	Lecture:	Introduction to fMRI (Huettel)
	Laboratory:	Visit to MR Scanner, Real-time fMRI (Voyvodic)
	Readings:	“An Introduction...”, Matthews
9/4	Lecture:	From Neuronal to Hemodynamic Activity (McCarthy)
	Laboratory:	Matlab and BIAC tools: I
	Readings:	Buxton, Ch. 1-3; Smith (2002) ; Hyder(2002) ; Raichle (2002)
9/11	Lecture:	MR Physics: Basic Principles (Song)
	Laboratory:	Matlab and BIAC tools: II
	Readings:	Buxton Ch. 4,7
9/18	Lecture:	MR Physics: Image Formation (Song)
	Laboratory:	Creating a MR Image
	Readings:	Buxton, Ch. 5,10; Damadian (1971) ; Lauterbur (1973)
9/25	Lecture:	MR Physics: Pulse Sequences and Contrast (Song)
	Laboratory:	Image types and contrasts
	Readings:	Buxton, Ch. 8,11
10/2	Lecture:	BOLD fMRI Imaging (Huettel)
	Laboratory:	Working with fMRI datasets
	Readings:	Buxton, Ch. 6, 16; Ogawa (1990, 1992); Blamire (1992) ; Kwong (1992)
10/9	Lecture:	Functional Localization of Activation using BOLD fMRI (Huettel)
	Laboratory:	Limits on Resolution, Understanding refractory effects
	Readings:	Buxton, Ch. 17
10/16	Lecture:	Spatial and Temporal Properties of BOLD fMRI (Huettel)
	Laboratory:	Effects of sampling upon functional images
	Readings:	Buxton, Ch. 12
10/23	Lecture:	Data preprocessing (Huettel)
	Laboratory:	Basic preprocessing steps: Use and evaluation
	Readings:	To be announced
10/30	Lecture:	Issues in Experimental Design (Huettel)
	Laboratory:	Comparison of Different Design Types
	Readings:	Buxton, Ch. 19
11/6	Lecture:	Statistical Analysis (Huettel, McKeown)
	Laboratory:	Consequences of averaging, hypothesis- and data-driven approaches
	Readings:	Buxton, Ch. 18
11/13	Lecture:	Functional Brain Anatomy (McCarthy)
	Laboratory:	To be announced
	Readings:	To be announced
11/20	Lecture:	Advanced functional MR imaging techniques (Song) [To be rescheduled]
	Laboratory:	To be announced
	Readings:	Buxton, Ch. 9, 13-15