

COURSE OUTLINE

Course: RADI 6051 Statistical Parametric Mapping
(Provides credit for RADI 6019 – Medical Image Processing)

Instructors: Jack L. Lancaster

Text: Functional MRI an introduction to methods
Peter Jezzard, Paul M. Matthews, and Stephen M. Smith, eds.

Schedule: Fall, TU-TH 2:00-3:30

Where: RIC classroom 2.534

Functional MRI (fMRI) is a 4-D study of the brain with the 4th dimension being time. Temporal changes in brain activity modulate the time course of an fMR signal, and the objective of fMRI studies is to determine the strength and location of such brain activity and present these findings as a 3-D statistical parametric map. This introductory course provides an overview of MRI physics relevant to fMRI including the physiological basis of fMRI signal production. Guidelines for designing fMRI studies using common paradigms will be presented and example studies detailed. Special emphasis will be placed on image processing steps essential to extract meaningful information from fMRI studies. Statistical detection theory and statistical analysis approaches specific to fMRI will be presented. Numerous fMRI studies will be detailed and **FSL** software (<http://www.fmrib.ox.ac.uk/fsl/>) for statistical parametric mapping demonstrated along with **Mango** software (<http://ric.uthscsa.edu/mango/>) used to visualize and augment fMRI studies.

Physics of MRI

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| 1. Principles of nuclear magnetic resonance and MRI | Chapter 3 |
| 2. Quantitative measurements using fMRI | Chapter 8 |
| 3. Hardware for fMRI | Chapter 5 |
| 4. Spatial and temporal resolution of fMRI | Chapter 7 |
| Optional | |
| Ultra-fastMRI | Chapter 4 |
| Optimal pulse sequence for fMRI | Chapter 6 |

Experimental Design

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| 1. Effective paradigm design | Chapter 9 |
| Optional: Stimulus presentation and response monitoring | |

Analysis of fMRI

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| 1. Overview of fMRI analysis | Chapter 11 |
| 1. fMRI practice at the Research Imaging Institute | |
| 2. Preparing fMRI data for statistical analysis | Chapter 12 |
| 3. Head motion correction | Chapter 13 |
| 4. Registration, brain atlases and cortical flattening | Chapter 14 |
| 5. Statistical Analysis (JLL/DG) | |

Applications

1. Acquisition and processing of task based fMRI
2. Acquisition and processing of Resting state fMRI
3. Acquisition and processing of PET functional studies