

Department of Mathematics, Statistics, and Computer Science - Marquette University

**Course:** MSCS 6960: Seminar in Math/Stats/Comp Sci, Summer 2010

**Time:** TBD

**Instructor:** Daniel B. Rowe, Ph.D.

**Office Hours:** By appointment

**Office:** CU 313

**E-mail:** [daniel.rowe@marquette.edu](mailto:daniel.rowe@marquette.edu)

**Readings List:** \* indicates background paper

### **Topic 1**

Bandettini, et al.: Time course EPI of human brain function during task activation, *MRM* 25:390-397, 1992.

Kwong et al.: Dynamic magnetic resonance imaging of human brain activity during primary sensory stimulation. *PNAS* 89:5675-5695, 1992. (Bandettini 92 submitted before Kwong 92.)

\*Ogawa et al.: Brain magnetic resonance imaging with contrast dependent on blood oxygenation. *PNAS* 87:9868-9872, 1990.

### **Topic 2**

Bandettini et al.: Processing strategies for time-course data sets in functional MRI of the human brain *MRM* 30:161-173, 1993.

Cox et al.: Real-time functional magnetic resonance imaging. *MRM* 33:230-236, 1995.

### **Topic 3**

Friston et al.: Analysis of fMRI time-series. *HBM* 1:153-171, 1994.

Friston et al.: Analysis of fMRI time-series revisited. *NIMG* 2:45-53, 1995.

Worsley and Friston: Analysis of fMRI time-series revisited - Again. *NIMG* 2:173-181, 1995.

### **Topic 4**

Rowe and Logan: A Complex way to compute fMRI activation. *NIMG* 23:1078-1092, 2004.

\*Rice: Mathematical analysis of random noise. *Bell Syst. Tech.* 23:282, 1944.

(Reprinted by N. Wax, Selected papers on Noise and Stochastic Process, Dover Publication, 1954. QA273W3).

\*Gudbjartsson and Patz: The Rician distribution of noisy data. *MRM* 34:910-914, 1995.

\*Lai and Glover: Detection of BOLD fMRI signals using complex data. *Proc. ISMRM*, 5:1671, 1997

\*Nan and Nowak: Generalized likelihood ratio detection for fMRI using complex data. *IEEE-TMI* 18:320-329, 1999.

\*Scharf and Friedlander: Matched subspace detectors. *IEEE-TSP* 42:2146-2157, 1994.

### **Topic 5**

Rowe: Parameter estimation in the magnitude-only and complex-valued fMRI data models. *NIMG* 25:1124-1132, 2005.

\*Review Cramer-Rao lower bounds.

Rowe and Logan: Complex fMRI analysis with unrestricted phase is equivalent to a magnitude-only model. *NIMG* 24:603-606, 2005.

### **Topic 6**

Menon: Postacquisition Suppression of large-vessel BOLD signals in high-resolution fMRI. *MRM* 47:1-9, 2002.

Nencka and Rowe: Reducing the unwanted draining vein BOLD contribution in fMRI with statistical post-processing methods. *NIMG* 37:177-188, 2007.

Bodurka et al: Current-induced magnetic resonance phase imaging. *JMR* 137:265-271, 1999.

\*Chow et al.: Investigating direct detection of axon firing in the adult human optic nerve using MRI *NIMG* 30:835-846, 2006.

### **Topic 7**

Rowe et al.: Characterizing phase-only fMRI data with an angular regression model. *JNM* 161:331-341, 2007.

\*Marsaglia: Ratios of normal variables and ratios of sums of uniform variables. JASA 60:193-204, 1965.

\* Johnson and Wehrly: Some angular-linear distributions and related regression models. JASA 73:602-606, 1978.

\*Fisher and Lee: Regression models for an angular response. Biometrics 665-377, 1992.

#### **Topic 8**

Rowe: Modeling both the magnitude and phase of complex-valued fMRI data. NIMG 25:1310-1324, 2005.

\*Rowe and Hernandez: An analytic magnitude and phase fMRI Activation model applied to ASL, Proc ISMRM 17:1716, 2009.

\*Hernandez-Garcia, Vazquez, Rowe. Complex analysis of arterial spin labeling based fMRI signals. MRM 62:1597-1608, 2009.

#### **Topic 9**

Lee et al.: Complex data analysis in high resolution SSFP fMRI. MRM 57:905-917, 2007.

Rowe: Magnitude and phase signal detection in complex-valued fMRI data. MRM 62:1356-1357, 2009.

Lee et al.: Combining complex signal changes in functional MRI. MRM 62:1358-1360, 2009.

#### **Topic 10**

Hahn et al.: Improving robustness and reliability of phase-sensitive fMRI analysis using Temporal Off-resonance Alignment of Single-echo Timeseries (TOAST). NIMG 44:742-752, 2009.

\*Jezzard and Balaban: Correction for geometric distortion in echo planar images from B0 field variations. MRM 34:65-73, 1995.

#### **Topic 11**

Rowe et al.: Signal and noise of Fourier reconstructed fMRI data. JNM 159:361-369, 2007.

\* Review FTs and multivariate transformations.

#### **Topic 12**

Nencka et al.: A Mathematical model for understanding the statistical effects of k-space (AMMUST-k) preprocessing on observed voxel measurements in fcMRI and fMRI. JNM 181:268-282, 2009.

#### **Topic 13**

Nencka et al.: A Mathematical Model for Understanding the STatistical effects of Time-series (AMMUST-T) preprocessing on observed voxel measurements in fcMRI and fMRI. In Submission, 2010.

#### **Topic 14**

Rowe et al.: Functional MRI brain activation directly from k-space. MRI 27:1370-1381, 2009.

#### **Topic 15**

Zhao et al.: Sources of phase changes in BOLD and CBV-weighted fMRI. MRM 57:520-527, 2007.

Feng et al.: Biophysical modeling of phase changes in BOLD fMRI. NIMG 47:540-548, 2009.

\* Arja et al.: Changes in fMRI magnitude data and phase data observed in block-design and event-related tasks. NIMG 49:3149-3160, 2010.