

Graduate Summer School: Mathematics in Brain Imaging

Monday July 12, 2004

- 12:00 *week1|Week 1 - Computational Anatomy*
- 1:00 *td1|Day 1 - Introduction to Computational Anatomy*
- 8:45–12:00
- 9:00–9:15 *Welcome and Opening Remarks*
- 9:15–10:15 **Michael Miller** (Johns Hopkins University)
The Emerging Field of Computational Anatomy
- 10:15–10:45 *Break*
- 10:45–11:45 **Paul Thompson** (UCLA)
Medical and Neuroscience Applications of Computational Anatomy
- 11:45–2:00 *Lunch (on your own)*
- 2:00–3:00 **Jerry Prince** (Johns Hopkins University)
Surface Segmentation and Topology
- 3:00–3:15 *Break*
- 3:15–4:15 **Bruce Fischl** (Massachusetts General Hospital)
Segmenting Anatomical Surfaces and Volumes with Markov Models
- 4:30–6:30 *Wine Reception (Hosted by IPAM)*

Tuesday July 13, 2004

- 1:00 *td2|Day 2 - Constructing Anatomical Manifolds; Cortical Surface Maps*
- 9:00–10:00 **David van Essen** (Washington University)
Surface-based approaches to spatial localization and registration in primate cerebral cortex
- 10:00–10:30 *Break*

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- 10:30–11:30 **Denis Riviere** (CEA Saclay, France)
Sulcus Generation
- 11:30–12:30 **James Duncan** (Yale University)
Geometric Strategies for Neuroanatomic Analysis from MRI
- 12:30–2:00 *Lunch (on your own)*
- 2:00–3:00 **Ken Stephenson** (University of Tennessee, Knoxville)
Conformal Mapping of Brain Surfaces: Circle Packing and the Riemann Mapping Theorem
- 3:00–3:30 *Break*
- 3:30–4:30 **Tony Chan** (UCLA)
Conformal Brain Mapping using Variational Methods and PDEs.

Wednesday July 14, 2004

- 1:00 *td3|Day 3 - Metrics on Anatomical Manifolds*
- 9:00–10:00 **David Mumford** (Brown University)
Metric Spaces on the space of Shape
- 10:00–10:30 *Break*
- 10:30–11:30 **Laurent Younes** (Ecole Normale Supérieure, France)
Moving templates
- 11:30–1:30 *Lunch (on your own)*
- 1:30–2:30 **John Ashburner** (Institute of Neurology)
Voxel-based morphometry
- 2:30–3:00 *Break*
- 3:00–4:00 **Guillermo Sapiro** (University of Minnesota)
Implicit Brain Imaging

Thursday July 15, 2004

- 1:00 *td4|Day 4 - Physics of mappings*
- 9:00–10:00 **Darryl D. Holm** (Los Alamos National Laboratory)
Geodesic solitons in nonlinear internal-wave interactions and in computational anatomy
- 10:00–11:00 **Alain Trouvé** (Ecole Normale Supérieure, France)
Geodesic Motions and Vector Fields on Anatomical Manifolds
- 11:00–11:15 *Break*
- 11:15–12:15 **P. S. Krishnaprasad** (University of Maryland)
Geometry of Collective Steering
- 12:15–2:00 *Lunch (Hosted by IPAM)*
- 2:00–2:45 **Anil Hirani** (California Institute of Technology)
Discrete Exterior Calculus and the Averaged Template Matching Equations
- 2:45–3:30 **Mathieu Desbrun** (University of Southern California)
Applied Geometry: Discrete Differential Calculus for Graphics
- 3:30–4:00 *Break*
- 4:00–5:00 **James Gee** (University of Pennsylvania)
DTI and Tensor Registration

Friday July 16, 2004

- 1:00 *td5|Day 5 - Statistical Inference and Shape*
- 9:00–10:00 **Olivier Faugeras** (INRIA Sophia Antipolis)
Approximating shape metrics and application to shape warping and empirical shape statistics
- 10:00–11:00 **John Csernansky** (Washington University)
Computational Anatomy and Neuropsychiatric Disease: Probabilistic Assessment of Variation and Statistical Inference of Group Difference, Hemispheric Asymmetry, and Time-Dependent Change
- 11:00–11:15 *Break*

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- 11:15–12:15 **Susumu Mori** (Johns Hopkins University)
Constructing Atlases and Measuring Structural Brain Changes via Diffusion Tensor Imaging
- 12:15–2:00 *Lunch (on your own)*
- 2:00–2:45 **Sarang Joshi** (Florida State University)
Statistics of Shape: Simple Statistics on Interesting Spaces
- 2:45–3:30 **Guido Gerig** (University of North Carolina)
Shape analysis to assess neurodevelopment and neurodegeneration
- 3:30–4:00 *Break*
- 4:00–5:00 **Nicholas Ayache** (INRIA Sophia Antipolis)
Brain Image Registration for Shape Analysis: Contributions from the Epidaure Laboratory at INRIA

Saturday July 17, 2004

- 9:00–9:15 **Art Toga** (UCLA)
Multimodality Brain Atlases of Mice and Men
- 9:15–9:45 **David Shattuck** (UCLA)
Cortical Surface Models from MRI
- 9:45–10:15 **David Rex** (UCLA)
Structured and Automated Analysis Pipelines for Brain Images
- 10:15–10:45 *Break*
- 10:45–11:15 **J. Tilak Ratnanather** (Johns Hopkins University)
Dynamic Programming Applications in Defining Cortical Manifold Boundaries
- 11:15–11:45 **Lei Wang** (Washington University/School of Medicine)
Statistical Computation and Inference on the Subcortical Surface
- 11:45–12:15 **Monica Hurdal** (Florida State University)
Cortical Surface Correction and Conformal Flat Mapping: TopoCV and CirclePack
- 2:00 *Tutorials and Demonstrations of Software for Computational Anatomy*
2:00 PM - 4:00 PM at [LONI](http://www.loni.ucla.edu/)
- 2:00–4:00 *Tutorials and Demonstrations*

Monday July 19, 2004

- 12:00 *week2|Week 2 - Functional Imaging*
- 1:00 *td6|Day 6 - Acquisition and preprocessing*
- 8:45–9:00 *Welcome and Opening Remarks*
- 9:00–10:15 **Douglas Noll** (University of Michigan)
fMRI Acquisition
- 10:15–10:30 *Break*
- 10:30–11:45 **Richard Buxton** (University of California at San Diego)
Hemodynamic Models
- 11:45–1:30 *Lunch (on your own)*
- 1:30–2:45 **Jean-Francois Mangin** (CEA Saclay, France)
Motion Correction
- 2:45–4:00 **Steven Strother** (University of Minnesota)
Effects of Preprocessing
- 4:00–4:15 *Break*
- 4:15–5:30 **Alan Yuille** (UCLA)
Bayesian Inference and Visual Processing
- 5:30–7:30 *Wine Reception (Hosted by IPAM)*

Tuesday July 20, 2004

- 1:00 *td7|Day 7 - Univariate models: Classical and Bayesian Approaches*
- 9:00–10:15 **Thomas D. Wickens** (University of California at Berkeley)
Statistical Modeling
- 10:15–10:30 *Break*
- 10:30–11:45 **Steve Engel** (UCLA)
The linear systems model of fMRI: Strengths and Weaknesses
- 11:45–1:30 *Lunch (on your own)*
- 1:30–2:45 **Chris Genovese** (Carnegie Mellon University)
Bayesian Analysis of Neuroimaging Data
- 2:45–4:00 **Jan de Leeuw** (UCLA)
Hierarchical Modeling
- 4:00–4:15 *Break*

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4:15–5:30 **Tom Mitchell** (Carnegie Mellon University)
Machine Learning Approaches to fMRI

Wednesday July 21, 2004

1:00 *td8|Day 8 - Univariate models: Temporal autocorrelation & Multiple Testing*

9:00–10:15 **Steve Smith** (Oxford University)
fMRI Time Series - Signal and Noise Modelling

10:15–10:30 *Break*

10:30–11:45 **Edward Bullmore** (Cambridge University)
Wavelets and functional MRI

11:45–1:30 *Lunch (on your own)*

1:30–2:45 **Thomas Nichols** (University of Michigan)
Group Modeling

2:45–4:00 **Keith Worsley** (McGill University)
Unified univariate and multivariate random field theory applied to canonical correlation SPMs from DBM

4:00–4:15 *Break*

4:15–5:30 **Jonathan Taylor** (Stanford University)
False Discovery Rate, Bayes and Multiple Comparisons

Thursday July 22, 2004

1:00 *td9|Day 9 - Multivariate techniques*

9:00–10:15 **Thomas Liu** (University of California at San Diego)
The Geometry of fMRI Statistics: Models, Efficiency, and Design

10:15–10:30 *Break*

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- 10:30–11:45 **Ivo Dinov** (UCLA)
Wavelet-Based Statistical Analysis of fMRI Data
- 11:45–1:30 *Lunch (Hosted by IPAM)*
- 1:30–2:45 **Randy McIntosh** (University of Toronto)
Connectivity Modeling
- 2:45–4:00 **Will Penny** (UCLA)
Dynamic Causal Modeling
- 4:00–4:15 *Break*
- 4:15–5:30 **Christian Beckmann** (Oxford University)
Independent Component Analysis for FMRI

Friday July 23, 2004

- 1:00 *td10|Day 10 - Multimodal imaging*
- 9:00–10:15 **Richard Leahy** (University of Southern California)
Approaches to Inverse Problem Estimation
- 10:15–10:30 *Break*
- 10:30–11:45 **Anders Dale** (Massachusetts General Hospital)
Relating Brain Imaging Signals to Biophysical Models of Neuronal Circuits
- 11:45–1:30 *Lunch (on your own)*
- 1:30–2:45 **David Boas** (Massachusetts General Hospital)
Diffuse Optical Imaging of Brain Activation: Approaches to Optimizing Image Sensitivity, Resolution, and Accuracy
- 2:45–4:00 *TBA*
- 4:00–4:15 *Conclusion*

