

# Table of Contents

## Connectivity

Matched Signal Detection on Graphs: Theory and Application to Brain Network Classification . . . . .	1
<i>Chenhui Hu, Lin Cheng, Jorge Sepulcre, Georges El Fakhri, Yue M. Lu, and Quanzheng Li</i>	

Exploring High-Order Functional Interactions via Structurally-Weighted LASSO Models . . . . .	13
<i>Dajiang Zhu, Xiang Li, Xi Jiang, Hanbo Chen, Dinggang Shen, and Tianming Liu</i>	

## Groupwise Registration

Feature-Based Alignment of Volumetric Multi-modal Images . . . . .	25
<i>Matthew Toews, Lilla Zöllei, and William M. Wells</i>	

Bayesian Estimation of Regularization and Atlas Building in Diffeomorphic Image Registration . . . . .	37
<i>Miaomiao Zhang, Nikhil Singh, and P. Thomas Fletcher</i>	

## Neuro Segmentation

Gradient Competition Anisotropy for Centerline Extraction and Segmentation of Spinal Cords . . . . .	49
<i>Max W.K. Law, Gregory J. Garvin, Sudhakar Tummala, KengYeow Tay, Andrew E. Leung, and Shuo Li</i>	

Automated Segmentation of the Cerebellar Lobules Using Boundary Specific Classification and Evolution . . . . .	62
<i>John A. Bogovic, Pierre-Louis Bazin, Sarah H. Ying, and Jerry L. Prince</i>	

## Statistical Analysis I

Tree-Space Statistics and Approximations for Large-Scale Analysis of Anatomical Trees . . . . .	74
<i>Aasa Feragen, Megan Owen, Jens Petersen, Mathilde M.W. Wille, Laura H. Thomsen, Asger Dirksen, and Marleen de Bruijne</i>	

Predicting Cognitive Data from Medical Images Using Sparse Linear Regression ..... 86  
*Benjamin M. Kandel, David A. Wolk, James C. Gee, and Brian Avants*

**Dynamic Imaging**

A Multiple Hypothesis Based Method for Particle Tracking and Its Extension for Cell Segmentation ..... 98  
*Liang Liang, Hongying Shen, Panteleimon Rempoulas, Valentina Greco, Pietro De Camilli, and James S. Duncan*

A Multiple Model Probability Hypothesis Density Tracker for Time-Lapse Cell Microscopy Sequences ..... 110  
*Seyed Hamid Rezatofighi, Stephen Gould, Ba-Ngu Vo, Katarina Mele, William E. Hughes, and Richard Hartley*

Multi-layer Deformation Estimation for Fluoroscopic Imaging..... 123  
*J. Samuel Preston, Caleb Rottman, Arvidas Cheryauka, Larry Anderton, Ross T. Whitaker, and Sarang Joshi*

**Poster Session I**

Fiber Connectivity Integrated Brain Activation Detection ..... 135  
*Burak Yoldemir, Bernard Ng, Todd S. Woodward, and Rafeef Abugharbieh*

Diffeomorphic Metric Mapping of Hybrid Diffusion Imaging Based on BFOR Signal Basis..... 147  
*Jia Du, A. Pasha Hosseinbor, Moo K. Chung, Barbara B. Bendlin, Gaurav Suryawanshi, Andrew L. Alexander, and Anqi Qiu*

Hyperbolic Harmonic Brain Surface Registration with Curvature-Based Landmark Matching..... 159  
*Rui Shi, Wei Zeng, Zhengyu Su, Yalin Wang, Hanna Damasio, Zhonglin Lu, Shing-Tung Yau, and Xianfeng Gu*

Geometric Tree Kernels: Classification of COPD from Airway Tree Geometry ..... 171  
*Aasa Feragen, Jens Petersen, Dominik Grimm, Asger Dirksen, Jesper Holst Pedersen, Karsten Borgwardt, and Marleen de Bruijne*

Segmenting the Papillary Muscles and the Trabeculae from High Resolution Cardiac CT through Restoration of Topological Handles .... 184  
*Mingchen Gao, Chao Chen, Shaoting Zhang, Zhen Qian, Dimitris Metaxas, and Leon Axel*

Data-Driven Interactive 3D Medical Image Segmentation Based on Structured Patch Model . . . . .	196
<i>Sang Hyun Park, Il Dong Yun, and Sang Uk Lee</i>	
Sparse Deformable Models with Application to Cardiac Motion Analysis . . . . .	208
<i>Yang Yu, Shaoting Zhang, Junzhou Huang, Dimitris Metaxas, and Leon Axel</i>	
A Longitudinal Functional Analysis Framework for Analysis of White Matter Tract Statistics . . . . .	220
<i>Ying Yuan, John H. Gilmore, Xiujuan Geng, Martin A. Styner, Kehui Chen, Jane-Ling Wang, and Hongtu Zhu</i>	
Groupwise Simultaneous Manifold Alignment for High-Resolution Dynamic MR Imaging of Respiratory Motion . . . . .	232
<i>Christian F. Baumgartner, Christoph Kolbitsch, Jamie R. McClelland, Daniel Rueckert, and Andrew P. King</i>	
Conformal Mapping via Metric Optimization with Application for Cortical Label Fusion . . . . .	244
<i>Yonggang Shi, Rongjie Lai, and Arthur W. Toga</i>	
A Novel Sparse Group Gaussian Graphical Model for Functional Connectivity Estimation . . . . .	256
<i>Bernard Ng, Gaël Varoquaux, Jean Baptiste Poline, and Bertrand Thirion</i>	
Joint Co-Segmentation and Registration of 3D Ultrasound Images . . . . .	268
<i>Raphael Prevost, Remi Cuingnet, Benoit Mory, Jean-Michel Correas, Laurent D. Cohen, and Roberto Ardon</i>	
Deformable Modeling Using a 3D Boundary Representation with Quadratic Constraints on the Branching Structure of the Blum Skeleton . . . . .	280
<i>Paul A. Yushkevich and Hui Gary Zhang</i>	
Sparse Projections of Medical Images onto Manifolds . . . . .	292
<i>George H. Chen, Christian Wachinger, and Polina Golland</i>	
Efficient 3D Multi-region Prostate MRI Segmentation Using Dual Optimization . . . . .	304
<i>Wu Qiu, Jing Yuan, Eranga Ukwatta, Yue Sun, Martin Rajchl, and Aaron Fenster</i>	

Locality Preserving Non-negative Basis Learning with Graph Embedding . . . . .	316
<i>Yasser Ghanbari, John Herrington, Ruben C. Gur, Robert T. Schultz, and Ragini Verma</i>	
Hierarchical Discriminative Framework for Detecting Tubular Structures in 3D Images . . . . .	328
<i>Dirk Breitenreicher, Michal Sofka, Stefan Britzen, and Shaohua Kevin Zhou</i>	
Joint Fractional Segmentation and Multi-tensor Estimation in Diffusion MRI . . . . .	340
<i>Xiang Hao and P. Thomas Fletcher</i>	
Retrospective Estimation of the Susceptibility Driven Field Map for Distortion Correction in Echo Planar Imaging . . . . .	352
<i>Hiroyuki Takeda and Boklye Kim</i>	

## Cortical Surface Registration I

Group-Wise Cortical Correspondence via Sulcal Curve-Constrained Entropy Minimization . . . . .	364
<i>Ilwoo Lyu, Sun Hyung Kim, Joon-Kyung Seong, Sang Wook Yoo, Alan C. Evans, Yundi Shi, Mar Sanchez, Marc Niethammer, and Martin A. Styner</i>	
Diffeomorphic Spectral Matching of Cortical Surfaces . . . . .	376
<i>Herve Lombaert, Jon Sporring, and Kaleem Siddiqi</i>	

## Diffusion MRI

The Non-Local Bootstrap – Estimation of Uncertainty in Diffusion MRI . . . . .	390
<i>Pew-Thian Yap, Hongyu An, Yasheng Chen, and Dinggang Shen</i>	
Beyond Crossing Fibers: Tractography Exploiting Sub-voxel Fibre Dispersion and Neighbourhood Structure . . . . .	402
<i>Matthew Rowe, Hui Gary Zhang, Neil Oxtoby, and Daniel C. Alexander</i>	

## Functional Imaging

Learning from M/EEG Data with Variable Brain Activation Delays . . . .	414
<i>Wojciech Zaremba, M. Pawan Kumar, Alexandre Gramfort, and Matthew B. Blaschko</i>	

Unsupervised Learning of Functional Network Dynamics in Resting State fMRI .....	426
<i>Harini Eavani, Theodore D. Satterthwaite, Raquel E. Gur, Ruben C. Gur, and Christos Davatzikos</i>	

Cohort-Level Brain Mapping: Learning Cognitive Atoms to Single Out Specialized Regions .....	438
<i>Gaël Varoquaux, Yannick Schwartz, Philippe Pinel, and Bertrand Thirion</i>	

## Torso Image Analysis

Rapid Multi-organ Segmentation Using Context Integration and Discriminative Models .....	450
<i>Nathan Lay, Neil Birkbeck, Jingdan Zhang, and Shaohua Kevin Zhou</i>	

Edge- and Detail-Preserving Sparse Image Representations for Deformable Registration of Chest MRI and CT Volumes .....	463
<i>Mattias P. Heinrich, Mark Jenkinson, Bartłomiej W. Papież, Fergus V. Glesson, Sir Michael Brady, and Julia A. Schnabel</i>	

## Cortical Surface Registration II

Multimodal Surface Matching: Fast and Generalisable Cortical Registration Using Discrete Optimisation .....	475
<i>Emma C. Robinson, Saad Jbabdi, Jesper Andersson, Stephen Smith, Matthew F. Glasser, David C. Van Essen, Greg Burgess, Michael P. Harms, Deanna M. Barch, and Mark Jenkinson</i>	

Globally Optimal Cortical Surface Matching with Exact Landmark Correspondence .....	487
<i>Alex Tsui, Devin Fenton, Phong Vuong, Joel Hass, Patrice Koehl, Nina Amenta, David Coeurjolly, Charles DeCarli, and Owen Carmichael</i>	

## Poster Session II

Joint Learning of Appearance and Transformation for Predicting Brain MR Image Registration .....	499
<i>Qian Wang, Minjeong Kim, Guorong Wu, and Dinggang Shen</i>	

Automatic Prostate MR Image Segmentation with Sparse Label Propagation and Domain-Specific Manifold Regularization .....	511
<i>Shu Liao, Yaozong Gao, Yinghuan Shi, Ambereen Yousuf, Ibrahim Karademir, Aytakin Oto, and Dinggang Shen</i>	

Moving Frames for Heart Fiber Geometry . . . . .	524
<i>Emmanuel Piuze, Jon Sparring, and Kaleem Siddiqi</i>	
Structural Brain Network Constrained Neuroimaging Marker Identification for Predicting Cognitive Functions . . . . .	536
<i>De Wang, Feiping Nie, Heng Huang, Jingwen Yan, Shannon L. Risacher, Andrew J. Saykin, and Li Shen</i>	
Multi-atlas Segmentation with Robust Label Transfer and Label Fusion . . . . .	548
<i>Hongzhi Wang, Alison Pouch, Manabu Takabe, Benjamin Jackson, Joseph Gorman, Robert Gorman, and Paul A. Yushkevich</i>	
A Hierarchical Geodesic Model for Diffeomorphic Longitudinal Shape Analysis . . . . .	560
<i>Nikhil Singh, Jacob Hinkle, Sarang Joshi, and P. Thomas Fletcher</i>	
Active Testing Search for Point Cloud Matching . . . . .	572
<i>Miguel Amável Pinheiro, Raphael Sznitman, Eduard Serradell, Jan Kybic, Francesc Moreno-Noguer, and Pascal Fua</i>	
Relating Fisher Information to Detectability of Changes in Nodule Characteristics with CT . . . . .	584
<i>Qin Li, Rongping Zeng, Kyle J. Myers, Berkman Sahiner, Marios A. Gavrielides, and Nicholas Petrick</i>	
Adaptive Multi-modal Particle Filtering for Probabilistic White Matter Tractography . . . . .	594
<i>Aymeric Stamm, Olivier Commowick, Christian Barillot, and Patrick Pérez</i>	
Can $T_2$ -Spectroscopy Resolve Submicrometer Axon Diameters? . . . . .	607
<i>Enrico Kaden and Daniel C. Alexander</i>	
Dictionary Learning on the Manifold of Square Root Densities and Application to Reconstruction of Diffusion Propagator Fields . . . . .	619
<i>Jiaqi Sun, Yuchen Xie, Wenxing Ye, Jeffrey Ho, Alireza Entezari, Stephen J. Blackband, and Baba C. Vemuri</i>	
Diseased Region Detection of Longitudinal Knee MRI Data . . . . .	632
<i>Chao Huang, Liang Shan, Cecil Charles, Marc Niethammer, and Hongtu Zhu</i>	
Model Selection and Estimation of Multi-compartment Models in Diffusion MRI with a Rician Noise Model . . . . .	644
<i>Xinghua Zhu, Yaniv Gur, Wenping Wang, and P. Thomas Fletcher</i>	

Bayesian Segmentation of Atrium Wall Using Globally-Optimal Graph Cuts on 3D Meshes .....	656
<i>Gopalkrishna Veni, Zhisong Fu, Suyash P. Awate, and Ross T. Whitaker</i>	
Using Region Trajectories to Construct an Accurate and Efficient Polyaffine Transform Model .....	668
<i>Gang Song, Yang Liu, Baohua Wu, Brian Avants, and James C. Gee</i>	
Extracting Evolving Pathologies via Spectral Clustering .....	680
<i>Elena Bernardis, Kilian M. Pohl, and Christos Davatzikos</i>	
Construction of Multi-scale Common Brain Networks Based on DICCOL .....	692
<i>Bao Ge, Lei Guo, Dajiang Zhu, Tuo Zhang, Xintao Hu, Junwei Han, and Tianming Liu</i>	
Rotation Invariant Features for HARDI .....	705
<i>Evan Schwab, H. Ertan Çetingül, Bijan Afsari, Michael A. Yassa, and René Vidal</i>	
Geodesic Shape Regression in the Framework of Currents .....	718
<i>James Fishbaugh, Marcel Prastawa, Guido Gerig, and Stanley Durrleman</i>	
<b>Tract Analysis</b>	
Multinomial Probabilistic Fiber Representation for Connectivity Driven Clustering .....	730
<i>Birkan Tunç, Alex R. Smith, Demian Wasserman, Xavier Pennec, William M. Wells, Ragini Verma, and Kilian M. Pohl</i>	
Reliable Selection of the Number of Fascicles in Diffusion Images by Estimation of the Generalization Error .....	742
<i>Benoit Scherrer, Maxime Taquet, and Simon K. Warfield</i>	
<b>Statistical Analysis II</b>	
IDiff: Irrotational Diffeomorphisms for Computational Anatomy .....	754
<i>Jacob Hinkle and Sarang Joshi</i>	
Joint Modeling of Imaging and Genetics .....	766
<i>Nematollah K. Batmanghelich, Adrian V. Dalca, Mert R. Sabuncu, and Polina Golland</i>	
<b>Author Index</b> .....	779