

Contents

Analysis on Manifolds

Robust Fréchet Mean and PGA on Riemannian Manifolds with Applications to Neuroimaging	3
<i>Monami Banerjee, Bing Jian, and Baba C. Vemuri</i>	
Inconsistency of Template Estimation with the Fréchet Mean in Quotient Space	16
<i>Loïc Devilliers, Xavier Pennec, and Stéphanie Allasonnière</i>	
Kernel Methods for Riemannian Analysis of Robust Descriptors of the Cerebral Cortex	28
<i>Suyash P. Awate, Richard M. Leahy, and Anand A. Joshi</i>	
Conditional Local Distance Correlation for Manifold-Valued Data.	41
<i>Wenliang Pan, Xueqin Wang, Canhong Wen, Martin Styner, and Hongtu Zhu</i>	
Stochastic Development Regression on Non-linear Manifolds	53
<i>Line Kühnel and Stefan Sommer</i>	

Shape Analysis

Spectral Kernels for Probabilistic Analysis and Clustering of Shapes	67
<i>Loïc Le Folgoc, Aditya V. Nori, and Antonio Criminisi</i>	
Optimal Topological Cycles and Their Application in Cardiac Trabeculae Restoration.	80
<i>Pengxiang Wu, Chao Chen, Yusu Wang, Shaoting Zhang, Changhe Yuan, Zhen Qian, Dimitris Metaxas, and Leon Axel</i>	
From Label Maps to Generative Shape Models: A Variational Bayesian Learning Approach	93
<i>Shireen Y. Elhabian and Ross T. Whitaker</i>	
Constructing Shape Spaces from a Topological Perspective	106
<i>Christoph Hofer, Roland Kwitt, Marc Niethammer, Yvonne Höller, Eugen Trinka, Andreas Uhl, and for the ADNI</i>	

Disease Diagnosis/Progression

A Discriminative Event Based Model for Alzheimer’s Disease Progression Modeling 121
Vikram Venkatraghavan, Esther E. Bron, Wiro J. Niessen, and Stefan Klein

A Vertex Clustering Model for Disease Progression: Application to Cortical Thickness Images 134
Răzvan Valentin Marinescu, Arman Eshaghi, Marco Lorenzi, Alexandra L. Young, Neil P. Oxtoby, Sara Garbarino, Timothy J. Shakespeare, Sebastian J. Crutch, Daniel C. Alexander, and for the Alzheimer’s Disease Neuroimaging Initiative

Unsupervised Anomaly Detection with Generative Adversarial Networks to Guide Marker Discovery 146
Thomas Schlegl, Philipp Seeböck, Sebastian M. Waldstein, Ursula Schmidt-Erfurth, and Georg Langs

A Novel Dynamic Hyper-graph Inference Framework for Computer Assisted Diagnosis of Neuro-Diseases 158
Yingying Zhu, Xiaofeng Zhu, Minjeong Kim, Daniel Kaufner, and Guorong Wu

A Likelihood-Free Approach for Characterizing Heterogeneous Diseases in Large-Scale Studies 170
Jenna Schabdach, William M. Wells III, Michael Cho, and Kayhan N. Batmanghelich

Multi-source Multi-target Dictionary Learning for Prediction of Cognitive Decline 184
Jie Zhang, Qingyang Li, Richard J. Caselli, Paul M. Thompson, Jieping Ye, and Yalin Wang

Predicting Interrelated Alzheimer’s Disease Outcomes via New Self-learned Structured Low-Rank Model. 198
Xiaoqian Wang, Kefei Liu, Jingwen Yan, Shannon L. Risacher, Andrew J. Saykin, Li Shen, Heng Huang, and for the ADNI

Weakly-Supervised Evidence Pinpointing and Description 210
Qiang Zhang, Abhir Bhalerao, and Charles Hutchinson

Quantifying the Uncertainty in Model Parameters Using Gaussian Process-Based Markov Chain Monte Carlo: An Application to Cardiac Electrophysiological Models. 223
Jwala Dhamala, John L. Sapp, Milan Horacek, and Linwei Wang

Cancer Metastasis Detection via Spatially Structured Deep Network 236
Bin Kong, Xin Wang, Zhongyu Li, Qi Song, and Shaoting Zhang

Risk Stratification of Lung Nodules Using 3D CNN-Based
Multi-task Learning 249
Sarfaraz Hussein, Kunlin Cao, Qi Song, and Ulas Bagci

Brain Networks and Connectivity

Topographic Regularity for Tract Filtering in Brain Connectivity 263
*Junyan Wang, Dogu Baran Aydogan, Rohit Varma, Arthur W. Toga,
and Yonggang Shi*

Riccati-Regularized Precision Matrices for Neuroimaging. 275
Nicolas Honnorat and Christos Davatzikos

Multimodal Brain Subnetwork Extraction Using Provincial Hub Guided
Random Walks 287
Chendi Wang, Bernard Ng, and Rafeef Abugharbieh

Exact Topological Inference for Paired Brain Networks
via Persistent Homology 299
*Moo K. Chung, Victoria Villalta-Gil, Hyekyoung Lee, Paul J. Rathouz,
Benjamin B. Lahey, and David H. Zald*

Multivariate Manifold Modelling of Functional Connectivity in Developing
Language Networks. 311
*Ernst Schwartz, Karl-Heinz Nenning, Gregor Kasprian, Anna-Lisa
Schuller, Lisa Bartha-Doering, and Georg Langs*

Hierarchical Region-Network Sparsity for High-Dimensional Inference
in Brain Imaging. 323
*Danilo Bzdok, Michael Eickenberg, Gaël Varoquaux,
and Bertrand Thirion*

A Restaurant Process Mixture Model for Connectivity Based Parcellation
of the Cortex 336
*Daniel Moyer, Boris A. Gutman, Neda Jahanshad,
and Paul M. Thompson*

On the Compactness, Efficiency, and Representation of 3D Convolutional
Networks: Brain Parcellation as a Pretext Task 348
*Wenqi Li, Guotai Wang, Lucas Fidon, Sebastien Ourselin,
M. Jorge Cardoso, and Tom Vercauteren*

Discovering Change-Point Patterns in Dynamic Functional Brain
Connectivity of a Population 361
Mengyu Dai, Zhengwu Zhang, and Anuj Srivastava

Extracting the Groupwise Core Structural Connectivity Network:
 Bridging Statistical and Graph-Theoretical Approaches 373
*Nahuel Lascano, Guillermo Gallardo-Diez, Rachid Deriche,
 Dorian Mazauric, and Demian Wassermann*

Estimation of Brain Network Atlases Using Diffusive-Shrinking Graphs:
 Application to Developing Brains 385
Islem Rekik, Gang Li, Weili Lin, and Dinggang Shen

A Tensor Statistical Model for Quantifying Dynamic
 Functional Connectivity 398
Yingying Zhu, Xiaofeng Zhu, Minjeong Kim, Jin Yan, and Guorong Wu

Modeling Task fMRI Data via Deep Convolutional Autoencoder 411
*Heng Huang, Xintao Hu, Milad Makkie, Qinglin Dong, Yu Zhao,
 Junwei Han, Lei Guo, and Tianming Liu*

Diffusion Imaging

Director Field Analysis to Explore Local White Matter Geometric Structure
 in Diffusion MRI 427
Jian Cheng and Peter J. Basser

Decoupling Axial and Radial Tissue Heterogeneity in Diffusion
 Compartment Imaging 440
*Benoit Scherrer, Maxime Taquet, Armin Schwartzman, Etienne St-Onge,
 Gaetan Rensonnet, Sanjay P. Prabhu, and Simon K. Warfield*

Bayesian Dictionary Learning and Undersampled Multishell
 HARDI Reconstruction 453
Kratika Gupta and Suyash P. Awate

Estimation of Tissue Microstructure Using a Deep Network Inspired
 by a Sparse Reconstruction Framework 466
Chuyang Ye

HFPRM: Hierarchical Functional Principal Regression Model
 for Diffusion Tensor Image Bundle Statistics 478
*Jingwen Zhang, Chao Huang, Joseph G. Ibrahim, Shaili Jha,
 Rebecca C. Knickmeyer, John H. Gilmore, Martin Styner,
 and Hongtu Zhu*

Quantitative Imaging

Orthotropic Thin Shell Elasticity Estimation for Surface Registration 493
*Qingyu Zhao, Stephen Pizer, Ron Alterovitz, Marc Niethammer,
 and Julian Rosenman*

Direct Estimation of Regional Wall Thicknesses via Residual Recurrent Neural Network 505
Wufeng Xue, Ilanit Ben Nachum, Sachin Pandey, James Warrington, Stephanie Leung, and Shuo Li

Multi-class Image Segmentation in Fluorescence Microscopy Using Polytrees. 517
Hamid Fehri, Ali Gooya, Simon A. Johnston, and Alejandro F. Frangi

Direct Estimation of Spinal Cobb Angles by Structured Multi-output Regression. 529
Haoliang Sun, Xiantong Zhen, Chris Bailey, Parham Rasoulinejad, Yilong Yin, and Shuo Li

Imaging Genomics

Identifying Associations Between Brain Imaging Phenotypes and Genetic Factors via a Novel Structured SCCA Approach 543
Lei Du, Tuo Zhang, Kefei Liu, Jingwen Yan, Xiaohui Yao, Shannon L. Risacher, Andrew J. Saykin, Junwei Han, Lei Guo, Li Shen, and for the Alzheimer’s Disease Neuroimaging Initiative

Image Registration

Frequency Diffeomorphisms for Efficient Image Registration 559
Miaomiao Zhang, Ruizhi Liao, Adrian V. Dalca, Esra A. Turk, Jie Luo, P. Ellen Grant, and Polina Golland

A Stochastic Large Deformation Model for Computational Anatomy 571
Alexis Arnaudon, Darryl D. Holm, Akshay Pai, and Stefan Sommer

Symmetric Interleaved Geodesic Shooting in Diffeomorphisms 583
Greg M. Fleishman, P. Thomas Fletcher, and Paul M. Thompson

Segmentation

Unsupervised Domain Adaptation in Brain Lesion Segmentation with Adversarial Networks 597
Konstantinos Kamnitsas, Christian Baumgartner, Christian Ledig, Virginia Newcombe, Joanna Simpson, Andrew Kane, David Menon, Aditya Nori, Antonio Criminisi, Daniel Rueckert, and Ben Glocker

Globally Optimal Coupled Surfaces for Semi-automatic Segmentation of Medical Images 610
Juan Eugenio Iglesias

Joint Deep Learning of Foreground, Background and Shape
for Robust Contextual Segmentation 622
*Hariharan Ravishankar, S. Thiruvenkadam, R. Venkataramani,
and V. Vaidya*

Automatic Vertebra Labeling in Large-Scale 3D CT Using Deep
Image-to-Image Network with Message Passing
and Sparsity Regularization 633
*Dong Yang, Tao Xiong, Daguang Xu, Qiangui Huang, David Liu,
S. Kevin Zhou, Zhoubing Xu, JinHyeong Park, Mingqing Chen,
Trac D. Tran, Sang Peter Chin, Dimitris Metaxas, and Dorin Comaniciu*

General Image Analysis

A Deep Cascade of Convolutional Neural Networks for MR
Image Reconstruction 647
*Jo Schlemper, Jose Caballero, Joseph V. Hajnal, Anthony Price,
and Daniel Rueckert*

Population Based Image Imputation. 659
*Adrian V. Dalca, Katherine L. Bouman, William T. Freeman,
Natalia S. Rost, Mert R. Sabuncu, and Polina Golland*

VTrails: Inferring Vessels with Geodesic Connectivity Trees 672
*Stefano Moriconi, Maria A. Zuluaga, H. Rolf Jäger, Parashkev Nachev,
Sébastien Ourselin, and M. Jorge Cardoso*

Author Index 685



<http://www.springer.com/978-3-319-59049-3>

Information Processing in Medical Imaging
25th International Conference, IPMI 2017, Boone, NC,
USA, June 25-30, 2017, Proceedings
Niethammer, M.; Styner, M.; Aylward, S.; Zhu, H.; Oguz,
I.; Yap, P.-T.; Shen, D. (Eds.)
2017, XVI, 687 p. 285 illus., Softcover
ISBN: 978-3-319-59049-3