Contents

Retinal Imaging

End-to-End Learning of a Conditional Random Field for Intra-retinal Layer Segmentation in Optical Coherence Tomography

Arunava Chakravarty and Jayanthi Sivaswamy

Superpixel-Based Line Operator for Retinal Blood Vessel Segmentation

Tong Na, Yitian Zhao, Yifan Zhao, and Yue Liu

Automatic Detection and Identification of Retinal Vessel Junctions in Colour Fundus Photography

Harry Pratt, Bryan M. Williams, Jae Ku, Frans Coenen, and Yalin Zheng

Fast Optic Disc Segmentation in Retinal Images Using Polar Transform

Muhammad Nauman Zahoor and Muhammad Moazam Fraz

A Novel Technique for Splat Generation and Patch Level Prediction in Diabetic Retinopathy

I. Syed Muhammedh Ajwahir, Kumar Rajamani, and S. Ibrahim Sadhar

Ultrasound Imaging

Deep Residual Networks for Quantification of Muscle Fiber Orientation and Curvature from Ultrasound Images

Ryan Cunningham, Peter Harding, and Ian Loram

Modelling, Speckle Simulation and Quality Evaluation of Synthetic Ultrasound Images

Prema Singh, Ramakrishnan Mukundan, and Rex de Ryke

Multi-level Trainable Segmentation for Measuring Gestational and Yolk Sacs from Ultrasound Images

Dheyaa Ahmed Ibrahim, Hisham Al-Assam, Sabah Jassim, and Hongbo Du

Weakly Supervised Learning of Placental Ultrasound Images with Residual Networks

Huan Qi, Sally Collins, and Alison Noble
Edge Aware Geometric Filter for Ultrasound Image Enhancement.  

Deepak Mishra, Santanu Chaudhury, Mukul Sarkar, and Arvinder Singh Soin

Cardiovascular Imaging

Tissues Classification of the Cardiovascular System Using Texture Descriptors  

Claudia Mazo, Enrique Alegre, Maria Trujillo, and Victor González-Castro

Multidimensional Assessments of Abdominal Aortic Aneurysms by Magnetic Resonance Against Ultrasound Diameter Measurements  


Comparison of Automatic Vessel Segmentation Techniques for Whole Body Magnetic Resonance Angiography with Limited Ground Truth Data  

Andrew McNeil, Giulio Degano, Ian Poole, Graeme Houston, and Emanuele Trucco

Evaluating Classifiers for Atherosclerotic Plaque Component Segmentation in MRI  

Arna van Engelen, Marleen de Bruijne, Torben Schneider, Anouk C. van Dijk, M. Eline Kooi, Jeroen Hendrikse, Aart Nederveen, Wiro J. Niessen, and Rene M. Botnar

Cardiac Mesh Reconstruction from Sparse, Heterogeneous Contours  

Benjamin Villard, Valentina Carapella, Rina Ariga, Vicente Grau, and Ernesto Zacur

Classification of Cross-sections for Vascular Skeleton Extraction Using Convolutional Neural Networks  

Kristina Lidayová, Anindya Gupta, Hans Frimmel, Ida-Maria Sintorn, Ewert Bengtsson, and Örjan Smedby

Segmenting Atrial Fibrosis from Late Gadolinium-Enhanced Cardiac MRI by Deep-Learned Features with Stacked Sparse Auto-Encoders  

Guang Yang, Xiahai Zhuang, Habib Khan, Shouvik Haldar, Eva Nyktari, Xujiang Ye, Greg Slabaugh, Tom Wong, Raad Mohiaddin, Jennifer Keegan, and David Firmin

Improved CTA Coronary Segmentation with a Volume-Specific Intensity Threshold  

Muhammad Moazzam Jawaid, Ronak Rajani, Panos Liatsis, Constantino Carlos Reyes-Aldasoro, and Greg Slabaugh
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segmentation of Abdominal Aortic Aneurysm (AAA) Based on Topology Prior Model</td>
<td>219</td>
</tr>
<tr>
<td>Safa Salahat, Ahmed Soliman, Tim McGloughlin, Naoufel Werghi, and Ayman El-Baz</td>
<td></td>
</tr>
<tr>
<td>Automated LGE Myocardial Scar Segmentation Using MaskSLIC Supervoxels - Replicating the Clinical Method</td>
<td>229</td>
</tr>
<tr>
<td>Iulia A. Popescu, Alessandra Borlotti, Erica Dall’Armellina, and Vicente Grau</td>
<td></td>
</tr>
<tr>
<td><strong>Oncology Imaging</strong></td>
<td></td>
</tr>
<tr>
<td>Multi-task Fully Convolutional Network for Brain Tumour Segmentation</td>
<td>239</td>
</tr>
<tr>
<td>Haocheng Shen, Ruixuan Wang, Jianguo Zhang, and Stephen McKenna</td>
<td></td>
</tr>
<tr>
<td>FF-CNN: An Efficient Deep Neural Network for Mitosis Detection in Breast Cancer Histological Images</td>
<td>249</td>
</tr>
<tr>
<td>Boqian Wu, Tasleem Kausar, Qiao Xiao, Mingjiang Wang, Wenfeng Wang, Binwen Fan, and Dandan Sun</td>
<td></td>
</tr>
<tr>
<td>Classification of Cervical-Cancer Using Pap-Smear Images: A Convolutional Neural Network Approach</td>
<td>261</td>
</tr>
<tr>
<td>Bilal Taha, Jorge Dias, and Naoufel Werghi</td>
<td></td>
</tr>
<tr>
<td>New Level Set Model in Follow Up Radiotherapy Image Analysis</td>
<td>273</td>
</tr>
<tr>
<td>Roushanak Rahmat, William Henry Nailon, Allan Price, David Harris-Birtill, and Stephen McLaughlin</td>
<td></td>
</tr>
<tr>
<td>Topological Analysis of the Vasculature of Angiopoietin-Expressing Tumours Through Scale-Space Tracing</td>
<td>285</td>
</tr>
<tr>
<td>Constantino Carlos Reyes-Aldasoro, Meit Bjorndahl, Chryso Kanthou, and Gillian M. Tozer</td>
<td></td>
</tr>
<tr>
<td>Quantitative Electron Density CT Imaging for Radiotherapy Planning</td>
<td>297</td>
</tr>
<tr>
<td>Jonathan H. Mason, Alessandro Perelli, William H. Nailon, and Mike E. Davies</td>
<td></td>
</tr>
<tr>
<td>3D Texton Based Prostate Cancer Detection Using Multiparametric Magnetic Resonance Imaging</td>
<td>309</td>
</tr>
<tr>
<td>Liping Wang and Reyer Zwiggelaar</td>
<td></td>
</tr>
<tr>
<td>Tumor Segmentation in Whole Slide Images Using Persistent Homology and Deep Convolutional Features</td>
<td>320</td>
</tr>
<tr>
<td>Talha Qaiser, Yee-Wah Tsang, David Epstein, and Nasir Rajpoot</td>
<td></td>
</tr>
<tr>
<td>Multispectral Biopsy Image Based Colorectal Tumor Grader</td>
<td>330</td>
</tr>
<tr>
<td>Suchithra Kunhoth and Somaya Al Maadeed</td>
<td></td>
</tr>
</tbody>
</table>
Semi-automatic Bone Marrow Evaluation in PETCT for Multiple Myeloma ............................................. 342
   Patrick Leydon, Martin O’Connell, Derek Greene, and Kathleen Curran

Mammography Image Analysis

A Texton-Based Approach for the Classification of Benign and Malignant Masses in Mammograms. .......................... 355
   Zobia Suhail, Azam Hamidinekoo, Erika R.E. Denton, and Reyer Zwiggelaar

Breast Density Classification Using Multiresolution Local Quinary Patterns in Mammograms. ................................. 365
   Andrik Rampun, Philip Morrow, Bryan Scotney, and John Winder

Rich Interaction and Feedback Supported Mammographic Training:
A Trial of an Augmented Reality Approach ........................................ 377
   Qiang Tang, Yan Chen, and Alastair G. Gale

A Robust Algorithm for Automated HER2 Scoring in Breast Cancer Histology Slides Using Characteristic Curves .................. 386
   Ramakrishnan Mukundan

Investigating the Effect of Various Augmentations on the Input Data Fed to a Convolutional Neural Network for the Task of Mammographic Mass Classification ............................................. 398
   Azam Hamidinekoo, Zobia Suhail, Talha Qaiser, and Reyer Zwiggelaar

Brain Imaging

Learning Longitudinal MRI Patterns by SICE and Deep Learning:
Assessing the Alzheimer’s Disease Progression. ............................ 413
   Andrés Ortiz, Jorge Munilla, Francisco J. Martinez-Murcia,
   Juan M. Górriz, Javier Ramírez, and for the Alzheimer’s Disease Neuroimaging Initiative

Improved Reference Tracts for Unsupervised Brain White Matter Tractography .................................................. 425
   Susana Muñoz Maniega, Mark E. Bastin, Ian J. Deary,
   Joanna M. Wardlaw, and Jonathan D. Clayden

Review of Fast Density-Peaks Clustering and Its Application to Pediatric White Matter Tracts ........................................ 436
   Shichao Cheng, Yuzhuo Duan, Xin Fan, Dongyu Zhang, and Hua Cheng
A Deep Learning Pipeline to Delineate Proliferative Areas of Intracranial
Tumors in Digital Slides ............................................................... 448
   Zaneta Swiderska-Chadaj, Tomasz Markiewicz, Bartłomiej Grala,
   Malgorzata Lorent, and Arkadiusz Gertych

Tree-Based Ensemble Learning Techniques in the Analysis
of Parkinsonian Syndromes .......................................................... 459
   J.M. Górriz, J. Ramírez, M. Moreno-Caballero, F.J. Martínez-Murcia,
   A. Ortiz, I.A. Illán, F. Segovia, D. Salas-González, and M. Gomez-Rio

Evaluating Alzheimer’s Disease Diagnosis Using Texture Analysis ............ 470
   Francisco Jesús Martínez-Murcia, Juan Manuel Górriz, Javier Ramírez,
   Fermin Segovia, Diego Salas-Gonzalez, Diego Castillo-Barnes,
   Ignacio A. Illán, Andres Ortiz, and for the Alzheimer’s Disease
   Neuroimaging Initiative

Evaluation of Four Supervised Learning Schemes in White Matter
Hyperintensities Segmentation in Absence or Mild Presence
of Vascular Pathology ................................................................. 482
   Muhammad Febrian Rachmadi, Maria del C. Valdés-Hernández,
   Maria Leonora Fatimah Agan, Taku Komura, and The Alzheimer’s Disease
   Neuroimaging Initiative

Context-Aware Convolutional Neural Networks for Stroke Sign
Detection in Non-contrast CT Scans ............................................... 494
   Aneta Lisowska, Alison O’Neil, Vismantas Dily, Matthew Daykin,
   Erin Beveridge, Keith Muir, Stephen Mclaughlin, and Ian Poole

Automatic Brain Tumor Detection and Segmentation Using U-Net
Based Fully Convolutional Networks ............................................. 506
   Hao Dong, Guang Yang, Fangde Liu, Yuanhan Mo, and Yike Guo

Modeling Diffusion Directions of Corpus Callosum ............................ 518
   Safa Elsheikh, Andrew Fish, Roma Chakrabarti, Diwei Zhou,
   and Mara Cercignani

Feature Extraction and Classification to Diagnose Hypoxic-Ischemic
Encephalopathy Patients by Using Susceptibility-Weighted MRI Images ....... 527
   Sisi Wu, Sasan Mahmoodi, Angela Darekar, Brigitte Vollmer,
   Emma Lewis, and Maria Liljeroth

Evaluation of an Automatic ASPECT Scoring System for Acute Stroke
in Non-Contrast CT ................................................................. 537
   Matt Daykin, Erin Beveridge, Vismantas Dily, Aneta Lisowska,
   Keith Muir, Mathini Sellathurai, and Ian Poole
Image Enhancement and Alignment

Pre-processing Techniques for Colour Digital Pathology Image Analysis . . . . . . 551
   Wael Saafin and Gerald Schaefer

Motion Compensation Using Range Imaging in C-Arm Cone-Beam CT . . . . . . 561
   Bastian Bier, Mathias Unberath, Tobias Geimer, Jennifer Maier,
   Garry Gold, Marc Levenston, Rebecca Fahrig, and Andreas Maier

Medical Image Colorization for Better Visualization and Segmentation . . . . . 571
   Muhammad Usman Ghani Khan, Yoshihiko Gotoh, and Nudrat Nida

Fetoscopic Panorama Reconstruction: Moving from Ex-vivo to In-vivo . . . . . . 581
   Floris Gaisser, Suzanne H.P. Peeters, Boris Lenseigne,
   Pieter P. Jonker, and Dick Oepkes

Finite Element Based Interactive Elastic Image Registration . . . . . . . . . . . . 594
   Yechiel Lamash, Anath Fischer, and Jonathan Lessick

Significance of Magnetic Resonance Image Details in Sparse
Representation Based Super Resolution . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 605
   Prabhjot Kaur, Srimanta Mandal, and Anil K. Sao

Restoration of Intensity Uniformity of Bi-contrast MRI Data with Bayesian
Co-occurrence Coring . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 616
   Stathis Hadjidemetriou, Marios Nikos Psychogios, Paul Lingor,
   Kajetan von Eckardstein, and Ismini Papageorgiou

Can Planning Images Reduce Scatter in Follow-Up Cone-Beam CT? . . . . . . . 629
   Jonathan H. Mason, Alessandro Perelli, William H. Nailon,
   and Mike E. Davies

Super Resolution Convolutional Neural Networks for Increasing Spatial
Resolution of 1H Magnetic Resonance Spectroscopic Imaging . . . . . . . . . . . . 641
   Sevim Cengiz, Maria del C. Valdes-Hernandez, and Esin Ozturk-Isik

Radial Basis Function Interpolation for Rapid Interactive Segmentation
of 3-D Medical Images . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 651
   Negar Mirshahzadeh, Tanja Kurzendorfer, Peter Fischer, Thomas Pohl,
   Alexander Brost, Stefan Steidl, and Andreas Maier

Modeling and Segmentation of Preclinical, Body
and Histological Imaging

Deep Quantitative Liver Segmentation and Vessel Exclusion
to Assist in Liver Assessment . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 663
   Benjamin Irving, Chloe Hutton, Andrea Dennis, Sid Vikal,
   Marija Mavar, Matt Kelly, and Sir J. Michael Brady
Initial Results of Multilevel Principal Components Analysis of Facial Shape ................................................................. 674
   D.J.J. Farnell, J. Galloway, A. Zhurov, S. Richmond, P. Perttiniemi, and V. Katic

Estimating Rodent Brain Volume by a Deformable Contour Model .......... 686
   Julio Camacho-Cañamón, María J. Carreira, Pedro Antonio Gutiérrez, and Ramón Iglesias-Rey

MIMONet: Gland Segmentation Using Multi-Input-Multi-Output Convolutional Neural Network ................................................. 698
   Shan E. Ahmed Raza, Linda Cheung, David Epstein, Stella Pelengaris, Michael Khan, and Nasir M. Rajpoot

Automated Polyp Segmentation in Colonoscopy Frames Using Fully Convolutional Neural Network and Textons ......................... 707
   Lei Zhang, Sunil Dolwani, and Xujiong Ye

Model-Based Correction of Segmentation Errors in Digitised Histological Images ........................................................................ 718
   David A. Randell, Antony Galton, Shereen Fouad, Hisham Mehanna, and Gabriel Landini

A 2D Morphable Model of Craniofacial Profile and Its Application to Craniosynostosis ............................................................... 731
   Hang Dai, Nick Pears, and Christian Duncan

A Comparison of Texture Features Versus Deep Learning for Image Classification in Interstitial Lung Disease ................................. 743
   Alison O’Neil, Matthew Shepherd, Erin Beveridge, and Keith Goatman

A Novel High-Throughput Multispectral Cell Segmentation Algorithm .... 754
   Jenia Golbstein, Yaniv Tocker, Revital Sharivkin, Gabi Tarcic, and Michael Vidne

Unsupervised Superpixel-Based Segmentation of Histopathological Images with Consensus Clustering ............................................. 767
   Shereen Fouad, David Randell, Antony Galton, Hisham Mehanna, and Gabriel Landini

A Non-integer Step Index PCNN Model and Its Applications .................. 780
   Zhen Yang, Yanan Guo, Xiaonan Gong, and Yide Ma

Segmentation of Overlapping Macrophages Using Anglegram Analysis .... 792
   José Alonso Solis-Lemus, Brian Stramer, Greg Slabaugh, and Constantino Carlos Reyes-Aldasoro
New Disagreement Metrics Incorporating Spatial Detail – Applications to Lung Imaging .......................................................... 804
Alberto M. Biancardi and Jim M. Wild

Unsupervised Segmentation of Cervical Cell Nuclei via Adaptive Clustering ................................................................. 815
Srishti Gautam, Krati Gupta, Arnav Bhavsar, and Anil K. Sao

Feature Detection and Classification

Simultaneous Cell Detection and Classification with an Asymmetric Deep Autoencoder in Bone Marrow Histology Images ........................................ 829
Tzu-Hsi Song, Victor Sanchez, Hesham EI Daly, and Nasir Rajpoot

Glomerulus Classification with Convolutional Neural Networks ......... 839
Anibal Pedraza, Jaime Gallego, Samuel Lopez, Lucia Gonzalez, Arvydas Laurinavicius, and Gloria Bueno

Paediatric Frontal Chest Radiograph Screening with Fine-Tuned Convolutional Neural Networks ........................................ 850
Jonathan Gerrand, Quentin Williams, Dalton Lunga, Adam Pantanowitz, Shabir Madhi, and Nasreen Mahomed

Automatic Hotspots Detection for Intracellular Calcium Analysis in Fluorescence Microscopic Videos ........................................ 862
David Traore, Katja Rietdorf, Nasser Al-Jawad, and Hisham Al-Assam

Cervical Nuclei Classification: Feature Engineering Versus Deep Belief Network ................................................................. 874
Christoph Rasche, Ciprian Țițăneșteanu, Mihai Neghină, and Alina Sultana

A New Method of Surgical Tracking System Based on Fiducial Marker .... 886
Shuaiyifan Ma and Zijian Zhao

Automated Detection of Barrett’s Esophagus Using Endoscopic Images: A Survey ................................................................. 897
Noha Ghatwary, Amr Ahmed, and Xujiong Ye

Estimating Bacterial Load in FCFM Imaging ................................. 909
Sohan Seth, Ahsan R. Akram, Kevin Dhaliwal, and Christopher K.I. Williams

Random Forest-Based Feature Importance for HEp-2 Cell Image Classification ................................................................. 922
Vibha Gupta and Arnav Bhavsar
Automatic Quantification of Epidermis Curvature in H&E Stained Microscopic Skin Image of Mice

Saif Hussein, Sabah Jassim, and Hisham Al-Assam

Author Index
Medical Image Understanding and Analysis
Valdes Hernandez, M.; González-Castro, V. (Eds.)
2017, XIX, 950 p. 421 illus., Softcover
ISBN: 978-3-319-60963-8