15th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine

Keynote Talks

1. Tensor Tomography - Mathematics and Applications
   Grant Gullberg, PhD
   Department of Radiology and Biomedical Imaging, University of California, San Francisco, CA, USA

2a. Oncologic Applications of 3D PET
   David Mankoff, MD, PhD
   University of Pennsylvania, Philadelphia, PA, USA

2b. Challenges in Clinical CT
   Harold Litt, MD
   University of Pennsylvania, Philadelphia, PA, USA

Tentative Program - Oral Sessions
* talks are temporarily listed in the order of their ID#

CT-1 Iterative Reconstruction in CT

Contrast-medium Anisotropy-aware Tensor Total Variation Model for Robust Cerebral Perfusion
CT Reconstruction with Weak Radiation: a preliminary study
Yuanke Zhang,ab Dong Zeng,a Sui Li,a Yuting Liao,a Zhaoying Bian,a Yongbo Wang,a Ji He,a Xiao
Jia,a Deyu Meng,c Hongbing Lu,b Jianhua Ma3

a Southern Medical University, School of Biomedical Engineering, Guangzhou, China
b Fourth Military Medical University, School of Biomedical Engineering, Xi’an, China
c Xi’an Jiaotong University, School of Mathematics and Statistics, Xi’an, China

Adaptive smoothing algorithms for MBIR in CT applications
Jingyan Xu,a, Frederic Nood
a Johns Hopkins University, Baltimore, MD
b University of Utah, Salt Lake City, UT

Clinical Study of Soft-Tissue Contrast Resolution in Cone-Beam CT of the Head Using Multi-
Resolution PWLS with Multi-Motion Correction and an Electronic Noise Model
P. Wu,1 A. Sisniega,1 J. W. Stayman,1 W. Zbijewski,1 D. Foos,2 X. Wang,2 N. Aygun,3 R. Stevens,4
and J. H. Siewerdsen1,3

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2Carestream Health, Rochester, NY, USA
3Department of Radiology, Johns Hopkins University, Baltimore, MD, USA
4Department of Anesthesiology and Critical Care Medicine, Johns Hopkins University, Baltimore, MD, USA

Statistical Iterative Reconstruction for Spectral Phase Contrast CT
Korbinian Mechlem,a,b, Thorsten Sellereia, Julia Herzena, Franz Pfleiffera,b,c

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b Dpt. of Diagnostic and Interventional Radiology, Technical University of Munich, Munich, Germany
c Institute for Advanced Study, Technical University of Munich, Garching, Germany
Application of Proximal Alternating Linearized Minimization (PALM) and inertial PALM to dynamic 3D CT
Nargiza Djurabekova¹, David Hawkes¹, Guy Long², Andrew Goldberg¹,³, Marta Betcke¹
¹University College, London
²Curvebeam
³RNOH NHS Trust

Convergence criterion for MBIR based on the local noise-power spectrum: Theory and implementation in a framework for accelerated 3D image reconstruction with a morphological pyramid
A. Sisniega,a J.W. Stayman,a S. Capostagno,a C.R. Weiss,b T. Ehtiati,c J.H. Siewerdena,b
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b Russell H. Morgan Department of Radiology, Johns Hopkins University, Baltimore, MD, USA
c Siemens Medical Solutions USA, Inc., Imaging & Therapy Systems, Hoffman Estates, IL, USA
CT-2  Cone-beam CT (Reconstruction and Corrections)

Reduction of metal artefacts in CBCT caused by needles crossing the FOV border
Dirk Schäfera, Christian Haasea, William van der Sterrenb, Michael Grassa
aPhilips Research Hamburg, Hamburg, Germany
bPhilips Healthcare, Best, The Netherlands

Motion Gradients for Epipolar Consistency
Alexander Preuhsa, Michael Manhartb, Elisabeth Hoppea, Markus Kowarschikb, Andreas Maiera
aPattern Recognition Lab, Friedrich-Alexander-Universitaet Erlangen-Nuernberg, Germany
bSiemens Healthcare GmbH, Forchheim, Germany

A motion estimation and compensation algorithm for 4D CBCT of the abdomen
Seongjin Yoona, Alexander Katsevichab, Michael Frenkela, Peter Munroc, Pascal Paysanc, Dieter Seghersc, Adam Strzeleckic
aTomography Corp., Texas Medical Center Innovation Institute, Houston, TX, USA
bUniversity of Central Florida, Mathematics Department, Orlando, FL, USA
cVarian Medical Systems Imaging Laboratory, Daettwil, Switzerland

Reduction of irregular view-sampling artifacts in a stationary gantry CT scanner
Alexander Katsevichab, Seongjin Yoona, Michael Frenkela, Ed Mortonc, William Thompsonc
aTomography Corp., Texas Medical Center Innovation Institute, Houston, TX, USA
bUniversity of Central Florida, Mathematics Department, Orlando, FL, USA
cRapiscan Systems, Torrance, CA, USA

Optimization of Cone-Beam CT Scan Orbits for Cervical Spine Imaging
Chumin Zhaoa, Magdalena Herbstb, Sebastian Vogtb, Ludwig Ritschlb, Steffen Kapplerb, Jefferey H. Siewerdsena, Woiciech Zbijewskia
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bSiemens Healthineers, Forchheim, Germany
cRussell H. Morgan Department of Radiology, Johns Hopkins University, Baltimore, MD, USA
CT-3 CT Reconstruction and Corrections

Low Frequency Recovery In 16cm Coverage Axial Multi-Detector Computed Tomography
Stanislav Zabic\textsuperscript{a}, Zhichong Yu\textsuperscript{a}\textsuperscript{*}, Wenjing Cao\textsuperscript{b}, Lu Wang\textsuperscript{b}
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A preliminary study on explicit compensation for the non-linear-partial-volume effect in CT
Xin Liu\textsuperscript{a}, Buxin Chen\textsuperscript{a}, Zheng Zhang\textsuperscript{a}, Dan Xia\textsuperscript{a}, Emil Y. Sidky\textsuperscript{a}, Xiaochuan Pan\textsuperscript{a},\textsuperscript{c}
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Simulating lower-dose scans from an available CT scan
Masoud Elhamiasl\textsuperscript{a}, Johan Nuyts\textsuperscript{a}
\textsuperscript{a} Nuclear Medicine and Molecular Imaging, Department of Imaging and Pathology, KU Leuven, Leuven, Belgium

Theoretically-exact filtered-backprojection reconstruction from real data on the line-ellipse-line trajectory
Zijia Guo\textsuperscript{a}, Gu’nter Lauritsch\textsuperscript{b}, Andreas Maier\textsuperscript{c}, Fre’dric Noo\textsuperscript{a}
\textsuperscript{a} Dept. of Radiology, University of Utah, Salt Lake City, Utah, USA
\textsuperscript{b} Siemens Healthcare, GmbH, Forchheim, Germany
\textsuperscript{c} Pattern Recognition Lab, University of Erlangen-Nu’rnberg, Germany

Performance Analysis for Nonlinear Tomographic Data Processing
Grace J. Gang, Xueqi Guo, J. Webster Stayman
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Optimized conversion from CT numbers to proton relative stopping power based on proton radiography and scatter corrected cone-beam CT images
Nils Krah\textsuperscript{a}, Simon Rit\textsuperscript{a}
\textsuperscript{a} University Lyon, CREATIS, Lyon, France
CT-4  Spectral CT / Material Decomposition

Image-domain Multi-Material Decomposition Using a Union of Cross-Material Models
Zhipeng Li, Saiprasad Ravishankar, Yong Long
aUniversity of Michigan – Shanghai Jiao Tong University Joint Institute, Shanghai, China
bTheoretical Division, Los Alamos National Laboratory, Los Alamos, NM, USA

Photon-Counting Spectral CT with De-noised Principal Component Analysis
Huiqiao Xie, Thomas Thuering, Yufei Liu, Wenting Long, Xiangyang Tang
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bDECTRIS Ltd., Switzerland
cSinoVision Technologies (Beijing) Co. Ltd., Beijing, China

Local response prediction in model-based CT material decomposition
Wenying Wang, Steven Tilley II, Matthew Tivnan, J. Webster Stayman
Department of Biomedical Engineering, Johns Hopkins University, Baltimore MD, USA

Optimized Spatial-Spectral CT for Multi-Material Decomposition
Matthew Tivnan, Wenying Wang, Steven Tilley, Jeffrey H. Siewersden, J. Webster Stayman
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Known-Component Model-Based Material Decomposition for Dual Energy Imaging of Bone Composition in the Presence of Metal Hardware
S. Z. Liu, S. Tilley, Q. Cao, J. H. Siewersden, J. W. Stayman, and W. Zbijewski
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DL-1  DL within CT Reconstruction

A Machine Learning Approach to Construct a Tissue-Specific Texture Prior from Previous Full-Dose CT for Bayesian Reconstruction of Current Ultralow-Dose CT Images
Yongfeng Gao, Jiaxing Tan, Yongyi Shi, Siming Lu, Zhengrong Liang
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Low-dose CT Reconstruction Assisted by a Global CT Image Manifold Prior
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Learned Primal-Dual Reconstruction for Dual Energy Computed Tomography with Reduced Dose
Dufan Wu, Kyungsang Kim, Mannudeep K. Kalra, Bruno De Man, Quanzheng Li
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Massachusetts General Hospital and Harvard Medical School, Department of Radiology, Boston, MA, USA
GE Global Research, Niskayuna, NY, USA

Quality-Guided Deep Reinforcement Learning for Parameter Tuning in Iterative CT Reconstruction
Chenyang Shen, Min-Yu Tsai, Yesenia Gonzalez, Liyuan Chen, Steve B. Jiang, Xun Jia
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A Hierarchical Approach to Deep Learning and Its Application to Tomographic Reconstruction
Lin Fu and Bruno De Man
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DL-2  DL within PET Reconstruction

**Motion Correction of Respiratory-gated PET Image Using Deep Learning Based Image Registration Framework**
Tiantian Li$^1$, Mengxi Zhang$^1$, Wenyuan Qi$^2$, Evren Asma$^2$, Jinyi Qi$^1$
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$^2$Canon Medical Research USA, Inc., Vernon Hills, IL, USA

**Generative adversarial networks based regularized image reconstruction for PET**
Zhaoheng Xie$^a$, Reheman Baikejiang$^a$, Kuang Gong$^a$, Xuezhu Zhang$^a$, and Jinyi Qi$^a$
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**MAPEM-Net: An Unrolled Neural Network for Fully 3D PET Image Reconstruction**
Kuang Gong$^a$, Dufan Wu$^a$, Kyungsang Kim$^a$, Jaewon Yang$^b$, Tao Sun$^a$, Georges El Fakhri$^a$, Youngho Seo$^b$, Quanzheng Li$^a$$^a$
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**Direct Patlak Reconstruction from Dynamic PET Using Unsupervised Deep Learning**
Kuang Gong$^a$, Ciprian Catana$^b$, Jinyi Qi$^c$, Quanzheng Li$^a$
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**On the impact of input feature selection in deep scatter estimation for positron emission tomography**
Yannick Berker, Marc Kachelrieß
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DL-3 Image Denoising and Characterization

Comparison of Deep Learning and Human Observer Performance for Lesion Detection and Characterization
Ruben De Man,¹ Grace J. Gang,² Xin Li,³ Ge Wang,⁴
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Feature aware deep learning CT image reconstruction
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Low-dose CT Image Denoising without High-dose Reference Images
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Deep learning based adaptive filtering for projection data noise reduction in x-ray computed tomography
Tzu-Cheng Lee, Jian Zhou, Zhou Yu
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Population and Individual Information Guided PET Image Denoising Using Deep Neural Network
Jianan Cuiab, Kuang Gongc, Ning Guoè, Chenxi Wub, Kyungsang Kimc, Huafeng Lia, Quanzheng Lic
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PET-1 PET Reconstruction

Extension of the emission EM look-alike algorithms to Bayesian algorithms
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Preliminary Investigation of Optimization-Based Image Reconstruction for TOF PET with Sparse Configurations
Zheng Zhang a, Buxin Chen a, Amy E. Perkins b, Chien-Min Kao a, Emil Y. Sidky a, Ravindra M. Manjeshwar b, Xiaochuan Pan a,c
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Simultaneous micro-PET imaging of F-18 and I-124 with correction for triple-random coincidences
Stephen C. Moore a, Srilalan Krishnamoorthy a, Eric Blankemeyer a, Sean D. Carlin a, Joel S. Karp a, Scott D. Metzler a
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Application of the Pseudoinverse for Real-Time 3D PET Image Reconstruction
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Rapid Construction of System Response Matrix based on Geometric Symmetries for a Quad-head PET System
Jian Cheng, Fanzhen Meng, Yu Shi, Ye Mao, Chenfeng Li, Jimin Liang, Shouping Zhu
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Non-TOF Fourier-Based Analytic Reconstruction from TOF Histo-Projections for High Resolution TOF Scanners
Vladimir Y. Panin a and Samuel Matej b
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PET-2 Quantitative Methods in PET

A linear estimator for timing calibration in time-of-flight PET
Michel Defrise
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Dynamic PET Imaging with the Generalized Method of Moments
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Joint Reconstruction of Activity and Attenuation with Autonomous Scaling for Time-of-Flight PET
Yusheng Li, Samuel Matej, Joel S. Karp
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Multiresolution spatiotemporal mechanical model of the heart as a prior to constrain the solution for 4D models of the heart
Grant T. Gullberg, a Alexander I. Veress, b,c Uttam M. Shrestha, a Jing Liu, a Karen Ordovas, a W. Paul Segars, d Youngho Seo, a
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GPU-Accelerated Generic Analytic Simulation and Image Reconstruction Platform for Multi-Pinhole SPECT Systems
Navid Zeraatkar a, Benjamin Auer a, Kesava Kalluri a, Arda Könik a, Lars R. Furenlid b, Philip Kuo b, and Michael A. King a

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Investigation of a Monte Carlo simulation and an analytic-based approach for modeling the system response for clinical 123I brain SPECT imaging
Benjamin Auer a, Navid Zeraatkar a, Jan De Beenhouwer b, Kesava Kalluri a, Philip H. Kuo c, Lars R. Furenlid c, and Michael A. King a

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Preliminary Investigation of AdaptiSPECT-C Designs with Square or Square and Hexagonal Detectors Employing Direct and Oblique Apertures.
Kesava Kalluri a, Navid Zeraatkar a, Benjamin Auer a, Philip H. Kuo b, Lars R. Furenlid b, Michael A. King a

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OT Other Novel Applications and Approaches

A step toward a clinically viable ABI phase-contrast imaging: Double emission line artifacts correction
Oriol Caudevilla, Wei Zhou, Jovan G Brankov
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Exact inversion of an integral transform arising in X-ray imaging
Fatma Terzioglu
University of Chicago, Department of Statistics, Chicago, IL, USA

Registration methods for augmented reality-assisted 3D image-guided interventions
Brian Park MD, Gregory Nadoski MD, Stephen Hunt MD, PhD, Terence Gade MD, PhD
University of Pennsylvania, Penn Image-Guided Interventions Lab, Dept of Radiology, Philadelphia, PA, USA

Task-driven Acquisition in Anisotropic X-ray Dark-Field Tomography
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