MEDICAL IMAGING 2020
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15–20 February 2020
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Houston, Texas, USA

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FOCUSED TECHNICAL TOPICS

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SPIE is the international society for optics and photonics, an educational not-for-profit organization founded in 1955 to advance light-based science, engineering, and technology. The Society serves nearly 264,000 constituents from 166 countries, offering conferences and their published proceedings, continuing education, books, journals, and the SPIE Digital Library in support of interdisciplinary information exchange, professional networking, and patent precedent. SPIE provided more than $5 million in support of education and outreach programs in 2019.

SPIE would like to express its deepest appreciation to the symposium chairs, conference chairs, program committees, session chairs, and authors who have so generously given their time and advice to make this symposium possible.

The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members. This program is based on commitments received up to the time of publication and is subject to change without notice.

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Plan to attend SPIE Medical Imaging—where the latest information is presented.

**Conferences:** Hear 1,000 presentations on the full range of medical imaging modalities including medical image acquisition, display, processing, analysis, perception, decision support, and informatics.

11312  Physics of Medical Imaging *(Chen, Bosmans, Zhao)* ......................................................... 24
11313  Image Processing *(Išgum, Landman)* ........................................................................... 24
11314  Computer-Aided Diagnosis *(Hahn, Mazurowski)* ......................................................... 24
11315  Image-Guided Procedures, Robotic Interventions, and Modeling *(Fei, Linte)* ............... 24
11316  Image Perception, Observer Performance, and Technology Assessment *(Samuelson, Taylor-Phillips)* ................. 24
11317  Biomedical Applications in Molecular, Structural, and Functional Imaging *(Gimi, Krol)* .... 25
11318  Imaging Informatics for Healthcare, Research, and Applications *(Chen, Deserno)* ........ 25
11319  Ultrasonic Imaging and Tomography *(Byram, Ruiter)* .................................................... 25
11320  Digital Pathology *(Tomaszewski, Ward)* ........................................................................ 25

**Courses:** Get focused, efficient training on current approaches in medical imaging and deep learning, and AI, photon counting, and many more, that you can apply directly to your daily work. Register soon to ensure a spot.

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SPIE Medical Imaging 2020  •  spie.org/mi20program  •  #SPIEMedicalImaging
Plenary and Keynote Sessions ............. 5–8
Don’t miss these world-class speakers discussing the latest advancements and most promising breakthroughs.

Technical Events ....................... 10–12
Join your peers and colleagues in group discussions around focused technical topics, various workshops, live demos, and at the interactive poster sessions.

Social + Networking Events .......... 13
Join your colleagues at various events, including the Student Dessert with the Experts, Women's Networking Lunch—events not to be missed!

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Participate in the following opportunities: RFW All-Conference Best Student Paper, Young Scientist Award, Student Paper Award, as well as information about Poster Awards.
Learn from over 1,000 presentations on the latest advances in medical imaging research

SPIE Medical Imaging is the internationally recognized forum for reporting state-of-the-art research and development in medical imaging. The event focuses on the latest innovations found in underlying fundamental scientific principles, technology developments, scientific evaluation, and clinical application. The symposium covers the full range of medical imaging modalities including image processing, physics, computer-aided diagnosis, perception, image-guided procedures, biomedical applications, ultrasound, informatics, radiology and digital pathology, with an increased focus on fast emerging areas like deep learning, AI, and machine learning. The event offers the latest advances covered in nine conference topics.

Join your peers where collaboration brings ideas to life and technology to market. Hear the work, network with leaders in the field, and see the applications of the future. We look forward to seeing you in Houston!

Symposium Chairs:

Metin N. Gurcan, M.D.
Wake Forest Baptist Medical Ctr. (USA)

Georgia D. Tourassi
Oak Ridge National Lab. (USA)

COOPERATING ORGANIZATIONS

AAPM—American Association of Physicists in Medicine
IFCARS—International Foundation for Computer Assisted Radiology and Surgery
MIPS—Medical Image Perception Society
SIIM—Society for Imaging Informatics in Medicine
WMIS—World Molecular Imaging Society

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Awards and Plenary Session
Don’t miss these world-class speakers discussing the latest directions and most promising breakthroughs.

Monday 17 February 2020 • 4:00 PM - 5:15 PM

4:00 PM

WELCOME AND NEW SPIE FELLOWS
ACKNOWLEDGEMENTS

4:15 PM

BEST STUDENT PAPER AWARDS
ANNOUNCEMENT
The first place winner and runner up of the Robert F. Wagner All-Conference Student Paper Award will be announced.

4:20 PM

SPIE HARRISON H. BARRETT AWARD IN
MEDICAL IMAGING
This award will be presented in recognition of outstanding accomplishments in medical imaging.

4:30 PM

Plenary Presentation
ARE TODAY’S MIXED REALITY EXPERIENCE PILLARS AND HARDWARE ARCHITECTURES WELL ALIGNED WITH THE SPECIFIC NEEDS OF MEDICAL IMAGING AND SURGICAL GUIDANCE?

Bernard Kress
Principal Optical Architect, HoloLens team
Microsoft Corp. (USA)

Mixed Reality (MR) headsets have the potential to revolutionize the way we work, learn, communicate, and get entertained. The main pillars for MR development are wearable, visual and social comfort, as well as immersion experience. Do these pillars intersect the specific needs of medical imaging and surgical guidance applications? We will review the various challenges to implement MR hardware specifically adapted to such tasks with today’s start of the art MR headset technology.

Biography:
Bernard Kress has been involved in AR, VR and MR technology for the past decade, specifically focussing on hardware issues such as optics, optical architectures and related technologies as well as sensors (depth mapping, head and eye tracking, gesture sensing). Bernard published various books and book chapters and authored more than 100 papers on this topics and holds 50+ international patents on related technologies.

He has been involved in the Google Glass project at Google X Labs since its infancy in 2010, as the principal optical architect, and later joined the HoloLens Team at Microsoft in 2015 as the Partner Optical Architect. He is in charge of shaping the next generation mixed reality optical hardware architectures at HoloLens. He is also a board member and fellow of the SPIE, and conference chair for various SPIE and OSA conferences related to AR, VR and MR.

His passion for the tremendous potential of artificial intelligence in medicine resulted in more than 90 publications spanning a range of topics from novel deep learning and Bayesian approaches for quantification to real-world applications in the clinic.
Special Events • Keynote Presentations

**IMAGING INFORMATICS FOR HEALTHCARE, RESEARCH, AND APPLICATIONS**
Conference 11318 Sunday Keynote Presentation
Sunday 16 February 2020 • 3:30 PM - 4:30 PM

Dr. Jim Whitfill
HonorHealth and Society for Imaging Informatics (USA)

Abstract: The cybersecurity landscape continues to rapidly evolve across all industries including healthcare. Unique to healthcare, however, is the fact that patients lives can be impacted by simply altering or withholding information. This session we will look at the evolution of attacks on personal information, to personal health information to personal health. In addition potential methods to balance sharing of data with protecting patients’ identities will be explored to better understand concepts around federated databases and other anonymization techniques.

Biography: As Chief Transformation Officer, Jim Whitfill, MD, brings leadership expertise in healthcare, organizational culture, and information technology to promote a customer-centric experience and offer new ways to deliver more complete, coordinated and accessible care. He brings together data, technology and marketing to advance technical innovations, such as call center technology, CRM systems, apps and digital tools, to give both the customer and caregivers an enhanced approach to care.

By focusing the efforts of these business areas and finding the right digital tools, Dr. Whitfill aims to improve the customer journey so that it becomes more seamless and focused on the needs of the individual. The goal is to transform the organization into a more patient-focused and provider friendly health system which better serves the surrounding community.

Before joining HonorHealth, Dr. Whitfill served as chief medical officer for Innovation Care Partners, a clinically integrated network in Phoenix. He also serves as a clinical associate professor in the departments of Internal Medicine and Biomedical Informatics at the University of Arizona College of Medicine-Phoenix.

Dr. Whitfill previously held or holds advisory board responsibilities at GE Healthcare, Philips Healthcare, IDX and KLAS. In July 2018, he began his term as the board chair of the Society of Imaging Informatics in Medicine and is a regular faculty member for the Radiology Society of North America and the American College of Radiology. He is a founding member of the HIMSS-SIIM community for Enterprise Imaging.

Dr. Whitfill received his BA from Princeton University and his MD from the University of Pennsylvania. He trained in internal medicine at the Hospital of the University of Pennsylvania, where he also completed a fellowship in medical informatics.

**IMAGING INFORMATICS FOR HEALTHCARE, RESEARCH, AND APPLICATIONS**
Conference 11318 Monday Keynote Presentation
Monday 17 February 2020 • 8:00 AM - 8:40 AM

William Hsu
Univ. of California, Los Angeles (USA)

Abstract: The rapid advancement of artificial intelligence (AI) and machine learning (ML) techniques has yielded models whose sensitivity and specificity rival those of trained human experts. However, as these models transition from proofs-of-concept to decision support tools that are used clinically, model developers and the end-users who interact with them should have a clear appreciation of how and what these models are “learning.” Future users of these models should not see them as a “black box” but demand greater transparency from model developers in conveying the rationale behind the chosen representation, how the model was trained, and the explanation associated with a model’s prediction.

In this talk, I will review current and late-breaking research on the development of explainable machine and deep learning algorithms, particularly in the areas of computer-aided detection and diagnosis. I will present a taxonomy of different types of explanations and highlight techniques that interrogate the model based on internal structure or the model’s response to perturbations in the input. I will discuss experiences in applying and interpreting the results of these techniques drawn from my work in lung and breast cancer screening and other published research. Finally, I will assess the limitations and opportunities of current work in interpretable AI/ML, emphasizing the need for visualizations that aid clinical end-users with understanding model outputs and tools for ensuring the validity of model predictions over time.

Biography: William Hsu is Associate Professor at University of California, Los Angeles in the Departments of Radiological Sciences, Bioinformatics, and Bioengineering and a core faculty member with the Medical & Imaging Informatics group. He directs the Integrated Diagnostics Shared Resource, an interdepartmental program that catalyzes research and development of computational tools to improve early detection, diagnosis, and treatment of cancer through the integration and curation of multi-scale data. His research lab focuses on adapting and validating novel AI/ML algorithms, towards assisting physicians with formulating timely, accurate, and personalized management strategies for individual patients. He is a Deputy Editor for the Radiology: Artificial Intelligence journal, a co-editor for the Sensor, Signal, and Imaging Informatics section of the IMIA Yearbook of Medical Informatics, and a working group leader for the American Medical Informatics Association.

**PHYSICS OF MEDICAL IMAGING**
Conference 11312 Monday Keynote Presentation
Monday 17 February 2020 • 10:10 AM - 10:50 AM

Georges El Fakhri
Massachusetts General Hospital and Harvard Medical School (USA)

Abstract: In this talk, recent developments in Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) are explored and the challenges of simultaneous imaging in PET/MR and PET/CT as well as the opportunities afforded by two modalities are discussed. The unique sensitivity of PET (picomolar) and its quantitative capabilities can be associated with the superb spatial and temporal resolution of MR as well as its excellent soft tissue contrast to provide an ideal imaging modality for many cancers as well as cardiac and brain explorations. Improvements in image quality and diagnostic accuracy are illustrated in specific patient studies in PET/MR and PET/CT, and synergies between PET and MR spectroscopy are discussed in the context of guiding radiotherapy. Beyond oncology, applications in cardiac viability, perfusion and brain imaging (neurodegenerative disease, traumatic brain injury) are presented including very early imaging of prodromal AD and normal aging, mapping of mitochondrial membrane potential and simultaneous PET/MRI for mapping dopaminergic and serotoninergic neurotransmission.

Biography: Dr. El Fakhri is the Nathaniel & Dani Alpert Professor of Radiology at Harvard Medical School (HMS) and the founding Director of the Gordon Center for Medical Imaging at Massachusetts General Hospital and HMS with over 150 members. He is also co-Director of the Division of Nuclear Medicine and Molecular Imaging. Dr El Fakhri is an internationally recognized expert in quantitative molecular imaging (SPECT, PET-CT, and PET-MR) for in vivo assessment of patho-physiology in brain, cardiac and oncological diseases. Current areas of research include high resolution PET & MR imaging in a range of diseases including neurodegenerative disease and traumatic brain injury (amyloid and neurofibrillary tangles), cardiac arrhythmia and heart failure (mitochondrial membrane potential), as well as guiding radiotherapy planning (PET/MRS). He has authored or co-authored over 300 papers and mentored over 100 students, post-docs and faculty. Dr El Fakhri received many awards and honors, including the Mark Tetelman Award from the Society of Nuclear Medicine, the Dana Foundation Brain and Immuno-Imaging Award, the Howard Hughes Medical Institutes Training Innovation Award and the Edward J. Hoffman Award from the Society of Nuclear Medicine and Molecular Imaging. He was elected Fellow to the SNMMI, AAPM and IEEF for “contributions to biological imaging”.

**Shining light into the machine learning “black box”: the state of explainable AI**

**Innovations and translation in molecular PET/MR and PET/CT**
Special Events • Keynote Presentations

Healthcare in need of innovation: (exponential) technology and biomedical entrepreneurship as solution providers

Michael Friebe
IDTM GmbH, Otto-von-Guericke Univ. Magdeburg (Germany)

Abstract: There are significant challenges in global healthcare delivery. Some countries have abundant services, but are stuck with a rather nimble and expensive system that focuses on incremental innovations. Other geographies are still in need of basic tools and infrastructure and require completely different, inexpensive, and with that more disruptive solutions.

Healthcare 4.0 with a focus on prevention / early detection and pro-active therapy will employ exponential technologies (AI, Big Data, Sensor Technology, Synthetic Biology, Robotics, 3D Printing, ...) that will surely lead to significant changes in the way we experience and deliver healthcare, where an empowered patient will play a more and more important role.

Innovation in that segment can only lead to meaningful solutions if these actually solve a problem and if these problems have been properly studied and understood including the future economics and delivery changes. Which leads to the question on whether we actually teach our biomedical engineers the right skills considering these developments.

We should introduce a “MEDTEC DESIGN FOR FUTURE HEALTH-CARE” type program that embraces technological developments, understands the needs of a future healthcare, teaches entrepreneurial basics and exponential thinking in an interdisciplinary setting.

Biography: Michael Friebe is a German citizen with expertise in diagnostic imaging + image guided therapies, as founder/investor/CEO/investor, and research scientist.

Dr. Friebe currently is a research fellow of TUM in Munich, an adjunct professor at the Queensland University of Technology in Brisbane, and a professor of Image Guided Therapies at Otto-von-Guericke University in Magdeburg, Germany.

He is a listed inventor of almost 100 patents, author of >250 scientific contributions, has started well over 20 medical technology start-ups, is a board member of four medical technology startup companies, and an investment partner of a MedTec investment-fund.

Quantitative ultrasound successes: past, present, and future

Michael Oelze
Beckman Institute, Univ. of Illinois (USA)

Abstract: Diagnostic ultrasound is ubiquitous in clinical practice because it is safe, portable, inexpensive, has high spatial resolution and is real time. Therefore, improving the capabilities of diagnostic ultrasound is a highly significant clinically. In this talk we will discuss different applications of quantitative ultrasound (QUS) imaging and how QUS approaches have evolved over time. Specifically, we will discuss the use of spectral-based approaches to estimate the backscatter coefficient (BSC) and attenuation slope and the use of envelope statistics to describe underlying tissue microstructure. These QUS approaches have been successful at classifying tissue state, monitoring focused ultrasound therapy, detecting early response of breast cancer to neoadjuvant chemotherapy and the automatic detection of nerves in the imaging field.

We will demonstrate how QUS approaches can be incorporated on breast tomography machines, which allow an expansion of the tradeoff between spatial resolution and the variance of QUS estimates. One of the ongoing issues with QUS is the inability to properly account for losses in tissues that affect the estimates of the backscatter coefficient. We will demonstrate new calibration procedures that can improve the ability to account for tissue losses. Finally, we will discuss how machine learning approaches can further improve QUS techniques by eliminating the need for models and in some cases eliminating the need for a reference scan.

Biography: Professor Oelze earned a B.S. in Physics and Mathematics (1994, Harding University) and Ph.D. in Physics (2000, University of Mississippi). Dr. Oelze joined the faculty of ECE at UIUC in 2005 and serves as a professor and Associate Head. His research interests involve biomedical ultrasound including: quantitative ultrasound, tomography, therapy and beamforming. Dr. Oelze is a fellow of the AILUM and a senior member of IEEE. He is a member of the Technical Program Committee of the IEEE Ultrasonics Symposium and serves as an associate editor-in-chief of IEEE TUFFC, associate editor of Ultrasonic Imaging and associate editor for IEEE TBME.

Label-free molecular imaging with spins: a path to high resolution through learned subspaces

Zhi-Pei Liang
Univ. of Illinois (USA)

Abstract: Since its invention in the early 1970s, magnetic resonance imaging (MRI) has become a premier tool for structural imaging and functional imaging using water proton spin signals. MR spectroscopic imaging (MRSI) has also long been recognized as a potentially powerful tool for non-invasive, label-free molecular imaging by exploiting the spin signals from other molecules. However, state-of-the-art MRSI methods, after more than four decades of development, still fall far short of providing adequate spatial resolution, speed, and signal-to-noise ratio (SNR) useful for label-free molecular imaging applications.

The talk will discuss our recent “breakthroughs” in overcoming the long-standing technical barriers of MRSI-based label-free molecular imaging using a new technology known as SPICE (SPectroscopic Imaging by exploiting spatiotemporal CorrElation). SPICE uses a subspace mathematical framework to effectively integrate rapid scanning, sparse sampling, constrained image reconstruction, quantum simulation, and machine learning. Preliminary results show an unprecedented capability for simultaneous mapping of brain structures, function and metabolism using intrinsic spin signals from multiple molecules. In this talk, I’ll will give an overview of SPICE and also show some “SPICY” experimental results we have obtained.

Biography: Zhi-Pei Liang is currently the Franklin W. Woeltge Professor of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign (UIUC). His research is in the general area of magnetic resonance imaging and spectroscopy, ranging from spin physics, signal processing, machine learning, to biomedical applications. His work has been recognized by a number of awards, including the Sylvia Sorkin Greenfield Award (Medical Physics, 1990), Whitaker Biomedical Engineering Research Award (1991), NSF CAREER Award (1995), Henry Magnuski Scholar Award (UIUC, 1999), University Scholar Award (UIUC, 2001), the Otto Schmitt Award (IFMBE, 2012), and the Technical Achievement Award (IEEE-EMBS, 2014). Dr. Liang is a Fellow of the IEEE, ISMRM and AIMBE. He was elected to the International Academy of Medical and Biological Engineering in 2012. Dr. Liang served as President of the IEEE-EMBS from 2011-2012 and received its Distinguished Service Award in 2015.
Towards understanding perception in the latest era of AI in medical imaging

Maryellen Giger
Univ. of Chicago, (USA)

Abstract: The study of human perception is as old as medical imaging. Understanding perception has yielded the rules of engagement for radiologists as they tackle the “Where’s Waldo?” situations, the satisfaction of search problem, distractions, fatigue, the varying subtleties of disease states and normal, their prior training and experience, and the somewhat endless non-image-interpretation tasks associated with a radiology practice. The understanding of artificial intelligence (AI) on a radiologist’s interpretation can be likened to considering the suggestions from a first-year resident to incorporating insights from a seasoned expert. Kundel’s eye gaze experiments which demonstrated the search patterns of radiologists and laymen continue to be used today to understand the added influence of AI in the end user’s performance. Multi-disciplinary perception research has evolved from understanding human performance in the interpretation of medical images, to the understanding of computer-aided diagnosis (CAD), and to now the understanding of AI -- either as an aid to radiologists as a second reader, a concurrent reader, or a primary reader, or as a complete replacement. This lecture will take the audience through history to appreciate the role and necessity of perception (and its associated metrics of performance) in the development, validation, and ultimate future implementation of AI in the clinical radiology workflow.

Biography: Maryellen Giger, Ph.D. is the A.N. Pritzker Professor of Radiology / Medical Physics at the University of Chicago. She has been working, for multiple decades, on computer-aided diagnosis /machine learning/deep learning in medical imaging and cancer diagnosis / management. Her AI research in breast cancer for risk assessment, diagnosis, prognosis, and therapeutic response has yielded various translated components, and she is using these “virtual biopsies” in imaging-genomics association studies. Giger is a former president of AAPM and of SPIE; and is the Editor-in-Chief of the Journal of Medical Imaging. She is a member of the NAE; Fellow of AAPM, AIMBE, SPIE, SBMR, IEEE, IAMBE; and was cofounder, equity holder, and scientific advisor of Quantitative Insights [now Qlarity Imaging], which produces QuantX, the first FDA-cleared, machine-learning driven CADx system.

Bringing machine learning to the clinic: opportunities and challenges

Tim Leiner
Univ. Medical Ctr. Utrecht (Netherlands)

Abstract: Machine learning and especially deep learning hold great promise to improve patient care. In several domains, algorithms perform as good as or better than fellowship trained radiologists for identification of abnormalities in clinically acquired images. However, there are much broader applications beyond image analysis such as patient selection and examination scheduling, image acquisition and reconstruction, using image data for prognostic purposes, and combing image data with information from electronic health records, laboratory and genetic data. Furthermore, in order for algorithms to be broadly accepted, there are many scenarios where it is important for the clinician that results are explainable. In addition, clinical deployment and workflow should be taken into consideration when designing the algorithm and bringing it to clinical practice. In my lecture I will focus on these aspects from a cardiovascular imaging perspective.

Biography: Dr. Tim Leiner is tenured Professor of Radiology and holds the Chair in Cardiovascular Imaging at Utrecht University Medical Center, Utrecht, The Netherlands. His research interests center around the development and implementation of new MR and CT techniques with a focus on cardiovascular imaging and machine learning. Dr. Leiner is Associate Editor of the Journal of Magnetic Resonance Imaging (JMRI), the Journal of Cardiovascular Magnetic Resonance (JCMR), and Radiology – Cardiothoracic. He is the author of over 300 original papers, review articles and book chapters as well as editor of several electronic radiology textbooks. He is currently Vice-President of the ISMRM.

Dr. Gurcan is the author of over 200 peer-reviewed publications, book chapters and was awarded three patents for his inventions in medical image analysis. He is the recipient of several awards including the British Foreign and Commonwealth Organization Award, NCI caBIG Embodying the Vision Award, NIH Exceptional, Unconventional Research Enabling Knowledge Acceleration (EUREKA) Award, Children’s Neuroblastoma Cancer Foundation Young Investigator Award, The OSU Cancer Center REAP Award, and Pelotonia Idea Award. As an internationally recognized researcher and educator, he is a senior member of IEEE, SPIE, and AMIA. He currently serves on the editorial boards of Journal of Pathology Informatics and Journal of Medical Imaging; and organizes the Pathology Informatics Histopathological Image Analysis (HIMA) workshop.
Petascale computational pathology for precision medicine

Nasir Rajpoot
Univ. of Warwick (United Kingdom)

Abstract: Modern day slide scanners are capable of generating large microscopic resolution images of conventional tissue slides, spurting a revolution in the practice of cellular pathology as a discipline. This development comes at a time when computing capacity and machine learning technologies are peaking, offering a remarkable opportunity to reveal complex cellular patterns in a data-driven manner. With an increasing number of NHS pathology labs being digitised in the UK, there is an explosion in the amount of pathology image data with linked clinical outcomes. This data is a potential goldmine of invaluable information, ripe for deep mining of novel digital histological biomarkers of the ‘state of play’ of complex diseases such as cancer. How can we facilitate the discovery of digital histology biomarkers to further our understanding of cancer, stratify patients into different risk groups and predict the progression and survival of cancer?

Biography: Nasir Rajpoot is Professor of Computational Pathology at the Computer Science department of the University of Warwick, where he started his academic career as a Lecturer (Assistant Professor) in 2001. He also holds an Honorary Scientist position at the Department of Pathology, University Hospitals Coventry & Warwickshire NHS Trust since 2016.

Prof Rajpoot is the founding Head of Tissue Image Analytics laboratory (TIA lab) at Warwick since 2012. In Autumn 2017, he was awarded the Wolfson Fellowship by the UK Royal Society and the Turing Fellowship by the Alan Turing Institute, the UK’s national institute for data science and artificial intelligence.

Current focus of research in Prof Rajpoot’s lab is on developing algorithms for the analysis of digitised pathology images, with applications to computer-assisted grading of cancer and image-based markers for prediction of cancer progression and survival. He has been active in the digital pathology community for almost a decade now, having co-chaired several meetings in the histology image analysis (HIMA) series since 2008 and served as a founding PC member of the SPIE Digital Pathology meeting since 2012.

Prof Rajpoot served as the President of the European Congress on Digital Pathology (ECDP), which was held at Warwick in April 2019. Since Jan 2019, he acts as Co-Director of the £15m PathLAKE national centre of excellence on AI in pathology, leading the computational arm of the centre.
Join your peers and colleagues in group discussions around focused technical topics, various workshops, live demos, and at the interactive poster sessions.

**Sunday/Monday Poster Viewing**
**Monday 17 February 2020 • 5:30 PM - 7:00 PM**

Poster authors are required to:
- Display the poster early on the first day of your session.
- Attend the Poster Session to answer questions.
See Poster Presentation Guidelines for additional information.

Poster presentations from the following conferences will be included: Physics of Medical Imaging; Computer-Aided Diagnosis; Image-Guided Procedures, Robotic Interventions, and Modeling; Imaging Informatics for Healthcare, Research, and Applications; and Ultrasonic Imaging and Tomography conferences will be included.

**Author Set-Up Time: Sunday after 12:00 PM (noon)**

In order to be fully considered for a Poster Award, it is recommended to have your poster up as soon as possible.

Posters should remain on display until the end of the Poster Session on Monday.

**Poster Session and Reception: Monday from 5:30 to 7:00 PM**

NOTE: Extended poster viewing until 9:00 PM on Sunday.

Poster award winners will be recognized and certificates distributed in the conference meeting rooms. Check conference schedules for times and locations. Ribbons will identify winning posters during the Poster Sessions.

**TECHNICAL WORKSHOP**
**X-ray Source Technologies: Fundamental Principles, Technological Advances, and Clinical Needs**
**Sunday 16 February 2020 • 5:45 PM - 7:45 PM**

WK 1 TECHNICAL WORKSHOP: PHYSICS OF MEDICAL IMAGING (CONFERENCE 11312)

The x-ray source is one of the key components in modern x-ray and Computed Tomography (CT) imaging. X-ray beam characteristics have a profound impact on conventional x-ray and CT image quality. For this workshop, expert speakers were invited to discuss the fundamentals of conventional x-ray tubes, the physical principles that drive source technological innovations, and finally the challenges and opportunities of new x-ray source technology in current and future x-ray based medical imaging. Several blue sky short talks will introduce potentially impactful source technologies.

**SPEAKERS:**
- **Rolf Behling,** Phillips Medizin Systeme GmbH (Germany) - “Fundamentals of Conventional X-ray Tube Technologies”
- **Paul Schwoebel,** Univ. of New Mexico and SRI International (USA) - “Fundamental Physics Principles that Drive New X-ray Source Developments”
- **Norbert Pelc,** Stanford Univ. (USA) - “Challenges and Opportunities of X-ray Source Technologies in Present and Future Applications”

Blue Sky Talks To Be Announced
**TECHNICAL WORKSHOP**

**Live Demonstrations**

Sunday 16 February 2020 • 5:45 PM - 7:45 PM  
**WK 4 COMPUTER-AIDED DIAGNOSIS (CONFERENCE 11314)**  
WORKSHOP CHAIRS:  
Dr. Lubomir Hadjiiski, Univ. of Michigan Health System (USA)  
Dr. Karen Drukker, Univ. of Chicago (USA)  

**CALL FOR PARTICIPATION**

The goal of this workshop is to provide a forum for systems and algorithms developers to show off their creations. The intent is for the audience to be inspired to conduct derivative research, for the demonstrators to receive feedback and find new collaborators, and for all to learn about the rapidly evolving field of medical imaging.  
The Live Demonstration Workshop invites participation from all of the conferences that comprise the SPIE Medical Imaging symposium. We encourage the CAD, Digital Pathology, Image Processing, Imaging Informatics, Image Perception, Physics, and all other conferences to participate.  
This workshop features interactive demonstrations that are complementary to the topics of SPIE Medical Imaging. Workshop demonstrations include samples, systems, and software demonstrations that depict the implementation, operation, and utility of cutting-edge as well as mature research. Having an accepted SPIE Medical Imaging paper is not required for giving a Live Demonstration; however, authors of SPIE Medical Imaging papers are encouraged to submit demonstrations that are complementary to their oral and poster presentations.  
The session will include a Certificate of Merit Award presented to one demonstration considered to be of exceptional interest. We invite all workshop visitors to vote for three of their favorite demonstrations, with the final winner chosen from the top scorers by a group of appointed judges.

**IMPORTANT DATES**

January 17, 2020: Deadline for submission  
January 24, 2020: Notification of acceptance  
January 31, 2020: Deadline for two-slide summary  

**JOIN THE WORKSHOP**

If you would like to demonstrate at the SPIE Medical Imaging Live Demonstrations Workshop, please send an e-mail with the subject “SPIE live demonstrations workshop” by the submission deadline to Lubomir Hadjiiski and Karen Drukker:  
- lhadjisk@umich.edu  
- kdrukker@uchicago.edu  

In the e-mail, supply the following information:  
- Title of the demo  
- Names and affiliations (name of institute, city, country) of the demonstrators  
- Short description of the demo, one paragraph minimum. Make sure it clearly describes the technology and application area of the demo. You may cite or include a paper describing the demo.  
- Optionally, describe the public data used in the development or evaluation of the system. Include a link to the data or to a page that describes how to access that data.  
- Optionally, include a link to a video showing the system in action.

**NOTES**

Please note the following rules and requirements:  
- The accepted demonstrations will be listed online in the workshop program.  
- If there are more proposals than presentation slots in the workshop, the organizers will accept teams for demonstrations based on the quality of the provided description, while also striving to select a representative mix of applications.  
- Each team is responsible for bringing their own equipment. The organization will provide a table and power supply for each demonstration. Demos should be done on a single laptop. If the demo requires an external monitor this is allowed, but there should be no more than one monitor of 25" maximum size.  
- Participation in the workshop is free of charge, but all demonstrators (those present during the workshop) must be registered to attend the SPIE Medical Imaging Conference.  
- Teams from academia (universities, university medical centers, research organizations), and from industry are invited to participate in this year’s workshop. Demonstrations from industry should be scientific and not commercial in nature; demonstration of research prototypes is highly encouraged.  
- All participating teams will need to provide one or two slides describing their system shortly before the conference from which the opening presentation will be compiled (two-slide summary).  
- After you submit a description, you will receive a confirmation by e-mail. Notification of acceptance or rejection will follow on the date given above.

**TECHNICAL WORKSHOP**

**Translation of Deep Learning Technology to the Clinic**

Tuesday 18 February 2020 • 5:00 PM - 7:00 PM  
**WK 2 TECHNICAL WORKSHOP: IMAGE PROCESSING (CONFERENCE 11313)**  
Medical AI market is expected to break to 2 billion USD revenue within 5 years. Even though promising we still need to overcome several barriers including technological robustness, clinical validation, regulatory compliance, market acceptance and financial risks. In a number of presentations we focus on the barriers and how to overcome these seen from start-up, regulators, and commercial perspectives.  

**SPEAKERS:**

To Be Announced
Special Events • Technical Events

**TECHNICAL WORKSHOP**

**Simulated Tumor Board: Brain and Breast**

*Tuesday 18 February 2020 • 5:00 PM - 7:00 PM*

**WK 3 TECHNICAL WORKSHOP: COMPUTER-AIDED DIAGNOSIS (CONFERENCE 11314) AND DIGITAL PATHOLOGY (CONFERENCE 11320)**

This workshop will present two example clinical cases, one breast cancer case and one brain cancer case. A multi-disciplinary team will discuss the case, the imaging information, pathology, and treatment options. The workshop will mimic the format of a standard clinical tumor board process with time for Q&A at the end.

**MODERATOR:**
Kristy Brock, PhD, DABR, FAAPM
Professor, Department of Imaging Physics and Department of Radiation Physics, Univ. of Texas MD Anderson Cancer Center (USA)

**BREAST PANEL SPEAKERS:**
Simona Shaitelman, Univ. of Texas MD Anderson Cancer Ctr., Radiation Oncology (USA)
Isabelle Bedrosian, Univ. of Texas MD Anderson Cancer Ctr., Surgery (USA)
Jennifer Litton, Univ. of Texas MD Anderson Cancer Ctr., Medical Oncology (USA)
Wei Yang, Univ. of Texas MD Anderson Cancer Ctr., Diagnostic Radiology (USA)
Alejandro Contreras, Univ. of Texas MD Anderson Cancer Ctr., Pathology (USA)

**BRAIN PANEL SPEAKERS:**
Caroline Chung, Univ. of Texas MD Anderson Cancer Ctr., Radiation Oncology (USA)
Jeff Weinberg, Univ. of Texas MD Anderson Cancer Ctr., Surgery (USA)
Melissa Chen, Univ. of Texas MD Anderson Cancer Ctr., Diagnostic Radiology (USA)
Jason Huse, Univ. of Texas MD Anderson Cancer Ctr., Pathology (USA)

**TECHNICAL WORKSHOP**

**Task-driven AI: Taking into Account the User’s Perspective**

*Tuesday 18 February 2020 • 5:00 PM - 7:00 PM*

**WK 5: TECHNICAL WORKSHOP: IMAGE PERCEPTION, OBSERVER PERFORMANCE, AND TECHNOLOGY ASSESSMENT CONFERENCE (CONFERENCE 11316)**

Machine learning and artificial intelligence techniques are exponentially being developed and applied to a wide variety of scenarios in medical imaging ranging from image segmentation and analysis to analyzing radiologists’ reports to managing clinical workflow. Although we are slowly seeing these applications integrated into clinical workflow, much of the development work is still in the research stages. In order to bridge the gap between research and clinical integration and implementation, a greater emphasis needs to be placed on understanding the impact of the output of these machine learning and AI schemes on the human decision-maker. This workshop will present a variety of perspectives on the role of AI and machine learning in medical imaging from the perspective of the users.

**MODERATORS:**
Yan Chen, Univ. of Nottingham (United Kingdom)
Elizabeth A. Krupinski, Emory Univ. (USA)

**PANELISTS:**
Sian Taylor-Phillips, Univ. of Warwick (United Kingdom)
Francine Jacobson, Brigham and Women’s Hospital (USA)
Elizabeth A. Krupinski, Emory Univ. (USA)

**Tuesday/Wednesday Poster Viewing**

*Wednesday 19 February 2020 • 5:30 PM - 7:00 PM*

Two poster sessions are scheduled. See Poster Presentation Guidelines for additional information.

Poster authors are required to:
- Display the poster early on the first day of your session
- Attend the Poster Session to answer questions.

See Poster Presentation Guidelines for additional information.

Poster presentations from the following conferences will be included: Image Processing; Image Perception, Observer Performance, and Technology Assessment; Biomedical Applications in Molecular, Structural, and Functional Imaging; and Digital Pathology.

**Author Set-Up Time:** Tuesday after 9:30 AM

In order to be fully considered for a Poster Award, it is recommended to have your poster up as soon as possible.

Posters should remain on display until the end of the Poster Session on Wednesday.

**Poster Session and Reception:** Wednesday from 5:30 to 7:00 PM

**NOTE:** Extended poster viewing until 9:00 PM on Tuesday.

Poster award winners will be recognized and certificates distributed in the conference meeting rooms. Check conference schedules for times and locations. Ribbons will identify winning posters during the Posters will be on display Tuesday and Wednesday with extended viewing until 9:00pm on Tuesday. The poster session with authors in attendance will be Wednesday evening from 5:30 to 7:00 pm. Poster award winners will be recognized and certificates distributed in the conference meeting rooms. Check conference schedules for times and locations. Ribbons will identify winning posters during the Poster Sessions.
Join your colleagues at various events, including the Student Dessert with the Experts, and Women’s Networking Lunch—events not to be missed!

**Special Events • Social and Networking Events**

**Equity, Diversity, and Inclusion Presentation and Reception**
Sunday 16 February 2020 • 5:30 PM - 7:00 PM
Open to those with a paid registration badge.
Join us for a thought-provoking presentation and stay after to discuss topics with your colleagues during the reception.

**Women’s Networking Luncheon**
Monday 17 February 2020 • 12:10 PM - 1:20 PM
Sign up at registration before Monday morning coffee break. Lunch ticket required.
Join other women in the field for informal discussions and networking during the scheduled lunch on Monday.

**Dessert with the Experts - A Student Networking Event**
Wednesday 19 February 2020 • 6:30 PM - 7:30 PM
Open to student conference attendees. First come, first served.
Enjoy a tasty dessert and casual atmosphere while networking with some of the best and brightest minds in medical imaging. Exchange ideas, share experiences, gain career advice, and make valuable contacts at this complimentary student event.

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**SCIENCE is FOR EVERYONE**

**EQUITY**
Is access to opportunities, fair treatment, and advancement for all people; it’s about eliminating barriers that prevent full participation.

**DIVERSITY**
Includes all the ways in which people differ—identity markers such as race, ethnicity, gender, ability, sexual orientation, and more.

**INCLUSION**
Goes beyond diversity; it’s the act of creating an environment where everyone feels welcomed, respected, supported, and valued.

spie.org/inclusion
Special Events • Award Events

THE 2020 STUDENT PAPER AWARDS INFORMATION
SPIE annually hosts the Best Student Poster presentation contests, with certificates awarded. Some conferences host Best Student Paper Awards with cash prizes supported by the generosity of our sponsors. Entrants are judged by a committee of SPIE volunteers and winners are announced onsite. We thank our many award sponsors.

WONDERING IF YOU ARE ELIGIBLE?
Download the individual awards application criteria PDFs online:
https://spie.org/conferences-and-exhibitions/medical-imaging/awards-information

Deadline for all applications is 11 November.

2020 Poster Award Information
Monday 17 February 2020 • 8:00 AM - 8:30 AM

POSTER AWARDS IN CONFERENCE ROOMS
Check the conference schedule for exact times.

RFW AWARD FINALISTS:
RFW Award finalists will be recognized and certificates distributed in the conference meeting rooms. See conference schedules for times and locations.

POSTER AWARDS:
Each conference will recognize selected poster presentations of exceptional quality at either the Cum Laude or Honorable Mention level. Winners will be chosen by members of conference review committees. The winning posters will be identified during the receptions with award ribbons. Winners will be recognized and certificates distributed in the conference meeting rooms. See conference schedules for times and locations.

In addition, Cum Laude poster award recipients will be recognized in the Proceedings of SPIE volumes and the following year’s Call for Papers.

RECOGNITION LEVELS:
Each conference will recognize 1 selected poster at the Cum Laude level and 1 selected poster at the Honorable Mention level for the quality of work presented as well as the presentation.

BASIS FOR SELECTION:
Work should be of a standard of excellence as judged by the quality and quantity of results presented. It should include results that are both significant and new to the field of study. Conclusions should be well supported by the results, and relevant references should be cited. Presentation should be well organized, clear, and concise. It should be self-contained, giving adequate background, concise results, and relevant references. Graphic design will be considered only to the extent that it contributes to the clarity of presentation. A conference may give preference to first authors who are students or who are within five years of their terminal degrees.

Robert F. Wagner All-Conference Best Student Paper Award
Monday 17 February 2019 • 4:15 PM - 4:30 PM

The Robert F. Wagner All Conference Best Student Paper Award (established 2014) is an acknowledgement of his many important contributions to the Medical Imaging meeting and his many important advances in the field of medical imaging.

CO-SPONSORED BY:

Image-Guided Procedures, Robotic Interventions, and Modeling Awards
Tuesday 18 February 2020 • 12:10 PM - 12:15 PM

Image-Guided Procedures, Robotic Interventions, and Modeling Young Scientist, Student Paper, and Poster Awards (Conference 11315)

YOUNG SCIENTIST AWARD
This award is specific to papers in the Image-Guided Procedures, Robotic Interventions, and Modeling conference.

SPONSORED BY:

The Young Scientist Award is a prize awarded to the first authors of high quality papers within the Image-Guided Procedures, Robotic Interventions, and Modeling conference.
Image-Guided Procedures Student Paper Award

This award is specific to papers in the Image-Guided Procedures, Robotic Interventions, and Modeling Conference 11315.

The Image-guided Procedures, Robotic Interventions and Modeling conference is featuring a new paper award specifically dedicated to recognize outstanding papers in the area of surgical robotics and related topics.

SPONSORED BY:

INTUITIVE.

The award winners for both awards will be recognized in the conference room on Tuesday morning before the lunch break.

POSTER PRESENTATION AWARDS

SPONSORED BY:

The Image-Guided Procedures, Robotic Interventions, and Modeling conference will offer cash prizes as part of the poster presentation awards. Poster presentations must be displayed early on the first day of the Sunday/Monday poster session to enter the competition. The space will be available to display posters beginning at noon on Sunday. Award announcements will take place in the conference room on Tuesday morning before the lunch break.

Physics of Medical Imaging Student Paper and Poster Awards

Wednesday 19 February 2020 • 9:40 AM - 9:45 AM

Physics of Medical Imaging Student Paper Award (Conference 11312)

This award is specific to papers in the Physics of Medical Imaging conference 11312.

The student paper award is a prize awarded to the first authors of high quality papers within the Physics of Medical Imaging conference.

SPONSORED BY:

GE Healthcare

The award winners will be recognized in the conference room before the morning coffee break on Wednesday.

PHYSICS OF MEDICAL IMAGING POSTER PRESENTATION AWARDS

SPONSORED BY:

SIEMENS Healthineers

The Physics of Medical Imaging conference will offer cash prizes as part of the poster presentation awards. Poster presentations must be displayed early on the first day of the Sunday/Monday poster session to enter the competition. The space will be available to display posters beginning at noon on Sunday. Award announcements will take place in the conference room before the morning coffee break on Wednesday.

Image Processing Student Paper and Poster Awards

Thursday 20 February 2020 • 12:10 PM - 12:15 PM

Image Processing Student Paper Award (Conference 11313)

This award is specific to papers in the Image Processing conference 11313.

The student paper award is a prize awarded to the first authors of high quality papers within the Image Processing conference.

SPONSORED BY:

The award winners will be recognized in the conference room before lunch on Thursday.

IMAGE PROCESSING POSTER PRESENTATION AWARD

SPONSORED BY:

The Image Processing conference will offer one cash prize as part of the poster presentation awards. Poster presentations must be displayed early on the first day of the Tuesday/Wednesday poster session to enter the competition. The space will be available to display posters beginning at noon on Tuesday. Award announcements will take place in the conference room before lunch on Thursday.

Poster session dates, locations, and times

<table>
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<th>SESSION</th>
<th>CONFERENCES</th>
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<tr>
<td>Monday</td>
<td>11312; 11314; 11315; 11318; 11319</td>
<td>Sunday, 16 February after 12:00 PM (noon)*</td>
<td>Texan Ballroom, 4th Floor - Salon D</td>
<td>Monday, 5:30 PM - 7:00 PM</td>
<td>7:00 PM</td>
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<tr>
<td>Wednesday</td>
<td>11313; 11316; 11317; 11320</td>
<td>Tuesday, 18 February after 9:30 AM*</td>
<td>Texan Ballroom, 4th Floor - Salon D</td>
<td>Wednesday, 5:30 PM - 7:00 PM</td>
<td>7:00 PM</td>
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</table>

*In order to be fully considered for a Poster Award, it is recommended to have your poster up as soon as possible. Posters should remain on display until the end of the Poster Session on either Monday or Wednesday.
### Daily Events Schedule

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<tr>
<td><strong>SPIE HARRISON H. BARRETT AWARD IN MEDICAL IMAGING</strong>&lt;br&gt;Join us for the presentation of the SPIE Harrison H. Barrett Award in Medical Imaging. The award is presented in recognition of outstanding accomplishments in medical imaging.</td>
<td><strong>Conference 11312: Physics of Medical Imaging</strong>&lt;br&gt;Chairs: Guang-Hong Chen, Univ. of Wisconsin-Madison (USA); Hilde Bosmans, Katholieke Univ. Leuven (Belgium)</td>
<td><strong>Conference 11313: Image Processing</strong>&lt;br&gt;Chairs: Ivana Išgum, Amsterdam UMC (Netherlands); Bennett A. Landman, Vanderbilt Univ. (USA)</td>
<td><strong>Conference 11317: Biomedical Applications in Molecular, Structural, and Functional Imaging</strong>&lt;br&gt;Chairs: Barjor Gimi, Cooper Medical School, Rowan Univ. (USA); Andrzej Krol, SUNY Upstate Medical Univ. (USA)</td>
<td><strong>Conference 11316: Image Perception, Observer Performance, and Technology Assessment</strong>&lt;br&gt;Chairs: Frank W. Samuelson, U.S. Food and Drug Administration (USA); Sian Taylor-Phillips, The Univ. of Warwick (United Kingdom)</td>
<td><strong>Register by 24 January 2020 and Save</strong>&lt;br&gt;STUDENT PAPER AWARDS 2020&lt;br&gt;For submission requirements see Awards + Student Info online at spie.org/mi20program</td>
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<tr>
<td>SC086 Fundamentals of Medical Image Processing and Analysis (Deserno)&lt;br&gt;8:30 AM 12:30 PM, $325 / $380, p. 64</td>
<td>SC1235 Introduction to Medical Image Analysis Using Anthropomorphic Neural Networks (Wenzel) 8:30 AM 5:30 PM, $325 / $380, p. 64</td>
<td><strong>Conference 11315: Image-Guided Procedures, Robotic Interventions, and Modeling</strong>&lt;br&gt;Chairs: Baowei Fei, The Univ. of Texas at Dallas (USA); The Univ. of Texas Southwestern Medical Ctr. (USA); Cristian A. Linte, Rochester Institute of Technology (USA)</td>
<td><strong>Conference 11318: Imaging Informatics for Healthcare, Research, and Applications</strong>&lt;br&gt;Chairs: Po-Hao Chen, Cleveland Clinic (USA); Thomas M. Deserno, Technische Univ. Braunschweig (Germany)</td>
<td><strong>Conference 11319: Ultrasonic Imaging and Tomography</strong>&lt;br&gt;Chairs: Brett C. Byram, Vanderbilt Univ. (USA); Nicole V. Ruitter, Karlsruher Institut für Technologie (Germany)</td>
<td><strong>Conference 11320: Digital Pathology</strong>&lt;br&gt;Chairs: John E. Tomaszewski, Univ. at Buffalo (USA); Aaron D. Ward, The Univ. of Western Ontario (Canada)</td>
</tr>
<tr>
<td><strong>SC1292 Technological Assessment of X-Ray Based Breast Imaging Systems Using Anthropomorphic Phantoms</strong>&lt;br&gt;(Glick, Bosmans, Badal)&lt;br&gt;8:30 AM 12:30 PM, $325 / $380, p. 66</td>
<td><strong>Conference 11314: Computer-Aided Diagnosis</strong>&lt;br&gt;Chairs: Horst K. Hahn, Fraunhofer MEVIS (Germany), Jacobs Univ. Bremen (Germany); Maciej A. Mazurowski, Duke Univ. (USA)</td>
<td><strong>Conference 11310: Technology Assessment: Moving AI/ML into Practice</strong>&lt;br&gt;Chairs: Maryellen Giger, The Univ. of Chicago; Baowei Fei, Cooper Medical School, Rowan Univ. (USA)</td>
<td><strong>SC1236 High-Performance Computing for Medical Imaging on Graphics Processing Units (GPU) with CUDA</strong>&lt;br&gt;(Caucchi) 1:30 PM - 5:30 PM, $325 / $380, p. 68</td>
<td><strong>Conference 11311: Spatial Intelligence</strong>&lt;br&gt;Chairs: Paul M. Thompson, Univ. of California, Los Angeles (USA); Aaron D. Ward, The Univ. of Western Ontario (Canada)</td>
<td><strong>Image Processing Student Paper and Poster Awards</strong>&lt;br&gt;• Conf. 11313, 12:10 PM - 12:15 PM, p. 15&lt;br&gt;STUDENT PAPER AWARDS 2020&lt;br&gt;For submission requirements see Awards + Student Info online at spie.org/mi20program</td>
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<tr>
<td><strong>SC1129 Photon Counting CT</strong> (Danielsson, Sjölin) 1:30 PM 5:30 PM, $325 / $380, p. 64</td>
<td><strong>Conference 11317: Image-Guided Procedures, Robotic Interventions, and Modeling</strong>&lt;br&gt;Chairs: Baowei Fei, The Univ. of Texas at Dallas (USA); The Univ. of Texas Southwestern Medical Ctr. (USA); Cristian A. Linte, Rochester Institute of Technology (USA)</td>
<td><strong>Conference 11318: Imaging Informatics for Healthcare, Research, and Applications</strong>&lt;br&gt;Chairs: Po-Hao Chen, Cleveland Clinic (USA); Thomas M. Deserno, Technische Univ. Braunschweig (Germany)</td>
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<td><strong>Image Processing Student Paper and Poster Awards</strong>&lt;br&gt;• Conf. 11313, 12:10 PM - 12:15 PM, p. 15&lt;br&gt;STUDENT PAPER AWARDS 2020&lt;br&gt;For submission requirements see Awards + Student Info online at spie.org/mi20program</td>
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<td><strong>Conference 11314: Computer-Aided Diagnosis</strong>&lt;br&gt;Chairs: Horst K. Hahn, Fraunhofer MEVIS (Germany), Jacobs Univ. Bremen (Germany); Maciej A. Mazurowski, Duke Univ. (USA)</td>
<td><strong>Conference 11310: Technology Assessment: Moving AI/ML into Practice</strong>&lt;br&gt;Chairs: Maryellen Giger, The Univ. of Chicago; Baowei Fei, Cooper Medical School, Rowan Univ. (USA)</td>
<td><strong>SC1236 High-Performance Computing for Medical Imaging on Graphics Processing Units (GPU) with CUDA</strong> (Caucchi) 1:30 PM - 5:30 PM, $325 / $380, p. 68</td>
<td><strong>Conference 11311: Spatial Intelligence</strong> (Chairs: Paul M. Thompson, Univ. of California, Los Angeles (USA); Aaron D. Ward, The Univ. of Western Ontario (Canada))</td>
<td><strong>Image Processing Student Paper and Poster Awards</strong>&lt;br&gt;• Conf. 11313, 12:10 PM - 12:15 PM, p. 15&lt;br&gt;STUDENT PAPER AWARDS 2020&lt;br&gt;For submission requirements see Awards + Student Info online at spie.org/mi20program</td>
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<td>SC1183 Modern Diagnostic X-ray Sources (Behling) 1:30 PM - 5:30 PM, $325 / $380, p. 65</td>
<td>KEYNOTE PRESENTATION: Healthcare in need of innovation: (exponential) technology and biomedical entrepreneurship as solution providers Conf. 11315, 1:20 - 2:20 PM, p. 7</td>
<td>KEYNOTE PRESENTATION: Title TBA • Conf. 11314, 1:20 - 2:20 PM, p. 8</td>
<td>Tuesday/Wednesday Poster Session/Reception, 5:30 PM - 7:00 PM, p. 12</td>
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<td>Equity, Diversity, and Inclusion Presentation and Reception, 5:30 TO 7:00 PM, p. 13</td>
<td>KEYNOTE PRESENTATION: Quantitative ultrasound successes: past, present, and future, Conf. 11319, Michael Gelze, 2:40 - 3:40 PM, p. 7</td>
<td>Workshop (CONF. 11313): Translation of Deep Learning Technology to the Clinic, 5:00 PM - 7:00 PM, p. 11</td>
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<td>Dessert with the Experts—A Student Networking Event, 6:30 PM - 7:30 PM, p. 13</td>
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<td>Workshop (CONF. 11314) Live Demonstrations, 5:45 PM - 7:45 PM, p. 11</td>
<td>Best Student Paper Awards Announcement, 4:15 PM</td>
<td>SPIE Harrison H. Barrett Award in Medical Imaging, 4:20 PM</td>
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<td>PLENARY PRESENTATION: Are today's Mixed Reality experience pillars and hardware architectures well aligned with the specific needs of medical imaging and surgical guidance? Bernard Kress, 4:30 PM, p. 5</td>
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<td>Workshop (CONF. 11312) X-ray Source Technologies: Fundamental Principles, Technological Advances, and Clinical Needs, 5:45 PM - 7:45 PM, p. 10</td>
<td>Women's Networking Lunch, 12:10 PM - 1:20 PM, p. 13</td>
<td>Workshop (CONF. 11314+ 11320) Simulated Tumor Board: Brain and Breast, 5:00 PM - 7:00 PM, p. 12</td>
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#### SUNDAY 16 FEBRUARY

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- Mammography, p. 26
- Calibration and Tracking for Image-guided Navigation, p. 26
- 3D Printing and Advanced Visualization, p. 26
- Photoacoustic and Flow Imaging, p. 26

9:40 AM - 10:10 AM

**COFFEE BREAK**

10:10 AM - 12:10 PM

**SESSION 2**

- CT Reconstruction with DL Techniques, p. 28
- Chest I, p. 28
- AI Methods for Image-guided Therapy, p. 28
- Big Data Management Platforms, p. 28
- Ultrasound Signal and Image Processing, p. 28

12:00 PM - 1:20 PM

**LUNCH BREAK**

1:20 PM - 3:00 PM

**SESSION 3**

- Photon Counting Detectors, p. 30
- Neuro I, p. 30
- Image-guided Orthopedic Applications, p. 30
- Deep Learning Diagnostics, p. 30
- USCT and 3D Ultrasound, p. 30

3:00 PM - 3:30 PM

**COFFEE BREAK**

3:30 PM - 5:30 PM

**SESSION 4**

- Quality Assessment and Optimization in Breast Imaging, p. 31
- Abdomen, p. 31
- Ultrasound Imaging and Image Guidance: Joint Session with Conferences 11315 and 11319, p. 31
- Advanced Imaging Informatics, p. 31
- Ultrasound Imaging and Image Guidance: Joint Session with Conferences 11315 and 11319, p. 31

5:45 PM - 7:45 PM

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- Live Demonstrations, p. 31
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<td>Image Perception, Observer Performance, and Technology Assessment</td>
<td>Biomedical Applications in Molecular, Structural, and Functional Imaging</td>
<td>Imaging Informatics for Healthcare, Research, and Applications</td>
<td>Ultrasonic Imaging and Tomography</td>
<td>Digital Pathology</td>
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<tr>
<td>LOCATION:</td>
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<td>Briargrove</td>
<td>Salon B</td>
<td>Hunters Creek</td>
<td>Briargrove</td>
<td>River Oak</td>
<td>River Oaks</td>
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<td>Musculoskeletal, p. 33</td>
<td>Neurosurgical Interventions, p. 33</td>
<td>Explainable Artificial Intelligence, p. 33</td>
<td>USCT and 3D Ultrasound II, p. 33</td>
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<td>9:40 AM - 10:10 AM</td>
<td>COFFEE BREAK</td>
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<td>MD Anderson Invited Talks, p. 34</td>
<td>Future PACS and Software, p. 34</td>
<td>High Frequency Ultrasound and Acoustic Microscopy, p. 34</td>
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   **Upload online:** upload online to Launchpad [http://spieuploads.com](http://spieuploads.com) by 13 February at 5:00 PM Pacific Time
   
   Launchpad accepts all file types except LibreOffice, and there are no file size restrictions. Should you require assistance with uploading or presenting, technicians will be available at Speaker Check-In and throughout the meeting rooms to help.
   
   **Upload at Medical Imaging:** Bring your USB device to Speaker Check-In at least 2 hours before your session begins or the day before if presenting in the first morning session.

2. **Preview your presentation onsite**
   
   All presenters are strongly encouraged to visit Speaker Check-In at least two hours prior to their presentation to preview their files through the SPIE presentation system, or the day before if presenting in first morning session.

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THIS PDF PROGRAM IS CURRENT AS OF 28 OCTOBER 2019. Find complete, up-to-date information and create your personalized schedule at [spie.org/mi20program](http://spie.org/mi20program)
## Daily Conference Session Schedule

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## Daily Conference Session Schedule

**WEDNESDAY 19 FEBRUARY**

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## Daily Conference Session Schedule

### THURSDAY 20 FEBRUARY

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| 10:10 AM - 12:10 PM|           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| 12:10 PM - 1:20 PM | COFFEE BREAK |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| 1:20 PM - 3:00 PM  |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| 3:00 PM - 3:30 PM  |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |
| 3:30 PM - 5:30 PM  |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |           |

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**LOCATION:**
- Salon A
- Salon B
- Salon C
- Hunters Creek
- Briargrove
- River Oaks
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CONFERENCE 11317
ROOM: RIVER OAKS
Tuesday–Thursday 18–20 Feb. 2020
Proceedings of SPIE Vol. 11317

Biomedical Applications in Molecular, Structural, and Functional Imaging

Conference Chairs: Barjor Gimé, Cooper Medical School, Rowan Univ. (USA); Andrzej Krol, SUNY Upstate Medical Univ. (USA)

Program Committee: Amir A. Amini, Univ. of Louisville (USA); Juan R. Cebalas, George Mason Univ. (USA); Nancy L. Ford, The Univ. of British Columbia (Canada); Alejandro F. Frangi, Univ. of Leeds (UK); Xavier Intes, Rensselaer Polytechnic Institute (USA); Ciprian N. Ionita, Unv. at Buffalo (USA); Rensselaer Polytechnic Univ. of (Canada); Nancy L. Ford, George Mason Univ. (USA); Juan R. Cebral, Louisville (USA); Amir A. Amini, Program Committee: Univ. of California, San Francisco (USA); Brian Park, The Univ. of Southern California (USA); Brian Park, The Univ. of Pennsylvania Health System (USA); Eliot L. Siegel, Univ. of Maryland Medical Ctr. (USA); Wyatt Tellis, Univ. of California, San Francisco (USA); Chaoqun Hu, Univ. of Pittsburgh (USA);

CONFERENCE 11318
ROOM: RIVER OAKS
Sunday–Monday 16–17 Feb. 2020
Proceedings of SPIE Vol. 11318

Imaging Informatics for Healthcare, Research, and Applications

Conference Chairs: Po-Hao Chen, Cleveland Clinic (USA); Thomas M. Deserno, Technische Univ. Braunschweig (Germany)

Program Committee: Peter R. Bak, McMaster Univ. (Canada); Tessa S. Cook, The Univ. of Pennsylvania Health System (USA); Steven C. Horii, The Univ. of Pennsylvania Health System (USA); Maria Y. Law, Hong Kong Sanatorium and Hospital (Hong Kong, China); Heinz U. Lemke, Computer Assisted Radiology and Surgery (Germany); Brett J. Liu, The Univ. of Southern California (USA); Brian Park, The Univ. of Pennsylvania Health System (USA); Eliot L. Siegel, Univ. of Maryland Medical Ctr. (USA); Wyatt Tellis, Univ. of California, San Francisco (USA);

CONFERENCE 11319
ROOM: SALON C
Sunday–Tuesday 16–18 Feb. 2020
Proceedings of SPIE Vol. 11319

Ultrasound Imaging and Tomography

Conference Chairs: Brett C. Byram, Vanderbilt Univ. (USA); Nicole V. Ruiter, Kartusche Institut für Technologie (Germany)

Program Committee: Mark A. Anastasio, Washington Univ. St. Louis (USA); Jeffrey C. Bamber, The Royal Marsden NHS Foundation Trust (UK); Johan G. Bosco, Erasmus Univ. Rotterdam (Netherlands); Jan D’hooge, Univ. of Leuven (Belgium); Marvin M. Doyley, Univ. of Rochester (USA); Stanislav Y. Emelianov, The Univ. of Texas at Austin (USA); Mostafa Fatemi, Mayo Clinic College of Medicine (USA); Aaron Fenster, Roberta Research Institute (Canada); Jérémie Fromageau, The Institute of Cancer Research (UK); James F. Greenleaf, Mayo Clinic (USA); Peter E. Houthuise, Imperial College London (UK); Michael Jaeger, Univ. Bern (Switzerland); Jørgen Arendt Jensen, Technical Univ. of Denmark (Denmark); David H. Kim, Pohang Univ. of Science and Technology (Korea, Republic of); Guiping Li, Delphus Medical Technologies, Inc. (USA); Roman G. Maev, Univ. of Windsor (Canada); Bial H. Malik, OT Ultrasound LLC (USA); Stephen A. McAleevay, Univ. of Rochester (USA); Mohammad Meihrommamadi, Wayne State Univ. (USA); Svetslav N. Nikolov, BK Medical (Denmark); Olivier Roy, Barbara Ann Karmanos Cancer Institute (USA); Kai E. Thomenius, Massachusetts Institute of Technology (USA); François Varray, GREATS (France); James W. Wiskin, OT Ultrasound LLC (USA)

CONFERENCE 11320
ROOM: SALON A
Wednesday–Thursday 19–20 Feb. 2020
Proceedings of SPIE Vol. 11320

Digital Pathology

Conference Chairs: John E. Tomasewszki, Univ. at Buffalo (USA); Aaron D. Ward, The Univ. of Western Ontario (Canada)

Program Committee: Seilm Aksoy, Bilkent Univ. (Turkey); Ulysses J. Balis, Univ. of Michigan Health System (USA); Rohit Bhargava, Univ. of Illinois at Urbana-Champaign (USA); Ulf-Dietrich Braumann, Hochschule für Technik, Wirtschaft und Kultur Leipzig (Germany); Weijie Chen, U.S. Food and Drug Administration (USA); Wei-Chung Cheng, U.S. Food and Drug Administration (USA); Eric Cosatto, NEC Labs. America, Inc. (USA); Scott Doyle, Rutgers, The State Univ. of New Jersey (USA); Michael D. Feldman, The Univ. of Pennsylvania Health System (USA); David J. Foran, Rutgers Cancer Institute of New Jersey (USA); Marios A. Gavrielides, U.S. Food and Drug Administration (USA); April Khademi, Ryerson Univ. (Canada); Tom R. L. Kime, Barro N.V. (Belgium); Elizabeth A. Krupinski, Emory Univ. School of Medicine (USA); Richard M. Leverson, Univ. of California, Davis (USA); Olivier Lecay, Univ. de Caen Basse-Normandie (France); Geert Litjens, Radboud Univ. Medical Ctr. (Netherlands); Anant Madabhushi, Case Western Reserve Univ. (USA); Deryk R. Magee, Univ. of Leeds (UK); Anne L. Martel, Sunnybrook Research Institute (Canada); Erik Meijering, The Univ. of New South Wales (Australasia); James P. Monaco, Inspireta, Inc. (USA); Mehdi Moradi, IBM Research (USA); Bahram Parvin, Lawrence Berkeley National Lab. (USA); Josien P. W. Pluim, Image Sciences Institute (Netherlands); Nasir M. Rajpoot, The Univ. of Warwick (UK); Gustavo Kunde Rohde, Carnegie Mellon Univ. (USA); Berksman Sahiner, U.S. Food and Drug Administration (USA); Chhakya Srinivas, Venenta Medical Systems, Inc. (USA); Darren Treanor, Univ. of Leeds (UK); Jeroen van der Leek, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); Martin J. Yaffe, Sunnybrook Research Institute (Canada); Bülent Yener, Rensselaer Polytechnic Institute (USA)

Note: Extended poster viewing until 9:00 PM on Tuesday.

Poster Sessions

Two poster sessions are scheduled. See Poster Presentation Guidelines for additional information.

Poster authors are required to:
• Display the poster early on the first day of your session
• Attend the Poster Session to answer questions.

Poster award winners will be recognized and certificates distributed in the conference meeting rooms. Check conference schedules for times and locations. Ribbons will identify winning posters during the Poster Sessions.

SUNDAY/MONDAY POSTER SESSION, see pp. 37–43
Location: Texan Ballroom, 4th Floor - Salon D
Posters will be on display Sunday and Monday with extended viewing until 9:00 PM on Tuesday. The poster session will continue in attendance will be Monday evening from 5:30 to 7:00 PM. Award winners will be identified with ribbons during the reception. Award announcement times are listed in the conference schedule.

Poster presentations from the following conferences will be included: Physics of Medical Imaging; Computer-Aided Diagnosis; Image-Guided Procedures, Robotic Interventions, and Modeling; Imaging Informatics for Healthcare, Research, and Applications; and Ultrasound Imaging and Tomography.

Author Set-Up Time:
Sunday after 12:00 PM (NOON)
Posters should remain on display until the end of the Poster Session on Monday.

Poster Session and Reception: Monday from 5:30 TO 7:00 PM

NOTE: Extended poster viewing until 9:00 PM on Sunday.

TUESDAY/WEDNESDAY POSTER SESSION, see p. 55–57
Location: Texan Ballroom, 4th Floor - Salon D
Conference attendees are invited to attend the Monday Poster Session, where authors will be in attendance. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Award winners will be identified with ribbons during the reception.

Poster presentations from the following conferences will be included: Physics of Medical Imaging; Computer-Aided Diagnosis; Image-Guided Procedures, Robotic Interventions, and Modeling; Imaging Informatics for Healthcare, Research, and Applications; and Ultrasound Imaging and Tomography. At the poster session, a special award will be presented for the best poster.
SESSION 1
ROOM: SALON A ....... SUN 8:00 AM TO 9:40 AM
New Technologies in Imaging
Session Chairs: Wei Zhao, Stony Brook Medicine (USA); Guang-Hong Chen, Univ. of Wisconsin School of Medicine and Public Health (USA)
8:00 am: Principles of solid immersion imaging and its application to super resolution microscopy of soft biological tissues in the terahertz spectral range. Nikolai Chernomyrdin, A. M. Prokhorov General Physics Institute (Russian Federation); Anna Kucheryavenko, Galina Kolontseva, Gleb Kolya, Irina Dolganova, Bauman Moscow State Technical Univ. (Russian Federation); Pavel Karakin, National Medical Research Radiology Ctr., Ministry of Healthcare of the Russian Federation (Russian Federation); Dmitry S. Ponomarev, Institute of UHF Microscopy of Soft Biological Tissues in the Principles of Solid Immersion
8:08 am: A hypersensitive breast cancer detector. Stefano Pedemonte, Whitnabatt.ai (USA) [11314-1]
8:20 am: Microcalification localization and cluster detection using unsupervised convolutional autoencoders and structural similarity index. Yifan Peng, Tsinghua Univ. (China) and Duke Univ. (USA); Rui Hou, Yinhao Ren, Lars Grimm, Jeffrey Marks, Shelley Hwang, Joseph Lu, Duke Univ. (USA). [11314-2]
8:40 am: Performance deterioration of deep neural networks for mass classification in mammography due to data source: an analysis based on artificially created distribution shift. Alexej Gossmann, U.S. Food and Drug Administration (USA); Xiaobing Sun, Luxun-Univ. Münch (Germany); Kenny H. Cha, U.S. Food and Drug Administration (USA). [11314-3]
9:00 am: A multi-task deep learning method in simultaneously predicting occult invasive disease in ductal carcinoma in situ and segmenting microcalcifications in mammography. Rui Hou, Duke Univ. (USA); Maciej A. Matuszowski, Lars J. Grimm, Jeffrey R. Marks, Lorraine M. King, Duke Univ. School of Medicine (USA); Carlo C. Malloy, Arizona State Univ. (USA); Shelley Hwang, Joseph Y. Lo, Duke Univ. School of Medicine (USA). [11314-4]
Coffee Break. Sun 9:40 am to 10:10 am
SESSION 1
ROOM: SALON B ....... SUN 8:00 AM TO 9:40 AM
Mammography
8:00 am: Principles of solid immersion imaging and its application to super resolution microscopy of soft biological tissues in the terahertz spectral range. Nikolai Chernomyrdin, A. M. Prokhorov General Physics Institute (Russian Federation); Anna Kucheryavenko, Galina Kolontseva, Gleb Kolya, Irina Dolganova, Bauman Moscow State Technical Univ. (Russian Federation); Pavel Karakin, National Medical Research Radiology Ctr., Ministry of Healthcare of the Russian Federation (Russian Federation); Dmitry S. Ponomarev, Institute of UHF Microscopy of Soft Biological Tissues in the Principles of Solid Immersion
8:08 am: A hypersensitive breast cancer detector. Stefano Pedemonte, Whitnabatt.ai (USA) [11314-1]
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Coffee Break. Sun 9:40 am to 10:10 am
SESSION 1
ROOM: HUNTERS CREEK ....... SUN 8:00 AM TO 9:40 AM
Calibration and Tracking for Image-guided Navigation
Session Chairs: Elvis C. S. Chen, Roberts Research Institute (Canada); Tamas Ungi M.D., Lab. for Percutaneous Surgery (Canada)
8:00 am: Miniature C-arm simulator using wireless accelerometer based tracking. Daniel R. Allen, John T. Moore, Roberts Research Institute (Canada); Colin Clarke, London Health Sciences Ctr. (Canada); Terry M. Peters, Elvis C. S. Chen, Roberts Research Institute (Canada). [11315-1]
8:20 am: Pivot calibration concept for sensor attached mobile c-arms. Sang Chun Lee, Johns Hopkins Univ. (USA); Matthias Seibold, Technische Univ. München (Germany) and Hospital Balgrist (Switzerland); Philipp Fürstnig, Maastrich, University Hospital Balgrist (Switzerland); Nasser Navab, Johns Hopkins Univ. (USA) and Technische Univ. München. (Germany). [11315-2]
8:40 am: 3D catheter guidance including shape sensing for endovascular navigation. Sonja Jäckle, Fraunhofer-Institut für Digitale Medizin (Germany); Verónica García-Vázquez, Felix von Hadhun. Univ. zu Lübeck (Germany); Tim Eixmann, Medizinisches Laserzentrum Lübeck GmbH (Germany); Malte Maria Sieren, Universitätsklinikum Schleswig-Holstein (Germany); Hinnerk Schultz-Hülsmann, Greifswald. (Germany); Andreas Greif, Universitätsklinikum Schleswig-Holstein (Germany); Torben Paetz, Fraunhofer-Institut für Digitale Medizin MEVIS (Germany). [11315-3]
### SESSION 1 (CONTINUED)
**ROOM: SALON A**  
**Sunday–Wednesday 16–19 Feb. 2020**  
Proceedings of SPIE Vol. 11312

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>9:20 am</td>
<td>Slot-scan dual-energy measurement of bone mineral density on a robotic x-ray system, Chumin Zhao, Johns Hopkins Univ. (USA); Christoph Luckner, Magdalena Herbst, Sebastian Vogt, Ludwig Ritschl, Steffen Kappler, Siemens Healthineers (Germany); Jeffrey H. Siewerdsen, Wojciech Zbijewski, Johns Hopkins Univ. (USA) .......... [11312-5]</td>
</tr>
<tr>
<td>Coffee Break</td>
<td>Sun 9:40 am to 10:10 am</td>
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### SESSION 1 (CONTINUED)
**ROOM: SALON B**  
**Sunday–Wednesday 16–19 Feb. 2020**  
Proceedings of SPIE Vol. 11314

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<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:20 am</td>
<td>Towards electromagnetic tracking of J-tip guidewire: precision assessment of sensors during bending tests, Roberta Piazza, EndoCAS, Univ. di Pisa (Italy) and Robarts Research Institute (Canada); Hareem Nisar, Robarts Research Institute (Canada) and Western Univ. (Canada); John Moore, Robarts Research Institute (Canada); Sara Condino, EndoCAS, Univ. di Pisa (Italy); Mauro Ferrari, EndoCAS (Italy); Vincenzo Ferrari, EndoCAS, Univ. di Pisa (Italy); Terry Peters, Elvis Chin, Robarts Research Institute (Canada) .................. [11315-5]</td>
</tr>
<tr>
<td>Coffee Break</td>
<td>Sun 9:40 am to 10:10 am</td>
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</table>

### SESSION 1 (CONTINUED)
**ROOM: HUNTERS CREEK**  
**Sunday–Wednesday 16–19 Feb. 2020**  
Proceedings of SPIE Vol. 11315

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>9:20 am</td>
<td>Use of 3D printed patient-specific neurovascular phantoms to investigate the correlation between disease severity and quantitative angiography data analysis, Lauren M. Shepard, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Maxim Mokin, Univ. of South Florida (USA); Adnan H. Siddiqui, Kenneth V. Snyder, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Elad I. Levy, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Jason M. Davies, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Stephen Rudin, Canon Stroke and Vascular Research Ctr. (USA) and Univ. at Buffalo (USA); Ciprian N. Ionita, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA) ..................... [11318-5]</td>
</tr>
<tr>
<td>Coffee Break</td>
<td>Sun 9:40 am to 10:10 am</td>
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### SESSION 1 (CONTINUED)
**ROOM: RIVER OAKS**  
**Sunday–Monday 16–17 Feb. 2020**  
Proceedings of SPIE Vol. 11318

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>9:20 am</td>
<td>Use of 3D printed patient-specific neurovascular phantoms to investigate the correlation between disease severity and quantitative angiography data analysis, Lauren M. Shepard, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Maxim Mokin, Univ. of South Florida (USA); Adnan H. Siddiqui, Kenneth V. Snyder, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Elad I. Levy, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Jason M. Davies, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Stephen Rudin, Canon Stroke and Vascular Research Ctr. (USA) and Univ. at Buffalo (USA); Ciprian N. Ionita, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA) ..................... [11318-5]</td>
</tr>
<tr>
<td>Coffee Break</td>
<td>Sun 9:40 am to 10:10 am</td>
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</table>
Session Chairs: Marc Kachelriess, Deutsches Krebsforschungszentrum (Germany); Yinji Qi, Univ. of California, Davis (USA)

10:10 am: Compressed sensing meets with deep learning: a deep learning enabled prior image constrained compressed sensing (DL-PICS) reconstruction framework, Chengzhu Zhang, constrained compressed sensing (DL-PICCS)

10:30 am: Generalized iterative sparse-view CT reconstruction with deep neural network, Yongshuai Ge, Ting Su, Jiongtao Zhu, Dong Liang, Shenzhen Institutes of Advanced Technology (China)

10:50 am: Ultra-fast-pitch acquisition and reconstruction with data-adaptive, convolutional regularization, Rui Hou, Carl E. Ravin, Advanced Imaging Labs. (USA); Krystyna Faryna, Univ. de Girona (Spain); Xiuxiu He, Qi Gao, Southern Medical Univ. (China); Dong Zeng, Sui Li, Lisha Titan Healthcare Co., Ltd. (China); Ronald M. Summers, National Institutes of Health Clinical Ctr. (USA); Jing Xiao, Ping An Technology Co., Ltd. (China); Ronny A. Le, Carl E. Ravin Advanced Imaging Labs. (USA)

11:10 am: A deep learning reconstruction method for sparsely spaced multidecoder helical CT using cascaded dual-domain CNN, AC Zheng, Weihui Gao, Li Zhang, Xuyang Xing, Tsinghua Univ. (China)

11:30 am: Fast spectral x-ray CT reconstruction with data-adaptive, convolutive regularization, Garathin B. Clark, Cristian T. Badea, Duke Univ. Medical Center (USA)

11:50 am: Semi-supervised learned sinogram restoration network for low-dose CT image reconstruction, Mingqiang Meng, Sui Li, Lisha Tai, Tsinghua Univ. Medical Center (China); Dong Zeng, South China Univ. of Technology (China); Danyang Li, Minman Zhu, Qi Gao, Southern Medical Univ. (China); Qi Xie, Qian Zhao, Xi’an Jiaotong Univ. (China); Zhanxing Bian, Jing Huang, Southern Medical Univ. (China); Deys Meng, Xi’an Jiaotong Univ. (China); Jianhua Ma, Southern Medical Univ. (China)

12:10 pm: Lunch Break. ..... Sun 12:10 pm to 1:20 pm
<table>
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<tr>
<th>CONFERENCE 11312</th>
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<th>CONFERENCE 11315</th>
<th>CONFERENCE 11318</th>
<th>CONFERENCE 11319</th>
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<tr>
<td><strong>ROOM: SALON A</strong></td>
<td><strong>ROOM: SALON B</strong></td>
<td><strong>ROOM: HUNTERS CREEK</strong></td>
<td><strong>ROOM: RIVER OAKS</strong></td>
<td><strong>ROOM: SALON C</strong></td>
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</tbody>
</table>

**SUNDAY/MONDAY POSTER VIEWING**
**ROOM: SALON D/E . . . . . . 12:00 PM TO 9:00 PM**
Posters will be on display Sunday and Monday with extended viewing until 9:00 pm on Sunday. The poster session with authors in attendance will be Monday evening from 5:30 to 7:00 pm. Award winners will be identified with ribbons during the reception. Award announcement times are listed in the conference schedule.
Lunch Break . . . . . . . . . . Mon 12:10 pm to 1:20 pm

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Lunch Break . . . . . . . . . . Mon 12:10 pm to 1:20 pm

THIS PDF PROGRAM IS CURRENT AS OF 28 OCTOBER 2019. Find complete, up-to-date information and create your personalized schedule at spie.org/mi20program
SESSION 4
ROOM: SALON B ........ SUN 3:30 PM TO 5:30 PM
Abdomen
3:30 pm: Organ segmentation from full-size CT images using memory-efficient FCN. Chenglong Wang, Masahiro Oda, Kensaku Mori, Nagoya Univ. (Japan).  
3:50 pm: A radiomics-based method for Cytokeratin 19 status prediction of Hepatocellular Carcinoma with Gadofusion–enhanced MRI. Dongsheng Gu, Institute of Automation (China) and Univ. of Chinese Academy of Sciences (China); Wentao Wang, Zhengshan Hospital, Fudan Univ. (China); Jingwei Wei, Institute of Automation (China) and Univ. of Chinese Academy of Sciences (China); Ying Ding, Li Yang, Kai Zhu, Zhenghan Hospital, Fudan Univ. (China); Rongkui Luo, Zhenghan Hospital, Fudan Univ. (China); Shengxiang Rao, Mengzu Zeng, Zhengshan Hospital, Fudan Univ. (China); Jie Tian, Institute of Automation (China) and Beijing Advanced Innovation Ctr. for Big Data-Based Precision Medicine (China) and Engineering Research Ctr. of Molecular and Neuro Imaging, Xidian Univ. (China).

3:40 pm: Multilevel UNet for pancreas segmentation from non-contrast CT scans through domain adaptation. Sai Aditya Srima, National Institutes of Health Clinical Ctr. (USA) and Rice Univ. (USA); Anantha Paul, Yingying Zhu, Vet Sandfort, National Institutes of Health Clinical Ctr. (USA); Perry J. Pickhardt, Univ. of Wisconsin School of Medicine and Public Health (USA); Ronald Summers, National Institutes of Health Clinical Ctr. (USA).

4:00 pm: High resolution microlithic detection of wide-angle digital breast tomosynthesis (DBT) and strategies for improving performance. Xiaoyu Duan, Hailiang Huang, Wei Zhao, Stony Brook Medicine (USA).

4:30 pm: Determining the optimal angular range of the X-ray source motion in tomosynthesis using virtual clinical trials. Bruno Barufaldi, Trevor Vent, Predrag R. Bakic, Peter B. Noel, Andrew D. A. Maidment, Univ. of Pennsylvania (USA).  

4:00 pm: Equivalent breast thickness and dose sensitivity of a next iteration 3D structured breast phantom with lesion models. Elisabeth Salomon, Medizinische Univ. Wien (Austria).

4:30 pm: Quality Assessment and Optimization in Breast Imaging
Session Chairs: Hilde Bosmans, UZ Leuven (Belgium); Joseph Yuan-Chieh Lo, Carl E. Ravin Advanced Imaging Labs. (USA)

3:30 pm: Factors affecting microlithic detection of wide-angle digital breast tomosynthesis (DBT) and strategies for improving performance. Xiaoyu Duan, Hailiang Huang, Wei Zhao, Stony Brook Medicine (USA).

3:50 pm: Determining the optimal angular range of the X-ray source motion in tomosynthesis using virtual clinical trials. Bruno Barufaldi, Trevor Vent, Predrag R. Bakic, Peter B. Noel, Andrew D. A. Maidment, Univ. of Pennsylvania (USA).
## SESSION 4 (CONTINUED)
### ROOM: SALON B  
#### SUN 5:45 PM TO 7:45 PM
4:50 pm: A complex dual-modality kidney phantom for renal biopsy studies, Jose Vargas, Phuc Le, Maysam Shahedi, Sarah Shahub, The Univ. of Texas at Dallas (USA); Jeffrey Gahan, Brett Johnson, The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA); Matthew Pfefferle, Blake O. Judson, Yasmeen Alshara, The Univ. of Texas at Dallas (USA); Qinmei Li, The Univ. of Texas at Dallas (USA) and The Second Affiliated Hospital of Guangzhou Medical Univ. (China); James D. Dorman, The Univ. of Texas at Dallas (USA); Baowei Fei, The Univ. of Texas at Dallas (USA) and The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA)  
4:50 pm: Automatic needle localization in intraoperative 3D transvaginal ultrasound images for high-dose-rate interstitial gynecologic brachytherapy, Jessica R. Rodgers, Derek J. Gillies, Roberts Research Institute, Western Univ. (Canada); William T. Hrinivich, Johns Hopkins Univ. (USA); Igor Gyaackov, Aaron Fenster, Roberts Research Institute, Western Univ. (Canada).  
5:10 pm: Ring-arrayed forward-viewing ultrasound imaging system: a feasibility study, Ryosuke Tsumura, Dosa P. Vang, Worcester Polytechnic Institute (USA); Nobuhiko Hata, Brigham and Women’s Hospital (USA); Huaichong Zhang, Worcester Polytechnic Institute (USA).  

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## WORKSHOP
### ROOM: SALON B  
#### SUN 5:45 PM TO 7:45 PM
See Special Events for more information.
Coffee Break ........... Mon 9:40 am to 10:10 am

Wells, Ignacio Hernandez Montilla, Univ. of Surrey (UK); Premkumar Elangovan, Kenneth C. Young, The University of Surrey (UK).

Modelling the use of stationary, rectangular arrays of X-ray emitters for digital breast tomosynthesis.

9:00 am: Bambot, Fischer Imaging Corp. (USA); Joseph W. Grace J. Gang, Alejandro Sisniega, Wenying Wang, Hailiang Huang, Xiaoyu Duan, Wei Zhao, Stanford Univ. (USA).

An investigation of slot-scanning for breast imaging.

8:40 am: Zhang, John W. Garrett, Guang-Hong Chen, Ke Li, Ran Deniz, NYU Langone Health (USA); Jimin Tan, Bofei Zhang, Kyunghyun Cho, Deniz, NYU Langone Health (USA).

Semi-supervised learning for predicting total knee replacement with unsupervised data augmentation.


Automatic Kellgren-Lawrence grade estimation driven deep learning algorithms.

9:00 am: Automatic Kellgren-Lawrence grade estimation driven deep learning algorithms.

8:40 am: Accurately identifying vertebral levels in large datasets.

Daniele Ettori, Veit Sandfort, National Institutes of Health Clinical Ctr. (USA); Perry J. Pickhardt M.D., Univ. of Wisconsin-Madison (USA); Ronald M. Summers M.D., National Institutes of Health Clinical Ctr. (USA).

8:20 am: Semi-supervised learning for predicting total knee replacement with unsupervised data augmentation.

Jimin Tan, Bofei Zhang, Kyunghyun Cho, New York Univ. (USA); Gregory Chang, Cem M. Deniz, NYU Langone Health (USA).

Deciphering tissue relaxation parameters from a single MR image using deep learning.

8:40 am: Deciphering tissue relaxation parameters from a single MR image using deep learning.

Yan Wu, Stanford Univ. (USA); Yajun Ma, Jiang Du, Univ. of California, San Diego (USA); Dante Capaldi, Lei Xing, Stanford Univ. (USA).

9:00 am: Automatic Kellgren-Lawrence grade estimation driven deep learning algorithms.


Juliane Müller, Universitätsklinikum Carl Gustav Carus Dresden, TU Dresden (Germany); Nico Hoffmann, Helmholtz-Zentrum Dresden-Rossendorf e. V. (Germany); Martin Oelschlägel, Christian Schnabel, Gerald Steiner, Edmund Koch, Stephan B. Sobottka, Gabriele Schackert, Universitätsklinikum Carl Gustav Carus Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany); Matthias Kirsch, Dresden, TU Dresden (Germany).
**SEASON 7**
ROOM: SALON A  .  MON 1:20 PM TO 3:40 PM
**Detector Technologies**
Session Chairs: Rebecca Fahrig, Siemens Healthineers (Germany);
Karim S. Karim, Univ. of Waterloo (Canada)
1:20 pm: Initial characterization of a hybrid direct-incident active matrix flat panel imager for digital radiography, Adrian F. Howardes, Stony Brook Univ. (USA);
Anastasia Mistchenko, Sebastien Léveillé, Analogic Canada Corp. (Canada);
Scott Dow, James R. Scheuermann, Adrian F. Howansky, Stony Brook Univ. (Canada)

1:40 pm: The effect on patient dose and image quality of simultaneous acquisition of high-resolution small field of view (FOV) and regular-resolution large FOV imaging modes of a dual-resolution imaging detector, Svetlana Vasen Settar Nagash, Daniel R. Rednarek, Stephen Rudin, Canon Stroke and Vascular Research Ctr. (USA)

2:00 pm: Lubberts-like effect in direct conversion x-ray imaging systems, Ke Li, Univ. of Wisconsin-Madison (USA)

2:20 pm: Theoretical performance of polycrystalline mercuric iodide X-ray converters incorporating pillar-supported frisch grid structures, Lixiu Shen, Albert K. Jiang, Youcef El-Mohri, Tong Zheng, Hirohisa Natori, Nishioka Hospital (Japan);
Kensaku Mor, Nagoya Univ. (Japan)

2:40 pm: Novel irradiation side sampling system flexible flat panel detectors with high image quality and light weight, Shinichi Ushikura, Tatsunori Tanimoto, Hiroyasu Shen, Albert K. Liang, Youcef El-Mohri, Tong Zheng, Hirohisa Natori, Nishioka Hospital (Japan);
Kensaku Mor, Nagoya Univ. (Japan)

**SESSION 1**
ROOM: BRIARGROVE  .  MON 1:20 PM TO 3:40 PM
**Image Synthesis, GANs, and Novel Architectures**
1:20 pm: Multi-modality MRI arbitrary transformation using unified generative adversarial networks, Yang Lei, Yabo Hu, Hu Miao, Walter Curran, Tian Liu, Xiaofeng Yang, Emory Univ. (USA)

1:40 pm: Joint intensity fusion with normalized cross-correlation metric for cross-modality MRI synthesis, Kathryn Ufford, Ipek Oguz, Vanderbilt Univ. (USA);
Simon Vandeke, Vanderbilt Univ. Medical Ctr. (USA)

2:00 pm: Multi-Portico super-resolution loss for GAN-based super-resolution of clinical CT Images using micro CT image database, Tong Zheng, Hirohisa Shen, Takayasu Moriyama, Takaaki Sugino, Shota Nakamura, Masahiro Oda, Nagoya Univ. (Japan);
Masaki Mori, Sapporo Kosei Hospital (Japan); Hirohito Takabatake, Minami Sanyo Hospital (Japan); Hiroshi Natori, Nishioka Hospital (Japan);
Kensaku Mor, Nagoya Univ. (Japan)

2:20 pm: Transfer generative adversarial network for multimodal CT image super-resolution, Yeo Xiao, Ruqiu Fang, Univ. of Florida (USA)

2:40 pm: GANet: Group Attention Network for Diabetic Retinopathy image segmentation, Le Yi, Wei Tang, Shuangliang Feng, Xinjian Chen, Soochow Univ. (China)

**SESSION 7**
ROOM: SALON B  .  MON 1:20 PM TO 3:40 PM
**Breast MRI / Skin**
1:20 pm: Explainable AI for medical imaging: deep-learning CNN ensemble for classification of estrogen receptor status from breast MRI, Zachary Papasotropoulos, Ravi K. Samala, Heang-Ping Chang, Lubomir Hadijiski, Chintara Paramagul, Mark A. Helvie, Colleen H. Neal, Univ. of Michigan (USA)

1:40 pm: Long shot-term memory networks predict breast cancer recurrence in analysis of consecutive MRIs acquired during the course of neoadjuvant chemotherapy, Karen Drucker, Univ. of Chicago Medical Ctr. (USA);
Alexandros Edwards, John Papasotropou, Magnus Giger, Univ. of Chicago Medical Ctr. (USA)

2:00 pm: Using ResNet feature extraction in computer-aided diagnosis of breast cancer on 927 lesions imaged with multi-parametric MRI, Yuan Hu, the Univ. of Chicago (USA);
Heather M. Whitney, Wheaton College (USA) and the Univ. of Chicago (USA)

2:20 pm: Interpretable deep learning regression for breast density estimation on MRI, Bas H. M. van der Velden, Maryam E. Sadeghian, Universiteit van Amsterdam (The Netherlands);
Maarten G. A. Giljus, Univ. Medical Ctr. Utrecht (Netherlands)

2:40 pm: MRI image harmonization using cycle-consistent generative adversarial network, Gourav Roy, Markos H. A. J. Ansele, Medical Ctr. Utrecht (Netherlands);
Claudette E. Loo, The Netherlands Cancer Institute-Antoni van Leeuwenhoek Hospital (Netherlands)

3:00 pm: Augmented reality visualization of wandering hyperintense imaging classifications for image-guided breast tumor resection, James Huang, Martin Halicek, Maysam Shahedi, Basoefi, the Univ. of Texas at Dallas (USA)

3:20 pm: Accuracy study of Smartglasses/Smartphone AR systems for percutaneous needle interventions, Reza Sofiabadi, Ming Li, Dilara Long, Sheng Xu, Bradford J. Wood, National Institutes of Health Clinical Ctr. (USA);
Cristian A. Linte, Rochester Institute of Technology (USA)

4:00 pm: Deep-learning-based multi-organ segmentation in pancreatic CT image, Yingzi Liu, Yang Lei, Yabo Fu, Tonghe Xie, Xiaoqian Jiang, Tian Liu, Walter Curran, Preti Datta, Xiaofang Yang, Emory Univ. (USA)

4:20 pm: Automated coronary artery segmentation in Coronary Computed Tomography Angiography (CCTA) using deep learning neural networks, Bang Jun Guo, Emory Univ. (USA);
Yang Lei, Emory Univ. (USA);
Yo Fu, Tonghe Xie, Xiaoqian Jiang, Tian Liu, Walter Curran, Emory Univ. (USA);
Long Jang Zhang, Nanjing Univ. (China);
Xiaofang Yang, Emory Univ. (USA)

4:40 pm: Augmented reality of hyperspectral imaging classifications for image-guided breast tumor resection, James Huang, Martin Halicek, Maysam Shahedi, Basoefi, the Univ. of Texas at Dallas (USA)

5:00 pm: Deep-learning-based multi-organ segmentation in pancreatic CT image, Yingzi Liu, Yang Lei, Yabo Fu, Tonghe Xie, Xiaoqian Jiang, Tian Liu, Walter Curran, Preti Datta, Xiaofang Yang, Emory Univ. (USA)

5:20 pm: Accurate study of Smartglasses/Smartphone AR systems for percutaneous needle interventions, Reza Sofiabadi, Ming Li, Dilara Long, Sheng Xu, Bradford J. Wood, National Institutes of Health Clinical Ctr. (USA);
Cristian A. Linte, Rochester Institute of Technology (USA)

5:40 pm: Deep-learning-based multi-organ segmentation in pancreatic CT image, Yingzi Liu, Yang Lei, Yabo Fu, Tonghe Xie, Xiaoqian Jiang, Tian Liu, Walter Curran, Preti Datta, Xiaofang Yang, Emory Univ. (USA)

6:00 pm: Skin cancer segmentation and classification with improved deep convolutional neural network, Mi Zahangir Alom, Theus Aspiras, Tarek M. Taha, Vijayan K. Asari, Univ. of Dayton (USA)

**SESSION 8**
ROOM: HUNTERS CREEK  .  MON 1:20 PM TO 3:40 PM
**Keynote Presentation**
Session Chairs: Cristian A. Linte, Rochester Institute of Technology (USA);
BaoFei Fei, The Univ. of Texas at Dallas (USA)
1:20 pm: Healthcare in need of innovation: (exponential) technology and biomedical entrepreneurship as solution providers (Keynote Presentation), Michael Friebe, Otto-von-Guericke Univ. Magdeburg (Germany)

1:40 pm: Deep learning cervix anatomical landmark segmentation and evaluation, Peng Guo, Zhiyun Xue, Leonard E. Davis, The Univ. of Texas at Austin (USA)
**MONDAY 17 FEBRUARY**

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<tr>
<th>SESSION 1 (CONTINUED)</th>
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<tr>
<td>3:00 pm: Fully automated segmentation of hyperreflective foci in OCT images using a U-shape network, Liangjiu Zhu, Weifang Zhu, Shuangang Feng, Xinjian Chen, Soochow Univ. (China) ... [11313-6]</td>
</tr>
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<td>3:20 pm: Adversarial domain adaptation for multi-device retinal OCT segmentation, Yufan He, Aaron Carass, Yihao Liu, Shu Saitta, Peter A. Calabresi, Jerry L. Prince, Johns Hopkins Univ. (USA) ... [11313-7]</td>
</tr>
<tr>
<td>Coffee Break ... Mon 3:40 pm to 4:00 pm</td>
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<th>SESSION 7 (CONTINUED)</th>
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<tr>
<td>3:20 pm: A multidimensional scaling and sample clustering to obtain a representative subset of training data for transfer learning based Rosacea lesion identification, Hamidullah Binol, M. Khalid Khan Niazi, Wake Forest Ctr. for Biomedical Informatics (USA); Benjamin Kaffenberger, The Ohio State Univ. (USA); Metin N. Gurcan, Wake Forest Ctr. for Biomedical Informatics (USA) ... [11314-38]</td>
</tr>
<tr>
<td>Coffee Break ... Mon 3:40 pm to 4:00 pm</td>
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<td>3:20 pm: Towards augmented reality-based suturing in monocular laparoscopic training, Chandrakanth Jayachandran Preetha, Otto-von-Guericke Univ. Magdeburg (Germany); Fabian Siehfried Wehrtmann, Universität der Bundeswehr Munich (Germany); Lahith Sharan, Hochschule Mannheim (Germany); Carolyn Fan, Universität des Saarlandes (Germany); Jonathan Kloss, Otto-von-Guericke Univ. Magdeburg (Germany); Beat Peter Müller-Stich, Nickel Felix, Universität der Bundeswehr Munich (Germany); Sandy Engelhardt, Hochschule Mannheim (Germany); ... [11315-32]</td>
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<tr>
<td>Coffee Break ... Mon 3:40 pm to 4:00 pm</td>
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**Awards and Plenary Session**

*Session Chairs: Metin N. Gurcan, Wake Forest Baptist Medical Ctr. (USA) and Georgia D. Tourassi, Oak Ridge National Lab. (USA)*

4:00 PM - 4:30 PM: Award presentations

4:30 pm: Are today’s Mixed Reality experience pillars and hardware architectures well aligned with the specific needs of medical imaging and surgical guidance? (Plenary), Bernard C. Kress, Microsoft Corp. (USA)
High-resolution vascular imaging of small animal using the NIR-fib window emitted from ICG, Meihan Cai, Zhenhua Hu, Jie Tian, Institute of Automation (China) .................. [11312-86]

Bone health assessment using synthetic aperture ultrasound reflectometry. Jonathan M. Richardson, Svetlana A. R. Tew, MPT, Lincoln Lab. (USA); Julie M. Hughes, U.S. Army Research Institute of Environmental Medicine (USA); Micha Feigin-Almog, Iran, Maschinenbau Institut of Technology (USA) .................. [11312-87]

A finite element mesh regrouping-based hybrid light transport model for enhancing the efficiency and accuracy in Biomimicence Tomography. Yanzi Liu, Hongbo Guo, Hengrui Zhao, Yuan Xu, Northwest Univ. (China) .................. [11312-88]

The potentials and limitations of holographic imaging for diagnosis of neoplasms, Kirill Zaysev, A. M. Prokhorov General Physics Institute (Russian Federation); Irina Dolgakova, Nkiru Chenmoyi, Gabe Kubha, Arseni Gavdash, Bauman Moscow State Technical Univ. (Russian Federation); Olga Cherkasova, Gennady Komanidt, A. M. Prokhorov General Physics Institute (Russian Federation). Marina S. Ponomarev, Institute of UHF Semicondor Electronics (Russian Federation); Igor Reshetov, I.M. Sechenov First Moscow State Medical Univ. (Russian Federation); Anatole Khodan, A. N. Frumin Institute of Physical Chemistry and Petrochemistry (Russian Federation); Maxim L. S. Ponomarev, Institute of UHF Semicondor Electronics (Russian Federation); Igor Reshetov, I.M. Sechenov First Moscow State Medical Univ. (Russian Federation); Valery Kuvor, Institute of Solid State Physics (Russian Federation); Maxim Skorobogaty, Polytechnique Montréal (Canada); Valery Tuchin, Saratov State Univ. (Russian Federation) .................. [11312-89]

Keratoconus stage impact on visual acuity and contrast sensitivity. Sanita Liduma, Dr. Lukins’ Eye Clinic (Latvia) and Univ. of Latvia (Latvia); Artis Luguzis, Guntas Krumina, Univ. of Latvia (Latvia) .................. [11312-90]

4D image construction from free-breathing MRI slice acquisitions of the thorax based on a concept of flux. You Hao, Institute of Computing Technology (China) and Univ. of Pennsylvania (USA); Jayaram K. Udupa, Yuting Tong, Caiyun Wu, Univ. of Pennsylvania (USA); Hua Li, Institute of Computing Technology (China) .................. [11312-100]

Synthesis of ghost-free panoramic radiographs from dental CBCT Images. Doi Ii, Jong Hyo Kim, Siwan Kim, Chul Kyun Ahn, Seoul National Univ. (Korea, Republic of); Chang Hyoung Seo, Seoul National Univ. (Korea, Republic of) .................. [11312-101]

Evaluation of a new low dose CBCT imaging protocol for measuring circumferential bone levels around dental implants. Lauren Cardarelli, Univ. of Connecticut (USA) .................. [11312-102]

Micro computed tomography system based on field emission x-ray source with carbon nanotube emitter. Wooseok Kim, Amar Prasad Gupta, Jaekyu Jang, Jaekyu Jang, Jechang Ryu, Kyung Hee Univ. (Korea, Republic of) .................. [11312-103]


Image quality assessment of real patient thorax CT images using modulation transfer function and noise power spectrum. Zaha Passand, Mohammad Partovian, Saeed Ebrahimi, Germany) .................. [11312-94]


Spectrum estimation based on a parametric physical model for CT. Shaojing Chi, Xi Chen, Xuanjun Mou, Xin Jianluo Univ. (China) .................. [11312-96]

Automatic phantom test pattern classification through transfer learning with deep neural networks. Rafael Fricks, Justin B. Solomon, Ehsan Samee, Duke Univ. (USA) .................. [11312-97]

Displaying information collected by intraluminal tomography devices in multi-view synthetic radiographs. Connor Puett, Christina R. Inscoe, Lisa Perrone, The Univ. of North Carolina at Chapel Hill (USA); Michael Regan Anderson, Laurence Gaaelaas, University of Glasgow (UK); Alex Gavrilov, Otto Zhou, The Univ. of North Carolina at Chapel Hill (USA) .................. [11312-98]

3D-localization of anatomic structures in tomographic images from optical flow of projection images. Jure Zupan, Otto-von-Guericke-Unive. Magdeburg (Germany); Robert Frischy, Otto-von-Guericke-Unive. Magdeburg (Germany); Oliver Beuving, Univ. Hospital Magdeburg (Germany); Oliver Speck, Otto-von-Guericke-Unive. Magdeburg (Germany); Georg Rose, Otto-von-Guericke-Unive. Magdeburg (Germany) .................. [11312-99]

Implementation and validation of a tool for the assessment of the modulation transfer function and noise power spectrum of dental CBCT scanners. Karen Merjen, KU Leuven (Belgium); Eman Shaheen, Guizhi Zhang, Reinhold Jacobs, Constantinus Polittis, Hilde Busmans, UZ Leuven, Belgium) .................. [11312-100]

Effect of geometric variations on image characteristics in digital tomosynthesis. Junyung Park, Seung Bum Kim, You Hao, Institute of Computing & Cyber Science, Univ. of Strasbourg, France (France); Michael Regan Anderson, Laurence Gaaelaas, University of Glasgow (UK); Alex Gavrilov, Otto Zhou, The Univ. of North Carolina at Chapel Hill (USA) .................. [11312-101]

Impact of chromophores on colour appearance in a computational skin model, Varun Vasudev, Barco N.V. (Belgium) and imec (Belgium); Andrew D. A. Mauders, Univ. of Ghent (Belgium); Tom Kimpe, Barco N.V. (Belgium); Jilliana Platisa, imec (Belgium) and Univ. Gent (Belgium); Withifed Philips, Univ. Gent (Belgium) and imec (Belgium); Predrag R. Bakic, Univ. Gent (Belgium) .................. [11312-110]

Fast and accurate brain T2 relaxation time quantification in animal models using a phantom and in vivo data for imaging at a biosafety level 4 environment. Marcello A. Castro, Joseph Laux, National Institute of Allergy and Infectious Diseases (USA); Harry T. Friel, National Institutes of Health (USA); Jeffrey Hesemann, Otto-von-Guericke-Unive. Magdeburg (Germany); Lijlana Platisa, Vrije Univ. Brussel (Belgium); Johan De Mey, Vrije Universiteit Brussel (Belgium); Thierry Smeets, Vrije Universiteit Brussel (Belgium); Nico Buls, Univ. Ziekenhuis Brussel (Belgium) .................. [11312-108]

Quantitative evaluation of cadaveric contrast agents: identifying anatomical structures with FLARE. Steven Lewis, Univ. of California at San Francisco (USA) .................. [11312-109]

Comparison of the patient’s skin dose for flat and curved surfaces as a function of x-ray beam angle of incidence. Sheng-Hsuan Sun, Chao Guo, Stephen Rudin, Daniel R. Bednarek, Univ. at Buffalo (USA) .................. [11312-110]

Evaluation of geometric and exposure parameters used in fluoroscopically-guided neuro-interventional procedures. Jacob Collins, Jonathan Troville, Chao Guo, Stephen Rudin, Daniel R. Bednarek, Univ. at Buffalo (USA) .................. [11312-119]

Methods for object tracking and shadowing in a top-down view virtual reality scattered radiation display. Jonathan Troville, Chao Guo, Stephen Rudin, Daniel R. Bednarek, Univ. at Buffalo (USA) .................. [11312-120]

Considerations for accurate inclusion of staff member body tracking in a top-down view virtual reality display of a scattered radiation dose map during fluoroscopic interventional procedures. Jonathan Troville, Chao Guo, Stephen Rudin, Daniel R. Bednarek, Univ. at Buffalo (USA) .................. [11312-121]
### POSTERS — MONDAY

#### Micro-CT imaging of super-resolution MBIR algorithm based on sub-pixel displacement, Yi Li, Shouhua Luo, Tianhu Wang, Maosen Lian, Jing Li, Southeast Univ. (China). [11312-131]

#### Low-dose digital tomosynthesis reconstruction based on field emission flat-panel X-ray source array, Xi Duan, Jianmei Cai, Xianqiu Mou, Xi’an Jiaotong Univ. (China). [11312-132]

#### Automatic geometric calibration in 3D parallel geometry, Hung Nguyen, Univ. Grenoble Alpes (France); Rolf Hackel, Laurent Debout, Univ. Grenoble Alpes (France). [11312-133]

#### Model-based material decomposition with system blur modeling, Wenying Wang, Matthew Trinan, Grace J. Gang, Yiquan Ma, Cao Qian, Johns Hopkins Univ. (USA); Minghui Lu, Josh Star-Lack, Richard E. Collbeth, Varex Imaging Corp. (USA); Wojciech Ziejski, Joseph W. Stayman, Johns Hopkins Univ. (USA). [11312-134]

#### Rotating projection based localizer radiograph for which enables multiple pre-scan function for CT, Yi Tian, Xiang Wen, Taotao Li, Yougu Yang, Yang Wang, Siemens Shanghai Medical Equipment Ltd. (China). [11312-135]

#### Single scan dual energy cone beam CT using flat panel detector, Daye Liu, Hongyan Wang, Lei Zhu, Univ. of Science and Technology of China (China). [11312-136]

#### Average consistency: a superior way of using the composite image to boost dynamic CT reconstruction, Xi Tao, Yongbo Wang, Hua Zhang, Jianhua Ma, Southern Medical Univ. (China). [11312-137]

#### Vf based TOF PET imaging using organ specific short axial FOV CT, Girish Bal, Vladimir Panin, Christian Michel, John Young, Curtis Howe, Frank Kehren, Siemens Healthineers (USA). [11312-138]

#### Characterization of a high-resolution dual-ended PET detector, Mohan Li, Shiva Abbaszadeh, Univ. of Illinois (USA). [11312-139]

#### Analysis of a new iodium gallium zinc oxide (IGZO) detector, Steven Freeston, Richard Weisfeldt, Carlo Togna, Varex Imaging Corp. (USA). [11312-140]

#### The effects of X-ray irradiation on a-IGZO TFIs used for active pixel sensor, Shan Yeh, Ya-Hsiang Tai, National Chiao Tung Univ. (Taiwan). [11312-141]

#### Response of GZT pixels to parallel and oblique x rays, Robert J. LeClair, Emily L. McCarthy, Laurentian Univ. (Canada). [11312-142]

#### Extended dynamic range CMOS active pixel architecture for X-ray detectors, Willem H. Maes Sr., Teledyne DALSA (Netherlands). [11312-143]

#### Achieving high resolution in geometrically confined X-ray scatterers, while mitigating inherent signal weakening by maximizing the trapping efficiency of the scintillator–sidewall interface, Nicholas Motlochuk, Brown Univ. (USA); Theodore Morse, NGS Detectors, LLC; Angus Kingon, Brown Univ. (USA); Everett E. Crisman, NGS Detectors, LLC (USA); Rajiv Gupta, Harvard Medical School (USA); Qiu Wei, Xi’an Jiaotong Univ. (China); Paula Chocouta, Halle Pardouv, Lvidia Belms-Wells, Prince Ncube, Brown Univ. (USA); Axel Weber, Univ. of Connecticut (USA); Christian Landis, Brown Univ. (USA). [11312-144]

#### Combined spatial and temporal deep learning for image noise reduction of fluoroscopic x-ray sequences, Chengyang Pu, Zheng Yang, Yan Xu, Neusoft Medical Systems Co., Ltd. (China); Jingyao Yao, Neusoft Medical Systems Co., Ltd. (China). [11312-145]

#### Low-dose CT reconstruction with simultaneous sinogram and image domain denoising by deep neural network, Yongzhou Ge, Jiqiang Zou, Ting Xu, Jianwei Chen, Wei Shi, Dong Liang, Shenzhen Institutes of Advanced Technology (China). [11312-154]

#### Progressive transfer learning strategy for low-dose CT image reconstruction with limited arterial-dose CT, Zhiyu Zhu, Zhiqian Wang, Pengda Yang, Xijun Wang, Southern Medical Univ. (China); Dong Zeng, South China Univ. of Technology (China); Sui Li, Manman Zhu, Lei Wei, Qi Gao, Zhiyuan Bian, Southern Medical Univ. (China); Jianhong Zhang, Zhanyang Fang, Guangzhou Municipality Central Hospital (China); Jinhua Zhang, Jianhua Ma, Southern Medical Univ. (China). [11312-158]

#### Deep neural networks for low-dose CT image reconstruction based on the maximum likelihood learning strategy, Manman Zhu, Sui Li, Danyang Li, Qi Gao, Southern Medical Univ. (China); Shali Zhang, Southern Medical Univ. of Traditional Chinese Medicine (China); Xinyu Zhang, Rikui Lisha Yao, Manman Zhu, Daiyan Li, Qi Gao, Southern Medical Univ. (China); Xinhua Jiang, Zhikui Zhang, Huzhou Municipal Central Hospital (China); Zhaoying Bian, Jianhua Ma, Southern Medical Univ. (China). [11312-162]

#### Dual-energy CT reconstruction using deep mutual-domain knowledge for basis decomposition and denoising, Yongzhou Ge, Yikun Zhang, Ting Su, Jiqiang Zou, Dong Liang, Shenzhen Institutes of Advanced Technology (China); Yang Chen, Southeast Univ. (China). [11312-166]

#### Unsupervised data fidelity enhancement network for low-dose CT reconstruction, Lei Wang, Qi Gao, MingQiang Meng, Sui Li, Mainman Zhu, Nanjing Medical University (China); Deyu Meng, Southern Medical Univ. (China); Dong Zeng, South China Univ. of Technology (China); Lisha Yao, Manman Zhu, Danyang Li, Qi Gao, Southern Medical Univ. (China); Xinhua Jiang, Zhikui Zhang, Huzhou Municipal Central Hospital (China); Zhaoying Bian, Jianhua Ma, Southern Medical Univ. (China). [11312-168]

#### Semi-supervised noise distribution learning for low-dose CT reconstruction, Lei Wang, Qi Gao, MingQiang Meng, Sui Li, Manman Zhu, Danyang Li, Gaofeng Chen, Southern Medical Univ. (China); Dong Zeng, South China Univ. of Technology (China); Qi Xie, Xi’an Jiaotong Univ. (China); Qian Zhao, Xi’an Jiaotong Univ. (China); Zhaoying Bian, Jianhua Ma, Southern Medical Univ. (China). [11312-146]

#### Simultaneous denoising and spatial resolution enhancement using convolutional neural network-based linear model in diagnostic CT images, Dojin Yim, Byunghyo Kim, Seungwan Lee, Yongyu Kong, Univ. of Foreign Studies (Korea, Republic of). [11312-150]

Deep convolutional neural networks for molecular subtyping of gliomas using magnetic resonance imaging, Dong Wei, Tencint (China); Yiming Li, Yinyin Wang, Capital Medical Univ. (China); Tianyi Qian, Tencint (China) and Sinovision Ventures (China); Yefeng Zheng, Tencint (China) .................. [11314-91]

Lesion conditional image generation for improved segmentation of intracranial hemorrhage from CT images using a generator for CTA images CADE Systems (USA) .................. [11314-92]

Feasibility of using recurrent neural networks to predict treatment outcome of intracranial aneurysms using angiographic parameter imaging, Mohammad Mahdi Shiraz Bhurwani, Kyle A Williams, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Mohammad Waqas, Canon Stroke and Vascular Research Ctr. (USA) and Univ. at Buffalo (USA); Ryan A. Rava, Alexander R. Podgurski, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA); Kenneth V. Snyder, Canon Stroke and Vascular Research Ctr. (USA) and University at Buffalo (USA); Laura T. Reggiori, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA) .................. [11314-93]

Retrospective study on computer-aided brain metastasis detection using 3D MR imaging, Eunjin Kim, Gyeong Yeon Yi, Ye Rang Park, Young Jae Kim, Kwang Gi Kim, Gachon Univ. (Korea) .................................. [11314-94]

Deep learning-based brain tumor bed segmentation for dynamic magnetic resonance perfusion imaging, Jiwoong J. Jeong, Yang Lei, Hyunsook Shim, Hui Miao, Tian Liu, Hui-Kuo Shu, Xiaofeng Yang, Emory Univ. (USA) .................. [11314-95]

Prediction of MCI to AD risk of conversion survival models: mlmi vs assessment scores, Jorge Orozco-Sanchez, José Tamez-Peña, Tecnológico de Monterrey (Mexico) .................. [11314-96]

Diagnosis of Parkinson’s Disease with a hybrid feature selection algorithm based on a discrete type II fuzzy classifier using combined region proposal network and V-NET, Yabo Fu, Yang Lei, Tongwei Wang, Xiaojuan Jiang, Tian Liu, Walter J. Currán, Hui-Kuo Shu, Xiaofeng Yang, Emory Univ. (USA) .................. [11314-103]

Computer-assisted quantification of surgical outcome in infants with sagittal craniosynostosis in 3D head CT images using mean normal skull model, Min Jin Lee, Hengong Sun, Seoul Women’s Univ. (Korea) .................. [11314-104]

Using “Lesion-habitat” radiomics to distinguish radiation necrosis from tumor recurrence on post-treatment MRI in metastatic brain tumors, Ramon Corella, Jonathan Chen, Pallavi Tiwari, Case Western Reserve Univ. (USA); Jennifer Yu, Johnathan Zeng, Qiu Lei, Cleveland Clinic (USA) .... [11314-105]

First steps into endoscopic video analysis for Barrett’s cancer detection: challenges and opportunities, Joost van der Putten, Technische Univ. Eindhoven (Netherlands); Jeroen de Groof, Amsterdam UMC (Netherlands); Fons van der Sommen, Technische Univ. Eindhoven (Netherlands); Maarten Struyvenberg, Amsterdam UMC (Netherlands); Svetlana Zinger, Technische Univ. Eindhoven (Netherlands); Erik Schoon, Catharina Hospital (Netherlands); Jacques Bergman, Amsterdam UMC (Netherlands); Peter H. de Witte, Technische Univ. Eindhoven (Netherlands) .................. [11314-93-98]

Deep learning applied to hyperspectral endoscopy for optical coherence tomography, Alexander Gioragio, Univ. of Cambridge (UK) and Cancer Research UK Cambridge Institute, Univ. of Cambridge (UK); Stephen Sanderson, Univ. of Cambridge (UK) and Cancer Research UK Cambridge Institute (UK) .... [11314-107]

A novel multi-classifier system for triaging patients with suspected prostate cancer using 3D convolutional neural networks and volumetric biplanar MRI, Prithi Mehta, Michela Antonelli, Hashim Ahmed, Mark Emberton, Shont Punwani, Univ. College London (UK); Sebastian Ourselin, King’s College London (UK) ............ [11314-100]

Automated localization and segmentation of meningiomas in 3D CT images from 3DSA using deep learning, Tatsadjrat Rand陪伴, Nikhil Palival, Canon Stroke and Vascular Research Ctr. (USA); Prakhar Jaiswal, Muhammad Waqas, Canon Stroke and Vascular Research Ctr. (USA); Adam H. Siddiqui, Delft University of Technology (Netherlands); Ciprian N. Ionita, Univ. at Buffalo (USA) and Canon Stroke and Vascular Research Ctr. (USA) .................. [11314-93]

Visualizing intestines for diagnostic assistance of ileus based on intestinal region segmentation from 3D CT images, Hiroshi Oda, Hiroyuki Hayashi, Nagoya Univ. (Japan); Takayuki Katasaka, Aichi Medical University (Japan); Yoshito Kusumoto, Hokkaido University (Japan); Takayuki Tsuchida, Yuji Kusumoto, Yoshiki Aokage, Genichirou Ishii, National Cancer Ctr. Hospital East (Japan); Kaneko, Tokyo Health Service Association (Japan) .................. [11314-98]

Comparative performance of 3D model-based detection of small polyps in dual-energy CT colonography, Janne J. Näppi, University College London (UK); Hyoungseop Kim, Kyushu Institute of Technology (Japan); Inoue, Nagoya Univ. (Japan); Hyoungseop Kim, Kyushu Institute of Technology (Japan); Janne J. Näppi, University College London (UK); Hyoungseop Kim, Kyushu Institute of Technology (Japan) ....... [11314-109]

Comparative performance of 3D-DepthNet, 3D-ResNet, and 3D-VGG models in polyp detection for CT colonography, Tomoki Uemura, Massachusetts General Hospital (USA) and Harvard Medical School (USA); Tomoki Uemura, Massachusetts General Hospital (USA); Se Hyung Kim, Seoul National Univ. Hospital (Korea, Republic of) and Seoul National Univ. College of Medicine (Korea, Republic of); Hyungseop Kim, Kyushu Institute of Technology (Japan); Hiroshi Yoshida, Massachusetts General Hospital (USA) and Harvard Medical School (USA) .................. [11314-117]

A deep learning based integration of multiple texture patterns from intensity, gradient, and texture GLCM to improve the discrimination between benign polyps, Shu Zhang, Weiqi Cao, Marc Pomeroy, Yongfeng Gao, Stony Brook Univ. (USA); Jiaxiang Tan, The City Univ. of New York (USA); Jian Li, Yuxi Liu, Nanyang Technological University (Singapore); Jian Li, Yuxi Liu, Nanyang Technological University (Singapore) .................. [11314-110]

Deformation robust texture features for polyp classification via CT colonography, Weiqi Cao, Marc J. Pomeroy, Shu Zhang, Stony Brook Univ. (USA); Perry J. Pickhardt, Univ. of Wisconsin-Madison (USA); Hongbing Lu, Fourth Military Medical Univ. (China); Zhenglong Liang, The State Univ. of New York at Stony Brook (USA) .................. [11314-119]

Deformation analysis method for Barrett’s esophagus: a macroscopic view using white light endoscopy based on three-dimensional shape analysis, Wooyeon Lee, Seung Hyeok Jeon, Seungho Lee, Gwangbeen Park, Minsuk Park, Jin-hyung Seo, Sohyun Byun, Hyunho Park, Yoonseok Lee, Nanjing Univ. of Science and Technology (China); Zhongchao Li, Guangyou Chen, Weiqin Song, Shangyou Li, Zhihui Wang, Bengte Y. Zhan, Xingde Li (China); Tianyi Qian, Tencent (China) and Sinovation Ventures (China); Guangyou Chen, Weiqin Song, Shangyou Li, Zhihui Wang, Bengte Y. Zhan, Xingde Li (China)
Evaluating texture-based prostate cancer classification on multi-parametric magnetic resonance imaging and prostate specific membrane antigen positron emission tomography. Ryan Aftano, Sieren Bauman, Western Univ. (Canada); Jonathan Thiessen, Western Univ. (Canada) and Lawson Health Research Institute (Canada); Irina Rachinsky, William Pavlovsky, John Butler, Lawrence Health Research Institute (Canada); Mena Gaed, Madeleine Moussa, Jose Gomez-Lemus, Joseph Chin, Stephen Pautler, Western Univ. (Canada); Aaron Ward, Western Univ. (Canada) and Lawson Health Research Institute (Canada). .............................................................................................................. [11314-120]

Radiomic features derived from peri-prostatic fat on pre-surgical 72M MRI predict extraprostatic extension of prostate cancer identified on post-surgical pathologic exam. Yan Liu, Polina Shadrak, Ruyuan Zuo, Case Western Reserve University (USA); Aam Mahrani. University of Cleveland (USA); Leo Ponizky, Case Western Reserve University (USA); See Harata Timaniu, Radiology (USA); Anant Madabhusi, Case Western Reserve University (USA). .............................................................................................................. [11314-121]

Automatic liver segmentation in abdominal CT images using combined 2D and 3D segmentation networks with high-score shape prior for radiotherapy treatment planning. Julip Jung, Helen Hong, Seoul Women’s Univ. (Korea, Republic of); Taekik Jae, Seoul National Cancer Center (Korea, Republic of); Jinsil Seong, Jin Sung Kim, Yonsei University College of Medicine (Korea, Republic of). .............................................................................................................. [11314-122]

Prediction of prostate cancer aggressiveness using quantitative radiomic features using multi-parametric MRI. Julip Jung, Seoul Women’s Univ. (Korea, Republic of); Helen Hong, Seoul Women’s Univ. (Korea, Republic of); Young-Gi Kim, Sung Il Heung, Hak Jung, Lionel Lee, Seoul National University Bundang Hospital (Korea, Republic of). .............................................................................................................. [11314-123]

Renal parenchyma segmentation in abdominal CT images based on deep convolutional neural networks with similar atlas selection and transformation. Hyunwoong Kim, Helen Hong, Seoul Women’s Univ. (Korea, Republic of); Koon Ho Rha, Yonsei University College of Medicine (Korea, Republic of). .............................................................................................................. [11314-124]


Survival prediction of liver cancer patients from CT images using deep learning and radiomic feature-based regression. Hanaang Lee, KAIST (Korea, Republic of); Helen Hong, Seoul Women’s Univ. (Korea, Republic of); Jinsil Seong, Jin Sung Kim, Yonsei University College of Medicine (Korea, Republic of); Junmo Kim, KAIST (Korea, Republic of). .............................................................................................................. [11314-126]

Usefulness of fine-tuning for deep learning based multi-organ region segmentation method from non-contrast CT volumes using small training dataset. Yuchiro Hayashi, Chen Shen, Holger R. Roth, Masahiro Oda, Nagoya Univ. (Japan); Kazunari Misawa, Aichi Cancer Center. (Japan); Masahiro Jinzaki, Masahiro Hashimoto, Keio University (Japan); Kasuaki K. Kumanuma, Shigeaki Aoki, Juntendo University. (Japan). .............................................................................................................. [11314-136]

Synthesise CT from paired MRI of the same patient with patch-based generative adversarial network, Yan Li, Tuo Sun, Yat-Sen Univ. (China); Jun Wei, Univ. of Michigan (USA); Zhenyu Qi, Ying Sun, Sun Yat-Sen University. CancerCtr. (China). .............................................................................................................. [11314-137]


Multi-modal component subspace similarity based multi-kernel SVM for multi-site classification. Shuang Gao, Institute of Automation (China); Vince D. Calhoun, Tri-institutional Ctr. for Translational Research in Neuroimaging and Data Science (China); Jing Su, Institute of Automation (China). .............................................................................................................. [11314-139]

The efficacy of microaneurysms detection with and without vessel segmentation in color retinal images. Meysam Tavakkoli, Indiana Univ.-Purdue Univ. Indianapolis (USA); Mahdiel Nazar, Shahid Beheshti University of Medical Sciences (Iran, Islamic Republic of); Shokoufeh Shokouhi, Shahid Beheshti University of Medical Sciences (Iran, Islamic Republic of). .............................................................................................................. [11314-140]

Using an attention-based multi-scale fully convolutional network to identify the cup-disc and nerve fiber layer defects for diagnosis glaucoma. Hong Kang, Xiaoyong Li, Beijing Shangdong Medical Letter Technology Co., Ltd. (China); Xia Su, Tianjin Univ. (China). .............................................................................................................. [11314-141]

Benign and malignant thyroid classification using convolutional neural network. Yasumasa Ishikawa, Masashi Honda, Jun Guo, Tazoe Taro, Yang Lei, Tian Liu, Emory University. (USA); Long Jiang Zhang, Nanjing Univ. (China); Xiaofeng Yang, Emory University (USA). .............................................................................................................. [11314-148]

Hyperparameter selection for ResNet classification of malignancy from thyroid ultrasound images. Joseph C., Michigan State Univ. (USA); and Syracuse, New York, USA; and Istituto Superconduttori, Materiali Innovativi e Dispositivi (Italy); Michele Cea, Univ. degli Studi di Genova (Italy). .............................................................................................................. [11314-149]

Detecting age-related macular degeneration (AMD) biomarker images using MFCC and texture features, Yiyang Wang, Xufan Ma, Rob Wedell, DePaul University (USA); Aam Okembo, Univ. of Pennsylvania USA; and David Rein, Duke Univ. (USA); Amani A. Fawzi, Northwestern Univ. (USA); Jacob Furst, Daniela Raicu, DePaul Univ. (USA). .............................................................................................................. [11314-150]

Computer-aided detection of benign from precancerous and cancerous oral lesions based on multispectral autofluorescence lifetime endoscopy. Elvis Duran, Shuna Cheng, Rodrigo Cuenceta, John Wright, Y.S. Lisa Cheng, Texas A&M Univ. (USA); Beena Ahmed, Ahmed J., Texas A&M Univ. at Qatar (Qatar); Javier A. Jo, The Univ. of Oklahoma (USA). .............................................................................................................. [11314-151]
Poster session dates, locations, and times

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<td>Sunday, 16 February after 12:00 PM (noon)*</td>
<td>Texan Ballroom, 4th Floor - Salon D</td>
<td>Monday, 5:30 PM - 7:00 PM</td>
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<td>Wednesday</td>
<td>11313; 11316; 11317; 11320</td>
<td>Tuesday, 18 February after 9:30 AM*</td>
<td>Texan Ballroom, 4th Floor - Salon D</td>
<td>Wednesday, 5:30 PM - 7:00 PM</td>
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*In order to be fully considered for a Poster Award, it is recommended to have your poster up as soon as possible. Posters should remain on display until the end of the Poster Session on either Monday or Wednesday.
8:00 am: Patient-informed modelling of hepatic and aortic contrast dynamics in contrast-enhanced CT imaging, Hananiel Setawwan, Duke Univ. Medical Physics Graduate Program (USA); Ehsan Abadi, Wangi Fu, Francesco R, Duke Univ. (USA); Taylor B. Smith, Duke Univ. Medical Physics Graduate Program (USA); Ehsan Samei, Duke Univ. (USA) . . . . [11312-40]

8:20 am: Contrast flow velocity quantification in pediatric cardiac with CMR: a novel method of CT angiography: a phantom study, Pieter Boonen, Vrije Univ. Brussels (Belgium) . . . . [11312-41]

8:40 am: Power injector for angiographic flow analysis using custom contrast density profiles, Erick L. Obester, Sarvesh Perijesaya, Paul F. Larasie, Michael A. Speidel, Univ. of Wisconsin-Madison (USA) . . . . [11312-42]

9:00 am: Simulation of contrast agent dynamics in digital brain phantom for CT perfusion optimization, Sarah E. Divel, Stanford Univ. (USA); Soren Christiansen, Maarten G. Lansberg, Stanford Univ. School of Medicine (USA); Norbert J. Pelc, Stanford Univ. (USA) . . . . [11312-43]

9:20 am: Combining spectral CT acquisition methods with high-sensitivity material decomposition, Matthew Timan, Wenying Wang, Grace J. Gang, Elieni Liapi, Johns Hopkins Univ. (USA); Peter B. Noell, Univ. of Pennsylvania (USA); Joseph W Staman, Johns Hopkins Univ. (USA) . . . . [11312-44]

9:40 am: Assessment of protein beam ablation in myocardial infarct tissue using delayed contrast-enhanced magnetic resonance imaging, Maryam E. Roettmann, Stefano Hohmann, Amanda Dawan, Heiko Konsnith, Jan Kruse, Laura Newman, Kay Parker, Michael Herman, Douglas Packer, Mayo Clinic (USA) . . . . [11313-36]

9:40 am: Imaging Analysis in Ultrasound and OCT

Joint Session with Conferences 11313 and 11319

8:00 am: Deep learning-based breast tumor detection and segmentation in 3D ultrasound image, Yang Lei, Emory Univ. (USA); Jinchao Yao, Zhejiang Cancer Hospital (China); Xiaohu He, Emory Univ. (USA); Dong Xu, Zhejiang Cancer Hospital (China); Walter J. Curran, Tian Liu, Xiaofeng Yang, Emory Univ. (USA) . . . . [11313-39]

8:20 am: Architectural distortion detection approach guided by mammmary gland spatial pattern in digital breast tomosynthesis, Yue Li, Zheng Xie, Yun Sat-Yen-Sun Univ. (China); Zizong He, Nanfang Hospital of the Southern Medical Univ. (China); Xiangyuan Ma, Sun Sat-Yen-Sun Univ. (China); Yanhui Guo, Univ. of Illinois at Springfield (USA); Weiguo Chen, Perinatal Hospital of the Southern Medical Univ. (China); Yao Lu, Sun Sat-Yen-Sun Univ. (China) . . . . [11313-40]

8:40 am: Image guided minivalve mitral valve replacement: registration of 3D ultrasound and 2D x-ray images, James D. Dormer, M.D. Ibarz Iblanuny, The Univ. of Texas at Dallas (USA); Nahian Rahman, Nancy Detroute, George Institute of Technology (USA); Jan Sheng, Univ. of California, Riverside (USA); Murzidhali Padala, Emory Univ. (USA); Jaydev P. Desai, George Institute of Technology (USA); Jun Bo, Sun, Taygun Kekec, Adriaan Moelker, Wiro Rens, Schiphol Airport, The Netherlands . . . . [11313-35]

9:00 am: Minimizing cancer retention in neurological procedures: which imaging modality can help?, Raphael Bechtold, Niki Tsapilisgaard, Zachary Buono, Benjamin Garlow, James Pitingolo, Daniel S. Duncan, Ultrasound and OCT Image Analysis in Conference 11319

SESSION 1

ROOM: RIVER OAKS
Tuesday–Wednesday 18–19 Feb. 2020 Proceedings of SPIE Vol. 11317

9:40 am: Graph embedding methods for InSAR classification and brain functional detection, Xiaoxiao Li, Nica C. Dvornek, Juntang Zhuang, Pamela Ventola, James Duncan, Yale Univ. (USA) . . . . [11317-1]

8:20 am: Classification of Attention-Deficit/Hyperactivity Disorder from resting-state functional MRI with multi-modality connectivity analysis, Seyed Samardak, John J. Fox, Xiaolu Li, Mingzhi He, Hongming Li, Minming Li, Shuang Jiang, Xiuxiu He, Emory Univ. (USA) . . . . [11317-39]

8:40 am: Unsupervised motion tracking of left ventricle in echocardiography, Shawn Ahn, Kevinminh Ta, Yale Univ. (USA) . . . . [11317-36]

8:00 am: Deep learning-based breast tumor detection and segmentation in 3D ultrasound image, Yang Lei, Emory Univ. (USA); Jinchao Yao, Zhejiang Cancer Hospital (China); Xiaohu He, Emory Univ. (USA); Dong Xu, Zhejiang Cancer Hospital (China); Walter J. Curran, Tian Liu, Xiaofeng Yang, Emory Univ. (USA) . . . . [11317-39]

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8:20 am: Unsupervised motion tracking of left ventricle in echocardiography, Shawn Ahn, Kevinminh Ta, Yale Univ. (USA) . . . . [11317-36]

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**TUESDAY 18 FEBRUARY**

| CONFERENCE 11312 | ROOM: SALON A  
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| Sunday–Wednesday 16–19 Feb. 2020  
| Proceedings of SPIE Vol. 11312  
| ROOM: SALON B  
| Monday–Thursday 17–20 Feb. 2020  
| Proceedings of SPIE Vol. 11313  
| ROOM: SALON C  
| Monday–Thursday 17–20 Feb. 2020  
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| ROOM: HUNTERS CREEK  
| Sunday–Wednesday 16–19 Feb. 2020  
| Proceedings of SPIE Vol. 11314  
| ROOM: RIVER OAKS  
| Tuesday–Thursday 18–20 Feb. 2020  
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### SESSION 9

**ROOM: SALON A**

**TUE 10:10 AM TO 12:10 PM**

| Lesions and Pathologies  
| Lesion prediction and classification in CT images  
| Zhiqiang Chen, Li Zhang, Hewei Gao, Chengpeng Wu, Xinbin Li, Chen, Univ. of Wisconsin School of Medicine and  
| Ran Zhang, Ke Li, Guang-Hong  

### SESSION 10

**ROOM: SALON C**

**TUE 10:10 AM TO 12:10 PM**

| Chest II: Lymph Nodes  
| 10:10 am: Automated detection and segmentation of mediastinal and axillary lymph nodes from CT using foveal fully convolutional networks, Tobias Klinker, Rafael Wiemker, Heike Carolus, Tom Brosch, Philips Research (Germany); Andra-Ita Iuga, Anna Höink, David Maintz, Michael Pusken, Univ. zu Köln (Germany); Frank Theile, Philips Healthcare (Germany).  
| 10:30 am: Feasibility of end-to-end trainable two-stage Li-net for detection of axillary lymph nodes in Contrast-Enhanced HT based on sparse annotations, Hidr Cem Altun, Fraunhofer-Institut für Digitale Medizin (Germany) and Jacobu Univ. Bremen (Germany); Gregor Stöhr, Fraunhofer-Institut für Digitale Medizin (Germany) and Radboud Univ. Medical Ctr. (Netherlands); Colin Jacobs, Radboud Univ. Medical Ctr. (Netherlands); Hans Meine, Fraunhofer-Institut für Digitale Medizin (Germany) and Univ. Bremen (Germany); Brand van Ginneken, Radboud Univ. Medical Ctr. (Netherlands); and Fraunhofer-Institut für Digitale Medizin (Germany); Neith K. Hahn, Fraunhofer-Institut für Digitale Medizin (Germany) (11314-45).  

### SESSION 11

**ROOM: HUNTERS CREEK**

**TUE 10:10 AM TO 12:10 PM**

| Video and Optical Methods for Imaging  
| Video and Optical Methods for Imaging  
| Session Chairs: William E. Higgins, The Pennsylvania State Univ. (USA); Ryan J. Halter, Thayer School of Engineering at Dartmouth (USA).  
| 10:10 am: Automatic A-line coronary plaque characterization using combined convolutional and textural features in intravascular OCT images, Juhan Lee, Chaithanya Kolluru, Yacazan Gharabeh, David Pradhan, Case Western Reserve Univ. (USA); Wadadie N. Zimin, Hiram G. Bezerra, Harrington Heart and Vascular Institute, Univ. Hospitals Cleveland Medical Ctr. (USA); David L. Wilson, Case Western Reserve Univ. (USA) (11315-38).  
| 10:30 am: Motion induced segmentation of stone fragments in ureteroscopy video, Soumya Gupta, Univ. of Oxford (UK) (11315-39).  
| 10:50 am: Evaluation of real-time guidewire navigation using virtual endoscopic 4D fluoroscopy, Brian J. Davis, Martin G. Wagner, Sarvesh Penyasamy, Charles A. Mistretta, Charles M. Strother, Paul F. Laeske, Michael A. Speidel, Univ. of Wisconsin-Madison (USA) (11315-40).  
| 11:10 am: Towards portable image guidance and automatic patient registration using an RGB-D camera and video projector, Cotton A. Barr, Andras Lasso, Mark Asselin, Lab. for Percutaneous Surgery, Queen’s Univ. (Canada); Steve Pieper, Isomics, Inc. (USA); Faith C. Robertson, Brigham and Women’s Hospital Medical School (USA); William A. Gormley, Brigham and Women’s Hospital (USA); Gabor Fichtinger, Lab. for Percutaneous Surgery, Queen’s Univ. (Canada) (11315-41).  
| 11:30 am: Open source platform for automated collection of training data to support video-based feedback in surgical simulators, Jacob Lafraimbois, Tamás Ungi, Kyle Sunderland, Lab. for Percutaneous Surgery, Queen’s Univ. (Canada); Boris Zvon, Queen’s Univ. (Canada); Gabor Fichtinger, Lab. for Percutaneous Surgery, Queen’s Univ. (Canada) (11315-42).  

### SESSION 2

**ROOM: RIVER OAKS**

**TUE 10:10 AM TO 12:10 PM**

| Keynote  
| Session Chairs: Barjor Gimi, Rowan Univ. (USA); Andraž Krol, SUNY Upstate Medical Univ. (USA).  
| 10:10 am: Label-free molecular imaging with spins: a path to high resolution through learned subspaces (Keynote Presentation), Zhi-Pei Liang, Univ. of Illinois (USA) (11317-6).  
| 11:10 am: Artificial intelligence in radiology: from machine learning to clinical application (Invited Paper), Alex Wissmuller, Univ. of Rochester Medical Ctr. (USA) (11317-7).  

**CONFERENCE 11312 continued page 46**

**CONF. 11313 continued page 46**

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**TUESDAY 18 FEBRUARY**

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**SESSION 11 CONTINUED**

11:50 am: Improved visual SLAM for bronchoscope tracking and registration with pre-operative CT images. Cheng Wang, Masahiro Oda, Yuichiro Hayashi, Nagoya Univ. (Japan); Takayuki Kitasaka, Aichi Institute of Technology (Japan); Hiroshi Horima, Sapporo Kosei Hospital (Japan); Hiroshi Takahashi, Minami Sanyo Hospital (Japan); Masaki Mori, Sapporo Kosei Hospital (Japan); Hiroshi Natori, Nishinose Hospital (Japan); Kensaku Mori, Nagoya Univ. (Japan). 

Lunch Break... 

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**WORKSHOP**

**Simulated Tumor Board: Brain and Breast**

*Workshop Chair: Kristy Brock, PhD, DABR, FAAPM Professor, Department of Imaging Physics and Department of Radiation Physics, Univ. of Texas MD Anderson Cancer Center (USA)*
**TUESDAY 18 FEBRUARY**

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**SESSION 10**
ROOM: SALON A  
**TUE 1:20 PM TO 3:00 PM**

**Photon Counting CT Applications**

Session Chairs: Lifeng Yu, Mayo Clinic (USA); Thomas Flor, Siemens Healthineers (Germany)

1:20 pm: Spectral CT metal artifact reduction using weighted masking and a ‘One Step’ direct inversion reconstruction algorithm. Taly Gilat Schmidt, Marquette Univ. (USA); Rina F. Barber, Emil Y. Sidky, The Univ. of Chicago (USA) .................................................. [11312-51]

1:40 pm: Bone density quantification via material decomposition in arthritic mouse model using a photon counting spectral CT. Nathaniel R. Reddette, Min Dai, Univ. of Houston (USA) .......................... [11312-52]

2:00 pm: Photon-counting CT reconstruction with a series expansion method. Mats U. Persson, KTH Royal Institute of Technology (Sweden); Lin Fu, Peter M. Edic, Bruno De Man, GE Global Research (USA) .................................................. [11312-53]

2:20 pm: Development of a spectral micro-CT system using a photon counting detector with anti-coincidence corrections. Matthew D. Holtbrook, Darrin P. Clark, Cristian T. Badesa, Duke Univ. School of Medicine (USA) .................................................. [11312-54]

2:40 pm: Impact of photon counting detector spectral distortion on virtual non-contrast CT imaging. Mang Fung, Xu Ji, Ran Zhang, Guang-Hong Chen, Ke Li, Univ. of Wisconsin-Madison (USA) .................................................. [11312-55]

Coffee Break ........................................... Tue 3:00 pm to 3:30 pm

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**SESSION 4**
ROOM: SALON C  
**TUE 1:20 PM TO 3:00 PM**

**Machine Learning and Deep Learning**

1:20 pm: Estimation of four-dimensional CT-based imaging biomarker of liver fibrosis using finite element method. Koya Fujimoto, Takehiro Shinokori, Yuki Yuasa, Yamaguchi Univ. (Japan) .................................................. [11313-18]

1:40 pm: Multilevel survival analysis with structured penalties for imaging genetics data. Pascal Lu, Olivier Collot, Institut du Cerveau et de la Moelle Épinière (France) .................................................. [11313-19]

2:00 pm: Generalizing deep whole brain segmentation for pediatric and post-contrast MRI with augmented transfer learning. Camilo Bermudez, Justin Blaber, Vanderbilt Univ. (USA); Samuel W. Remedios, Henry M. Jackson Foundation (USA); Jess E. Reynolds, Catherine Lefebre, Univ. of Calgary (Canada); Maureen McHugo, Stephan Heckers, Vanderbilt Univ. Medical Ctr. (USA); Yuankai Hu, Bennett A. Landman, Vanderbilt Univ. (USA) ......................... [11313-20]

2:20 pm: Deep learning and multi-contrast based denoising for low-SNR Arterial Spin Labeling (ASL) MRI. Enhao Gong, Subtle Medical, Inc. (USA); Jie Deng, Rush Univ. Medical Ctr. (USA) .................................................. [11313-21]

2:40 pm: Motion artifact reduction in brain Magnetic Resonance Imaging (MRI) by means of a Dense Residual Network with K-space Blending (DRN-KB). Junchi Liu, Illinois Institute of Technology (USA); Jie Deng, Rush Univ. Medical Ctr. (USA) .................................................. [11313-22]

Coffee Break ........................................... Tue 3:00 pm to 3:30 pm

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**SESSION 10**
ROOM: SALON B  
**TUE 1:20 PM TO 3:00 PM**

**Keynote and Methodology**

1:20 pm: Keynote – To be determined  
(Keynote Presentation) .................................................. [11314-50]

2:20 pm: Weakly-supervised lesion segmentation on CT scans using co-segmentation. Vatsal Agarwal, National Institutes of Health (USA) and Univ. of Maryland, College Park (USA); Youbao Tang, National Institutes of Health (USA); Jing Xiao, China Ping An Insurance (Group) Co., Ltd. (China); Ronald M. Summers, National Institutes of Health (USA) .................................................. [11314-51]

2:40 pm: Explainable AI for medical imaging: deep-learning CNN ensemble for classification of estrogen receptor status from breast MRI. Zachary Papastavrou, Ravi K. Samala, Heang-Ping Chan, Lubomir Hadjiiski, Chintana Paramagul, Mark A. Helvie M.D., Coleen H. Neal M.D., Univ. of Michigan (USA) .................................................. [11314-52]

Coffee Break ........................................... Tue 3:00 pm to 3:30 pm

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**SESSION 12**
ROOM: HUNTERS CREEK  
**TUE 1:20 PM TO 3:00 PM**

**Robot-assisted Image-guided Therapy**

Session Chairs: Gabor Fichtinger, Lab. for Percutaneous Surgery (Canada); Shuo Li, Western Univ. (Canada)

1:20 pm: Robotic tissue scanning with biophotonic probe. Lauren Yates, Laura Connolly, Ammon Jamzad, Mark Asselin, Rachel Rubin, Scott S. Yam, Tamas Ungi, Andras Lasso, Christopher Nicol, Parvin Mousavi, Gabor Fichtinger, Queen’s Univ. (Canada) .................................................. [11315-44]

1:40 pm: Image-guided robotic K-Wire placement for orthopaedic trauma surgery. Rohan C. Vijayan, Runze Han, Pengwei Wu, Niral M. Sheth, Michael D. Ketcha, Prasad Vagdargi, Johns Hopkins Univ. (USA); Sebastian Vogt, Gerhard Kleinzing, Siemens Healthineers (Germany); Greg M. Osgood, Johns Hopkins Medicine (USA); Jeffrey H. Sieversdien, Ali Uneri, Johns Hopkins Univ. (USA) .................................................. [11315-45]

2:00 pm: A novel mechatronic guidance system for integrated positron emission mammography ultrasonound-guided breast biopsy. Claire K. Park, Zachary Pennington, Erick Westbroek, Bowen Jiang, Johns Hopkins Univ. (USA); Guiliang Ying, Rongrong Chai, Yu Shrike Zhang, Harvard Medical School (USA); Ian Suk, Nicholas Theodore, Johns Hopkins Univ. (USA) .................................................. [11315-46]

2:20 pm: Deep learning of volumetric 3D CNN for fMRI in Alzheimer’s disease classification. Harshit S. Parmar, Brian Nutter, Sunanda Mitra, Texas Tech University Health Sciences Center (USA); Mehran Armand, Johns Hopkins Univ. (USA); Rodney Long, U.S. National Library of Medicine, National Institutes of Health (USA); Sameer Antani, U.S. National Library of Medicine (USA) .................................................. [11315-11]

2:40 pm: How to meet the 10 ps Coincidence Timing Resolution PET challenge. Eric S. Harmon, LightSpin Technologies, Inc. (USA); Andrzzej Krol, SUNY Upstate Medical University (USA); Michael O. Thompson, Cornell Univ. (USA); Charles Ross, Schmidelt, Memorial Sloan-Kettering Cancer Ctr. (USA); James N. Turner, Binghamton Univ. (USA) .................................................. [11315-12]

Coffee Break ........................................... Tue 3:00 pm to 3:30 pm

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**SESSION 3**
ROOM: RIVER OAKS  
**TUE 1:20 PM TO 3:00 PM**

**Neurological Imaging II**

Session Chairs: Barjor Gimi, Rowan Univ. (USA); Nicholas J. Tustison, Univ. of Virginia (USA)

1:20 pm: Identification of dementia subtypes based on a diffusion MRI multi-model approach. Rajkha Raja, Georgia State Univ. (USA); Arvind Caprithan, The Mind Research Network (USA); Gary Rosenberg, The Univ. of New Mexico Health Sciences Ctr. (USA); Vince D. Calhoun, Georgia State Univ. (USA) .................................................. [11317-8]

1:40 pm: A graph deep learning model for the classification of groups with different IQ using resting state fMRI. Gang Gu, Wenxing Li, Hu Xiao, Yu-Ping Wang, Tulane Univ. (USA) .................................................. [11317-9]

2:00 pm: Intraoperative ultrasound to monitor spinal cord blood flow after spinal cord injury. Amir Manbachi, Sandeep Kambhampton, Ana M. Anechi, Smuth Mahapatra, Micah Belzberg, Zach Pennington, Erick Westbroek, Bowen Jiang, Johns Hopkins Univ. (USA); Guiliang Ying, Rongrong Chai, Yu Shrike Zhang, Harvard Medical School (USA); Ian Suk, Nicholas Theodore, Johns Hopkins Univ. (USA) .................................................. [11317-10]

2:20 pm: Deep learning of volumetric 3D CNN for fMRI in Alzheimer’s disease classification. Harshit S. Parmar, Brian Nutter, Sunanda Mitra, Texas Tech University Health Sciences Center (USA); Mehran Armand, Johns Hopkins Univ. (USA); Rodney Long, U.S. National Library of Medicine, National Institutes of Health (USA); Sameer Antani, U.S. National Library of Medicine (USA) .................................................. [11317-11]

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Coffee Break ........................................... Tue 3:00 pm to 3:30 pm

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CBCT Reconstruction Techniques

Session Chairs: Adam M. Alessio, Michigan State Univ. (USA); Adam S. Wang, Stanford Univ. School of Medicine (USA)

3:30 pm: High temporal resolution time-resolved C-arm cone-beam CT imaging using a multi-sweep data acquisition scheme. Yinheng Li, John W. Garrett, Ke Li, Charles Strother, Guang-Hong Chen, Univ. of Wisconsin-Madison (USA) .................................................. [11312-56]

3:50 pm: Deep learning-aided CBCT image reconstruction of interventional material from four x-ray projections. Elias Elsig, Deutsches Krebsforschungszentrum (Germany) and Stanford Univ. (USA); Joscha Maier, Deutsches Krebsforschungszentrum (Germany); N. Robert Bennett, Stanford Univ. School of Medicine (USA); Michael Kraupa, Deutsches Krebsforschungszentrum (Germany); Klaus Hörndler, Ziehm Imaging GmbH (Germany); Adam S. Wang, Stanford Univ. School of Medicine (USA); Joscha Maier, Deutsches Krebsforschungszentrum (Germany) and Stanford Univ. School of Medicine (USA) .................. [11313-56]
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<td>Spectral CT New Hardware</td>
<td>Session Chairs: John M. Sabol, GE Healthcare (USA); Hee-Joung Kim, Yonsei Univ. (Korea, Republic of)</td>
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<td>8:20 am:</td>
<td>Dual-layer x-ray detector simulation, Klaus-Jürgen Engel, Bernd Monser, Walter Ruttmann, Matthias Simon, Koninklijke Philips Electronics N.V. (Netherlands); Axel Trän, Philips GmbH (Germany). ([11312-60])</td>
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<td>8:40 am:</td>
<td>Benefit of dual energy CT for lesion localization and classification with convolutional neural networks, Nadav Shapira, Univ. of Pennsylvania (USA); Julia Fokuti, Manuel Schultefellner, Stefanie Beik, Felix K. Kopp, Daniela Pfeffer, Julia Dangelmaier, Technische Univ. München (Germany); Gregor Pan, Philips Healthcare (Netherlands); Andreas Sauter, Bernhard Rengier, Alexander A. Fingerle, Technische Univ. München (Germany); Andrew D. A. Maidment, Univ. of Pennsylvania (USA); Ernst J. Rummney, Shad Aabarpour, Nasser Navab, Technische Univ. München (Germany); Peter B. Nold, Univ. of Pennsylvania (USA). ([11312-62])</td>
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<td>9:20 am:</td>
<td>Multi-energy CT with triple X-ray beams: a feasibility animal study, Liqiang Ren, Kishore Rajendran, Joel Fletcher, Mayo Clinic (USA); Thomas Alamendinger, Ahmed Halaweise, Bernhard Schmid, Thomas Flot, Siemens Healthineers (Germany); Cynthia McCollough, Lifeng Yu, Mayo Clinic (USA). ([11312-63])</td>
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<th>SESSION 2</th>
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<tr>
<td>fMRI and DTI</td>
<td>8:00 am:</td>
<td>Deep learning estimation of multi-tissue constrained spherical deconvolution with limited single shell DW-MRI, Vishwesh Nath, Vanderbilt Univ. (USA); Sudhir K. Pathak, Pathak, Univ. of Pittsburgh (USA); Kurt G. Schilling, Vanderbilt Univ. (USA); Walter Schneider, Univ. of Pittsburgh (USA); Bennett A. Landman, Vanderbilt Univ. (USA). ([11313-27])</td>
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<td>8:20 am:</td>
<td>Anatomically-informed data augmentation for functional MRI with applications to deep learning, Kevin P. Nguyen, Cherise Chin Fatt, Alex Treacher, Cooper Mellema, Madhukar H. Trivedi, Albert Montillo, The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA). ([11313-28])</td>
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<td>9:00 am:</td>
<td>Neural effect induced by exercise intervention can be categorized by altered functional connectivity in early psychotic patients, Xiaojuan Geng, The Chinese Univ. of Hong Kong (China); Peilun Song, Zhenzhuang Univ. (China); Eric Y. H. Chen, The Univ. of Hong Kong (China); Yaping Wang, Zhenzhuang Univ. (China); Jingxing Lin, The Univ. of Hong Kong (China). ([11313-29])</td>
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<td>9:40 am:</td>
<td>Brain entropy features for predicting behavioral measures from fMRI, Shengchao Zhang, Catie Chang, Matthew A. Lewis, Ananth J. Viswanath, Case Western Reserve Univ. (USA). ([11313-30])</td>
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<td>9:20 am:</td>
<td>Numerical DWI phantoms to optimize accuracy and precision of quantitative parametric maps for non-Gaussian diffusion, Dariya Malyarenko, Robert H. Vannier, Southwestern Medical Ctr. at Dallas (USA); Jayaram K. Udupa, Yubing Tong, Penn Medicine (USA). ([11313-31])</td>
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<tr>
<th>SESSION 3</th>
<th>ROOM: SALON B</th>
<th>Wed. 8:00 am to 9:40 am</th>
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<tbody>
<tr>
<td>Novel Applications</td>
<td>8:00 am:</td>
<td>Attention-guided classification of abnormalities in semi-structured Computed Tomography reports, Koryrynna Faryna, Univ. de Girona (Spain) and Univ. de Bourgogne (France) and Univ. degli Studi di Cassino e del Lazio Meridionale (Italy); Fakrul I. Tashir, Rui Hou, Carl E. Ravin Advanced Imaging Labs., Duke Univ. Medical Ctr. (USA); Geoffrey D. Rubin M.D., Duke Univ. School of Medicine (USA); Joseph Y. Lo, Carl E. Ravin Advanced Imaging Labs., Duke Univ. Medical Ctr. (USA). ([11314-57])</td>
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<tr>
<td>8:20 am:</td>
<td>Cascading YOLD: automated malaria parasite detection for plasmodium vivax in thin blood smears, Feng Yang, Nicolas Guzon, National Institutes of Health (USA); Kamrolat Silanat, Richard Maude, Mahbod Uni, (Thailand); Stefan Jaeger, Sameer Antoni, Lister Hill National Ctr. for Biomedical Communications, U.S. National Library of Medicine (USA). ([11314-58])</td>
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<tr>
<td>9:00 am:</td>
<td>Segmentation of uterine and placenta in MR images using a fully convolutional neural network, Mayasam Shahedi, James D. Dormer, Anusha Devi Tenigera Rang Tanha Kanti, The Univ. of Texas at Dallas (USA); Quyen N. O. Tran, Matthew A. Lewis, Ananth J. Viswanath, University of Chicago (USA). ([11314-59])</td>
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<tr>
<td>9:40 am:</td>
<td>How well do U-Net-based segmentation trained on adult cardiac magnetic resonance imaging data generalize to rare congenital heart diseases for surgical planning?, Sven Koehler, Hochschule Mannheim (Germany); Animesh Tandon, Tarique Hussain, The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA); Heiner Latus, Deutsches Herzszentrums Hamburg (Germany); Thomas Pickardt, Kompetenznetz Anorganierte Herzfehler (Germany); Samir Sarkouch, Kompetenznetz Anorganierte Herzfehler (Germany) and Medizinische Hochschule Hannover (Germany); Philipp Beerbaum, Medizinische Hochschule Hannover (Germany). ([11314-60])</td>
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<tr>
<td>9:20 am:</td>
<td>Textural fiducial detection in breast conserving surgery for a near-real-time image guidance system, Winona L. Richey, Jon S. Heiselman, Ma Luo, Vanderbilt Univ. (USA); Ingrid M. Meszoly, Vanderbilt Univ. Medical Ctr. (USA); Michael J. Miga, Vanderbilt Univ. (USA). ([11314-65])</td>
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<th>SESSION 4</th>
<th>ROOM: HUNTERS CREEK</th>
<th>Wed. 8:00 am to 9:40 am</th>
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<tbody>
<tr>
<td>AI-based Image Segmentation and Feature Detection</td>
<td>8:00 am:</td>
<td>CNN-based hierarchical coarse-to-fine segmentation of pelvic CT images for prostate cancer radiotherapy, Sharmin Sultana, Adam Robinson, Daniel Y. Song, Junghoon Lee, The Johns Hopkins Univ. School of Medicine (USA). ([11315-53])</td>
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<td>8:20 am:</td>
<td>CondenseNet: a memory-efficient condensely-connected architecture for bi-ventricular blood pool and myocardium segmentation, S. M. Kamrul Hasan, Cristian A. Little, Rochester Institute of Technology (USA). ([11315-54])</td>
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<th>SESSION 5</th>
<th>ROOM: BRIARGROVE</th>
<th>Wed. 8:00 am to 9:40 am</th>
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<tbody>
<tr>
<td>Innovations in Image Processing</td>
<td>8:00 am:</td>
<td>Towards understanding perception in the latest era of AI in medical imaging (Keynote Presentation), Maryellen L. Giger, The Univ. of Chicago (USA). ([11316-1])</td>
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<td>9:00 am:</td>
<td>Observers, artificial intelligence, and genuine ignorance (Invited Paper), Harold L. Kundel, Univ. of Pennsylvania (USA). ([11316-2])</td>
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<tr>
<th>SESSION 6</th>
<th>ROOM: SALON C</th>
<th>Wed. 8:00 am to 9:40 am</th>
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<tr>
<td>Al-based Image Segmentation and Feature Detection</td>
<td>8:00 am:</td>
<td>Attention-guided classification of abnormalities in semi-structured Computed Tomography reports, Koryrynna Faryna, Univ. de Girona (Spain) and Univ. de Bourgogne (France) and Univ. degli Studi di Cassino e del Lazio Meridionale (Italy); Fakrul I. Tashir, Rui Hou, Carl E. Ravin Advanced Imaging Labs., Duke Univ. Medical Ctr. (USA); Geoffrey D. Rubin M.D., Duke Univ. School of Medicine (USA); Joseph Y. Lo, Carl E. Ravin Advanced Imaging Labs., Duke Univ. Medical Ctr. (USA). ([11314-57])</td>
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<td>Textural fiducial detection in breast conserving surgery for a near-real-time image guidance system, Winona L. Richey, Jon S. Heiselman, Ma Luo, Vanderbilt Univ. (USA); Ingrid M. Meszoly, Vanderbilt Univ. Medical Ctr. (USA); Michael J. Miga, Vanderbilt Univ. (USA). ([11314-65])</td>
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SESSION 12 CONTINUED
9:20 am: Accurate proton stopping power images reconstructed using joint statistical dual energy CT: experimental verification and impact of scatter, Maria Jose Medrano Matamoros, Tyler Webb, Washington Univ. in St. Louis (USA); Mariela Porras-Chaverri, Univ. de Costa Rica (Costa Rica); Ruirui Liu, Tianyu Zhao, David G. Politte, Jeffrey F. Williamson, Washington Univ. in St. Louis (USA); Bruce R. Whiting, Univ. of Pittsburgh (USA); Joseph A. O’Sullivan, Washington Univ. in St. Louis (USA). [11312-64]
Coffee Break. Wed 9:40 am to 10:10 am

SESSION 12 CONTINUED
Coffee Break. Wed 9:40 am to 10:10 am

SESSION 14 CONTINUED
9:20 am: A deep learning approach for surgical instruments detection in Orthopaedic surgery using transfer learning, Belayat Hossain, Shoichi Nishio, Univ. of Hyogo (Japan); Hiranaka Takafumio, Takatsuki General Hospital (Japan); Syoji Kobashi, Univ. of Hyogo (Japan). [11315-57]
Coffee Break. Wed 9:40 am to 10:10 am

SESSION 5 CONTINUED
Coffee Break. Wed 9:40 am to 10:10 am

Sarvesh Periyasamy, Luis A. Torres, Paul Joseph F. Whitehead, Ethan P. Nikolau, Simulation of hepatic arteries

Kian Shaker, fluorescence tomography Carlo simulations of small-animal X-ray

SESSION 13 CONTINUED
11:50 am: Prognostic power of the human psoas muscles FDG metabolism in amyotrophic lateral sclerosis, Rita Lai, Istituto Superconduttori, Materiali Innovativi e Dispositivi (Italy); Daniela Schenone, Univ. degli Studi di Genova (Italy); Gianmario Sambuceti, Univ. degli Studi di Genova (Italy) and IRCCS Ospedale Policlinico San Martino Genova (Italy); Anna Maria Maesone, Istituto Superconduttori, Materiali Innovativi e Dispositivi (Italy) and Univ. degli Studi di Genova (Italy); Michele Piana, Univ. degli Studi di Genova (Italy) and Istituto Superconduttori, Materiali Innovativi e Dispositivi, Consiglio Nazionale delle Ricerche (Italy); Adriano Chi, ALS Ctr. Rita Levi Montalcini, Univ. degli Studi di Torino (Italy) and AOU Città della Salute e della Scienza Torino (Italy); Claudia Caponnetto, ALS Ctr. Rita Levi Montalcini, Univ. degli Studi di Torino (Italy); Angelina Cistaro, PET Ctr., IRMET SpA Affidea Torino (Italy); Matteo Bauckneht, Vanessa Costi, Univ. degli Studi di Genova (Italy); Silvia Morbelli, IRCCS Ospedale Policlinico San Martino (Italy) and IRCCS Ospedale Policlinico San Martino San Martino (Italy). .......................... [11314-67]

Lunch Break . . . Wed 12:10 pm to 1:20 pm

SESSION 2 CONTINUED
11:50 am: Using “Reader Disagreement Index” as a predictive reviewer performance monitoring tool for timely intervention, Manish Sharma, PAREXEL International Corp. (India); J. Michael O'Connor, PAREXEL International Corp. (USA) and Univ. of Massachusetts Lowell (USA); Anitha Singareddy, PAREXEL International Corp. (USA) and Univ. of Massachusetts Lowell (USA); Sayali Karve, Nicholas Enus, PAREXEL International Corp. (USA); Kassel Fotinos-Hoyer, PAREXEL International GmbH (Germany); Yibin Shao, PAREXEL China Co., Ltd. (China). .......................... [11316-8]

Lunch Break . . . Wed 12:10 pm to 1:20 pm

SESSION 6 CONTINUED
11:50 am: Quantification of flow through intracranial AVMs using Angiographic Parametric Imaging (API) software, Kyle A. Williams, Mohammed Mahdi Shiraz Bhrwani, Canon Stroke and Vascular Research Ctr. (USA); Kenneth V. Snyder, Eiad I. Levy, Jason M. Davies, Adnan H. Siddiqui, Gates Vascular Institute (USA); Ciprian N. Ioniţa, Canon Stroke and Vascular Research Ctr. (USA). .......................... [11317-27]

Lunch Break . . . Wed 12:10 pm to 1:20 pm
**SESSION 14**
ROOM: SALON A .......... WED 1:20 PM TO 3:00 PM

**New Reconstruction Techniques in Dual Energy CT**
Session Chairs: Frédéric Noo, The Univ. of Utah (USA); Yuxiang Xing, Tsinghua Univ. (China)

1:20 pm: Prospective prediction and control of image properties in model-based material decomposition for spectral CT, Wenyang Wang, Matthew Tivnan, Grace J. Gang, Joseph W. Stayman, Wenying Wang, Johns Hopkins Univ. (USA) ........... [11312-71]

1:40 pm: Comparative study of dual energy cone-beam CT using a dual-layer detector and kVp switching for material decomposition, Linxi Shi, N. Robert Bennett, Stanford Univ. (USA); Edward Shapiro, Richard E. Colbath, Josh Star-Lack, Minghui Lu, Varex Imaging Corp. (USA); Adam S. Wang, Stanford Univ. (USA) ........... [11312-72]

2:00 pm: Tensor convolutional neural network architecture for spectral CT reconstruction, Yongyi Shi, Xi’an Jiaotong Univ. (China) and Stony Brook Univ. (USA); Yongfeng Gao, Stony Brook Univ. (USA); Xuaming Mo, Xi’an Jiaotong Univ. (China); Zhengrong Liang, Stony Brook Univ. (USA) ........... [11312-73]

2:20 pm: Feasibility of achieving spectral CT imaging from a single KV acquisition and deep learning method, Yinheng Li, Juan Pablo Cruz Bastida, Ke Li, Daniel Bushe, Christopher Francois, Meghan Lubner, Guang-Hong Chen, Univ. of Wisconsin-Madison (USA) ........... [11312-74]

2:40 pm: A cascaded deep-learning reconstruction method for sparse-view kV-switching dual-energy CT, Jianhao Zhang, Jian Zhou, Zhou Yu, Canon Medical Research USA, Inc. (USA) ........... [11312-75]

Coffee Break .......... Wed 3:00 pm to 3:30 pm

**CONFERENCE 11313**
ROOM: SALON C .......... WED 1:20 PM TO 3:00 PM

**Labeling and Segmentation**
1:20 pm: Vessel wall segmentation of common carotid artery via multi-branch light network, Haochen Tan, Huimin Shi, Mingquan Lin, City Univ. of Hong Kong (Hong Kong, China); John David Spence, Stroke Prevention & Atherosclerosis Research Ctr., Roberts Research Institute (Canada); Kwok-Leung Chan, Bernard Chu, City Univ. of Hong Kong (Hong Kong, China) .......... [11313-36]

1:40 pm: Anatomical labeling of human airway branches using a novel two-step machine learning and hierarchical features, Syed Ahmed Nadeem, Eric A. Hoffman, The Univ. of Iowa (USA); Alejandro P. Comellas, The Univ. of Iowa Hospitals and Clinics (USA); Panum K. Saha, The Univ. of Iowa (USA) ........... [11313-37]

2:00 pm: Incorporating minimal user input into deep learning based image segmentation, Mayksam Shahidi, The Univ. of Texas at Dallas (USA); Martin Halicek, Georgia Institute of Technology (USA) and The Univ. of Texas at Dallas (USA); James D. Dormer, The Univ. of Texas at Dallas (USA); Banwei Fei, The Univ. of Texas at Dallas (USA) and The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA) ........... [11313-38]

2:20 pm: Weakly supervised pancreas segmentation based on classification maps, Mona Schumacher, Univ. zu Lübeck (Germany) and MeVis Medical Solutions AG (Germany); Andreas Genz, MeVis Medical Solutions AG (Germany); Matthias Paul Heinrich, Univ. zu Lübeck (Germany) .......... [11313-39]

2:40 pm: Detection of frame informativeness in endoscopic videos using Grad-CAM and recurrent neural networks, Tim Boers, Joost van der Putten, Technische Univ. Eindhoven (Netherlands); Jeroen de Graaf, Maarten R. Streyenberg, Kiki Fockens, Amsterdam AMC (Netherlands); Wouter Curvers, Erik Schoon, Catharina Hospital (Netherlands); Fons van der Sommen, Technische Univ. Eindhoven (Netherlands); Jacques Bergman, Amsterdam AMC (Netherlands); Peter H. N. de With, Technische Univ. Eindhoven (Netherlands) .......... [11313-40]

Coffee Break .......... Wed 3:00 pm to 3:30 pm

**CONFERENCE 11316**
ROOM: BRIARGROVE .......... WED 1:20 PM TO 3:00 PM

**Model Observers I**
Session Chairs: Stephen L. Hillis, The Univ. of Iowa (USA); Howard G. Cifftord, Univ. of Houston (USA)

1:20 pm: Supervised learning of model observers for assessment of CT image reconstruction algorithms, Gregory Ongle, Emi Y. Sakiy, Ingrid S. Reiser, Xiaochuan Pan, The Univ. of Washington (USA) .......... [11316-9]

1:40 pm: Autoencoder dual layer: a generalized method for computing task-specific efficient channels for the Hotelling Observer, Jason L. Granstedt, Weimin Zhou, Washington Univ. in St. Louis (USA); Mark A. Anastasio, Univ. of Illinois (USA) .......... [11316-10]

2:00 pm: Markov-Chain Monte Carlo approximation of the Ideal Observer using generative adversarial networks, Weimin Zhou, Washington Univ. in St. Louis (USA); Mark A. Anastasio, Univ. of Illinois (USA) .......... [11316-11]

2:20 pm: Deep learning-based model observers that replicate human observers for PET imaging, Fenglei Fan, Sangtae Ahn, Bruno De Man, GE Global Research (USA); Kristen A. Wangerman, Scott D. Wollenweber, GE Healthcare (USA); Craig K. Abbey, Univ. of California, Santa Barbara (USA); Paul E. Knahan, Univ. of Washington (USA) .......... [11316-12]


Coffee Break .......... Wed 3:00 pm to 3:30 pm

**CONFERENCE 11317**
ROOM: RIVER OAKS .......... WED 1:20 PM TO 3:00 PM

**Deep Convolutional Neural Networks in Molecular, Structural, and Functional Imaging I**
Session Chairs: Baohong Yuan, The Univ. of Texas at Arlington (USA); David L. Wilson, Case Western Reserve Univ. (USA)

1:20 pm: Supervised machine learning for region assignment of zebrafish brain nuclei based on computational assessment of cell neighborhoods, Samarth Gupta, Sharon X. Huang, Yuan Xue, The Pennsylvania State Univ. (USA); Keith C. Cheng, Damian V. Rossoum, Maxim Yakovlev, Daniel Vanselow, Yufu Ding, Penn State College of Medicine (USA) .......... [11317-28]

1:40 pm: Deep learning-based high-resolution reconstruction of trabecular bone microarchitectures from low-resolution CT scans using GAN-CIRCLE, Indrani Gaha, Syed Ahmed Nadeem, The Univ. of Iowa (USA); Chenyu You, Stanford Univ. (USA); Xiaolong Zhang, Steven M. Levy, The Univ. of Iowa (USA); Ge Wang, Reneelaar Polytechnic Institue (USA); James C. Tomen, Panum K. Saha, The Univ. of Iowa (USA) .......... [11317-29]

2:00 pm: Deep learning based multi-organ segmentation and metastases segmentation in whole mouse body using cryo-imaging cancer imaging and therapy analysis platform (CITAP), Yijioo Liu, Case Western Reserve Univ. (USA); Madhu Gargesha, BioInVision, Inc. (USA); Mohammed Qutaisi, Zhuxian Zhou, Case Western Reserve Univ. (USA); Bryan Scott, BioInVision, Inc. (USA); Hamed Yousefi, Cheng Lu, David L. Wilson, Case Western Reserve Univ. (USA) .......... [11317-30]

2:20 pm: ASNet: an adaptive scale network for skin lesion segmentation based on dermoscopy images, Zhu Lingshu, Shuangfeng Feng, WeiXiang Zhu, Xinjian Chen, Soochow Univ. (China) .......... [11317-31]

2:40 pm: A causal brain network estimation method leveraging Bayesian analysis and the PC algorithm, Gengeng Zhang, Yu-Ping Wang, Aiyong Zhang, Tulane Univ. (USA); Vince D. Calhoun, Ctr. for Model Observers I

Coffee Break .......... Wed 3:00 pm to 3:30 pm

**CONFERENCE 11320**
ROOM: SALON A .......... WED 1:20 PM TO 3:00 PM

**Keynote and Computer-Aided Diagnosis, Prognosis, and Predictive Analysis**
1:20 pm: Petascale computational pathology for precision medicine (Keynote Presentation), Nair S. Rajagop, The Univ. of Warwick (UK) .......... [11320-1]

2:20 pm: Compactness measures of tumor infiltrating lymphocytes in lung adenocarcinoma are associated with overall patient survival and immune scores, Ruiwen Ding, Prateek Prasanna, Germán Corredor, Cheng Lu, Case Western Reserve Univ. (USA); Priya Velu, Welli Cornelie Medicine (USA); Khol Le, Patrick Leo, Case Western Reserve Univ. (USA); Vamsidhar Veilcheti, New York Univ. (USA); David Rimm, Kurt Schalper, Yale Univ. (USA); Anant Madabhushi, Case Western Reserve Univ. (USA) .......... [11320-2]

2:40 pm: Computationally derived image markers for predicting risk of relapse in acute myeloid leukemia patients following bone marrow transplantation, Sara Arabayoomhammi, Case Western Reserve Univ. (USA); Zejin Zhang, Nanjing Univ. of Information Science & Technology (China); Patrick Leo, Andrew Janowczyk, Haoja Li, Kaustav Bera, Case Western Reserve Univ. (USA); Behtash Nazzmi, Howard Meyerson, Univ. Hospitals Cleveland Medical Ctr. (USA); Jun Xu, Nanjing Univ. of Information Science & Technology (China); Leland Metheny, Univ. Hospitals Cleveland Medical Ctr. (USA); Anant Madabhushi, Case Western Reserve Univ. (USA) and Louis Stokes Cleveland Veterans Administration Medical Ctr. (USA) .......... [11320-3]

Coffee Break .......... Wed 3:00 pm to 3:30 pm
**SESSION 15**
ROOM: SALON A  WED 3:30 PM TO 5:30 PM
Artifacts in CBCT Solved
Session Chairs: Joseph W. Stayman, Johns Hopkins Univ. (USA); Marc Kachelriess, Deutsches Krebsforschungszentrum (Germany)
3:30 pm: Evaluation of patient-specific scatter-corrected digital chest tomosynthesis, Christina R. Inceoe, Carson Puett, Alex J. Billington, Kevin H. Bhimani, Otto Zhou, Jianning Lu, Yueh Lee, The Univ. of North Carolina at Chapel Hill (USA)  ... [11312-76]
3:50 pm: Projection-domain metal artifact correction using a dual layer detector, Linti Shi, N. Robert Bennett, Stanford Univ. (USA); Josh Star-Lack, Minghui Lu, Varix Imaging Corp. (USA); Adam S. Wang, Stanford Univ. (USA)  ... [11312-77]
4:10 pm: Method for metal artifact avoidance in C-Arm cone-beam CT, Pengwei Wu, Niral S. Wang, Stanford Univ. (USA) ......... [11312-78]
**SESSION 9**
ROOM: SALON C  WED 3:30 PM TO 5:30 PM
Deep Learning: Segmentation
3:30 pm: Spatial information-embedded fully convolutional networks for multi-organ segmentation with improved data augmentation and instance normalization, Chen Shen, Chenglong Wang, Nagoya Univ. (Japan); Holger R. Roth, NVIDIA Corp. (USA); Masahiro Oda, Yuichiro Hayashi, Nagoya Univ. (Japan); Kazunari Misawa, Achi Cancer Ctr. (Japan); Kensaku Mori, Nagoya Univ. (Japan)  ... [11313-41]
3:50 pm: Identification of kernels in a convolutional neural network: connections between the level set equation and deep learning for image segmentation, Jonas Actor, Beatrice Riviere, Rice Univ. (USA); David T. Fuentes, The Univ. of Texas M. D. Anderson Cancer Ctr. (USA)  ... [11313-42]
4:10 pm: RedNet: influence of decoder size for binary segmentation tasks in medical imaging, Jooest van der Putten, Fons van der Sommen, Peter H. N. de Wit, Technische Univ. Eindhoven (Netherlands)  ... [11313-43]
4:30 pm: Unified multi-scale feature abstraction for medical image segmentation, Xi Fang, Reneselaer Polytechnic Institute (USA); Bo Du, Wuhan Univ. (China); Sheng Xu, Bradford J. Wood, National Institutes of Health (USA); PingKun Yan, Reneselaer Polytechnic Institute (USA)  ... [11313-44]
4:50 pm: Topology-aware activation layer for neural network segmentation, John S. H. Baxter, Pierre Jannin, Univ. de Rennes 1 (France)  ... [11313-45]
5:10 pm: Separation between mis-registration artifacts and vasculature in time-resolved cone-beam CT angiography using a deep learning strategy, Juan Camilo Montoya, Yijing Wu, Yinheng Li, Guang-Hong Chen, Univ. of Wisconsin-Madison (USA)  ... [11313-61]
**SESSION 4**
ROOM: BRIAGROVE  WED 3:30 PM TO 4:50 PM
Deep Convolutional Neural Networks in Molecular, Structural, and Functional Imaging II
Session Chairs: Xavier Intes, Rensselaer Polytechnic Institute (USA); Armando Manduca, Mayo Clinic (USA)
3:30 pm: Efficacy of radiomics and genomics in predicting TPO3 mutations in diffuse low grade, Zeina S. Aboul, Khan M. Khalil, Sudan Genomics, Amman (Jordan); Holger R. Roth, NVIDIA Corp. (USA); Armando Manduca, Mayo Clinic (USA)  ... [11313-37]
3:50 pm: Classification of skin-cancer lesions based on Fluorescence Lifetime Imaging, Priyanka Vasanthakumari, Texas A&M Univ. (USA); Renan A. Romano, Ramon Gabriel Teixeira Rosa, Instituto de Fisica de Sao Carlos (Brazil); Ana G. Salvio, Hospital Amaral Carvalho (Brazil); Cristina Kurachi, Instituto de Fisica de Sao Carlos (Brazil); Javier A. Jo, The Univ. of Oklahoma (USA)  ... [11313-38]
4:10 pm: A hypergraph learning method for brain functional connectivity network construction from fMRI data, Li Xiao, Tulane Univ. (USA); Julia M. Stephen, The Mind Research Network (USA); Tony W. Wilson, Univ. of Nebraska Medical Ctr. (USA); Vincent D. Calhoun, The Mind Research Network (USA) and Ctr. for Translational Research in Neuroimaging and Data Science (USA); Yu-Ping Tang, Tulane Univ. (USA)  ... [11313-39]
4:30 pm: MRI-based radiomics of colorectal tumors in the proximal arm of a co-clinical trial, Matthew D. Holbrook, Stephanie J. Blocker, Yvonne Mowery, Alexandra Badea, Yi Gu, David G. Kirsch, Cristian T. Badea, Duke Univ. School of Medicine (USA)  ... [11313-40]
4:50 pm: Radiomic biomarker of 4-D functional tumor heterogeneity predicts breast cancer recurrence in pre-treatment dynamic FDG-PET, Rhea Chritista, Vamsi Venkatram, Austin Pantel, Univ. of Pennsylvania (USA); Lanell Peterson, Mark Marko, Univ. of Washington (USA); Joel Karp, David Mannkoff, Densia Kompas, Univ. of Pennsylvania (USA)  ... [11313-41]
5:10 pm: A machine learning approach for abdominal aortic aneurysm severity assessment using geometric, biomechanical, and patient-specific clinical historical features, Goinaz Jalalshahi, Maria Helena, Cristina A. Linte, Rochester Institute of Technology (USA)  ... [11313-42]
**SESSION 8**
ROOM: RIVER OAKS  WED 3:30 PM TO 5:30 PM
Breast Deep Convolutional Neural Networks in Molecular, Structural, and Functional Imaging II
Session Chairs: Xavier Intes, Rensselaer Polytechnic Institute (USA); Armando Manduca, Mayo Clinic (USA)
3:30 pm: Efficacy of radiomics and genomics in predicting TPO3 mutations in diffuse low grade, Zeina S. Aboul, Khan M. Khalil, Sudan Genomics, Amman (Jordan); Holger R. Roth, NVIDIA Corp. (USA); Armando Manduca, Mayo Clinic (USA)  ... [11313-37]
3:50 pm: Classification of skin-cancer lesions based on Fluorescence Lifetime Imaging, Priyanka Vasanthakumari, Texas A&M Univ. (USA); Renan A. Romano, Ramon Gabriel Teixeira Rosa, Instituto de Fisica de Sao Carlos (Brazil); Ana G. Salvio, Hospital Amaral Carvalho (Brazil); Cristina Kurachi, Instituto de Fisica de Sao Carlos (Brazil); Javier A. Jo, The Univ. of Oklahoma (USA)  ... [11313-38]
4:10 pm: A hypergraph learning method for brain functional connectivity network construction from fMRI data, Li Xiao, Tulane Univ. (USA); Julia M. Stephen, The Mind Research Network (USA); Tony W. Wilson, Univ. of Nebraska Medical Ctr. (USA); Vincent D. Calhoun, The Mind Research Network (USA) and Ctr. for Translational Research in Neuroimaging and Data Science (USA); Yu-Ping Tang, Tulane Univ. (USA)  ... [11313-39]
4:30 pm: MRI-based radiomics of colorectal tumors in the proximal arm of a co-clinical trial, Matthew D. Holbrook, Stephanie J. Blocker, Yvonne Mowery, Alexandra Badea, Yi Gu, David G. Kirsch, Cristian T. Badea, Duke Univ. School of Medicine (USA)  ... [11313-40]
4:50 pm: Radiomic biomarker of 4-D functional tumor heterogeneity predicts breast cancer recurrence in pre-treatment dynamic FDG-PET, Rhea Chritista, Vamsi Venkatram, Austin Pantel, Univ. of Pennsylvania (USA); Lanell Peterson, Mark Marko, Univ. of Washington (USA); Joel Karp, David Mannkoff, Densia Kompas, Univ. of Pennsylvania (USA)  ... [11313-41]
5:10 pm: A machine learning approach for abdominal aortic aneurysm severity assessment using geometric, biomechanical, and patient-specific clinical historical features, Goinaz Jalalshahi, Maria Helena, Cristina A. Linte, Rochester Institute of Technology (USA)  ... [11313-42]
Enhancing infarct segmentation performance using domain-specific attention in Acute Ischemic Stroke patients, Manikanda Krishnan V, Siminasa Rao Kundettu, Anu H. Shanthy, Phillips Research (India); Shankar Prasad Gorthi, Kasturba Medical College (India) .......................... [11313-77]

A grid-line suppression technique based on deep convolutional neural networks, Kyoungwoo Kim, Hyungkyu Kim, JP Healthcare Co., Ltd. (Korea, Republic of); Hyungkyu Kim, Kyoungwoo Kim, (Korea, Republic of); Joohyunk Park, Handong Global University (Korea, Republic of); Donghyun Kim, Hyewon Kim, Joohyunk Park, Handong Global University (Korea, Republic of) .......................... [11313-78]

An unsupervised deep learning approach for landmark detection and matching in medical images, Monika Grewal, Timo M. Deist, Ctr. Wiskunde & Informatica (Netherlands); Jan Wierstra, Amsterdam UMC (Netherlands); Peter A. N. Bosman Ctr. Wiskunde & Informatica (Netherlands); Tanja Alderliesten, Amsterdam UMC (Netherlands) .......................... [11313-79]

Deformable MRI-CT image registration with unsupervised deep learning, Tingting Bu, Xinying Pang, Yuxiao Yang, Emory University (USA); Xiaofeng Yang, Emory University (USA) .......................... [11313-80]

A target-oriented and multi-patch based framework for image quality assessment on carotid artery MRI, Hongjian Jiang, Li Chen, Dongmei Xu, University of Washington (USA); Hulin Zhu, Jinzhou Hospital, Jiangsu Jiujiang University School of Medicine (China); Hiroko Watanabe, University of Washington (USA); Xiuhong Zhao, Rui Li, Tsinghua University (China); Chen Yuan, University of Washington (USA)............... [11313-81]

Convolutional neural network-based ordinal regression for brain age prediction from raw MRI scans, Kenoka Sokolovka, Gareth Barker, King's College London (UK); Giovanni Montana, The University of Warwick (UK)........ [11313-82]

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Automatic epicardial fat segmentation in cardiac CT imaging using 3D deep attention U-Net, Bangjun Guo, Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Xiaofeng Yang, Emory University (USA) .......................... [11313-84]

A TVLG-QCA framework to study sex differences in resting state fMRI dynamic connectivity, Biao Cai, Tulane University (USA); Julia M. Stephens, The Mind Research Network (USA); Tony W. Wilson, Univ. of Nebraska Medical Ctr. (USA); Vincent D. Cahoun, Ctr. for Translational Research in Neuroimaging and Data Science, Georgia State Univ. (USA); Yu-Ping Wang, Tulane University (USA) ...... [11313-86]

A generalized method for computation of intrinsic Radon transforms, Robert Schijns, Otto-von-Guericke-Univ. Magdeburg (Germany) and Forschungscampus STIMULATE (Germany); Tim Pfeiffer, Otto-von-Guericke-Univ. Magdeburg (Germany); Richard G. Bammer, Univ. Medical Ctr. (China); Yuanhui Hu, Bennett A. Landman, Vanderbilt Univ. (USA) .......................... [11313-90]

An unsupervised learning-based detection and matching technique for 3D brain tumor deformation, Mu Qiu, Xinying Pang, Yuxiao Yang, Emory University (USA) .......................... [11313-90]

Simultaneously spatial and temporal Higher-Order Total Variations for noise suppression and motion reduction in DCE and IVIM, Renjie Hu, Yuheng Zhang, Chaoyang Zhao, Ruixing Zhang, Ping Ng, Rachel B. Ger, Hesham Elshehawany, Bahar A. Eighorai, The Univ. of Texas M. D. Anderson Cancer Center (USA); Kristina H. Young, Earl A. Chiles Research Institute (USA) and The Oregon Health and Science University (USA); Kate Hutcheson, Clifton Fuller, Stephen Lai, The Univ. of Texas M. D. Anderson Cancer Center (USA) ........ [11313-91]

Liver synthetic CT generation based on a dense-convolutional autoencoder, Abhishek Patel, Yingyi Liu, Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Xiaofeng Yang, Emory University (USA) .......................... [11313-91]

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Deep similarity learning using a Siamese ResNet trained on similarity labels from disparity maps of cerebral MRA MIP pairs, Christian Neumann, Hochschule Nordheim (Germany); Klaus D. Tönnes, Hochschule Nordheim (Germany); Regina Poehl-Fritschl, Hochschule Nordheim (Germany) ........ [11313-94]

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MRI correlates of chronic symptoms in mild traumatic brain injury, Ialei C. Kerley, Kurt G. Schilling, Justin Baber, Beth Milardo, Doug Newton, Adam W. Anderson, Bennett A. Landman, Tonia S. Rex, Vanderbilt Univ. (USA).......................... [11313-97]

Development of a 3d cortical atlas for quantification of local volume change, Xueli Chen, Yungao Zuo, City Univ. of Hong Kong (Hong Kong, China); Jean David Spence, Stroke Prevention & Atherosclerosis Research Ctr., Roberts Research Institute (Canada); Bernard Chiu, City Univ. of Hong Kong (Hong Kong, China)........ [11313-98]

Integrating deep transfer learning and radiomics features in Globoloma multiforme patient survival prediction, Wei Han, Brigham and Women’s Hospital (USA) ........ [11313-99]

An unsupervised deep learning approach for 4DCT deformable image registration, Xinying Pang, Yuxiao Yang, Emory University (USA); Yu Fu, Yan Lei, Tonghe Wang, Tian Liu, Xiaofeng Yang, Emory University (USA); Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Yang Lei, Tonghe Wang, Tian Liu, Xiaofeng Yang, Emory University (USA) .......................... [11313-100]

Cone-beam Computed Tomography (CBCT) and CT images were produced by CBCT-based synthetic CT, Yabo Fu, Yang Lei, Yingyi Liu, Tonghe Wang, Walter J. Curran, Trian Patel, Xiaofeng Yang, Emory University (USA) .......................... [11313-101]

Imposing implicit feasibility constraints on the minimization of a statistical generative model, Yudi Sang, Univ. of California, Los Angeles (USA); Xiangpei Xing, Harbin Engineering Univ. (China) and Univ. of California, Los Angeles (USA); Ying Nian Wu, Univ. of California, Los Angeles (USA); Ying Nian Wu, Dan Ruan, Univ. of California, Los Angeles (USA)........ [11313-102]

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Left ventricular myocardium segmentation in coronary computed tomography angiography using 3D deep attention u-net. Bangjun Guo, Xiuixiu He, Yang Lei, Tonghe Wang, Xiaofeng Yang, The Winship Cancer Institute of Emory Univ. (USA). [11317-86]

Full automated classification of glomerular lesions in lupus nephritis. Brandon Ginley, Univ. at Buffalo (USA); Kuang-Yu Jen, Univ. of California, Davis (USA); Ari Rosenberg, Giovanni Maria Rossi, Johns Hopkins Univ. (USA); Sanjay Jain, Washington Univ. School of Medicine in St. Louis (USA); Pinaki Sarder, Univ. at Buffalo (USA). [11320-33]

Low-cost phase imaging microscopy via Phycographic Modulation Engine (PME). Zichao Bian, Shaowei Jiang, Guoan Zheng, Univ. of Connecticut (USA). [11320-34]

Using a 22-layer U-Net to perform segmentation of squamous cell carcinoma on digitized head and neck histological images. Amol Masutwani, The Univ. of Texas at Dallas (USA); Martin Halicek, Georgia Institute of Technology & Emory Univ. School of Medicine (USA); Maysam Shahrara, The Univ. of Texas at Dallas (USA); James V. Little, Amy Y. Chen, Emory Univ. School of Medicine (USA); Larry L. Myers, The Univ. of Texas Southwestern Medical Ctr. at Dallas (USA); Baowei Fei, The Univ. of Texas at Dallas (USA). [11320-35]

Predicting MYC translocation in H&E specimens using a pilot computational study. John E. Tomaszewski, Pinaki Sarder, Univ. at Buffalo (USA); Samuel P. Border, Univ. at Buffalo (USA); Brahm H. Segal, Roswell Park Comprehensive Cancer Ctr. (USA). [11320-38]

Autoimmune grade classification of oral epithelial dysplasia using morphometric analysis of histology images. Raja Muhammad Saad Bashir, The Univ. of Warwick (UK); Hanyah Mahmood, The Univ. of Sheffield (UK); Shan E. Ahmed Raza, The Univ. of Warwick (UK); Muhammad Mazoom Frat, National Univ. of Sciences and Technology (Pakistan); Syed Ali Khurram, The Univ. of Sheffield (UK); Nasir Razaq, Muhammad Shaban, The Univ. of Warwick (UK). [11320-39]

Neuropil Extracellular Traps (NETs): an unexplored territory in renal pathobiology, a pilot computational study. Briana S. Santo, Univ. at Buffalo (USA); Brah M. Segal, Roswell Park Comprehensive Cancer Ctr. (USA). [11320-40]

Preliminary radiomic texture analysis of high-channel fluorescence confocal images of triple-negative breast cancer biopsies. Madeleine S. Durkee, The Univ. of Chicago (USA); Bradie M. Ferguson, The Univ. of Chicago (USA) and Univ. of Washington (USA); Rebecca Abraham, Li Lan, Hui Li, Marcus R. Clark, Maryellen L. Giger, The Univ. of Chicago (USA). [11320-41]


Characterization of color normalization methods in digital pathology whole-slide imaging. Dorsa Ziaei, Univ. of Maryland, Baltimore County (USA); Wei-Chung Cheng, U.S. Food and Drug Administration (USA); Samuel Lam, Univ. of Maryland, College Park (USA); Weizhe Li, Weijie Chen, U.S. Food and Drug Administration (USA). [11320-44]

The presence and location of podocytes in glomeruli as affected by diabetes mellitus. Kathryn E. Maraszek, Bransa Santo, John E. Tomaszewski, Pinaki Sarder, Univ. at Buffalo (USA). [11320-45]

Improved instance segmentation of immune cells in human lupus nephritis biopsies with Mask R-CNN. Madeline S. Durkee, Adam Sibley, Junting Ai, Rebecca Abraham, Vladimir M. Lierski, Marcus R. Clark, Maryellen L. Giger, The Univ. of Chicago (USA). [11320-46]

**CONFERENCE 11320 Digital Pathology**

**Making esophageal squamous cell carcinoma survival prediction from histopathological images and CT images, Jinjing Wang, Sun Yat-Sen Univ. (China); Lei Li, Wu Guowei Ma, Sun Yat-Sen Univ. Cancer Ctr. (China); Yao Lu, Sun Yat-Sen Univ. (China).** [11320-32]

**Fully automated classification of glomerular lesions in lupus nephritis, Brandon Ginley, Univ. at Buffalo (USA); Kuang-Yu Jen, Univ. of California, Davis (USA); Ari Rosenberg, Giovanni Maria Rossi, Johns Hopkins Univ. (USA); Sanjay Jain, Washington Univ. School of Medicine in St. Louis (USA); Pinaki Sarder, Univ. at Buffalo (USA).** [11320-33]

**Low-cost phase imaging microscopy via Phycographic Modulation Engine (PME), Zichao Bian, Shaowei Jiang, Guoan Zheng, Univ. of Connecticut (USA).** [11320-34]

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**Autoimmune grade classification of oral epithelial dysplasia using morphometric analysis of histology images, Raja Muhammad Saad Bashir, The Univ. of Warwick (UK); Hanyah Mahmood, The Univ. of Sheffield (UK); Shan E. Ahmed Raza, The Univ. of Warwick (UK); Muhammad Mozamm Frat, National Univ. of Sciences and Technology (Pakistan); Syed Ali Khurram, The Univ. of Sheffield (UK); Nasir Razaq, Muhammad Shaban, The Univ. of Warwick (UK).** [11320-39]

**Neuropil Extracellular Traps (NETs): an unexplored territory in renal pathobiology, a pilot computational study. Briana S. Santo, Univ. at Buffalo (USA); Brah M. Segal, Roswell Park Comprehensive Cancer Ctr. (USA).** [11320-40]

**Preliminary radiomic texture analysis of high-channel fluorescence confocal images of triple-negative breast cancer biopsies, Madeleine S. Durkee, The Univ. of Chicago (USA); Bradie M. Ferguson, The Univ. of Chicago (USA) and Univ. of Washington (USA); Rebecca Abraham, Li Lan, Hui Li, Marcus R. Clark, Maryellen L. Giger, The Univ. of Chicago (USA).** [11320-41]

**Searching histology patterns in gastric glands for predicting gastric cancer survival. Eduardo Romero Castro, Ricardo Alexander Moncayo Martinez, Sunny Catalina Alfonso, Angel Yobany Sanchez Merchán, Univ. Nacional de Colombia Sede Bogota (Colombia).** [11320-42]

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**SESSION 11**  
**ROOM: SALON C**  
**THU 10:00 AM TO 12:10 PM**  
Deep Learning: Uncertainty and Quality

- 10:10 am: Adding uncertainty to dermatological assistance, Jaideep V. Murkute, Ronit D. Jaman, Nukun R. Kota,チャ, टी, नेगरूरा, रोबर्ट Phipps, VisualData (USA); Raymond Pucha, Rochester Institute of Technology (USA); Artar Pasha, Rochester Institute of Technology (USA).
- 10:30 am: Semi-supervised multi-organ segmentation through quality assurance supervision, Ho Hin Lye, Yucheng Tang, Olivia Tang, Xu, Vanderbilt Univ. (USA); Yunqiang Chen, Dashaan Gao, Shizhong Han, 12 Sigma Technologies Ltd. (USA).

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**SESSION 6**  
**ROOM: BRIARGROVE**  
**THU 10:00 AM TO 12:10 PM**  
Technology Assessment

- 10:10 am: Network output visualization to uncover limitations of deep learning detection of pneumothorax, Jennie Crosby, Sophia Chen, Fong Li, Heber MacMahon, Maryellen Giger, The Univ. of Chicago (USA).
- 10:30 am: Towards a video quality assessment based framework for enhancement of laparoscopic videos, Zohair Amjad Khan, Azeddine Bebedhig, Univ. Paris 13 (France); Faouzi Alaya Cheikhi, Norwegian Univ. of Science and Technology (Norway); Moune Kaaniche, Univ. Paris 13 (France); Egidius Pelanis, Oslo Univ. Hospital (Norway); Rafael Palomar, Norwegian Univ. of Science and Technology (Norway); Åsmund Avdem Fretland, Bjørn Edwin, Ole Jakob Elle, Oslo Univ. Hospital (Norway).

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**SESSION 10**  
**ROOM: RIVER OAKS**  
**THU 10:00 AM TO 12:10 PM**  
Ocular and Optical Imaging

- 10:10 am: Spatially aware deep learning improves identification of retinal pigment epithelial cells with heterogeneous fluorescence levels visualized using adaptive optics, Jianli Liu, National Institutes of Health (USA); Tuan Han, Tso Liu, Johnny Tam, National Eye Institute, National Institutes of Health (USA).
- 10:30 am: Comparison different vessel segmentation methods in automated microaneurysms detection in retinal images using convolutional neural networks, Meyyam Tavakoli, Indiana Univ.-Purdue Univ. Indianapolis (USA); Mahdih Nazari, Shahid Behesti Univ. of Medical Sciences (Iran, Islamic Republic of).

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**SESSION 4**  
**ROOM: SALON A**  
**THU 10:00 AM TO 12:10 PM**  
Grading and Classification of Pathology Images

- 10:10 am: Three-dimensional histomorphometric features from light-sheet microscopy results in improved discrimination of benign from malignant glands in prostate cancer, Can F. Koyuncu, Andrew Janowczyk, Cheng Lu, Patrick Leo, Case Western Reserve Univ. (USA); Adam K. Glaser, Nicholas P. Reder, Jonathan T. C. Li, Univ. of Washington (USA); Anant Madabhushi, Case Western Reserve Univ. (USA).
- 10:30 am: Automatic cancer sub-grading on digital histopathology images of radical prostatectomy specimens, Wenchao Han, Western Univ. (Canada); Michelle Downes, Theodorus Van Der Kwast, Univ. of Toronto (Canada); Joseph Chin, Stephen Pautler, Aaron Ward, Western Univ. (Canada).

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SESSION 12
ROOM: SALON C .................................... THU 1:20 PM TO 3:00 PM
Nuclear and Molecular
1:20 pm: Homology-based approach for prognostic prediction of lung cancer using novel topologically invariant radiomic features, Kenta Ninomiya, Hidetaka Arimura, Kyushu Univ. (Japan) ........................................ [11313-58]
1:40 pm: Fully convolutional network with sparse feature-maps composition for automatic lung tumor segmentation from PET images, Hailing Tian, Daxin Xiang, Fei Shi, Weifang Zhu, Xinjian Chen, Soochow Univ. (China) ................................ [11313-59]
2:00 pm: Ultra-low-dose 18F-FDG brain PET/MR denoising using deep learning and multi-contrast information, Junshen Xu, Massachusetts Institute of Technology (USA); Enhao Gong, Stanford Univ. (USA); Jiahong Ouyang, Carnegie Mellon Univ. (USA); John Pauly, Greg Zaharchuk, Stanford Univ. (USA) ................ [11313-60]
2:20 pm: The improved reconstruction of Fluorescence Molecular Tomography via Regularized Doubly Orthogonal Matching Pursuit Method, Linping Kong, Yu An, Yang Du, Ji Tian, Institute of Automation (China) ................................. [11313-61]
2:40 pm: Automated threshold selection on whole-body 18F-FDG PET/CT for assessing tumor metabolic response, Ine Dirks, Vrije Univ. Brussels (Belgium); Marleen Keyaerts, Bart Neyns, Vrije Univ. Brussels (Belgium) and UZ KU Leuven (Belgium); Jef Vandemeulebroucke, Vrije Univ. Brussels (Belgium) ........ [11313-62]

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SESSION 7
ROOM: BRIARGROVE .................................. THU 1:20 PM TO 3:00 PM
Model Observers II
Session Chairs: Matthew A. Kupinski, Wyant College of Optical Sciences (USA); Pontius A. Timberg, Scania Univ. Hospital (Sweden)
1:20 pm: Human observer templates for lesion discrimination tasks, Craig K. Abbey, Univ. of California, Santa Barbara (USA); Frank W. Samuelson, Rongping Zeng, U.S. Food and Drug Administration (USA); John M. Boone, UC Davis Medical Ctr. (USA); Miguel P. Eckstein, Univ. of California, Santa Barbara (USA); Kyle J. Myers, U.S. Food and Drug Administration (USA) ........ [11316-28]
1:40 pm: Foveated model observer to predict human search performance with virtual digital breast tomosynthesis phantoms, Miguel A. Lago, Univ. of California, Santa Barbara (USA); Bruno B. Barfueld, Predrag R. Bakić, Univ. of Pennsylvania (USA); Craig K. Abbey, Univ. of California, Santa Barbara (USA); Andrew D. A. Maitland, Univ. of Pennsylvania (USA); Miguel P. Eckstein, Univ. of California, Santa Barbara (USA) .......... [11316-29]
2:00 pm: Learning numerical observers using unsupervised domain adaptation, Shenghua He, Weimin Zhou, Washington Univ. in St. Louis (USA); Hua Li, Mark Anastasio, Univ. of Illinois (USA) .......................... [11316-30]
2:20 pm: Deep learning channelized Hotelling Observer for generic DBT system image quality evaluation, Dimitar Petrov, Nicholas Marabani, Hélène Bosmans, KU Leuven (Belgium) .......................................................... [11316-31]
2:40 pm: Convolutional neural network-based anthropomorphic model observer for breast cone-beam CT images, Byegoon Kim, Minah Han, Jongduk Baek, Yonsei Univ. (Korea, Republic of) ............ [11316-32]

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SESSION 11
ROOM: RIVER OAKS .................................. THU 1:20 PM TO 3:00 PM
Bone and Skeletal Imaging, Segmentation, Registration, and Decision-making
Session Chairs: Axel Wismüller M.D., Univ. of Rochester Medical Ctr. (USA); Nancy L. Ford, The Univ. of British Columbia (Canada)
1:20 pm: Application of a novel ultra-high resolution multi-detector CT in quantitative imaging of trabecular microstructure, Gengxin Sh, Shalini Subramaniam, Gian Cao, Shadpour Demehr, Jeffrey H. Sieverding, Wojciech Zgliweski, Johns Hopkins Univ. (USA) .......................................................... [11317-50]
1:40 pm: CT-based characterization of transverse and longitudinal trabeculae and its applications, Xiaoliu Zhang, Elena M. Letcher, Steven M. Levy, James C. Torner, Punam K. Saha, The Univ. of Iowa (USA) ................ [11317-51]
2:00 pm: Graph Laplacian learning based Fourier Transform for brain network analysis with resting state fMRI, Junji Wang, Tulane Univ. Health Sciences Ctr. (USA); Julia M. Stephen, The Mind Research Network (USA); Tony W. Wilson, Univ. of Nebraska Medical Ctr. (USA); Vince D. Calhoun, Ctr. for Translational Research in Neuroimaging and Data Science (USA) and Georgia State Univ. (USA) and Georgia Institute of Technology (USA); Yu-Ping Wang, Tulane Univ. (USA) ................ [11317-52]
2:20 pm: Evaluation of intensity-based deformable registration techniques of multi-parametric MRI for radiomics analysis of the prostate, Stephanie Alley, Polytechnique Montréal (Canada); Andrey Fedorov, Brigham and Women’s Hospital (USA); Cynthia Menard, Ctr. Hospitalier de l’Univ. de Montréal (Canada); Samuel Kadoury, Polytechnique Montréal (Canada) ....... [11317-53]
2:40 pm: Automatic measurement of extra-axial CSF from infant MRI data, Arthur Le Maout, Han Bit Yoon, SunHyung Kim, Mahmoud Mostapha, Mark Shen, Juan C. Prieto, Martin A. Shynier, The Univ. of North Carolina at Chapel Hill (USA) ................ [11317-54]
Coffee Break .......................... Thu 3:00 pm to 3:30 pm

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SESSION 5
ROOM: SALON A .................................... THU 1:20 PM TO 3:00 PM
Integration of Multimodal and Spatial Information
1:20 pm: Discovering correspondences between molecular profiles and morphological features via deep learning, Richard Chen, Faisal Mahmood, Harvard Medical School (USA) and Brigham and Women’s Hospital (USA) ........ [113120-21]
1:40 pm: Multimodal fusion of histology and molecular features for improved survival outcome prediction, Richard J. Chen, Harvard Medical School (USA) and Brigham and Women’s Hospital (USA); Max Lu, Brigham and Women’s Hospital (USA); Faisal Mahmood, Harvard Medical School (USA) and Brigham and Women’s Hospital (USA) ................ [113120-22]
2:00 pm: Histographs: graphs in histopathology, Deepak Anand, Shrey Gadiya, Indian Institute of Technology Bombay (India); Amit Sethi, Indian Institute of Technology Bombay (India) and Univ. of Illinois at Chicago (USA) ........ [113120-23]
2:20 pm: Deep learning-based automated hot-spot detection and tumor grading in human gastrointestinal neuroendocrine tumor, Darshana Govind, Univ. at Buffalo (USA); Kuang-Yu Jen, Univ. of California, Davis (USA); Pinaki Sarder, Univ. at Buffalo (USA) ........ [113120-24]
2:40 pm: Computer extracted features related to the spatial arrangement of tumor-infiltrating lymphocytes predict overall survival in epithelial ovarian cancer, Sepideh Azarpanpour, German Corredor, Kauat Bera, Patrick Leo, Nathaniel Braman, Pingu Fu, Case Western Reserve Univ. (USA); Haider Mahdi, Cleveland Clinic (USA); Anant Madabhushi, Case Western Reserve Univ. (USA) ................ [113120-25]
Coffee Break .......................... Thu 3:00 pm to 3:30 pm
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<td>Medical Imaging 2020 Includes Volumes 11312, 11313, 11314, 11315, 11316, 11317, 11318, 11319, 11320</td>
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**Personal Instruction from Leading Experts**

SPIE Medical Imaging offers focused, face-to-face instruction from some of the leading minds in medical imaging research and applications.

### Courses

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<td><strong>SC086 Fundamentals of Medical Image Processing and Analysis (Deserno)</strong>&lt;br&gt;8:30 am to 5:30 pm, $565 / $660, p. 64</td>
<td><strong>SC1262 Adversarial Networks: From Architecture to Practical Training (Wenzel)</strong>&lt;br&gt;8:30 am to 12:30 pm, $325 / $380, p. 66</td>
<td><strong>SC987 Spectral CT Imaging (Schmidt, Flohr, Grant)</strong>&lt;br&gt;8:30 am to 12:30 pm, $325 / $390, p. 68</td>
<td><strong>SC1295 From Analytic to Clinical Validation: Moving AI/ML Into Practice (Hsu, Brown, Nishikawa, Krupinski)</strong>&lt;br&gt;8:30 am to 5:30 pm, $565 / $660, p. 67</td>
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**SC1235 Introduction to Medical Image Analysis Using Convolutional Neural Networks (Wenzel)**<br>8:30 am to 5:30 pm, $595 / $690, p. 65

**SC1296 High Performance Computing for Medical Imaging on Graphics Processing Units (GPU) with CUDA (Caucci)**<br>1:30 pm to 5:30 pm, $325 / $380, p. 68

**SC1239 Virtual Clinical Trials: An In-depth Tutorial (Maidment, Bakic, Barufaldi)**<br>8:30 am to 12:30 pm, $335 / $390, p. 65

**SC1232 Technological Assessment of X-Ray Based Breast Imaging Systems Using Anthropomorphic Phantoms (Glick, Bosmans, Badal)**<br>8:30 am to 12:30 pm, $325 / $380, p. 66

**SC1183 Modern Diagnostic X-ray Sources (Behling)**<br>1:30 pm to 5:30 pm, $325 / $380, p. 65

**SC1129 Photon Counting CT (Danielsson, Sjölin)**<br>1:30 pm to 5:30 pm, $325 / $380, p. 64

**CONTINUING EDUCATION UNITS**

SPIE is accredited by the International Association for Continuing Education and Training (IACET) and is authorized to issue the IACET CEU.

Earn Course Credits: SPIE has applied to CAMPEP for approval of 44 MPCEC hours for its courses at Medical Imaging 2020. If you attend one of our Medical Imaging courses and meet CAMPEP’s qualifications, you may apply for these credits at no charge. CAMPEP is a continuing professional education accreditation organization specific to the medical imaging community.
This course gives an overview of medical image formation, enhancement, analysis, visualization, and communication with many examples from medical applications. It starts with a brief introduction to medical imaging modalities and acquisition systems. Basic approaches to display one-, two-, and three-dimensional (3D) biomedical data are introduced. As a focus, image enhancement techniques, segmentation, texture analysis, and their application in diagnostic imaging will be discussed. To complete this overview, storage, retrieval, and communication of medical images are also introduced.

In addition to this theoretical background, a 45 min practical demonstration with ImageJ is given. ImageJ is a Java-based platform for medical image enhancement and visualization. It is developed by the National Institutes of Health, USA, open source and freely available in the public domain. For this course, ImageJ is appropriately configured with useful plug-ins (e.g., DICOM import, 3D rendering) and distributed on CD-ROM. Attendees are welcome to perform on their own laptop computers.

**LEARNING OUTCOMES**

This course will enable you to:
- identify major processes involved in formation of medical images
- recognize the imaging modality from their visualization
- classify the various medical image processing algorithms
- describe fundamental methods of image enhancement
- enhance medical images using appropriate software
- visualize all types of medical image data
- appraise efficacy and drawbacks of several techniques of image segmentation
- get familiar with the fundamental concepts of texture analysis
- explain the basic principles of medical image communication
- get started with ImageJ and self-perform fundamentals of medical image processing

**INTENDED AUDIENCE**

Engineers, scientists, biomedical researchers and managers who need a basic understanding of medical image processing technologies and methods. Some prior background with image processing and computer technology will be helpful.

**INSTRUCTOR**

Thomas Deserno (né Lehmann), PhD, is full professor of Medical Informatics at TU Braunschweig University, Germany, where he heads the Peter L. Reichertz Institute for Medical Informatics of TU Braunschweig and Hannover Medical School. He lectures undergraduate and graduate courses on biomedical signal and image acquisition and processing, co-authored the textbook Image Processing for the Medical Sciences (1997), and edited the Handbook of Medical Informatics (2005) and Biomedical Image Processing (2011). His research interests include signal and image analysis for computer-assisted diagnoses and event prediction as well as eHealth applications, where he has authored over 100 scientific publications. Dr. Deserno is Senior Member of IEEE and SPIE, where he is member of the Program Committee of the Medical Imaging Symposium (both, computer-aided diagnosis and imaging informatics tracks). He is a member of the International Association of Dentomaxillofacial Radiology (IADMR), and serves on the International Editorial Boards of PLOS ONE, the European Journal for Biomedical Informatics, Methods of Information in Medicine, Dentomaxillofacial Radiology, World Journal of Radiology, Acta Informatica Medica, and GMS Medical Informatics, Biometry and Epidemiology (MIBE). He is Co-editor Europe of the International Journal of Healthcare Information Systems and Informatics and Associated Editor of the SPIE Journal of Medical Imaging. He is the German representative in the International Medical Informatics Association (IMIA).

This course is also available in online format.

**ATTENDEE TESTIMONIAL:**

Excellent depth and breadth-I really enjoyed the course.

**Photon Counting CT**

**SC129 • Course Level: Introductory • CEU: 0.4**

$325 Members • $182 Student Members • $380 Non-Members USD Saturday 1:30 pm to 5:30 pm

This course explains the principles of photon counting detectors for spectral x-ray imaging. Typical technical implementations are described and fundamental differences to energy integrating systems are pointed out. In particular, the issues of high-rate handling and the effect of detector cross talk on energy resolution are described. Requirements on electronics for spectral imaging in computed tomography is also discussed.

A second objective of the course is to describe how energy sensitive counting detectors make use of the energy sampling of the linear attenuation coefficients of the background and target materials for any given imaging task; methods like material basis decomposition and optimal energy weighting will be explained.

The second objective highlights the interesting fact that while the spatial-frequency descriptor of signal-to-noise-ratio transfer (DQE) of a system gives a complete characterization of performance for energy integrating (and pure photon counting) systems, it fails to characterize multibin systems since a complete description of the transfer characteristics requires specification of how the information of each energy bin is handled. The latter is in turn dependent on the imaging case at hand which shows that there is no such thing as an imaging case independent system DQE for photon counting multibin systems. We also suggest how this issue could be resolved.

**LEARNING OUTCOMES**

This course will enable you to:
- list essential requirements on read-out electronics and predict effect on image quality if not fulfilled
- explain the physical origin of pile-up and separate between the effects of decreased energy resolution and loss of counts
- explain the physical origins of cross-talk and how it degrades performance, both in terms of resolution and noise
- compute optimal weights for the energy bins
- illustrate how poor choice of weights results in inferior image quality
- perform material basis decomposition and explain why noise in decomposed images is a poor figure-of-merit
- distinguish between system DQE and task dependent DQE and suggest solutions to allow comparison at system level between multibin energy resolved systems and other solutions

**INTENDED AUDIENCE**

Scientists, engineers, or managers who wish to learn more about basic strengths and challenges of photon counting detectors for spectral x-ray imaging, how the data is treated and how performance can be quantified.

**INSTRUCTOR**

Mats Danielsson has been developing photon counting x-ray detectors for medical imaging for 15 years and his research has resulted in detector systems in worldwide clinical use. He received his Ph.D. in experimental physics in 1996 based on work at CERN, Geneva and later at his postdoc at Lawrence Berkeley National Laboratory. In 2006 he was appointed Professor at KTH Royal Institute of Technology in Stockholm, Sweden, where he heads the physics of medical imaging research group. Dr. Danielsson is a lifetime member of SPIE.

Martin Sjölin has worked with the development of photon-counting spectral x-ray detectors since 2011. He has worked on several topics related to photon-counting spectral detectors, including: energy calibration, geometric calibration, count-rate performance, sampling and digital data compression. Martin received his PhD from KTH Royal Institute of Technology, Sweden, in 2016 with the thesis “Methods of image acquisition and calibration for x-ray computed tomography”. His current research is focused on the design and development of spectral photon-counting detectors suitable for clinical CT.

**ATTENDEE TESTIMONIAL:**

Great course, summarized the research into photon counting detectors well as well as providing some interesting open questions in the field.
Modern Diagnostic X-ray Sources

SC1183 • Course Level: Introductory • CEU: 0.4
$325 Members • $182 Student Members • $380 Non-Members USD
Sunday 1:30 pm to 5:30 pm

During recent decades, in particular since the advent of computed tomography and the increasing sophistication of interventional X-ray systems, progress in the development of diagnostic X-ray sources has been tremendous. More than 100,000 diagnostic X-ray tubes are being installed or replaced every year. Tubes for detail application, non-destructive testing and material analysis add to this. As a sound basis for their work, specialists and academicians working in the realm of X-rays like system developers, medical and X-ray physicists and clinicians may want to improve their background knowledge. Literature on the topic has grown recently, among others with several publications by the authors, see [1-15], including a textbook. In addition, this course will offer 1:1 interaction to improve understanding the physics of production of "clinical" X-rays for diagnostics.

It will comprehensively treat functional principles of X-ray sources. Design aspects, special features, radiation protection, modern performance metric, manufacturing technology, and cost aspects will be discussed. Why is vacuum technology not at all regarded outdated? Will we see, the X-ray LED, compact X-ray Lasers or flat panel sources in medical imaging soon? Why do hundreds of tube types populate the market? The lecture will cover system performance aspects related to the source, material boundary conditions, and manufacturing technology. The quest for affordable healthcare demands for trade-offs between value and cost, and objective comparison of tube types. Initial costs and costs of tube replacement will be discussed as well as means to extend tube life and to save natural resources. Recent technology and application will be treated. Last but not least, the lecture may spark fascination for these vacuum electronic light sources off the scientific mainstream.

LEARNING OUTCOMES

This course will enable you to:
- see rare historic artifacts and pictures from various vendors and other sources
- explain the principles of the generation of braking radiation
- summarize milestones of innovation for X-ray tubes
- explain differences per field of application and trends
- know latest developments for spectral imaging and dark field imaging
- classify X-ray tubes by technology, explain pro’s and con’s
- predict the performance in an X-ray system using documented metrics
- select the right tube, based on improved metric
- describe key components like bearings, cathodes, vacuum frame, and housing
- explain methods for heat management
- treat unwanted side-effects like vacuum discharges, off-focal radiation and others, and propose remedies
- summarize the peculiarities of bremsstrahlung from the various types of X-ray tubes
- explain the benefits of reflection targets for imaging
- analyze X-ray tubes by their initial and service costs in an imaging system
- discuss failure patroen’s and means to extend tube life
- predict the impact of the X-ray tube design on the clinical work-flow
- name the measures for protection against hazards of ionizing radiation
- look out into future application of X-ray tubes, e.g. for phase contrast imaging, dark-field imaging, spectral imaging with various concepts
- touch dead-ends of development
- compare X-ray production from X-ray tubes and other means (brilliance, photon flux, costs)

INTENDED AUDIENCE

Medical physicists, researchers who intend to use vacuum electronic X-ray sources, X-ray physicists, radiologists, cardiologists and other surgeons with interest in X-ray diagnostics and interventional X-ray application, students of engineering, radiology and physics, X-ray system and X-ray tube developers, X-ray manufacturers staff, bodies, suppliers and personnel responsible for quality insurance in the field of X-ray equipment, members of standardization committees, managers responsible for costs of service. Undergraduate training in engineering or equivalent science is assumed.

INSTRUCTOR

Rolf Behling is a physicist (Diploma), Fellow Scientist of the Philips group, and a veteran in the field of medical imaging. During his 39-year tenure in this industry, he headed vacuum technology development, customer specific product development, international project coordination and global innovation, head of marketing and field support for X-ray tubes, department head for X-ray tube development, project manager, and manufacturing process physicist. The first ever game changing X-ray tube with liquid bearing was developed under his project leadership. Rolf Behling currently heads Philips’s advanced development of X-ray tubes and X-ray generators at Philips Healthcare in Hamburg, Germany. He is a part-time lecturer at the University of Hamburg, and has contributed numerous patents, talks and publications in the field of vacuum technology and medical imaging.

Introduction to Medical Image Analysis Using Convolutional Neural Networks

SC1235 • Course Level: Introductory • CEU: 0.7
$595 Members • $306 Student Members • $690 Non-Members USD
Tuesday 8:30 am to 12:30 pm

Segmentation, detection, and classification are major tasks in medical image analysis and image understanding. Medical imaging researchers heavily use the results of recent developments in machine learning approaches, and with deep learning methods they achieve significantly better results in many real-world problems compared to previous solutions. The course aims to enable students and professionals to apply deep learning methods to their data and problem. Using an interactive programming environment, participants of the course will explore all required steps in practice and learn the tools and techniques from data preparation to result interpretation. We will work on example data and train models to segment anatomical structures, to detect abnormalities, and to classify them. Simple methods to explain predictions and assess network uncertainty will be discussed briefly as well. Participants will work in a prepared online environment providing selected deep learning toolkit installations, example data, and fully functional skeleton code as a basis for own experiments.

LEARNING OUTCOMES

This course will enable you to:
- describe the state of the art of deep learning methods in medical applications
- construct computing pipeline using Python based infrastructure, using frameworks (Keras, Tensorflow) commonly used for research
- select a suitable deep learning network architecture for a given problem and implement it
- explain and interpret learning progress using appropriate metrics
- improve resulting model performance using simple visual analytics

INTENDED AUDIENCE

Students, researchers, and engineers from academia and industry, who seek to obtain first practical working knowledge in deep learning.

INSTRUCTOR

Markus Wenzel works on machine learning methods for medical applications since 2005 and has published more than 30 conference and journal papers on the subject. He received his PhD for his work on decision support systems for breast care. At Fraunhofer MEVIS, he is a senior scientist for cognitive medical computing. He is a funded member of the Fraunhofer Society research class “Cognitive Machines” and is experienced in teaching and lecturing for academia and industry. He has acquired and led several international research projects. This is an interactive course and participants will need to bring their own laptops.

ATTENDEE TESTIMONIAL:

Great presentation, great hands-on material very knowledgeable instructors.

Courses

Virtual Clinical Trials: An In-depth Tutorial

SC1239 • Course Level: Intermediate • CEU: 0.4
$335 Members • $186 Student Members • $390 Non-Members USD
Tuesday 8:30 am to 12:30 pm

In 2014, it was estimated that there were just 450 anatomic phantoms in the world. Today, based on advanced models of breast anatomy, an infinite number of models exist. As such, it is possible to simulate individuals and specific pathologies from the population of all humans with increasingly higher accuracy. This, together with advanced models of image simulation, image processing and image reconstruction, means that we can create arbitrarily large databases of simulated images. At the same time, advances in machine observer methods mean that it is possible to conduct virtual clinical
Adversarial Networks: From Architecture to Practical Training

SC1262 • Course Level: Intermediate
CEU: 0.4 $325 Members •$182 Student Members •$380 Non-Members USD
Sunday 8:30 am to 12:30 pm

This half-day deep dive course will guide researchers with some background knowledge, e.g. from the introductory course, SC1235 Introduction to Medical Image Analysis using Convolutional Neural Networks, through the most important concepts of generative adversarial networks (GANs) and show example applications to medical data. GANs are powerful appearance models, but GANs can also be used to map between different domains (such as between CT and MRI) or to help training better segmentation models. Adversarial training can be introduced into several learning tasks in medical image analysis. It has been shown to help make image analysis algorithms more robust to variability in the data and to reduce the probability of failure on unseen cases. GANs in their initial implementation have been known to be hard to configure and train, but recent advances have helped them catch ground in applications of classification and segmentation. We will introduce GANs conceptually and from a Variational Inference perspective, give an overview of their development towards the state of the art, and explain specific architectural decisions and developments that have been proposed to stabilize their training. We will show code examples and illustrate the course content with live demonstrations on example data, so that the participants gain some first-hand experience on the subject. The course is not designed as a hands-on workshop, though.

LEARNING OUTCOMES
This course will enable you to:
• describe the roles and methods for conducting VCT
• identify the necessary constituent software components for conducting VCT
• name the standards relevant for conducting VCT, including DICOM, ASME, IEEE, AAPM, etc.
• construct and Design examples of VCTs to illustrate there usage
• demonstrate new use cases
• explain the underlying statistical considerations for conducting VCT

INTENDED AUDIENCE
Clinicians, scientists, and administrators from academia, industry and government interested in adopting or gaining further knowledge of VCT methods.

INSTRUCTOR
Andrew D. Maidment has 30 years of experience in breast cancer research, with specific training and expertise in development of digital x-ray detectors and 3D breast x-ray imaging. Dr. Maidment has been conducting research into VCT for nearly 20 years, has extensive grant funding in VCTs, and has published extensively in this field. A Fellow Adjunct Professor in Radiology at the University of Pennsylvania, he has extensive teaching experience.

Predrag Bakic has more than 20 years experience in breast cancer research, with specific training and expertise in developing and conducting VCT. Dr. Bakic’s PhD thesis was on the topic of breast anatomy models for imaging simulation.

Bruno Barufaldi received his Ph.D. from the University of Sao Paolo in 2016. For the last 2 years, he has been active in the field of VCT, designing much of the pipeline software used in the OpenVCT suite of software tools. The latest draft of the OpenVCT standard will be provided to participants. This document is open-source and does not have copyright restrictions. Instructors will quickly introduce the material to those unfamiliar with VCT. However, the majority of the material will be at the intermediate to advanced level to benefit those with VCT experience. The instructors were very motivated and eager to teach us as much as possible.

ATTENDEE TESTIMONIAL:
The instructors were very motivated and eager to teach us as much as possible.

Technological Assessment of X-Ray Based Breast Imaging Systems Using Anthropomorphic Phantoms

SC1292 • Course Level: Introductory • CEU: 0.4 $325 Members •$182 Student Members •$380 Non-Members USD
Saturday 8:30 am to 12:30 pm

Development of new breast X-ray imaging technologies or improvements to hardware or software of current systems usually require the accurate assessment of image quality. Image quality assessment methods are also required for quality control (QC) of clinical systems, for example as required by the U.S. Mammography Quality Standards Act (MQSA) program. The gold standard for assessment of image quality is human reader studies assessing diagnostic performance over a cohort of representative clinical images. These clinical trials are often difficult and expensive to perform, and therefore researchers have been studying alternative approaches that can assess diagnostic task performance without imaging patients. This short course will describe methods for objectively assessing task performance of breast imaging systems without conducting a clinical trial. One approach that will be discussed is the in silico modeling of a clinical trial. This approach involves complete computer modeling of each step in the imaging chain including: 1) modeling of breast and relevant breast lesions, 2) modeling of the imaging system, and 3) modeling of the observer. Another more experimental approach that will also be discussed involves: 1) development of anthropomorphic physical phantoms with diagnostic features, 2) imaging of these phantoms on breast imaging commercial or prototype systems, and 3) assessment of task performance with either model or human observers.

For maximum efficiency, the proposed in silico and experimental approaches require the development of computer or model observers that can emulate either ideal or human observer task performance. This short course will discuss the use of new machine learning algorithms that can be used to model observer performance in the assessment of breast imaging technology.

This course will describe and make attendees aware of useful open-source software tools that can be downloaded. This course will describe and make attendees aware of useful open-source software tools that can be downloaded.

ATTENDEE TESTIMONIAL:
Excellent course and presenters. Great topic and material.
• Summarize an approach for in silico Monte Carlo modeling of breast imaging systems.
• Describe and learn about approaches to validate modeling tools.
• Identify open-source Monte Carlo software available for in silico modeling of breast imaging systems.
• Describe various approaches to modeling observers for breast phantom images. These include both conventional and machine-learning based model observers.
• List advantages and disadvantages of various model observers.
• Describe a new approach for objectively assessing breast imaging detectors.
• Explain how to use machine learning model observers to assess task performance achieved with various breast imaging modalities.
• Describe and learn about an in silico clinical trial conducted by the FDA to compare task performance with full-field digital mammography and digital breast tomosynthesis.

INTENDED AUDIENCE
Scientists, engineers, technicians, or managers who wish to learn more about how to objectively assess breast imaging technology. Anyone who wants to learn more about; 1) optimizing new breast imaging systems, 2) optimizing new hardware or software based modifications to current breast imaging systems, 3) possible approaches of assessing system effectiveness for regulatory submissions, and 4) new methods that can be used for quality control of clinical breast imaging systems.

Familiarity with x-ray interactions in tissue and digital imaging systems would be helpful.

INSTRUCTOR
Stephen Glick is a Research Biomedical Engineer in the Division of Imaging, Diagnostics, and Software Reliability at the U.S. Food and Drug Administration. He received the Ph.D. degree in Biomedical Engineering from Worcester Polytechnic Institute (WPI) in 1991. From 1991 to 2014, he held positions of Assistant Professor, Associate Professor and Professor in the Department of Radiology at University of Massachusetts Medical School. His primary research interests include the development, optimization and evaluation of new methods for x-ray imaging of breast cancer, and he has published over 70 peer-reviewed journal papers, 120 conference proceedings papers, and 10 book chapters. He is an AAPM Fellow and is currently on the Board of Associate Editors for the journals Medical Physics, and Journal of Medical Imaging.

Hilde Bosmans received the Ph.D. degree in 1992 with a thesis on MR Angiography. Her activities in breast cancer screening started with involvement in the early EU projects of the European Breast Cancer Network, where she took the lead in 1996 for the contributions on physico-technical QA. Today, she assures, with her team, medical physics expertise in the radiology department of the University Hospitals of Leuven, in 5 regional hospitals and for a network of 102 breast cancer screening sites. Dr. Bosmans has made scientific contributions in (model) observer work, development of phantoms, virtual clinical trials, dosimetry and measurement techniques in general. She has currently 11 PhD students and a track record of 235 peer reviewed publications and 73 SPIE papers. She is member of the Physico-Technical Steering Group of EURERF, of the Belgian IEC committee and of several task groups of EFOMP and AAPM dealing with Quality Assurance of radiological devices. She is coordinator of the EUTEMPE-RX courses for medical physics experts.

Andreu Badal is a Staff Fellow in the Division of Imaging, Diagnostics, and Software Reliability at the U.S. Food and Drug Administration. Badal earned his PhD degree from the University of Barcelona, and a Ph.D. in Nuclear Engineering from the Universitat Politècnica de Catalunya in Barcelona (Spain), working in the research group developing the Monte Carlo code PENEOLE. He has specialized in the application of Monte Carlo radiation transport simulation methods in medical imaging, and is the main developer of MC-GPU, the first GPU-accelerated Monte Carlo code for the simulation of x-ray imaging devices.

From Analytic to Clinical Validation: Moving AI/ML into Practice

SC1295 • Course Level: Intermediate • CEU: 0.7
$565 Members • $294 Student Members • $660 Non-Members USD
Tuesday 8:30 am to 5:30 pm

Artificial Intelligence (AI) is increasingly being used in a wide variety of medical imaging applications. Most of the focus, however, is on algorithm and scheme development, but this is only part of the picture. In order to have an impact on clinical decision making, workflow and patient care these AI tools must be evaluated using real-world cases and actual clinical providers that are expected to use them in routine care. The techniques used to conduct these types of studies are less well known in this field thus investigators need to know the best way to study design and analysis methods.

This course will cover basic principles, techniques, and process for validating models developed using artificial intelligence (AI)/machine learning (ML) techniques. The primary goal of this course is to help the audience understand and apply fundamental principles related to designing, executing, and interpreting model evaluation studies.

The course will be organized around two parts: analytic validation and clinical validation. In the first half, the audience will be exposed to approaches for performing a technical validation of a prediction model, including different study designs, appropriate statistical tests, metrics, dataset considerations, and decision curve analysis. The second half will cover the process of undertaking clinical validation that would address real-world use of models, regulatory and deployment issues. Topics include workflow integration, prospective clinical trials, reader impact studies, and regulatory approvals. Examples will focus on imaging-related models that are drawn from literature and the instructors’ personal experiences in prognostic modeling, computer-aided diagnosis, and imaging biomarker development.

Learning Outcomes
This course will enable you to:
• Describe the process of analytic and clinical validation, elucidating the steps involved and the considerations in designing an evaluation.
• Explain basic concepts (e.g., training/testing/validation, cross-validation) and metrics (e.g., precision/recall) related to algorithm evaluation.
• Choose the appropriate study design and metrics for comparing algorithms, depending on data, model, and objective.
• Interpret various metrics to determine whether one algorithm is superior over others for a specific task.
• Identify sources of potential biases that may influence model performance due to characteristics of the training or target populations.
• Identify potential steps in moving beyond an algorithm paper to deploying AI/ML in clinical practice.
• Identify appropriate methods to assess the impact of AI techniques and tools on observer accuracy.

INTENDED AUDIENCE
Data scientists, health information technology practitioners, and clinician informaticians who wish to learn about the process of evaluating prediction models and the considerations involved in assessing the suitability and impact of adopting a model in a clinical environment. Basic biostatistics (hypothesis testing, statistical tests) and a working knowledge of machine learning concepts (how models are constructed, types of machine learning algorithms) are assumed.

INSTRUCTOR
William Hsu PhD is an Associate Professor of Radiological Sciences at the University of California, Los Angeles and a member of the Medical & Imaging Informatics group. Dr. Hsu’s research interest is in data integration and machine and reinforcement learning with applications in improving diagnostic decisions support to improve early detection of cancers. He has developed and evaluated many machine learning-based algorithms that utilize clinical, imaging, and molecular data as inputs. In his role as a Deputy Editor for the Radiology: Artificial Intelligence journal, he has developed an interest in improving the transparency and consistency of reporting of model evaluations.

Matthew Brown PhD is a Professor of Radiological Sciences at the University of California, Los Angeles and the Director of the Center for Computer Vision and Imaging Biomarkers (CVIB) at UCLA. Dr. Brown’s research interests include medical image segmentation, quantitative analysis, and imaging biomarker development. He is a co-founder of MedQIA, a company that provides image analysis services for clinical trials to the biotech, pharma, and medical device industries.

Robert Nishikawa PhD is Professor of Radiology at the University of Pittsburgh. He has research interests are in developing quantitative imaging techniques for breast imaging; image quality assessment; and evaluation of imaging technologies, specifically, the clinical effectiveness of computer aids for radiologists. He has over 200 scientific publications and has been a consultant for several medical imaging companies on digital imaging and computer-aided diagnostic software. He is a fellow of SPIE, AAPM, AIMBE, and the Society of Breast Imaging.

Elizabeth Krupinski PhD is an Experimental Psychologist with research interests in medical image perception, observer perfor-
Courses

Spectral CT Imaging
SC987 • Course Level: Intermediate • CEU: 0.4
$325 Members • $182 Student Members • $380 Non-Members USD
Monday 8:30 am to 12:30 pm

This course provides attendees with an advanced knowledge of spectral CT imaging. The course focuses on the properties of a spectral CT measurement and the main applications in spectral CT reconstruction and spectral CT image postprocessing. Many clinical examples of spectral CT imaging applications are provided to illustrate the diagnostic outcome of this technique.

LEARNING OUTCOMES
This course will enable you to:
• describe the system properties of a spectral CT system
• compare different system approaches to acquire spectral CT data, such as dual source CT, kV switching and energy-resolving detectors
• summarize various algorithms for spectral CT reconstructions and spectral CT image postprocessing
• list the relevant clinical applications of spectral CT
• explain the main challenges of spectral CT techniques

INTENDED AUDIENCE
This material is intended for anyone who is interested in the usage of the spectral information provided by modern CT systems. Those who wish to update their knowledge on the CT measurement and reconstruction process and who work with spectral CT applications will find this course valuable.

INSTRUCTOR
Bernhard Schmidt is head of the Siemens Healthcare CT Scanner Applications and Algorithm Predevelopment Group. Over the last few years, he has been closely involved into the development of the Dual Energy product provided by Siemens.

Thomas Flohr is head of Siemens Healthcare CT physics and applications development and has been instrumental in developing multi-detector row CT and dual-source CT. He is an assistant professor at the Eberhard-Karls University, Tübingen, Germany.

Katharine Grant earned her BS in Physics from Miami University and her PhD from the Mayo Clinic. Dr. Grant joined Siemens Healthcare as a Staff Scientist in 2009 and served as a scientific research collaboration manager within the Computed Tomography business. She is currently a Principle Key Expert and the Senior Director of CT Research and Development in North America. Her main role is to drive new innovations, serve as a liaison between luminary customers/collaborators and Siemens’ physicists and product development specialists, while supporting marketing and sales efforts within the USA.

High-Performance Computing for Medical Imaging on Graphics Processing Units (GPU) with CUDA

SC1296 • Course Level: Introductory • CEU: 0.4
$325 Members • $182 Student Members • $380 Non-Members USD
Sunday 1:30 pm to 5:30 pm

This course covers the basic principles of graphics processing unit (GPU) programming with CUDA. To become familiar with the programming model, we will start with a simple example, to be followed by more in-depth topics related to GPU programming. Some applications to medical imaging will be presented. Anyone who wants to know how to parallelize their code and make it run 10 times faster by harnessing the massively parallel capabilities of modern GPUs, will benefit from taking this course.

LEARNING OUTCOMES
This course will enable you to:
• design efficient general-purpose CUDA code tailored to the parallel capabilities of modern GPUs
• be able to learn on your own, understand, and use advanced material on CUDA programming
• analyze and debug existing CUDA code
• modify code samples and use them as building blocks for more complex applications

INTENDED AUDIENCE
Scientists, engineers, or technicians who wish to learn CUDA and GPU programming. Knowledge of the C programming language is assumed.

INSTRUCTOR
Luca Caucci is an assistant professor in the Department of Medical Imaging at the University of Arizona. He earned his PhD in Optical Sciences from the University of Arizona. Dr. Caucci’s research interests include emission computed tomography, list-mode data processing, photon-processing detectors, signal detection, parameter estimation, adaptive imaging, parallel computing, and digital radiology.
Registration

ONSITE REGISTRATION HOURS / BADGE PICK-UP
Texan Foyer, 4th Floor
Saturday 15 February ....................... 7:15 AM - 4:00 PM
Sunday 16 February ......................... 7:15 AM - 4:00 PM
Monday 17 February ......................... 7:30 AM - 4:00 PM
Tuesday 18 February ......................... 7:30 AM - 4:00 PM
Wednesday 19 February ..................... 7:30 AM - 4:00 PM
Thursday 20 February ....................... 7:30 AM - 1:30 PM

CONFERENCE REGISTRATION
Includes admission to all conference sessions, plenaries, panels, and poster sessions, coffee breaks, and a choice of online proceedings.

COURSE AND WORKSHOP REGISTRATION
Courses and workshops are priced separately. Course-only registration includes your selected course(s), course notes, and coffee breaks. Course prices include applicable taxes. Onsite, please go to the registration desk after picking up your badge.

EARLY REGISTRATION PRICING AND DATES
Conference registration prices increase by $150 (Students, $50) and course prices increase $75 after 29 January 2020. The online form will automatically display the increased prices.

SPIE MEMBER, SPIE STUDENT MEMBER, AND STUDENT PRICING
- SPIE Members receive conference and course registration discounts. Discounts are applied at the time of registration.
- SPIE Student Members receive a 60% discount on all courses.
- Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their PhD. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

PRESS REGISTRATION
For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

SPIE CASHIER
Registration Desk, Atlas Foyer

OPEN DURING REGISTRATION HOURS
REGISTRATION PAYMENTS
If you are paying by cash or check as part of your onsite registration, wish to add a course, workshop, or special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier at Registration.

RECEIPT AND CERTIFICATE OF ATTENDANCE
Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

BADGE CORRECTIONS
Badge corrections can be made by the SPIE Cashier at Registration. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

REFUND INFORMATION
There is a $50 service charge for processing refunds. Requests for refunds must be received by 7 February 2019. All registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions, or Special Events purchased are not refundable.

U.S. GOVERNMENT CREDIT CARDS
U.S. Government credit card users may have your purchasing officer contact the credit card company and get prior authorization before attempting to register. Advise your purchasing agent that SPIE is considered a 5968 company for authorization purposes.

Author / Presenter Information

SPEAKER CHECK-IN AND PREVIEW STATION
David Mitzner Room, 4th Floor
Sunday ........................................... 7:00 AM - 5:00 PM
Monday through Thursday ................... 7:30 AM - 5:00 PM

All presenters must stop by Speaker Check-in to upload their file(s) at least two hours before their scheduled talk. Authors are not able to present using their own devices. All conference rooms have a laptop, projector, screen, lapel microphone, and laser pointer.

Save money—Register by 24 January
General Information

Onsite Services

INTERNET ACCESS
Complimentary wireless access available; instructions will be posted onsite.

SPIE CONFERENCE AND EXHIBITION APP
Search and browse the program, special events, participants, courses, and more. Free Conference App available for iPhone and Android phones. Check out the SPIE App.

SPIE BOOKSTORE
Texan Foyer, 4th Floor
Stop by the SPIE Bookstore to browse the latest SPIE Press Books, proceedings, and educational materials. While there, get a t-shirt or educational toy to bring home to the family.

SPIE EDUCATION SERVICES
SPIE Registration Desk, Texan Foyer, 4th Floor
Browse course offerings or learn more about SPIE courses available in portable formats such as Online and customized, In-company courses.

SPIE LUGGAGE & COAT CHECK
Hotel Front Desk
Complimentary luggage, package, and coat storage are available. Please note hours; no late pickup available.

BUSINESS CENTER
Marriott Marquis Houston Lobby
Services include copy service, fax service, notary services, overnight delivery/pickup, network/internet printing, and post/parcel.

RESTAURANT & CITY INFORMATION
Restaurant and City information available at Hotel Concierge in the Marriott Marquis Houston Lobby.

CHILD CARE SERVICES
Mom’s Best Friend – Hotel Child Care - 281.578.2584 or 713.776.2669
NOTE: SPIE does not imply an endorsement nor recommendation of these services. They are provided on an “information only” basis for your further analysis and decision. Other services may be available.

URGENT MESSAGE LINE
An urgent message line is available during registration hours:
+1.360.685.5529

LOST AND FOUND
Registration Desk, Texan Foyer 4th Floor - open during registration hours
Found items will be kept at the Registration Desk until 1 pm on Thursday and then turned over to Marriott Marquis security. At the end of the meeting, all found items will be turned over to the Marriott Marquis.

Food and Beverage Services

COFFEE BREAKS
Texan Foyer, 4th Floor
Complimentary coffee will be served all day in the Texan Foyer.

SPIE-HOSTED LUNCHES
Texan Ballroom Salon F, 4th Floor
SPIE-hosted lunches will be included in registration packets for all conference registrants Monday through Wednesday.
Monday through Wednesday ...................... 12:10 - 1:20 PM

FOOD & REFRESHMENTS FOR PURCHASE
The Marriott Marquis has several onsite dining and food options. See website for details.
**Hotel**

If you book your room by **Monday January 6, 2020** you will be entered to win:

- **Grand Prize** - one of (5) $100 Marriott Gift Cards, or
- **Second Prize** - one of (4) Gift Certificates (for future two-night stay at the Marriott Marquis Houston*)

*Subject to availability and other restrictions

Winning registrants must attend Medical Imaging 2020 and book their hotel room through the hotel link provided. Winners are notified during the conference and claim their prize onsite.

A block of rooms at special conference rates has been reserved for event attendees. The conference rates cannot be guaranteed after the room block has been filled. Please do not contact SPIE to book your hotel room.

**MARRIOTT MARQUIS HOUSTON**

1777 Walker Street • Houston, TX

This AAA Four-Diamond hotel has incredible views and is located downtown near the Houston Zoo, Space Center Houston, The Galleria and much more.

Receive **FREE internet** and **25% off parking** when you book in the SPIE hotel block.

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**Car Rental**

Hertz Car Rental is the selected as the official car rental agency for this Event. To reserve a car, identify yourself as a Medical Imaging conference attendee using the Hertz Meeting Code CV# 029B0025. Discount rates apply for rentals up to one week prior through one week after the conference dates. Note: When booking from International Hertz locations, the CV # must be quoted with the letters CV before the number, i.e. CV029B0025.

Book online at Hertz.com

- In the United States call 1-800-654-2240
- In Canada call 1-800-263-0600, or 1-416-620-9620 in Toronto
- In Europe and Asia call a Hertz Reservation Center or travel agent
- Outside of these areas call 1-405-749-4434

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**Airport Information**

- **George Bush Intercontinental Airport** - (IAH) is located approximately 20 miles SW of the hotel.
- **William P Hobby Airport** - (HOU) is located approximately 9 miles NW of the hotel.
- **Ellington Field** - (EFD) is located approximately 17.5 miles NW of the hotel.

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**WARNING: UNOFFICIAL HOUSING SOLICITATIONS**

SPIE has arranged special discounted hotel rates for SPIE conference attendees.

- Use the SPIE Official Housing Vendor to book your room.
- SPIE has arranged special discounted hotel rates for SPIE conference attendees. To receive special hotel rates for this meeting, you must use the SPIE Official Housing Vendor.
- SPIE strongly recommends you DO NOT book housing from any company that contacts you via phone or email.
  - The reservation system that SPIE uses for this event is available only via the Hotel page on the event website.
  - SPIE Official Housing Vendors use an Official SPIE Contractor logo to verify they are authorized by SPIE
  - Our housing vendors DO NOT reach out to you with solicitations.
  - Our housing vendors may follow up with you about housing once you have begun booking via our website, but NOT as an initial solicitation.
  - SPIE cannot be liable for any claims made by unofficial entities or for any damages suffered by you if you use any vendor or service that is not an SPIE Official Housing Vendor.
SPIE Event Policies

Acceptance of Policies and Registration Conditions

The following Policies and Conditions apply to all SPIE Events. As a condition of registration, you will be required to acknowledge and accept the SPIE Registration Policies and Conditions contained herein.

Agreement to Hold Harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Anti-Harassment Policy

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated. This policy applies to all locations and situations where SPIE business is conducted and to all SPIE-sponsored activities and events.

Read complete policy http://spie.org/harassment

Attendee Registration and Admission Policies

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual’s registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry of or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Capture and Use of a Person’s Image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE marketing or promotional purpose. By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify and hold harmless SPIE from and against any claims, damages or liability arising from or related to the use of the images, recordings or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion or use in composite form that may occur or be produced in taking, processing, reduction or production of the finished product, its publication or distribution.

Code of Conduct

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

Read complete Code: http://spie.org/conduct

Event Cancellation Policy

If for some unforeseen reason SPIE should have to cancel an event, processed registration fees will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

Family-Friendly Policy

Conference Events: All conference technical and networking events require a badge for admission. Registered attendees may bring children with them if they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

Exhibition Hall: Everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

Identification Requirement

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials. Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.
Laser Pointer Safety Policy
SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers. Use of a personal laser pointer represents the user’s acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, you must have it tested at Speaker Check-in.

No-Smoking Policy
Attendees will observe all non-smoking regulations that are publicly posted by the facilities used by the event.

Payment Policy
Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner’s Club, checks and wire transfers. Onsite registrations can also be paid with cash.

Recording Policy
Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at Speaker Check-In or SPIE Registration. Individuals not complying with this policy will be asked to leave immediately.

Unsecured Items
Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless Internet Service
At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other kinds of computer damage.
Watch more than 20,000 conference presentations on the SPIE Digital Library

SPIEDigitalLibrary.org/videos

See the talks you missed.