CALL FOR PAPERS

Medical Imaging 2018

CALL FOR PAPERS

Submit abstracts by 7 August 2017

10-15 February 2018
Marriott Marquis Houston
Houston, Texas

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Present your work in Houston at Medical Imaging 2018
The multidisciplinary event for the advancement of imaging technologies

Why Medical Imaging is at home in Houston:

- The area is rich in medical research and advances directly affecting the applications of imaging, wearable sensors, deep learning, precision medicine, digital pathology and much more.
- **City of Possibilities** - In 25 to 50 years, the Texas Medical Center will continue to be a hub for medical advancement and care, but its role for patients will change. Join your colleagues in Houston and learn why.
- **Texas Medical Center** - the largest medical center in the world with one of the highest densities of clinical facilities for patient care, basic science, and translational research.
- **MD Anderson Cancer Center** - #1 Ranked Cancer Center. The Main Building is located in Houston, not far from the Texas Medical Center campus.
- **Rice University** - Nanotube technology first began here, winning Nobel prizes for the research team. The university has the first nanotechnology lab with many of the first patents given that applied to medical and energy applications.
Greetings,

The SPIE Medical Imaging meeting is the internationally recognized premier 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, to technology developments, scientific evaluation, and clinical application. The symposium covers the full range of medical imaging modalities including medical image acquisition, display, processing, analysis, perception, decision support, and informatics. Broad topics of interest include the following:

- imaging physics, systems analysis and modeling
- x-ray imaging and computed tomography
- ultrasonic acquisition and processing
- magnetic resonance imaging (MRI)
- molecular imaging
- digital pathology
- emerging image acquisition technologies
- tomographic image reconstruction
- quantitative imaging
- image processing and analysis
- computer-aided detection and diagnosis
- computational models
- image-guided therapies
- visual rendering of complex datasets
- visual perception and observer performance
- physiological and functional interpretation of image data
- clinical evaluations of new technologies
- image data management (storage, retrieval, transmission)
- medical informatics
- imaging for precision medicine
- machine learning
- deep learning

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:

Leonard Berliner
Weill Cornell Medical College, and New York Presbyterian - Brooklyn Methodist Hospital (USA)

Ronald M. Summers
National Institutes of Health (USA)
EXECUTIVE ORGANIZING COMMITTEE

Elsa D. Angelini, Imperial College London (United Kingdom), Télécom ParisTech (France)
Brett C. Byram, Vanderbilt Univ. (USA)
Guang-Hong Chen, Univ. of Wisconsin-Madison (USA)
Po-Hao Chen, The Univ. of Pennsylvania Health System (USA)
Neb Duric, Delphinus Medical Technologies (USA), Barbara Ann Karmanos Cancer Institute (USA)
Baowei Fei, Emory Univ. (USA)
Barjor Gimi, Cooper Medical School, Rowan Univ. (USA)
Metin N. Gurcan, The Ohio State Univ. Wexner Medical Ctr. (USA)

Andrzej Krol, SUNY Upstate Medical Univ. (USA)
Bennett A. Landman, Vanderbilt Univ. (USA)
Joseph Y. Lo, Duke Univ. Medical Ctr. (USA)
Kensaku Mori, Nagoya Univ. (Japan)
Robert M. Nishikawa, Univ. of Pittsburgh (USA)
Nicholas A. Petrick, U.S. Food and Drug Administration (USA)
Frank W. Samuelson, U.S. Food and Drug Administration (USA)
Taly Gilat Schmidt, Marquette Univ. (USA)
John E. Tomaszewski, Univ. at Buffalo (USA)
Robert J. Webster III, Vanderbilt Univ. (USA)
Jianguo Zhang, Shanghai Institute of Technical Physics (China)

COOPERATING ORGANIZATIONS

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

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### 2018 STUDENT PAPER AWARDS INFORMATION

**ATTENTION STUDENTS**

See web for submission instructions and eligibility requirements for the 2018 awards. Submission instructions and eligibility requirements for the 2018 All Conference Best Student Paper Award will be available in October 2018.

*See 2017 Award Winners online: [www.spie.org/awards2017](http://www.spie.org/awards2017)*

Submit your abstract today: [www.spie.org/mi18call](http://www.spie.org/mi18call)
This conference will cover all aspects of image formation in medical imaging, including systems using ionizing radiation (x-rays, gamma rays) or non-ionizing techniques (ultrasound, optical, thermal, magnetic resonance, or magnetic particle imaging). Systems of interest include those producing projection, tomographic, volumetric, dynamic, or time resolved studies, along with systems using specialized approaches for depth or tissue discrimination. Papers of a theoretical nature or papers reporting new experimental results are invited. Topics of particular interest include experimental methods and results regarding image performance, image reconstruction, detector materials and electronic design, analytical and computer modeling of imaging systems, and novel methods for image formation including the physics of contrast media. The conference will cover predicted and measured system performance, including image noise and contrast, spatial and temporal resolution, and inherent artifacts. Work directed toward the imaging of human subjects, small animals, or tissue specimens are welcome. The conference will also cover dedicated approaches for various imaging tasks resulting from the above mentioned general imaging framework, like cardiovascular or neuroimaging tasks. Original papers are especially requested in the following areas:

**IMAGING SCIENCE**
- Physics of signal detection, image formation and signal degradation
- Object characterization and contrast mechanisms
- Characterization of detector and system performance (MTF, NPS, DQE, task- and observer-based)
- Detection and discrimination
- Characterization of detector and system performance (MTF, NPS, DQE, task- and observer-based)

**TECHNOLOGY**
- Novel medical imaging systems and methods including contrast media / nanoparticles
- Properties of scintillating, photoconductive, or other sensor materials
- Novel sources of radiation
- Image reconstruction methods (e.g., for CT, tomosynthesis, SPECT and PET, optical imaging, MRI, etc.)
- Multi-energy (spectral) x-ray and CT imaging
- Computer simulation of imaging systems including models for radiation sources, imaged objects, physical interactions, and detectors
- Phantoms (physical and numerical)
- Photon counting
- Proton based imaging
- Radiation (e.g., optical) and signal transport
- Radiation dose, dosimetry, and dose effects (risk), as well as possible stratification

**DEVICES**
- Advanced multi-slice or cone beam CT systems
- Advanced radiographic, fluoroscopic, or angiographic systems (including phase contrast and diffraction)
- Non-ionizing radiation systems (ultrasound, MRI, optical, thermal, magnetic particle imaging)
- Small animal imaging systems
- Nuclear medical imaging methods
- Multi-modality imaging devices
- Low-cost imaging devices with global health applications

**APPLICATIONS**
- Cardiovascular imaging
- Neuroimaging
- Mammographic imaging
- Interventional imaging
- Imaging applications in therapy (e.g., radiation therapy, surgery, in-vivo verification)
- Advanced applications (clinical, translational, preclinical, basic science, biomarkers)
- Novel medical imaging for precision medicine applications
CALL FOR PAPERS

TOPIC AREAS: FOR THIS CONFERENCE ONLY

During the submission process, you will be asked to choose three different topics to assist in the review process.

- **ALG** - Algorithmic developments, simulations, calibration, classification, etc. (for reconstruction use dedicated categories)
- **CARD** - Cardiovascular imaging
- **CLIM** - Clinical evaluation
- **CON** - Physics of contrast enhancement using contrast media / nanoparticles
- **CT** - All conventional and multi-energy CT topics (for cone beam use dedicated category)
- **CTCB** - Cone beam CT
- **DET** - Detector technology; scintillators, photoconductors, diodes, TFT
- **DIAG** - Diagnostic imaging
- **DOSE** - Radiation dose, dosimetry, and dose effects
- **IGI** - Image guided interventions
- **IMG** - Imaging methods including optical, MR, ultrasound, etc. (for x-ray, CT, or nuclear based methods use dedicated categories)
- **MAM** - Imaging of the breast (any device)
- **METR** - Measurement methods (MTF, NPS, DQE, eDQE, gDQE, Spectra, ...)
- **MULTI** - Multi modality imaging
- **NEURO** - Neuroimaging
- **NUC** - Nuclear medical imaging innovations
- **ONC** - Oncology
- **OTHER** - Other methodology, systems or applications
- **PCI** - Photon counting imaging
- **PER** - Observer or perception-based performance evaluations of systems
- **PHS** - Phase contrast imaging
- **PHT** - Work involving development of phantoms or anatomical simulation models
- **PRI** - Proton based imaging
- **RECON** - Image reconstruction including CT, SPECT, PET, OCT and tomosynthesis
- **SMAX** - Small animal or microscopic imaging
- **TSY** - Tomosynthesis
- **XIM** - X-ray imaging, x-ray sources, scatter reduction techniques
- **XME** - Multi-energy radiography or mammography

Submit your abstract today: **www.spie.org/mi18call**

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**SAVE THE DATE**

**ABSTRACTS DUE:** 7 August 2017
Midnight all time zones

**AUTHOR NOTIFICATION:** 9 October 2017
The contact author will be notified of acceptance by email.

**MANUSCRIPT DUE DATE:** 15 January 2018
Midnight all time zones

**PLEASE NOTE:** Submissions imply the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.
Image Processing (MI102)

Conference Chairs: Elsa D. Angelini, Imperial College London (United Kingdom), Télécom ParisTech (France); Bennett A. Landman, Vanderbilt Univ. (USA)

Program Committee: Rafeef Abugharbieh, The Univ. of British Columbia (Canada); Paul Aljabar, King's College London (United Kingdom); Mostafa Analoui, Livingston Securities LLC (USA); Brian B. Avants, Univ. of Pennsylvania (USA); Meritxell Bach-Cuadra, Univ. de Lausanne (Switzerland); Kyongtae Ty Bae, Univ. of Pittsburgh Medical Ctr. (USA); Ulas Bagci, Univ. of Central Florida (USA); Christian Barillot, IRISA / INRIA Rennes (France); Benoit M. Dawant, Vanderbilt Univ. (USA); Marileen de Bruijne, Erasmus MC (Netherlands); Alexandre X. Falcão, Univ. Estadual de Campinas (Brazil); Aaron Fenster, Robarts Research Institute (Canada); Alejandro F. Frangi, The Univ. of Sheffield (United Kingdom); Mona K. Garvin, The Univ. of Iowa (USA); James C. Gee, Univ. of Pennsylvania (USA); Guido Gerig, New York Univ. (USA); Benjamin Glocker, Imperial College London (United Kingdom); Miguel Angel González Ballester, Univ. Pompeu Fabra (Spain); Hayit Greenspan, Tel Aviv Univ. (Israel); Ghassan Hamarneh, Simon Fraser Univ. (Canada); David R. Haynor, Univ. of Washington (USA); Tobias Heimann, Siemens AG (Germany); Ivana Išgum, Univ. Medical Ctr. Utrecht (Netherlands); Stefan Klein, Erasmus MC (Netherlands); Ender Konukoglu, ETH Zürich (Switzerland); Tianhe Lei, MD Imaging Research (USA); Bouwdeijn P. F. Lelieveldt, Leiden Univ. Medical Ctr. (Netherlands); Marius George LInguraru, Children's National Medical Ctr. (USA); Murray H. Loew, The George Washington Univ. (USA); Cristian Lorenz, Philips Research (Germany); Frederik Maes, Katholieke Univ. Leuven (Belgium); Vincent A. Magnotta, The Univ. of Iowa Hospitals and Clinics (USA); Diana Mateus, Technische Univ. München (Germany); Sunanda D. Mitra, Texas Tech Univ. (USA); Kensaku Mori, Nagoya Univ. (Japan); Nassir Navab, Technische Univ. München (Germany), Johns Hopkins Univ. (USA); Mads Nielsen, Niels Bohr Institute (Denmark); Wiro J. Niessen, Erasmus MC (Netherlands); Brian Nutter, Texas Tech Univ. (USA); Sébastien Ourselin, Univ. College London (United Kingdom); Dzung L. Pham, Henry Jackson Foundation/USU (USA), National Institutes of Health (USA), Johns Hopkins Univ. (USA); Jerry L. Prince, Johns Hopkins Univ. (USA); Sonia Pujol, Brigham and Women’s Hospital (USA); Xin Qi, Rutgers, The State Univ. of New Jersey (USA); Punam K. Saha, The Univ. of Iowa (USA); Olivier Salvado, Commonwealth Scientific and Industrial Research Organisation (Australia); Lin Shi, The Chinese Univ. of Hong Kong (China); Marius Staring, Leiden Univ. Medical Ctr. (Netherlands); Martin A. Styner, The Univ. of North Carolina at Chapel Hill (USA); Raphael Szlachta, Univ. Bern (Switzerland); Philippe Thvenaz, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Jayaram K. Udupa, Univ. of Pennsylvania (USA); Koen Van Leemput, Harvard Medical School (USA), Massachusetts General Hospital (USA); Tom K. Vercauteren, Univ. College London (United Kingdom); Tomáž Vrtovec, Univ. of Ljubljana (Slovenia); Wolfgang Wein, ImFusion GmbH (Germany)

Original papers are invited on all aspects of the processing and analysis of medical, small animal, or cellular images, with applications in medicine, biological, and pharmaceutical research. Of interest are algorithms applied to all imaging modalities, including x-ray, DSA, CT, MRI, neuroimaging, nuclear medicine, optical, ultrasound, macroscopic, and microscopic imaging. Papers dealing with the challenges of bringing advances in research laboratories into clinical application are particularly welcomed.

Papers typically involve research that includes one or more of the following categories (in alphabetical order):

- Augmented/virtual reality
- Classification
- Compressed sensing, sparse reconstruction methods
- Computational anatomy and atlases
- Computer vision
- Deep learning
- Deformable geometry
- Diffusion MRI analysis
- Functional imaging and connectivity analysis
- Image representation and compression
- Image restoration and enhancement
- Image synthesis
- Imaging-genetics
- Machine learning (not deep learning)
- Model-based image analysis
- Motion/time series analysis
- Open software for medical image processing and translational research
- Population/clinical studies
- Quantitative image analysis/quantitative imaging biomarkers
- Radiomics
- Registration methodologies
- Segmentation methodologies
- Shape representation and analysis
- Statistical methodology
- Texture representation and analysis
- Validation, including creation of ‘ground truth’ image repositories
- Visualization methods
- Voxel/deformation/tensor-based morphometry
CALL FOR PAPERS

TOPIC AREAS: FOR THIS CONFERENCE ONLY

To assist the reviewers, choose up to three keywords in order of relevance from the following list.

- Augmented/virtual reality
- Classification
- Compressed sensing, sparse reconstruction methods
- Computational anatomy and atlases
- Computer vision
- Deformable geometry
- Diffusion MRI analysis
- Functional imaging and connectivity analysis
- Image representation and compression
- Image restoration and enhancement
- Image synthesis
- Imaging genetics
- Machine learning and pattern recognition
- Model-based image analysis
- Motion/time series analysis
- Open software for medical image processing and translational research
- Population/clinical studies
- Quantitative image analysis/quantitative imaging biomarkers
- Registration methodologies
- Segmentation methodologies
- Shape representation and analysis
- Statistical methodology
- Texture representation and analysis
- Validation, including creation of ‘ground truth’ image repositories
- Visualization methods
- Voxel/deformation/tensor-based morphometry

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Save the date

ABSTRACTS DUE: 7 August 2017
Midnight all time zones

AUTHOR NOTIFICATION: 9 October 2017
The contact author will be notified of acceptance by email.

MANUSCRIPT DUE DATE: 15 January 2018
Midnight all time zones

PLEASE NOTE: Submissions imply the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.
Computer-Aided Diagnosis (MI103)

Conference Chairs: Nicholas A. Petrick, U.S. Food and Drug Administration (USA); Kensaku Mori, Nagoya Univ. (Japan)

Program Committee: Samuel G. Armato III, The Univ. of Chicago (USA); Susan M. Astley, The Univ. of Manchester (United Kingdom); Stephen Aylward, Kitware, Inc. (USA); Matthew S. Brown, Univ. of California, Los Angeles (USA); Heang-Ping Chan, Univ. of Michigan (USA); Wei Ji Chen, U.S. Food and Drug Administration (USA); Marileen de Bruijine, Erasmus MC (Netherlands); Thomas M. Deserno, Technische Univ. Braunschweig (Germany); Karen Drukker, The Univ. of Chicago (USA); Catalin Fetita, Télécom SudParis (France); Hiroshi Fujita, Gifu Univ. School of Medicine (Japan); Maryellen L. Giger, The Univ. of Chicago (USA); Hayit Greenspan, Tel Aviv Univ. (Israel); Lubomir M. Hadjiiski, Univ. of Michigan (USA); Horst Karl Hahn, Fraunhofer MEVIS (Germany); Khan M. Iftekharuddin, Old Dominion Univ. (USA); Nico Karssmeijer, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); JongHyo Kim, Seoul National Univ. Hospital (Korea, Republic of); Marius George Lingurar, Children's National Medical Ctr. (USA); Mieczyslaw Mazurowski, Duke Univ. (USA); Fabrice Meriaudeau, Univ. Teknologi Petronas (Malaysia); Janne J. Näppi, Massachusetts General Hospital (USA); Noboru Niki, Univ. of Tokushima (Japan); Carol L. Novak, Siemens Healthineers (USA); Clarissa I. Sánchez, Radboud Univ. Medical Ctr. (Netherlands); Ronald M. Summers, National Institutes of Health (USA); Kenji Suzuki, Illinois Institute of Technology (USA); Georgia D. Tourassi, Oak Ridge National Lab. (USA); Bram van Ginneken, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); Rafael Viemker, Philips Research (Germany); Axel Wismüller, Univ. of Rochester Medical Ctr. (USA); Xiaofeng Yang, Emory Univ. (USA); Hiroyuki Yoshida, Massachusetts General Hospital (USA), Harvard Medical School (USA)

This conference will provide a forum for researchers involved in development and application of computer-aided detection and diagnosis systems. Original papers are requested on all aspects of CAD, including segmentation, pattern recognition, feature extraction, classifier design, machine learning, workstation design, human interaction, radiomics, database construction, and system performance evaluation. CAD methods involving any medical imaging modality are encouraged, including but not limited to x-ray, CT, MRI, nuclear medicine, molecular imaging, optical, ultrasound, endoscopy, macroscopic and microscopic imaging, and multi-modality technologies.

TOPIC AREAS: FOR THIS CONFERENCE ONLY

During the submission process, you will be asked to choose no more than three topics (one Applications and up to two Topics) from the following list to assist in the review process.

Topics:
- Applications: Prostate
- Applications: Pediatrics/Fetal
- Applications: Eye (including retina)
- Applications: Colon and other Gastrointestinal Tract
- Applications: Lung
- Applications: Musculoskeletal
- Applications: Pediatrics/Fetal
- Applications: Fetal Medicine
- Applications: Prostate
- Applications: Other Organ Systems
- Applications: Multiple Organ Systems
- Applications: Novel Algorithms
- Applications: Novel Systems
- Applications: Novel Applications
- Applications: Novel Algorithms
- Applications: Novel Systems
- Applications: Novel Applications

Choose one topic from the following applications list:
- Applications: Breast
- Applications: Brain
- Applications: (Cardio-)Vascular, Vessel
- Applications: Colon and other Gastrointestinal Tract
- Applications: Eye (including retina)
- Applications: Head and Neck
- Applications: Liver
- Applications: Lung
- Applications: Musculoskeletal
- Applications: Pediatrics/Fetal
- Applications: Fetal Medicine
- Applications: Prostate
- Applications: Other Organ Systems
- Applications: Multiple Organ Systems
- Applications: Novel Algorithms
- Applications: Novel Systems
- Applications: Novel Applications
Image-Guided Procedures, Robotic Interventions, and Modeling (MI104)

Conference Chairs: Baowei Fei, Emory Univ. (USA); Robert J. Webster III, Vanderbilt Univ. (USA)

Program Committee: Purang Abolmaesumi, The Univ. of British Columbia (Canada); Wolfgang Birkfellner, Medizinische Univ. Wien (Austria); Elvis C. S. Chen, Robarts Research Institute (Canada); Sandrine de Ribaupierre, Western Univ. (Canada); Gabor Fichtinger, Queen’s Univ. (Canada); George J. Grevera, Saint Joseph’s Univ. (USA); David Hawkes, Univ. College London (United Kingdom); David R. Haynor, Univ. of Washington (USA); William E. Higgins, The Pennsylvania State Univ. (USA); David R. Holmes III, Mayo Clinic (USA); Pierre Jannin, Univ. de Rennes 1 (France); David M. Kwartowitz, Clemson Univ. (USA); Cristian A. Linte, Rochester Institute of Technology (USA); Lena Maier-Hein, Deutsches Krebsforschungszentrum (Germany); Michael I. Miga, Vanderbilt Univ. (USA); Kensaku Mori, Nagoya Univ. (Japan); Parvin Mousavi, Queen’s Univ. (Canada); Jack H. Noble, Vanderbilt Univ. (USA); Maryam E. Rettmann, Mayo Clinic (USA); Frank Sauer, Siemens Healthineers (USA); Eric J. Seibel, Univ. of Washington (USA); Guy Shechter, Philips Healthcare (USA); Jeffrey H. Siewerdsen, Johns Hopkins Univ. (USA); Amber L. Simpson, Memorial Sloan-Kettering Cancer Ctr. (USA); Stefanie Speidel, Karlsruher Institut für Technologie (Germany); Andrew D. Wiles, Northern Digital Inc. (Canada); Ivo Wolf, Hochschule Mannheim (Germany); Ziv R. Yaniv, National Library of Medicine (USA)

This conference is primarily concerned with applications of medical imaging data in the engineering of therapeutic systems. Original papers are requested in the following topic areas:

- Image-guided procedures
- Minimally invasive surgery
- Computer-assisted therapy and therapy planning
- Robotic interventions and surgical tools
- Localization technologies and navigation systems
- Tracking and calibration
- Intraoperative imaging
- Novel image-to-patient registration for surgery and intervention
- Mathematical modeling to guide and understand therapy
- Modeling of intraprocedural changes
- Modeling and analysis of procedures and procedure workflows
- Techniques in population-specific and patient-specific model generation
- Image-based models for characterization of tissue and disease properties
- Medical image-based simulation and training
- Validation/evaluation
- 3D visualization
- Novel interfaces for therapy and visualization of data
- Augmented, virtual, and enhanced reality
- Clinical applications and technology integration
- High performance computing for real-time modeling and/or large dataset visualization
- Safety and standards for image-guided and robotic procedures
- Other related areas.

Submissions that cross over between this conference and others at SPIE Medical Imaging, and which would be appropriate for combined sessions, are also welcomed.

TOPIC AREAS: FOR THIS CONFERENCE ONLY

During the submission process, you will be asked to choose no more than three topics from the following list to assist in the review process.

- Abdominal procedures
- Calibration
- Cardiac procedures
- Pelvic procedures
- Data science
- Deep learning
- Diagnosis
- Disease characterization
- Endoscopic procedures
- Enhanced reality
- Human factors
- Image-guided therapy
- Data integration for the clinic/OR
- Intraoperative imaging
- Localization and tracking technologies
- Medical robotics
- Modeling
- Monitoring and feedback
- Multimodality display
- Neurosurgical procedures
- Registration
- Segmentation
- Stereoscopic display
- Surgical simulation
- Therapy planning
- Treatment planning
- Ultrasound guidance
- Validation/evaluation
- Visualization
Image Perception, Observer Performance, and Technology Assessment (MI105)

Conference Chairs: Robert M. Nishikawa, Univ. of Pittsburgh (USA); Frank W. Samuelson, U.S. Food and Drug Administration (USA)

Program Committee: Craig K. Abbey, Univ. of California, Santa Barbara (USA), Jongduk Baek, Yonsei Univ. (Korea, Republic of), François O. Bochud, Ctr. Hospitalier Univ. Vaudois (Switzerland), Jovan G. Brankov, Illinois Institute of Technology (USA), Yan Chen, Loughborough Univ. (United Kingdom), Brandon D. Gallas, U.S. Food and Drug Administration (USA), Howard C. Gifford, Univ. of Houston (USA), Stephen L. Hillis, The Univ. of Iowa (USA), Elizabeth A. Krupinski, Emory Univ. School of Medicine (USA), Matthew A. Kupinski, College of Optical Sciences, The Univ. of Arizona (USA), Maciej A. Mazurowski, Duke Univ. (USA), Mark F. McEntee, The Univ. of Sydney (Australia), Claudia R. Mello-Thoms, The Univ. of Sydney (Australia), Univ. of Pittsburgh (USA), Ljiljana Platiša, Univ. Gent (Belgium), Ingrid S. Reiser, The Univ. of Chicago (USA), Sian Taylor-Phillips, The Univ. of Warwick (United Kingdom), Pontus A. Timberg, Scania Univ. Hospital (Sweden), David L. Wilson, Case Western Reserve Univ. (USA)

This conference focuses on a broad understanding of medical image perception, observer-performance assessment, and the application of these methods to the evaluation of medical technology. Areas of traditional interest include, but are not limited to, optimizing image acquisition, display and workstations, psychophysical and vision-science based models of human observer performance, perceptual factors that affect the diagnostic process, eye-movement studies, observer performance methodologies, human-computer interaction, medical decision-making strategies, statistical models for evaluation of observer performance, and observer variability assessment. The conference welcomes new areas of research as well.

Original papers and posters are requested in the following areas:

• Technology assessment
• Diagnostic-performance evaluation methodologies (ROC, FROC and alternatives)
• Observer performance evaluation of new technologies (acquisition devices, CAD, display devices etc.)
• Cognitive aspects of image interpretation
• Visual search of medical images
• Perceptual and performance factors in diagnostic workstation and environmental design
• Perceptual and performance factors in new modalities (e.g., digital pathology and telemedicine)
• Models of detection, discrimination, and localization
• The nature of reader expertise
• Sources of observer variance
• Human Factors

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Biomedical Applications in Molecular, Structural, and Functional Imaging (MI106)

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

Program Committee: Amir A. Amini, Univ. of Louisville (USA); Juan R. Cebral, George Mason Univ. (USA); Alejandro F. Frangi, The Univ. of Sheffield (United Kingdom); Xavier Intes, Rensselaer Polytechnic Institute (USA); Vikram Kodibagkar, Arizona State Univ. (USA); Changqing Li, Univ. of California, Merced (USA); Armando Manduca, Mayo Clinic College of Medicine (USA); Robert C. Molthen, GE Healthcare (USA); Marquette Univ. (USA), Medical College of Wisconsin (USA); Nicholas J. Tustison, Univ. of Virginia (USA); John B. Weaver, Dartmouth Hitchcock Medical Ctr. (USA); Axel Wismüller, Univ. of Rochester Medical Ctr. (USA); Baohong Yuan, The Univ. of Texas at Arlington (USA)

This conference will cover all aspects of observing, measuring and quantifying molecular, structural and functional parameters from biomedical images. Descriptions of work based on any imaging technology, including multidimensional and multimodality, are invited. Techniques, methods, and systems for evaluation and interpretation of structure-function relationships and interrelationships from images of intact, living tissues, are of particular interest. Work in emerging areas such as novel contrast agents, small animal imaging, optical or electrical impedance tomography, and multi-modality imaging is also of specific interest.

Original papers are requested in, but not limited to, the following areas:

- Imaging methods, processing, analysis, registration, modeling
- Preclinical imaging, small animal imaging, molecular imaging, fluorescence tomography, bioluminescence tomography, x-ray phase contrast tomography, photoacoustic tomography, Cerenkov luminescence imaging, X-ray fluorescence computed tomography (XFCT), x-ray luminescence computed tomography (XLCT)
- Multimodality imaging, hybrid imaging
- Nanoparticle, biosensors and magnetic particle imaging (MPI)
- Electrical impedance, electrical impedance spectroscopy (EIS), terahertz or microwave imaging
- Optical imaging, optical coherence tomography (OCT), diffuse optical tomography, NIRS
- Ocular imaging, segmentation
- Pulmonary structure and function: perfusion, ventilation, mechanics, and modeling
- Vessel and airway imaging: detection, modeling, trees, reactivity, blood flow, perfusion
- Cardiac structure and function: perfusion, modeling, electrophysiology
- Functional neuroimaging and brain imaging, fMRI, fcmRI, PET, SPECT, tractography, connectome
- Magnetic resonance imaging (MRI)
- MRI quantitation of fat, diffusion and CEST, MRI spectroscopy
- Soft tissue imaging: deformation, quantification, segmentation, detection, analysis
- Breast imaging
- Bone and skeletal imaging: micro-structure, orthopedic, finite-element models, and segmentation
- Biomechanical imaging and modeling
- Nuclear medicine: PET, SPECT, molecular breast imaging (MBI), molecular brain imaging, scintigraphy, Cerenkov luminescence imaging
- Novel physiological imaging agents/probes: quantum dots, nanoparticles, radiopharmaceuticals
- Physiologic modeling: metabolism, receptor-ligand binding
- Pharmacokinetic models
- Machine learning

TOPIC AREAS: FOR THIS CONFERENCE ONLY

During the submission process, you will be asked to choose no more than three topics from the following list to assist in the review process.

- Physiological modeling / computational physiology
- Novel imaging methods
- Neuroimaging, neurochemistry, brain mapping, fMRI, brain PET, brain SPECT
- Optical imaging
- Vascular imaging
- Breast imaging
- Bone and skeletal imaging, biomechanics
- Cardiac imaging and cardiomechanical modeling
- Ocular imaging, segmentation
- Imaging agents/molecular probes: receptor-ligand binding / pharmacokinetic models
- Pulmonary structure and function: perfusion, ventilation, mechanics, segmentation, and modeling
- Image processing, detection, segmentation, registration, and analysis for quantifying and modeling molecular, structural and functional parameters
- Magnetic particle imaging (MPI)
- Nanoparticle imaging: sensing/therapy
- Machine learning
Imaging Informatics for Healthcare, Research, and Applications (MI107)

Conference Chairs: Jianguo Zhang, Shanghai Institute of Technical Physics (China); Po-Hao Chen, The Univ. of Pennsylvania Health System (USA)

Program Committee: Peter R. Bak, Humber River Hospital (Canada); Tessa S. Cook, The Univ. of Pennsylvania Health System (USA); Thomas M. Deserno, Technische Univ. Braunschweig (Germany); 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); Brent 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)

Imaging informatics is a multidisciplinary field and research in the field emphasized the development and evaluation of new and efficient means of extracting and transforming data to improve patient outcomes. Advances in the field have substantial implications in diagnosing and tracking disease response, optimizing treatment, and predicting outcomes. In the era of advanced imaging modalities, increasing data complexity, and new payment models based on quality and outcomes, there is need for more efficient workflows, more accurate analytics, and more sophisticated 3D visualizations. In addition, the growing demand for personalized, precision medicine requires the integration of clinical information, molecular and genomic data, imaging results and pathology. Imaging informatics can also bridge the gaps between basic science, clinical practice and diagnosis, and therapies and rehabilitation. This track focuses on new methods for obtaining, transferring, managing, analyzing, and visualizing data for healthcare and biomedical applications. It supports new technical solutions that can accommodate the needs of all imaging-rich clinical specialties, not just radiology. The conference will include, but is not limited to, the following themes.

THEME 1: BIG DATA TECHNOLOGIES AND APPLICATIONS IN HEALTHCARE IMAGING AND BIOMEDICAL RESEARCH

Medical imaging practice and research activities generate big data, not only because of its sheer volume, but also due to the velocity of change, diversity, and the variable veracity of the data. Big data in medical imaging has features that greatly impact its scalability, heterogeneity, availability, storage, and processing, as well as the clinical utility and accessibility of the data for medical practice. New research, technical solutions, clinical challenges and experiences surrounding big data in medical imaging will be included in this theme. These include report data and workflow management, systems integration and standards, quantitative analysis, high-dimensional databases for medical and biomedical applications, image content-based indexing and searching, and data mining and image-based patient-specific data modeling.

THEME 2: IMAGING INFORMATICS FOR DIAGNOSTICS AND THERAPEUTIC APPLICATIONS

Imaging informatics often requires analysis and manipulation of rich multimedia datasets for a variety of diagnostic, therapeutic and rehabilitative applications. In addition, the DICOM standard has broadened its scope of interoperability to include use cases within radiation oncology, optical imaging, and digital pathology. This allows for the advancement of research for both pre-clinical and post-clinical applications. Research topics that bridge the gaps between research, diagnosis, and treatment are encouraged.

THEME 3: IMAGING INFORMATICS FOR PRECISION MEDICINE

Precision medicine involves using detailed, patient-specific molecular, genetic and imaging information to diagnose and categorize disease, then guide treatment to improve clinical outcome. The combination of medical imaging, genomics, and molecular markers presents a new opportunity to link observations made at the cellular or molecular levels to macroscopic phenotypes. Research related to the correlation of genomic information and quantitative imaging biomarkers, linking anatomic structure with functional information at the molecular or cellular level as well as other imaging informatics research for precision medicine will be included in this theme. Innovation that tailors medical treatment to the individual characteristics of each patient based on molecular diagnostics, imaging, and analytics, is also welcome on this theme.

THEME 4: TRANSLATIONAL RESEARCH AND APPLICATION OF ARTIFICIAL INTELLIGENCE FOR MEDICAL IMAGING

Advances in artificial intelligence (AI), especially deep learning and reinforcement learning, are poised to profoundly change health care. However, integrating AI into the clinical environment requires integration with traditional PACS and the wider electronic health records (EHR) of the health system. Furthermore, integration with clinical medical imaging requires integration with clinical providers’ existing workflow. Therefore, translating artificial intelligence into clinical practice is faced with great challenges. Research addressing the everyday challenges of implementing machine learning, natural language processing, heuristic search, fuzzy logic, or other prescriptive analytics in clinical practice are welcome.

THEME 5: 3-D VISUALIZATION WITH AUGMENTED REALITY AND VIRTUAL REALITY FOR MEDICAL IMAGING RESEARCH, EDUCATION, AND APPLICATION

Augmented and virtual reality provide a new landscape for 3D visualization and offer a more immersive way to display and interact with 3D imaging. Projection of 3D imaging into virtual space or the immediate surrounding environment may be a valuable tool for education, simulation, and training, pre-surgical planning, or intra-operative localization. Research related to 3D model generation or implementation, interaction with 3D projections, and assessment of augmented or virtual reality applications or devices are welcome.
THEME 6: IMAGE SHARING AND COLLABORATING FOR HEALTHCARE AND RESEARCH

Modern medicine increasingly depends on efficient collaboration between radiologists, physicians, and patients. Collaboration is commonplace in the consumer market, where numerous social media platforms exist and are universally accessible. However, the culture and technology of digital collaboration have been slower to permeate the healthcare setting. There is a demand for new applications and a change in the workflow to better integrate radiology into shared decision-making between patients and providers. Any research, technology, and clinical applications related to collaboration, image sharing, unified communication, and social media for medical imaging are welcome in this theme.

THEME 7: SURGICAL PACS AND THE DIGITAL OPERATING ROOM (DOR)

Topics in the session on surgical PACS and the Digital Operating Room will include: pre-operative image integration, intra-operative image acquisition, navigated control, intelligent cameras and surgical instruments, workflow management, DOR process redesign with EMR and signal integration, smart walls including n-dimensional visualization, model guided intervention, vendor independent integration of DOR technologies, interoperability, knowledge and decision management, clinical quantitative and statistical assessment of therapeutic outcomes, intelligent infrastructure and processes, surgical cockpit systems, surgical process repositories, full voice/gesture control, real-time CAD integration and intelligent (situational aware) robotic devices. DICOM in surgery and IHE integration profiles for surgery and pathology will also be welcome.

THEME 8: 3-D PRINTING FOR MEDICAL APPLICATIONS

As technology for 3-D printing has evolved in recent years, new clinical applications are arising rapidly. Surgical planning for complex congenital heart disease and scaffolds on which grafts and tissue-based replacements can be grown represent just two of many recent applications. This topic welcomes novel applications of 3-D printing, including more efficient model generation, image processing to improve model production, dynamic models, biological materials and scaffolds, and workflow development to support 3-D printing.

THEME 9: IMAGE ACQUISITION, COMMUNICATION, DISPLAY, STANDARDIZATION AND APPLICATIONS FOR NON-RADIOLOGY IMAGES

Image data generated in cardiology, endoscopy, ophthalmology, dermatology, and surgery has been widely used in screening, diagnosis, treatment and rehabilitation, and often becomes part of the electronic medical record. Compared to radiology-centric imaging practices, the data acquisition methods, workflow operations and management of these non-radiological images are quite different. As such, clinical practices, research and applications within image data acquisition, transmission, management, systems integration, standardization, image processing and quantitative analysis for non-radiological images and imaging informatics for translational research will be included in this theme.

THEME 10: NEW REGULATORY ENVIRONMENT AND IMPLICATIONS IN MEDICAL IMAGING

Capitated healthcare payment systems are already in effect. Medicare Access and CHIP Reauthorization Act (MACRA) puts in place Merit-Based Incentive Payment System (MIPS) to replace Meaningful Use. Physician Quality Reporting System, and Value-Based Payment Modifier regulations. In the new regulatory environment, providers are rewarded for performing their peers in quality metrics. Interoperability, data integration, and decision support in medical imaging will likely play key roles in aligning care efficiency, quality, and reimbursement. Research or knowledge that can model potential strategies is welcome under this theme.

THEME 11: INNOVATION, TECHNOLOGY ASSESSMENT, AND ECONOMICS IN RADIOLOGICAL IMAGING INFORMATICS AND PRACTICES

Leading tomorrow’s new exponential growth in medical imaging begins with tackling today’s unsolvable problems. Today’s radiology practices face a mounting pressure to create and measure value - right imaging choice to the right patient at the right time, all the while managing ever-increasing imaging volume. To deliver value, radiologists require tools that aid their efficient assessment of the patient’s history, laboratory, prior imaging, and pathology as part of each imaging procedure. Innovation methods and practical solutions that apply informatics tools, such as business intelligence solutions, data mining and distributed computing to tackle practical problems in clinical radiology, are welcome on this theme.

TOPIC AREAS (FOR THIS CONFERENCE ONLY):

During the submission process, you will be asked to choose no more than three topics from the following list to assist in the review process:

- Big Data Technologies and Applications in Healthcare Imaging and Biomedical Research
- Imaging Informatics for Diagnostics and Therapeutic Applications
- Imaging Informatics for Precision Medicine
- Translational Research and Application of Machine Learning for Medical Imaging
- 3-D Visualization with Augmented Reality and Virtual Reality for Medical Imaging Research, Education, and Application
- Image Sharing and Collaborating for healthcare and research
- Surgical PACS and the Digital Operating Room (DOR)
- 3-D Printing for Medical Applications
- Image Acquisition, Communication, Display, Standardization and Applications for Non-Radiology Images
- New Regulatory Environment and Implications in Medical Imaging
- Innovation, Technology Assessment, and Economics in Radiological Imaging Informatics and Practices
Ultrasonic Imaging and Tomography (MI108)

Conference Chairs: Neb Duric, Delphinus Medical Technologies (USA), Barbara Ann Karmanos Cancer Institute (USA); Brett C. Byram, Vanderbilt Univ. (USA)

Program Committee: Mark A. Anastasio, Washington Univ. in St. Louis (USA); Jeffrey C. Bamber, The Royal Marsden NHS Foundation Trust (United Kingdom); Johan G. Bosch, 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, Robarts Research Institute (Canada); Jérémy Fromageau, The Institute of Cancer Research (United Kingdom); James F. Greenleaf, Mayo Clinic (USA); Emma J. Harris, The Institute of Cancer Research (United Kingdom); 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); Lasse Lovstakken, Norwegian Univ. of Science and Technology (Norway); Roman G. Maev, Univ. of Windsor (Canada); Stephen A. McAleavey, Univ. of Rochester (USA); Mohammad Mehrmohammadi, Wayne State Univ. (USA); Svetoslav I. Nikolov, BK Medical (Denmark); Olivier Roy, Barbara Ann Karmanos Cancer Institute (USA); Nicole V. Ruiter, Karlsruher Institut für Technologie (Germany); Kai E. Thomenius, Massachusetts Institute of Technology (USA); François Varray, CREATIS (France)

This conference provides a forum for in-depth discussions related to medical ultrasound engineering, imaging and clinical applications. We are soliciting original contributions related to the following topics: physics of ultrasound wave propagation, image reconstruction techniques, hardware and system design, novel transducer technologies, ultrasound image analysis strategies, ultrasound functional imaging, contrast agents and biological and biomedical applications of new ultrasound imaging modalities.

A joint session with the Image-Guided Procedures, Robotic Interventions, and Modeling conference will be held in order to have a high-level discussion on the state-of-the-art in ultrasound guidance of surgical interventions.

TOPIC AREAS: FOR THIS CONFERENCE ONLY

During the submission process, you will be asked to choose no more than three topics from the following list to assist in the review process.

• Physics and computer simulations
• Transducer technologies
• Novel beamforming techniques
• Ultrasound tomography and reconstruction
• Tissue characterization
• Elastography
• Motion and deformation imaging
• Blood flow imaging
• Contrast imaging
• Ultrafast imaging
• Shear-wave imaging
• High frequency imaging
• Ultrasound image analysis
• Photoacoustic imaging
• Acoustic microscopy
• Ultrasound therapeutics
• Ultrasound procedure guidance
• New applications of ultrasound in medicine and biology

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Digital Pathology (MI109)

Conference Chairs: John E. Tomaszewski, Univ. at Buffalo (USA); Metin N. Gurcan, The Ohio State Univ. Wexner Medical Ctr. (USA)

Program Committee: Selim Aksoy, Bilkent Univ. (Turkey); Ulysses J. Ballis, Univ. of Michigan Health System (USA); Rohit Bhardwaj, 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); Tom R. L. Kimpe, Barco N.V. (Belgium); Elizabeth A. Krupinski, The Univ. of Arizona (USA); Richard M. Levenson, Univ. of California, Davis (USA); Olivier Lezoray, Univ. de Caen Basse-Normandie (France); Geert Litjens, Radboud Univ. Medical Ctr. (Netherlands); Anant Madabushi, Case Western Reserve Univ. (USA); Derek R. Magee, Univ. of Leeds (United Kingdom); Anne L. Martel, Sunnybrook Research Institute (Canada); Erik Meijering, Erasmus MC (Netherlands); James P. Monaco, Inspirata, 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 (United Kingdom); Gustavo Kunde Rohde, Carnegie Mellon Univ. (USA); Berkman Sahiner, U.S. Food and Drug Administration (USA); Chukka Srinivas, Ventana Medical Systems, Inc. (USA); Darren Treanor, Univ. of Leeds (United Kingdom); Jeroen van der Laak, Radboud Univ. Nijmegen Medical Ctr. (Netherlands); Aaron D. Ward, The Univ. of Western Ontario (Canada); Martin J. Yaffe, Sunnybrook Research Institute (Canada); Bülent Yener, Rensselaer Polytechnic Institute (USA)

This conference will address digital pathology, from acquisition of pathology data to its management, analysis, and interpretation by observers. The use of digital pathology data, by both the human and computer, is growing in importance with the recent advances in whole slide scanners and novel instrumentation for multispectral, multiparametric tissue imaging. There is evidence that digital pathology can improve diagnosis and grading of cancer and other pathology tasks, but there are still limitations and challenges that must be addressed before it can be fully incorporated in the clinical workflow.

Although there has been great progress in the development and application of digital pathology over recent years, there are a number of significant computational challenges specific to pathology imaging that distinguish it from its radiological counterpart. There are also unique challenges in terms of how digitized pathology specimens and correlated data are presented to, modified and interpreted by clinicians and computers.

We invite submissions that address specific problems related to image acquisition, display, interpretation, computer-aided diagnosis, and quantitative image analysis of pathology specimens. We particularly welcome contributions that identify and address challenges encountered in digital pathology imaging as well as in new approaches for image capture and analysis.

**TOPIC AREAS: FOR THIS CONFERENCE ONLY**

During the submission process, you will be asked to choose no more than three topics from the following list to assist in the review process.

**IMAGE ACQUISITION, STORAGE AND DISPLAY**
- Acquisition, storage, display and processing of digital microscopy images
- Image mosaicking of nontraditional near-real-time microscopy (OCT, confocal)
- Multispectral imaging
- High-dimensional multiplexed staining and imaging of tissues
- Multi-focus volume imaging
- Compression
- Methodologies for the objective technical assessment of digital pathology systems including color calibration
- Whole slide imaging
- Strategies for data storage and remote processing

**QUANTITATIVE IMAGE ANALYSIS**
- Computer-aided diagnosis, prognosis and predictive analysis
- Automated quantification of tissue biomarkers
- Grading and classification of pathology images
- Segmentation of cellular and tissue structures
- Shape analysis and morphology in pathology imaging
- Architectural feature extraction and quantification
- Multispectral- and volume-based segmentation
- Content-based image retrieval
- High-performance computing for whole-slide tissue image analysis
- Multi-stain and multiplexed image analysis
- Machine learning trends in digital pathology: handcrafted features versus deep learning

**INFORMATION FUSION**
- Radiology-pathology registration and fusion
- Registration of multiple stained tissue microscopy images
- Integration of digital image features with ‘omics’ data for fused diagnostics

**DIGITAL PATHOLOGY AND THE PATHOLOGIST**
- Observer performance, human factors, reading strategies, and diagnostic interpretation issues
- Remote consultation
- Metrics, variability and standardization issues unique to digital pathology
- Methodologies for the objective technical assessment of digital pathology systems
- Optical probe tracking and visualization tools
- PACS and new DICOM standards for histopathology
- Making the case for clinical digital pathology systems in pathology practice
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The website will be kept current with any updates.

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Maryellen Giger, Editor-in-Chief, is the A. N. Pritzker Professor of Radiology/Medical Physics at The University of Chicago. She received her PhD in medical physics at The University of Chicago.

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  - Conclusions
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