

Proposal for MICCAI 2019 Workshop
Multimodal Brain Image Analysis (MBIA)

This workshop, which focuses on brain image analysis employing information from multiple modalities, was well received when previously held in conjunction with MICCAI 2011 in Toronto, MICCAI 2012 in Nice and MICCAI 2013 in Nagoya. We propose to continue organizing this workshop in conjunction with MICCAI 2019 to foster collaborative efforts in solving important problems pertinent to multimodal analysis.

Scope

Noninvasive brain imaging techniques including structural MRI, diffusion MRI, perfusion MRI, functional MRI (fMRI), EEG, MEG, PET, SPECT, and CT are playing increasingly important roles in elucidating structural and functional properties in normal and diseased brains. These different imaging modalities provide distinctive yet complementary information to better understand the working dynamics of the brain. Effective processing, fusion, analysis, and visualization of images from multiple sources, however, pose new and challenging problems due to variation in imaging resolutions, spatial-temporal dynamics, and the fundamental biophysical mechanisms involved in determining the character of the images.

The objective of this MICCAI workshop on MBIA is to move forward the state of the art in multimodal brain image analysis, in terms of analysis methodologies, algorithms, software systems, validation approaches, benchmark datasets, neuroscience, and clinical applications. We hope that MBIA will become a forum for researchers to exchange ideas, data, and software, in order to speed up the development of innovative technologies for hypothesis testing and data-driven discovery in brain science.

Topics include but are not limited to:

- Multimodal brain data fusion methodologies, e.g., fusion of multimodal structural, functional, diffusion, and/or perfusion MRI data, fusion of fMRI and EEG data, fusion of MRI and PET data, and fusion of radiology and pathology data.
- Methods that model temporal brain dynamics, e.g., modeling brain states via fMRI and/or EEG data, longitudinal analysis of brain image data.
- Structural and functional brain network construction methods, e.g., identification and optimization of network nodes, assessment of network properties, and creation of graph models for description of structural and functional brain networks.
- Brain connectivity analysis methods, e.g., joint modeling of structural and functional brain connectivity, relationship between structural and functional connectivity, and dynamics of connectivity.
- Classification and predictive modeling using multimodal brain image data, e.g., disease classification via multimodal image features, feature extraction and/or feature selection for dimensionality reduction of multimodal image data, multimodal image predictors of clinical measures, and integrative analysis of multimodal neuroimaging, genetics, multi-omics, biomarker and/or clinical data.

- Multimodal brain image visualization and data management methods, e.g., visual analytics of multimodal image data and visualization of large-volume, dynamic, multimodal image data.
- Registration, segmentation, shape analysis, and signal processing methods, e.g., multimodal image registration, multi-parametric image segmentation, and multi-resolution signal processing.
- Validation approaches and benchmark data generation, e.g., cross-validation via multiple image modalities and generation of benchmark data via reproducibility studies.
- Clinical applications, e.g., computer aided diagnosis and follow-up of brain diseases via multimodal images, early diagnosis of brain diseases via multimodal images, and differential diagnosis of brain diseases via multimodal images.

Academic objectives

The academic objectives of MBIA include: 1) Bringing together researchers in brain imaging, image analysis, neuroscience, and clinical application communities to share ideas, algorithms, data and code, and to bridge research outcome in this area with neuroscience and clinical applications. 2) Stimulate exploration of new application scenarios, interactions with related fields, and novel paradigms of multimodal image analysis. The MICCAI-MBIA 2019 will feature a single-track workshop with keynote speakers, technical paper presentations, and poster sessions.

Review Process

Papers will be limited to eight pages and follow the double-blinded review process as MICCAI main conference: anonymity should be preserved for both submitting authors and workshop reviewers. After considering any conflicts of interest (details can be found at <http://www.miccai2019.org/calls/call-for-reviewers/reviewers-guide>), Program committee (PC) members will be matched to submissions based on research expertise and interest. All submissions will be peer-reviewed by at least 2 PC members and paper selection will be based on methodological innovation, technical merit, results, validation, and application potentials. PC reviewers will make recommendations to the workshop committee who will make all final decisions.

Proceedings

This workshop will have proceedings. We would like to arrange the proceedings (including all accepted papers) as part of the MICCAI Satellite Events joint LNCS proceedings to be published by Springer Nature.

Space requirements and special equipment or technical support

A room that accommodates 50-60 people with multimedia equipment: laptop projector/screen, microphone/speaker (wireless would be desirable). A nearby poster area is preferred. Approximately 10 poster boards will be needed.

Preliminary agenda

We propose to hold a ***full-day workshop*** following the agenda below:

8:30am - 9:00am Breakfast
9:00am - 9:15am Welcome
9:15am - 10:15am Plenary Session (invited talk 1)
10:15am - 10:30am Coffee break
10:30am -12:30pm Oral Session 1
12:30pm - 1:30pm Lunch
1:30pm - 2:30pm Plenary Session (invited talk 2)
2:30pm - 3:30pm Poster Session
3:30pm - 3:45pm Coffee break
3:45pm - 5:45pm Oral Session 2
5:45pm - 6:00pm Closing remarks
6:00pm - 9:00pm Dinner for the authors and the program committee (on their own)

Workshop organizers

Dajiang Zhu, Ph.D.
Assistant Professor
Department of Computer Science & Engineering
The University of Texas at Arlington
Email: Dajiang.zhu@uta.edu

Jingwen Yan, Ph.D.
Assistant Professor
Department of Bioinformatics
Indiana University-Purdue University Indianapolis
Email: jingyan@iupui.edu

Heng Huang, Ph.D.
John A. Jurenko Endowed Professor
Department of Electrical and Computer Engineering
Department of Biomedical Informatics
University of Pittsburgh
Email: heng.huang@pitt.edu

Li Shen, Ph.D.
Professor
Department of Biostatistics, Epidemiology and Informatics

University of Pennsylvania

Email: li.shen@pennmedicine.upenn.edu

Paul M. Thompson, Ph.D.

Professor

Director of the Imaging Genetics Center (IGC)

Associate Director of Mark and Mary Stevens Neuroimaging and Informatics Institute

University of Southern California

Email: pthomp@usc.edu

Carl-Fredrik Westin, Ph.D.

Professor of Radiology, Harvard Medical School

Director, Laboratory of Mathematics in Imaging (LMI)

Brigham and Women's Hospital

Email: westin@bwh.harvard.edu