

Workshop IV: Multi-Modal Imaging with Deep Learning and Modeling

NOVEMBER 28 - DECEMBER 2, 2022

Scientific Overview

Multimodal microscopy that combines complementary nano- and atomic-scale imaging techniques is critical for extracting comprehensive chemical, structural, magnetic, and functional information. Experiments from correlative electron, X-ray, optical and scanning probe microscopes have generated very large data sets, and the scientific community desperately needs more efficient methods. Methodologies such as compressed sensing and deep learning developed for natural images come without any performance guarantee for the microscopy problem. Furthermore, when multimodal data is collected, the data processing of each modality usually is separate, and the combined results are checked for consistency. Simultaneous processing has the advantage to require less data for extracting the same amount of information. To achieve this, however, one must have consistent imaging modalities for each detector and stable mathematical learning procedures to fuse the data in reliable and reproducible ways. The goal of the workshop is to bridge the gap between mathematicians, physicists, materials scientists, and engineers to advance data acquisition, modeling, simulation, and analysis in multimodal microscopy. It will be instrumental to build foundations for interdisciplinary research by engaging all these subject areas. This workshop will provide the opportunity to present and exchange ideas, share data, and introduce new mathematical techniques needed in this cross-disciplinary field.

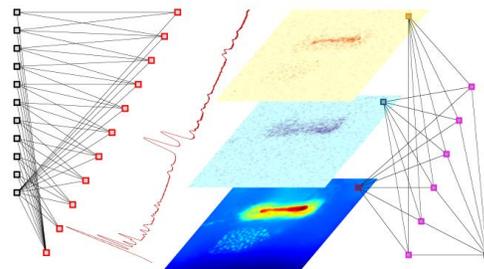
Long Program Schedule

This workshop is part of the long program on "Computational Microscopy"

- Computational Microscopy Opening Day : September 12, 2022
- Computational Microscopy Tutorials : September 13-16, 2022
- Workshop I: Diffractive Imaging with Phase Retrieval : October 10-14, 2022
- Workshop II: Mathematical Advances for Multi-Dimensional Microscopy : October 24-28, 2022
- Workshop III: Cryo-Electron Microscopy and Beyond : November 14-18, 2022
- **Workshop IV: Multi-Modal Imaging with Deep Learning and Modeling : November 28 - December 2, 2022**
- Computational Microscopy Culminating Retreat at Lake Arrowhead : December 11-16, 2022

Participation

Additional information about this workshop including links to register and to apply for funding, can be found on the webpage listed below. Encouraging the careers of women and minority mathematicians and scientists is an important component of IPAM's mission, and we welcome their applications.



Organizers

Peter Binev (University of South Carolina), **Sergei Kalinin** (Oak Ridge National Laboratory), **Gitta Kutyniok** (Technische Universität Berlin), **Deanna Needell** (University of California, Los Angeles (UCLA)), **Paul Weiss** (University of California, Los Angeles (UCLA))

Speakers

Speakers to be announced.

Laura Balzano (University of Michigan) Andrea Bertozzi (University of California, Los Angeles (UCLA)) Keith Brown (Boston University) Daniel Cremers (Technische Universität München) Naomi Ginsberg (University of California, Berkeley (UC Berkeley)) Jamie Haddock (Harvey Mudd College) Paul Hand (Northeastern University) Reinhard Heckel (Technical University of Munich) Piotr Indyk (Massachusetts Institute of Technology) Mark Iwen (Michigan State University) Kevin Kelly (Rice University) Anna Little (University of Utah) Michael Lustig (University of California, Berkeley (UC Berkeley)) Hanbaek Lyu (University of Wisconsin-Madison) Elizaveta Rebrova (Princeton University) Ben Recht (University of California, Berkeley (UC Berkeley)) Cynthia Rush (Columbia University) Zineb Saghi (Commissariat à l'Énergie Atomique (CEA)) Palina Salanevich (Utrecht University) Mary Scott (University of California, Berkeley (UC Berkeley)) Mahdi Soltanolkotabi (University of Southern California (USC)) Rama Vasudevan (Oak Ridge National Laboratory) Thomas Vogt (University of South Carolina) Robert Wolkow (University of Alberta)



For more information, visit the program webpage:
www.ipam.ucla.edu/CMSWS4