

Workshop II: Mathematical Advances for Multi-Dimensional Microscopy

Monday October 24, 2022

- 8:00–8:55 *Check-in/Breakfast (hosted by IPAM)*
- 8:55–9:00 *Welcome & Opening Remarks: Dean Miguel García-Garibay (Dean of Physical Sciences, UCLA) and Dima Shlyakhtenko (Director, IPAM)*
- 9:00 *SESSION CHAIR: Paul Voyles, University of Wisconsin-Madison*
- 9:00–9:50 **Nigel Browning** (University of Liverpool)
Virtual Talk: Inpainting Approaches to Dose Control in High Resolution and In-Situ STEM
- 10:00–10:15 *Break*
- 10:15–11:05 **Huolin Xin** (University of California, Irvine (UCI))
AI inroads in imaging sciences for materials research
- 11:15–11:30 *Break*
- 11:30–12:20 **Colin Ophus** (Lawrence Berkeley Laboratory)
Using multi-dimensional scanning transmission electron microscopy to solve 3D nanostructures using atomic electron tomography
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Andrew Minor, University of California, Berkeley (UC Berkeley)*
- 2:30–3:20 **Anna Gilbert** (Yale University)
Virtual Talk: Imaging from the Inside Out - Inverse Scattering in Fluorescence Microscopy
- 3:30–3:45 *Break*
- 3:45–4:35 **Juan-Carlos Idrobo** (University of Washington)
Into the Realms of Quantum Phenomena with Electron Microscopy: Exploring New Possibilities & Limitations
- 4:35–4:50 *Lightning Poster Session*
- 4:50–6:30 *Poster Session & Reception (Hosted by IPAM)*

Tuesday October 25, 2022

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *SESSION CHAIR: Ivan Pedro Lobato Hoyos, University of Antwerp*
- 9:00–9:50 **Christoph Koch** (Humboldt-Universität)
Virtual Talk: Reconstructing 2D and 3D atomic structure from various types of TEM data
- 10:00–10:15 *Break*

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- 10:15–11:05 **Andy Minor** (University of California, Berkeley (UC Berkeley))
TBA
- 11:15–11:30 *Break*
- 11:30–12:20 **Bryan Reed** (Integrated Dynamic Electron Solutions)
Compressive sensing and other fast-deflection tricks in an electron microscope
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Angus Kirkland, University of Oxford*
- 2:30–3:20 **Ivan Pedro Lobato Hoyos** (University of Antwerp)
Application of machine learning to electron microscopy data
- 3:30–3:45 *Break*
- 3:45–4:35 *Discussion*

Wednesday October 26, 2022

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *SESSION CHAIR: Emily King, (Colorado State University)*
- 9:00–9:50 **Sandra van Aert** (University of Antwerp)
Virtual Talk: 3D atomic resolution reconstructions through dose-efficient fusion of imaging techniques and analytical techniques in quantitative STEM
- 10:00–10:15 *Break*
- 10:15–11:05 **Claudio Mazzoli** (Brookhaven National Laboratory)
(coherent diffractive) Correlation Imaging: a view on complex matter across space and time
- 11:15–11:30 *Break*
- 11:30–12:20 **Eric Stach** (University of Pennsylvania)
Virtual Talk: Exploiting automatic image processing and in-situ transmission electron microscopy to understand the stability of supported nanoparticles
- 12:30–12:40 *Group Photo - CMSWS2*
- 12:40–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Paul Voyles, University of Wisconsin-Madison*
- 2:30–3:20 **Emily King** (Colorado State University)
PCA is not dead: Vectorized persistent homology and flag medians
- 3:30–3:45 *Break*
- 3:45–4:35 **Yongsoo Yang** (Korea Advanced Institute of Science and Technology (KAIST))
Neural network-assisted atomic electron tomography

Thursday October 27, 2022

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00 *SESSION CHAIR: Angus Kirkland, University of Oxford*
- 9:00–9:50 **Yonina Eldar** (Weizmann Institute of Science)
Virtual Talk: Model Based Deep Learning with Application to Super Resolution
- 10:00–10:15 *Break*
- 10:15–11:05 **Soledad Villar** (Johns Hopkins University)
Virtual Talk: Introduction to equivariant machine learning
- 11:15–11:30 *Break*
- 11:30–12:20 **Emilie Ringe** (University of Cambridge)
Electron and optical microscopy of magnesium nanoparticles
- 12:30–2:30 *Lunch (on your own)*
- 2:30 *SESSION CHAIR: Paul Voyles, (University of Wisconsin-Madison)*
- 2:30–3:20 **Benjamin Berkels** (RWTH Aachen University)
Unsupervised hyperspectral image segmentation with the Mumford-Shah model and motif extraction from crystalline images
- 3:30–3:45 *Break*
- 3:45–4:35 *Discussion*

Friday October 28, 2022

- 8:00–9:00 *Check-in/Breakfast (hosted by IPAM)*
- 9:00–9:50 **Peng Wang** (University of Warwick)
Virtual Talk: Electron Ptychography: An Emerging Computational Microscopy for Physical and Biological Sciences
- 10:00–10:15 *Break*
- 10:15–11:05 **Andrew Maiden** (University of Sheffield)
Ptychographic imaging via set projection algorithms
- 11:15–11:30 *Break*
- 11:30–12:20 **Yimo Han** (Rice University)
Assisting 4D-STEM data processing by machine learning and Bayesian optimization

