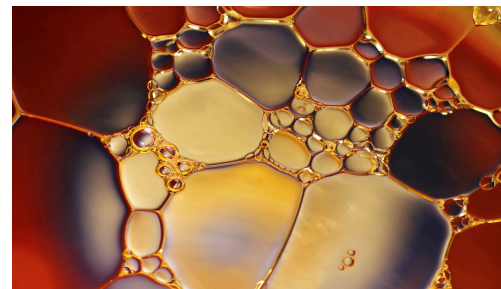# Calculus of Variations in Probability and Geometry

February 7 - 11, 2021

Scientific Overview

The goal of this long program proposal is to bring together senior and junior applied mathematicians, physicists, chemists, materials scientists, engineers and biologists to discuss and debate on the current status and future perspectives of modern microscopy using computation, mathematics and modeling. Cryo-EM has revolutionized biology and life science (including very recently solving the 3D atomic structure of COVID-19, which has been greatly facilitating the development of the vaccines) and aberration-corrected electron optics and high brightness X-ray sources have transformed physical science imaging. The next steps in these fields will advance by orders of magnitude the temporal resolution and energy resolution, while maintaining atomic spatial resolution, in a variety of sample environments from near zero Kelvin in vacuum to temperatures of a thousand degrees in a highly corrosive atmosphere. These advances will transform research in macromolecules, materials, energy technologies, quantum devices, and other fields. However, they all result in multidimensional, multimodal, big and extremely noisy data. Therefore, sophisticated mathematical and computational methods to derive the maximum possible useful scientific information from the minimum possible quanta of radiation are urgently needed. The four workshops will bring together leading applied mathematicians, physicists, data scientists and computational scientists to discuss strategies to tackle these major scientific challenges through a combination of advanced algorithms, mathematical modeling, computational tools, big data processing and deep learning.

This workshop will include a poster session; a request for posters will be sent to registered participants in advance of the workshop.

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

Steven Heilman (University of Southern California), Alina Stancu (Concordia University), and Elisabeth Werner (Case Western Reserve University).

Speakers

Shiri Artstein-Avidan (Tel Aviv Univ.), Jacob Bernstein (Johns Hopkins Univ.), Karoly Boroczky Renyi (Institute of Mathematics), Barbara Brandolini (Univ.degli Studi di Palermo), Francesco Chiacchio (Univ. di Napoli "Federico II"), Tobias Colding (Massachusetts Institute of Technology), Panagiota Daskalopoulos (Columbia Univ.), Alessio Figalli (ETH Zurich), Matthieu Fradelizi (Univ. Paris-Est Marne-la-Vallée), Wilfrid Gangbo (Univ. of California, Los Angeles), Maria Gordina (Univ. of Connecticut), Han Huang (Georgia Institute of Technology), Paata Ivanisvili (North Carolina State Univ.), Inwon Kim (Univ. of California, Los Angeles), Bo'az Klartag (Weizmann Institute of Science), Galyna Livshyts (Georgia Institute of Technology), Emanuel Milman (Technion - Israel Institute of Technology), Assaf Naor (Princeton Univ.), Joe Neeman (Univ. of Texas at Austin), Grigorios Paouris (Texas A&M University - College Station), Liran Rotem (Technion - Israel Institute of Technology), Dima Ryabogin (Kent State Univ.), Shay Sadovsky (Tel Aviv University), Eugenia Saorin-Gomez (Univ. Bremen), Yair Shenfeld (Massachusetts Institute of Technology), Santosh Vempala (Georgia Institute of Technology), Beatrice-Helen Vritsiou (Univ. of Alberta), Lu Wang (Yale Univ.), Guofang Wei (Univ. of California, Santa Barbara), Jonathan J. Zhu (Princeton Univ.)

For more information, visit the program webpage:
www.ipam.ucla.edu/CV2022