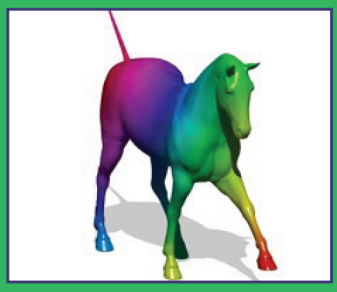
INSTITUTE FOR PURE AND APPLIED MATHEMATICS



GEOMETRY AND LEARNING FROM DATA IN 3D AND BEYOND

March 11 - June 14, 2019 | Los Angeles

Organizers: Ron Kimmel (Technion - Israel Institute of Technology), Rongjie Lai (Rensselaer Polytechnic Institute), Yann LeCun (New York University and Facebook), Stanley Osher (UCLA and IPAM), Olga Sorkine-Hornung (ETH Zürich), Gabriele Steidl (TU Kaiserslautern), and Hongkai Zhao (University of California, Irvine).

SCIENTIFIC OVERVIEW

Fast acquisition and routine use of 3D data due to the advance of modern technology and computer power makes 3D description of the real world imminent and practical in many applications such as 3D modeling, virtual reality, 3D camera, 3D printing and prototyping, etc. It is increasingly important and urgent for efficient processing, analysis, and intelligent use of a large variety of 3D data. Although many advanced technologies and efficient computational tools are well developed for 2D images from acquisition to processing, analysis, understanding and learning, their counterparts for 3D modeling and shape analysis are more challenging and less developed. From a mathematical point of view, image space is linear since it can be simply regarded as a space of two variable functions defined on a rectangular domain sampled by a uniform grid in practice. However, shape space is nonlinear and shape geometry is more challenging to represent, characterize and analyze. This makes higher-level tasks for shape analysis and understanding even more challenging. Beyond 3D shapes, understanding and learning geometric structures for data in high dimensional spaces is also of great importance in practice.

Recently, a lot of progress has been made in developing computational models and tools based on geometric theory. In particular, these developments provide computational techniques for extracting local and global intrinsic features and structures that are invariant under various transformations or embeddings. On the other hand, recent advances in machine learning, supervised or non-supervised, can be very effective in learning robust and distinctive features and used for data or application specific tasks such as recognition and classification. The goals of this program are to (1) further advance mathematical and computational techniques for 3D modeling and shape analysis, (2) design effective problem specific approaches combining geometry and machine learning, i.e., learning geometry from geometry, (3) generalize our understandings and techniques for shape analysis to geometric data analysis in higher dimensions.

WORKSHOP SCHEDULE

- Opening Day : March 11, 2019.
- Tutorials Workshop : March 12-15, 2019.
- Workshop I: Geometric Processing : April 1-5, 2019.
- Workshop II: Shape Analysis : April 15-19, 2019.
- Workshop III: Geometry of Big Data : April 29 - May 3, 2019.
- Workshop IV: Deep Geometric Learning of Big Data and Applications : May 20-24, 2019.
- Culminating Workshop at Lake Arrowhead Conference Center : June 9-14, 2019.

PARTICIPATION

This long program will involve senior and junior researchers from several communities relevant to this program. You may apply for financial support to participate in the entire fourteen-week program, or a portion of it. We prefer participants who stay for the entire program. Applications will be accepted through **December 11, 2018**, but offers may be made up to one year before the start date. We urge you to apply early. Mathematicians and scientists at all levels who are interested in this area of research are encouraged to apply for funding. Supporting the careers of women and minority researchers is an important component of IPAM's mission, and we welcome their applications.

www.ipam.ucla.edu/gl2019

NSF UCLA ipam