Departments of Mathematical Sciences & Computer & Information Science welcomes

Dr. Andrea Bertozzi
University of California, Los Angeles

Geometric Graph-Based Methods for High Dimensional Data

ABSTRACT:

We present new methods for segmentation of large datasets with graph-based structure. The method combines ideas from classical nonlinear PDE-based image segmentation with fast and accessible linear algebra methods for computing information about the spectrum of the graph Laplacian. The goal of the algorithms is to solve semi-supervised and unsupervised graph cut optimization problems. The methods make parallels between geometric ideas in Euclidean space such as motion by mean curvature, ported to a graphical framework. These ideas can be made rigorous through total variation minimization, and gamma convergence results, and convergence of time stepping methods in numerical analysis. We show diverse examples including image processing applications such as image and video labeling and hyperspectral video segmentation, and machine learning and community detection in social networks, including modularity optimization posed as a graph total variation minimization problem.

March 30, 2018

Hosted by:
G. Mohler,
Department of Computer & Information Science

Research Topic begins at 11:00 am in IT 167

ABOUT THE SPEAKER:

Andrea Bertozzi is an applied mathematician with expertise in nonlinear partial differential equations and fluid dynamics. She also works in the areas of geometric methods for image processing, crime modeling and analysis, and swarming/cooperative dynamics. Bertozzi completed all her degrees in Mathematics at Princeton. She was an L. E. Dickson Instructor and NSF Postdoctoral Fellow at the University of Chicago from 1991-1995. She was the Maria Geoppert-Mayer Distinguished Scholar at Argonne National Laboratory from 1995-6. She was on the faculty at Duke University from 1995-2004 first as Associate Professor of Mathematics and then as Professor of Mathematics and Physics. She has served as the Director of the Center for Nonlinear and Complex Systems while at Duke. Bertozzi moved to UCLA in 2003 as a Professor of Mathematics. Since 2005, she has served as Director of Applied Mathematics, overseeing the graduate and undergraduate research training programs at UCLA. In 2012, she was appointed the Betsy Wood Knapp Chair for Innovation and Creativity. Bertozzi's honors include the Sloan Research Fellowship in 1995, the Presidential Early Career Award for Scientists and Engineers in 1996, and SIAM's Kovalevsky Prize in 2009. She was elected to the American Academy of Arts and Sciences in 2010 and to the Fellows of the Society of Industrial and Applied Mathematics (SIAM) in 2010. She became a Fellow of the American Mathematical Society in 2013 and a Fellow of the American Physical Society in 2016. She won a SIAM outstanding paper prize in 2014 with Arjuna Flenner, for her work on geometric graph-based algorithms for machine learning. Bertozzi is a Thomson-Reuters 'highly cited' Researcher in mathematics for both 2015 and 2016, one of about 100 worldwide in her field.

Bertozzi has served on the editorial boards of fourteen journals: SIAM Review, SIAM J. Math. Anal., SIAM's Multiscale Modeling and Simulation, Interfaces and Free Boundaries, Applied Mathematics Research Express (Oxford Press), Applied Mathematics Letters, Mathematical Models and Methods in the Applied Sciences (M3AS), Communications in Mathematical Sciences, Nonlinearity, and Advances in Differential Equations, Journal of Nonlinear Science, Journal of Statistical Physics, Nonlinear Analysis Real World Applications; and the J. of the American Mathematical Society.

She served as Chair of the Science Board of the NSF Institute for Computational and Experimental Research in Mathematics at Brown University from 2010-2014 and previously on the board of the Banff International Research Station. She served on the Science Advisory Committee of the Mathematical Sciences Research Institute at Berkeley from 2012-2016.

To date she has graduated 32 PhD students and has mentored over 40 postdoctoral scholars.

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