New Frontiers in Topological Data Analysis: New Math for Biology, Imaging and Neuroscience

Dr. Benjamin Mann
Executive Director of Texas Operations
Ayasdi, Inc.
Austin, Texas

Monday, October 18, 2010
1:30 p.m.
ARMS 1109

Abstract - Data collection and interpretation are essential first steps for solving problems. Misinterpretation can lead to incorrect or ineffective solutions. Data collection continues to explode exponentially across scientific and societal domains, yet the ability to analyze and extract useful information from that data remains a grand challenge. This talk will describe powerful new mathematical tools built to confront this problem. These tools cut across application domains and are adaptable. Examples to be discussed include analyzing data from images, biology, and neuroscience. In addition, the talk will discuss how the methods might be adapted to data collected from other domains where anomaly detection, data fusion, and compression issues are paramount. Finally, Dr. Mann will describe how this “new mathematics” is related to new insights in mathematical biology.

Dr. Benjamin Mann is Executive Director of Texas Operations for Ayasdi, Inc., a small company that applies novel topological ideas to analyze massive data sets, networks, and dynamical systems. Before joining Ayasdi, Ben served 6 years as a Program Manager at DARPA in the Defense Sciences Office (DSO). At DARPA, he created, funded, and managed novel mathematics programs with applications across the sciences, including materials, physics, chemistry, biology, neuroscience, and engineering. His Topological Data Analysis Program used sophisticated methods from algebraic topology and geometry to analyze massive data sets; The Sensor Topology for Minimal Planning Program used similar ideas to analyze dynamical properties of distributed networks; The Fundamental Laws of Biology Program sought to find fundamental structure in Biology akin to Newton’s Laws; and The Focused Areas of Mathematics Program uncovered deep connections between number theory, representation theory, symmetries, and quantum field theories.

Ben also served at the National Science Foundation (NSF) where he was a program officer for algebra, number theory, and combinatorics as well as topology, geometric analysis, and foundations. Prior to joining the NSF, he spent 25 years in academics and was on the mathematics faculties of Rutgers University, Harvard University, Clarkson University, and the University of New Mexico. He has also held visiting positions at Stanford University and the University of Edinburgh. He received a bachelor’s degree in mathematics from UCLA and a master’s degree and doctorate in mathematics from Stanford University.