UNIVERSITY AT ALBANY
State University of New York

Applied Topology in Albany (ATiA) Seminar

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An Efficient Algorithm for the Computation of Reeb Graphs from Roadmaps

Friday, November 12, 2021
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ABSTRACT. The Reeb graph, a tool from Morse theory, has recently found use in applied topology due to its ability to track the changes in connectivity of level sets of a function. The roadmap of a set, a construction that arises in semi-algebraic geometry, is a one-dimensional set that encodes information about the connected components of a set. In this talk, I will show that the Reeb graph and, more generally, the Reeb space, of a semi-algebraic set is homeomorphic to a semi-algebraic set, which raises the algorithmic problem of computing a semi-algebraic description of the Reeb graph. We present an algorithm with singly-exponential complexity that realizes the Reeb graph of a function $f : X \to Y$ as a semi-algebraic quotient using the roadmap of X with respect to f.