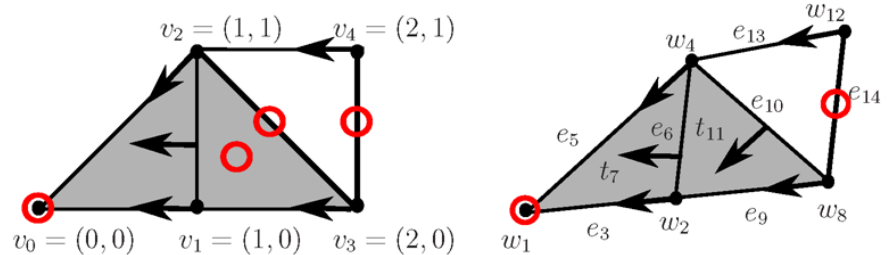The Computer Science Program of CSU Channel Islands presents:

A Reduction Algorithm in Topological Data Mining

a talk by

Tomasz Kaczynski

University of Sherbrooke, Canada

Tuesday, April 18ᵗʰ, 2017, 6:00 – 7:00 p.m. in SIE 1411

Abstract: In the past decade, persistent homology became an important tool in Topological Data Analysis. Connections between distinct elements of data can be expressed in terms of finite combinatorial structures such as simplicial complexes, also carrying a geometric flavor. Homology provides information on properties of complexes such as connectivity, cycles, tunnels or voids. Persistent homology detects those properties which persist over changes of a chosen parameter, say, a resolution scale. Multidimensional persistent homology has been introduced with the purpose of analyzing and comparing data according to several parameters simultaneously. Its effective computation remains a challenge due to the huge size of complexes built from data. A reduction of the size of a complex can be achieved by suitable pairing of cells, called partial matching.

Following a brief introduction to the topic, I will present an algorithm that constructs an acyclic partial matching on cells of a given simplicial complex. This is used to obtain a reduced complex with the same multidimensional persistent homology as the original one. Numerical tests on triangle meshes show that the achieved rate of reduction is substantial. This is joint work with Claudia Landi and Madjid Allili.

Tomasz Kaczynski is a Professor at the University of Sherbrooke in Canada. His current research interests are in the field of Computational Topology, and its applications to Dynamical Systems and to Image Analysis. He has contributed to foundations, development, and popularization of that field. His book "Computational Homology," co-authored with M. Mrozek and K. Mischaikow, has prompted many graduate research projects and has become a reference in the field. Contact: Pawel Pilarczyk

Refreshments may be served.