Seminar/Talk

Lexicographic optimal chains and manifold triangulations

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Dassault Systemes

Host: Herbert Edelsbrunner

This talk will consist in three parts. In the first part we will describe algorithms for the computation of lexicographic minimal chains in an abstract setting. Given a simplicial complex K, we consider the problem of finding a simplicial d-chain minimal in a given homology class.This is sometimes referred to as the {\em Optimal Homologous Chain Problem} (OHCP).We consider here simplicial chains with coefficients in $\Z/2 \Z$ and the particular situation where, given a total order on d-simplices$\sigma_1<\ldots<\sigma_n$, the weight of simplex i is 2^i. In this case,the comparison of chains is a {\em lexicographic ordering}.Similarly, we consider the problem of {\em finding a minimal chain for a prescribed boundary}.We show that, for both problems, the same matrix reduction algorithm used for the computation of homological persistence diagrams, applied to the filtration induced by the order on d-simplices, allows a $\BigO(n^3)$ worst case time complexity algorithm.In the particular case where K is a $(d+1)$-pseudo-manifold,there is a $\BigO(n \log n)$ algorithm which can be seen, by duality, as a {\em lexicographic minimum cut} in the dual graph of K.The second part will show how a carefully chosen total order on simplices allows to retrieve regular triangulations in euclidean spaces, as well as the triangulation of positive reach 2-manifolds as the support of lexicographic minimal chains.We see that each part is motivated by the other.In a last part we will consider two open questions suggested by the preceding results.Results from a joined work with David Cohen-Steiner and Julien Vuillamy.Thanks for ongoing works and discussions with:Dominique Attali, Jean-Daniel Boissonnat, Mathijs Wintraecken

Tuesday, February 11, 2020 02:00pm - 03:00pm

Mondi Seminar Room 2, Central Building

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.