

Institut für Diskrete Mathematik

## Combinatorics Seminar

Friday 20th May 14:15

Seminarraum NT02008 (212) Kopernikusgasse 24 / Webex

# Average complexity of matrix reduction for clique filtrations

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We study the algorithmic complexity of computing persistent homology of a randomly chosen filtration. Specifically, we prove upper bounds for the average fill-up (number of non-zero entries) of the boundary matrix on Erdős–Rényi and Vietoris–Rips filtrations after matrix reduction. Our bounds show that, in both cases, the reduced matrix is expected to be significantly sparser than what the general worst-case predicts. Our method is based on previous results on the expected first Betti numbers of corresponding complexes. We establish a link between these results to the fill-up of the boundary matrix. Our bound for Vietoris–Rips complexes is asymptotically tight up to logarithmic factors. We also provide an Erdős–Rényi filtration realising the worst-case.

Joint work with Barbara Giunti (TU Graz) and Guillaume Houry (Ecole Polytechnique)

Meeting link:

<https://tugraz.webex.com/tugraz/j.php?MTID=m40f85343e56ff5051d731ace1bea82e4>

Meeting number: 2731 089 0467

Password: btHRJxCa252

Joshua Erde, Mihyun Kang