## Persistent Homology of Maps and Relations

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The study of persistent homology has provided profound insight into the topology of data, but its extension to broader mathematical constructs remains an ongoing challenge. In this talk, we discuss the persistent homology of maps and relations, presenting a generalized framework that extends the study of persistent structures from self-maps to broader classes of relations.

Building on the foundational work of Edelsbrunner, Jabłoński, and Mrozek (2015) [1], which laid the foundation for the analysis of persistence in selfmaps, and incorporating the framework introduced by Harker, Kokubu, Mischaikow and Pilarczyk (2016) [2] for relations, we present an approach to understanding the persistence of relations.

This extension of persistent homology opens the door to a wide range of applications in fields such as computational topology, dynamical systems, and topological data analysis. Finally, we outline future directions for this research, including the development of computational methodologies.

- H. Edelsbrunner, G. Jabłoński, M. Mrozek. The persistent homology of a self-map. Foundations of Computational Mathematics 15 (2015), 1213—1244. https://doi.org/10.1007/s10208-014-9223-y
- S. Harker, H. Kokubu, K. Mischaikow, P. Pilarczyk. Inducing a map on homology from a correspondence. *Proceedings of the American Mathematical Society* 144 (2015), 1787—1801. https://doi.org/10.1090/proc/12812