

Toward an Application of Combinatorial Topological Dynamics to Multifiltering Functions

Guillaume Brouillette

Département de mathématiques, Faculté des sciences

Université de Sherbrooke, Sherbrooke, Canada

`Guillaume.Brouillette2@USherbrooke.ca`

Combinatorial multivector fields [2] provide a framework for modeling dynamical systems on finite topological spaces and yield a variety of tools for analyzing the underlying space. Meanwhile, multipersistent homology offers an alternative approach for capturing topological features through multifiltrations.

In this poster, we explore a connection between these two perspectives. More specifically, we show how a multifiltering function naturally induces a combinatorial multivector field, which allows us to define critical points for multifiltering functions in the spirit of Morse-Forman theory [1]. Furthermore, it leads directly to meaningful results, notably a Morse decomposition and Morse-type inequalities for multifiltering functions.

References

- [1] G. Brouillette. Analyzing multifiltering functions using multiparameter discrete Morse theory. *Topological Methods in Nonlinear Analysis*, in press. ArXiv.2406.09537.
- [2] M. Lipiński, J. Kubica, M. Mrozek, and T. Wanner. Conley-Morse-Forman theory for generalized combinatorial multivector fields on finite topological spaces. *Journal of Applied and Computational Topology*, 7(2):139–184, 2023.