

Properties of the Depth Poset

Fedor Zimin

ISTA, Klosterneuburg, Austria

7zimfv@gmail.com

The Depth Poset was recently defined in [1], motivated by questions about simplification and topology optimization. It is a partial order defined over the birth-death pairs of a filtered Lefschetz complex. Its minimal elements can be canceled safely without changing the topological structure of the Lefschetz complex. These minimal elements are called shallow pairs, they are defined as birth-death pairs such that they are mutually each other's last face and first coface in the filtration.

In this poster, we explain how classical poset notions, such as chains (paths), antichains (sets of pairwise incomparable elements), successors and ancestors (elements greater or smaller in the poset) looks like in the depth poset. We also explore their geometric interpretation. Additionally, we present statistical observations of these properties for the alpha complexes of poisson point processes.

References

- [1] Herbert Edelsbrunner, Michał Lipiński, Marian Mrozek, and Manuel Soriano-Trigueros, *The Poset of Cancellations in a Filtered Complex*, arXiv preprint arXiv:2311.14364, 2024.