

# Point Calculus for Interlevel Homology

Herbert Edelsbrunner

<sup>1</sup> Institute of Science of Technology, Austria. [edels@cs.duke.edu](mailto:edels@cs.duke.edu)

**Abstract** Given a continuous function on a topological space,  $f : X \rightarrow R$ , an *interlevel set* is the preimage of an interval on the real line, which can be closed, open, or half-open. We explain how to read the homology of an interlevel set from the extended persistence diagram of  $f$ . We also give the beginnings of a combinatorial way of reasoning about relationships between interlevel sets and its application to identify robust subgroups of the homology group.

This is joint work with Paul Bendich at IST Austria, Dmitriy Morozov at Stanford University, and Amit Patel at INRIA-Saclay.

