
Measuring and Representing Holes in Discrete Objects

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Abstract

A discrete object is a set of points that have integer coordinates, such as a binary image or volume. We can use homology theory to obtain the number of holes in an object, but this approach disregards their geometric properties. In this paper, we combine persistent homology and signed distance transforms to understand the geometry of holes.

We show how this approach can be used for obtaining a robust topological-geometric signature of an object (the *thickness-breadth diagram*) and for representing the holes with balls instead of homology generators. This work is suitable for analysing and understanding possibly noisy objects in any dimension.

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