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1-Dimensional intrinsic persistence of geodesic spaces. (English) Zbl 1443.55002
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In this paper the author develops the theory of 1-dimensional persistence, which refers to the persistence obtained from any filtration by applying the fundamental group or the homology group (with any coefficients) functor. The main new results developed by this paper are roughly the following:

- (1) a Rips-critical point of persistence corresponds to an isometrically embedded circle(s) of length $3c$, which arises from the boundaries of critical triangles;
- (2) 0 is the only possible accumulation point of the set of critical points, with the latter being finite for locally contractible spaces;
- (3) persistence measures precisely the 'size' of holes measured by the length (equivalently the diameter or the radius of the smallest enclosing disc) of the corresponding embedded circle;
- (4) persistences via Rips and Čech filtrations are isomorphic up to a factor $3/4$.

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MSC:

- 55N31 Persistent homology and applications, topological data analysis
- 57N65 Algebraic topology of manifolds
- 55N05 Čech types
- 55N35 Other homology theories in algebraic topology
- 55Q05 Homotopy groups, general; sets of homotopy classes
- 53C22 Geodesics in global differential geometry
- 30F99 Riemann surfaces
- 53B21 Methods of local Riemannian geometry

Cited in 1 Document

Keywords:

geodesic spaces; persistence; Rips filtrations; Čech filtration; fundamental group; geodesic; homology base

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