
Topological data analysis of biological aggregation models

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Abstract

We use topological data analysis to characterize global dynamics of the biological aggregation models of Vicsek et al. (1995) and D’Orsogna et al. (2006). Numerical position and velocity data from simulations are construed as point clouds varying over time. Using methods from persistent homology, we measure topological features such as connected components and circles that persist over multiple spatial scales. The topological analysis detects dynamical events that classical order parameters do not.

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