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Identification of Cosmic Filaments using the Simba-C simulation and DisPerSE Filament Finder

In this study, we combine simulation and topological analysis techniques to identify and study cosmic filaments. We employ the Simba-C simulation, a large-volume hydrodynamic cosmological simulation that incorporates dark matter, baryonic matter, and chemical enrichment, to produce a representative slice of the Universe. To detect filamentary structures within this simulated data, we utilize the DisPerSE (Discrete Persistent Structures Extractor) algorithm, which applies Discrete Morse Theory and Persistence Theory to extract topologically meaningful features from noisy cosmological data.

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