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Learning the principal graph of the galaxy distribution

Wednesday, February 10, 2021 4:30 PM (15 minutes)

In the context of recent and upcoming large-sky galaxy surveys, it is essential to automatically identify features of the Cosmic Web and, in particular, its filamentary pattern. In this presentation, we introduce T-ReX, a framework allowing the extraction of a principal graph from the observed set of galaxies, even in case noisy and heteroscedastic sampling. Based on a regularised mixture model, the method approximates the data manifold by a graph structure acting like a topological prior on the Gaussian clusters paving the galaxy distribution. The procedure is made robust to outliers of the pattern by introducing an additional uniform background component modelling galaxies that should not be represented by the graph structure, like those standing in walls and voids. The overall computation is guaranteed to converge toward a local maximum of the regularised log-likelihood of the probabilistic model using the Expectation-Maximisation algorithm. The proposed method uses a graph prior given by the minimum spanning tree that we extend using random sub-samplings of the dataset to make the topology more general and able to take into account cycles that are observed in the spatial arrangement of matter.

Field

Cosmology

Day constaints

Available on Wednesday, Thursday and Friday.

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