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Topological Data Analysis Meets Information Theory. New Perspectives for the Analysis of Higher-Order Interactions in Complex Systems

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Message from the Guest Editors

Complexity lies in the rich variety of interactions taking place among the constituents of a given system. While research has mostly focused on pairwise relationships, recent work has shown that neglecting higher-order interactions can lead to a poor representation of the same systems. Examples of these "group-wise" interactions can be found in many fields, including neuroscience, biology, finance and sociology. Researchers have developed various approaches to quantify and investigate these interactions, including Topological Data Analysis and Information Theory. While the former focuses on defining the structures to be considered and their topological invariants, the latter deals with inferring higher-order interdependencies among the system constituents using, for instance, multivariate information theory. This Special Issue aims to bridge the perspectives of Complex Systems, Topological Data Analysis and Information Theory to better understand higher-order structures. Researchers are encouraged to explore commonalities between these approaches, their integration and the challenges they bring to application domains.



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Special Issue



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Message from the Editor-in-Chief

The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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