

# Spectral clustering methods in data processing and image analysis

Anastasios Matzavinos  
Iowa State University

The need to interpret and extract possible inferences from high-dimensional datasets has led over the past decades to the development of dimensionality reduction and data clustering techniques. Scientific and technological applications of clustering methodologies include among others computer imaging, data mining and bioinformatics. Current research in data clustering focuses on identifying and exploiting information on dataset geometry and on developing robust algorithms for noisy datasets. Recent approaches based on spectral graph theory have been devised to efficiently handle dataset geometries exhibiting a manifold structure, and fuzzy clustering methods have been developed that assign cluster membership probabilities to data that cannot be readily assigned to a specific cluster. In this talk, we develop a novel fuzzy spectral clustering algorithm that combines seamlessly the strengths of spectral approaches to clustering with various desirable properties of fuzzy methods. The developed methodology is applied to image segmentation and registration problems.

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