Spectral methods toward correspondence-free geometric deep learning

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Abstract

Spectral geometry is at the heart of a variety of problems in computer vision, graphics, and pattern recognition. However, little is known on the practical utility of spectral methods within geometric deep learning pipelines, where the data has a non-Euclidean or combinatorial structure, as opposed to classical deep learning pipelines where the data lives on a "flat" domain (e.g. images). In this talk, I will present several new directions where spectral geometry not only leads to qualitative leaps in a range of challenging geometric deep learning problems; but also, I will show how it allows to tackle novel and unprecedented settings. Among these, I will demonstrate (1) how universal adversarial attacks can be concocted on geometric data via simple, yet purely spectral algorithms, and (2) how several tough tasks in 3D vision and graphics, including generative modeling, can be successfully addressed via data-driven approaches based on spectral quantities (eigenvalues).

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