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Seminar

Approximation of differential operators on unknown manifolds and applications

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Abstract: I will discuss the numerical approximation of differential operators on unknown manifolds where the manifolds are identified by a finite sample of point cloud data. While our formulation is general, we will focus on Laplacian operators whose spectral properties are relevant to manifold learning. I will report the spectral convergence results of these formulations with Radial Basis Functions approximation and their strengths/weaknesses in practice. Supporting numerical examples, involving the spectral estimation of various vector Laplacians will be demonstrated. Applications to solve elliptic PDEs will be discussed. To address the practical issue with the RBF approximation, I will discuss a weak approximation with a higher-order local mesh method that not only promotes sparsity but also allows for an estimation of differential operators with nontrivial Cristoffel symbols such as Bochner and Hodge Laplacians.

Thursday, October 17, 2024, 10:00 am
Mathematics and Science Center: MSC N306

Mathematics
Emory University