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# SEMINARIO

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### ***Using summation-by-parts (SBP) operators to construct structure-preserving discretizations***

**Abstract:** Partial differential equations (PDEs) can have several geometric structures. Structure-preserving methods can provide both qualitative and quantitative enhancements to numerical solutions, such as ensuring stability and robustness, as well as improving accuracy. In many instances, PDEs are linked to functionals of the solution that are either conserved or dissipated. For instance, the total energy of a nonlinear wave equation is typically conserved, depending on the boundary conditions. In this talk, we will review how summation-by-parts (SBP) operators can be used to construct structure-preserving discretizations of PDEs. SBP operators provide discrete derivative and integration operators that mimic integration by parts. When combined with split forms of the PDEs, SBP operators can be used to obtain energy-conserving or entropy-stable discretizations of linear and nonlinear PDEs. We present several examples and highlight how SBP operators enable a unified analysis of structure-preserving properties in finite difference, finite volume, and (pseudo-)spectral methods collocation, continuous finite element, and discontinuous Galerkin methods.

**Sala de Grados I, Facultad de Ciencias**  
**Martes 16 de Septiembre de 2025 (16:00)**  
**Organiza: G.I.R. MTANPOEE**

