Department of Mathematics and Statistics

Colloquium Series

Going in Depth: From defining Lebesgue Spaces to control of dispersive KdV-like equations

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Abstract: The purpose of this talk is to introduce Lebesgue spaces using the Fourier Transformation. In order to appeal to the broadest possible audience, we will use the heat equation as a model problem. Additionally, we investigate the exact control problem associated to the linearized dispersion-generalized Benjamin-Ono equation, which contains fractional order spatial derivatives on the one-dimensional torus. The dispersion operator in the linear DGBO presents a continuum of operators between the well-known Korteweg-de Vries equation and the Benjamin-Ono equation. To study control, we will introduce a mass-preserving external force that can be applied to the linear dispersion-generalized system to achieve a final state from a given initial state. The stabilizability problem with a linear feedback control is also studied. A brief discussion of the controllability of the associated nonlinear problem based on the Fredholm Alternative is included. Finally, we examine L^2 well-posedness and stabilization property of the full dispersion-generalized Benjamin-Ono equation with periodic boundary conditions. The main ingredient of this new result is a development of dissipation-normalized Bourgain space, which gains smoothing properties simultaneously from dissipation and dispersion within the equation.

Keywords: analysis, partial differential equations

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