

Optimal control of fractional order PDEs

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Diffusion is the tendency of a substance to evenly spread into an available space, and is one of the most common physical processes. The classical models of diffusion lead to well-known equations. However, in recent times, it has become evident that many of the assumptions involved in these models are not always satisfactory or not even realistic at all. Consequently, different models of diffusion have been proposed, fractional diffusion being one of them. The latter has received a great deal of attention recently, mostly fueled by applications in diverse areas such as finance, turbulence and quasi-geostrophic flow models, image processing, peridynamics, biophysics, and many others.

This talk will serve as an introduction to fractional diffusion equation - fractional derivative in both space and time. A novel PDE result by Caffarelli and Silvestre '07 has led to innovative schemes to realize the fractional order operators. We will discuss these numerical methods and their application to PDE constrained optimization problems.