

Diffusion, fractional derivatives and inverse problems

Mikko Salo
University of Jyväskylä

Diffusion is a basic process that explains the spreading out of particles from high to low concentration regions. It is closely related to the conduction of heat or electricity. Mathematically these processes can be described either in terms of differential equations (the heat and Laplace equations), or probabilistically in terms of random movements of large ensembles of small particles (Brownian motion).

In certain anomalous models of diffusion, differential equations involving fractional (non-integer order) derivatives or random processes involving jumps may appear. This colloquium talk will give an introduction to fractional derivatives and related differential equations, which turn out to have remarkable uniqueness and approximation properties. I will also describe an application to inverse problems based on recent joint work with Tuhin Ghosh and Gunther Uhlmann.