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CENTRO DE I&D EM MATEMÁTICA E APLICAÇÕES
CENTER FOR R&D IN MATHEMATICS AND APPLICATIONS

# SEMINAR

## Grupo de Análise Funcional e Aplicações
## Functional Analysis and Applications Group

# Finite difference methods for ultra-slow diffusive models

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## Abstract

It is known that the diffusion equation is an important tool in the modeling of many processes in several sciences, as physics, engineering, finance and biology. Physically, the most important characteristic of diffusion is the mean square displacement of a diffusive particle. In normal diffusion, described for example by the heat equation, the mean square displacement of a diffusive particle grows linearly in time, that is, it behaves as $Ct$ as $t \to +\infty$. On the other hand, in anomalous diffusion processes, the mean square displacement of a diffusive particle behaves as $Ct^{\alpha}$, $\alpha \neq 1$, as $t \to +\infty$. Anomalous diffusion can be described through time-fractional differential equations, that is diffusion equations, in which, for example the first order time derivative is replaced with a derivative with order $\alpha$, $0 < \alpha < 1$. In the case where $0 < \alpha < 1$, a sub-linear growth in time is observed, and this fact has encouraged the appearance of a still growing number of publications where the time-fractional diffusion equation is used as a mathematical model for sub-diffusive processes.

Recently, a number of publications focused in the case where the mean square displacement of a diffusive particle has a logarithmic growth. In this case, the evolution equation for the probability density function that describes particles diffusing is given by a diffusion equation with distributed order in time.

In this talk we will focus on the development of finite difference methods for the approximation of the solution of some classes of problems for this kind of equations. Some numerical schemes will be presented together with their stability and convergence properties, which are illustrated through some numerical examples.

**Room *11.2.16***
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