Dr. Oleg Reichmann, (ETH Zürich, Switzerland) will present a seminar entitled:

"High dimensional option pricing and time-inhomogeneity"

Abstract:

Lévy processes have, since their initial use in the early 1990ies by D. Madan and his collaborators, become a standard tool in financial modeling. Time-inhomogeneity severely hampers their efficient performance in pricing derivatives across multiple strikes and maturities in markets which are intrinsically time inhomogeneous.

We present a class of numerical methods for time-inhomogeneous parabolic partial integrodifferential equations (PIDEs) which exhibit strong degeneracies in time and arise in such models.

We establish existence and uniqueness of space-time variational solutions of these strongly degenerate high-dimensional PIDEs.

A weak space-time formulation is considered. The use of appropriate wavelet bases in the space-time domain leads to Riesz bases for the ansatz and test spaces. Besides, a class of variational timestepping schemes is discussed and their exponential convergence is proved. For the spatial domain a low rank approximation using the tensor-train format is employed. Numerical experiments in multiple space dimensions confirm the theoretical results.