

НАЦИОНАЛЕН СЕМИНАР ПО СТОХАСТИКА

секция „Изследване на операциите, вероятности и статистика“

Поредната сбирка на *Националния семинар по стохастика* ще се проведе на **12 май 2026 г.** (вторник) от **14:00** часа в зала **503** на ИМИ-БАН. Доклад на тема:

"Random Flights and Anomalous Diffusion: A non-Markovian Take on Lorentz Processes"

ще изнесе **Lorenzo Facciaroni** (Sapienza University of Rome).

Abstract: A Lorentz process is a model for the motion of a particle among randomly located scatterers, also known as obstacles. It was originally used to describe the transport of electrons through a conductor. In the classical setting, when the scatterers are distributed according to a Poisson point process, the deterministic dynamics of elastic collisions can be approximated, under the Boltzmann-Grad scaling limit, by a Markovian random flight. The density of this limiting process is governed by the Boltzmann equation. Passing further to the hydrodynamic limit, one recovers Brownian motion as the macroscopic description of the particle's position. In this work, we introduce a new class of point processes that generalizes the Poisson process and we investigate the motion of a particle which collides elastically with obstacles distributed according to this distribution. Unlike the classical case, the corresponding limiting random flight process is no longer Markovian. Instead, it exhibits memory effects that lead to superdiffusive behavior. At the macroscopic level, the particle's position converges to a continuous superdiffusive process. Within this framework, we derive a non-local analogue of the Boltzmann equation governing the non-Markovian random flight. Moreover, we show that the density of the superdiffusive scaling limit satisfies a fractional heat equation, reflecting the anomalous transport induced by the underlying correlations.

Keywords: Lorentz process · Boltzmann-Grad limit · Feller semigroups.

References:

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