İTÜ MATEMATİK BÖLÜMÜ

Chaotic and Predictable Representations for Markov Additive Processes with Lévy Modulator

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The classical Itô representation theorem states that every square-integrable martingale adapted to the natural filtration of a Brownian motion can be represented as a stochastic integral with respect to the same Brownian motion. One of the further generalizations of this result is the representation property for Markov additive processes (MAPs) with a Markov chain modulator. A MAP is a pair of stochastic processes in which the increments of the first process, called the ordinate, are governed by the second process, called the modulator, which possesses the Markov property. In this work, we extend this representation result to MAPs with Lévy modulators.

The presentation will begin with a motivation stemming from a fundamental application of martingale representation in option pricing. We will then provide an introductory overview of stochastic integration and MAPs, providing the necessary background and intuition. Finally, we will present our main results: the chaotic representation property (CRP) and predictable representation property (PRP) for MAPs with Lévy modulators.

***Tarih*: 20 Mayıs 2026 Çarşamba**

***Saat*: 14:30-15:30**

***Yer*: Fen-Edebiyat Fakültesi B1-326**

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About the speaker:

Celal Umut Yaran completed his undergraduate studies in Mathematics at Koç University between 2013 and 2019, and also pursued a double major in Physics during the same period. He then continued at Koç University for an integrated Ph.D. program in Mathematics and obtained his Ph.D. in 2025.

Since 2023, he has been serving as a Research Assistant in the Department of Mathematics Engineering at Istanbul Technical University.

His research interests lie primarily in probability theory and stochastic processes, with recent work focusing on Markov additive processes, Lévy processes, and self-similar Markov processes. His recent publications investigate the long-time behavior and martingale representations of general Markov additive processes.