FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA Fakultät für Mathematik und Informatik

Institut für Mathematik

Seminar zur Stochastik

Donnerstag, 30. April 2026
14:15 Uhr c.t.
SR 1086, Inselplatz 5

Dr. Paul Honoré Takam
(Brandenburgische Technische Universität Cottbus)

“Optimal Management of Renewable Energy Systems under Uncertainty: A Quantization-Based Approach”

Abstract: The increasing integration of renewable energy sources introduces significant uncertainty in energy production, making the cost-optimal management of energy systems challenging. In this paper, we study the optimal management of a microgrid combining photovoltaic panels, a wind farm, a battery storage unit, and grid interaction. We develop a stochastic optimal control framework to minimize operating costs and reformulate the problem as a finite-horizon Markov decision process. The associated Bellman equation is solved using backward recursion. A key difficulty lies in the computation of conditional expectations, for which no closed-form expressions are available. To address this issue, we use the optimal quantization techniques, which provide an efficient and accurate approximation of the underlying stochastic dynamics and significantly improve the numerical resolution of the problem. We compare this approach with a classical Markov-chain method. Numerical results illustrate the effectiveness of the quantization-based approach in computing optimal policies and value functions.

Alle Interessierte sind herzlich eingeladen!

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