



Mathematics and CS Seminar

A regularized Kellerer theorem in arbitrary dimension

Benjamin Robinson

University of Vienna

Host: M. Beiglböck, N. Berestycki, L. Erdős, J. Maas, F. Toninelli, E. Schertzer

Given a family of probability measures increasing in convex order, does there exist a Markov martingale with the corresponding marginal laws? This question was answered positively by Strassen in 1965 in discrete time on a general space, and by Kellerer in 1972 in continuous time in dimension one. The multidimensional continuous-time case, however, remained open until recently. In this talk I present a multidimensional extension of Kellerer's theorem. In particular I show that, after applying some Gaussian regularization to the given measures, there exists a strongly Markovian martingale Itô diffusion with these marginals. The proof of this result makes use of the Bass martingales that arise in martingale optimal transport, as well as a mimicking theorem for Itô processes, and a novel compactness result for martingale diffusions. In dimensions two and higher, I show that uniqueness does not hold in general. In particular, there exists a two-dimensional strong Markov martingale with continuous paths that has the same marginal laws as a Brownian motion and yet is not itself a Brownian motion. Moreover, I present counterexamples showing that the existence of Markov martingales with given marginal distributions may also fail in higher dimensions. Thus, Kellerer's theorem cannot be extended to higher dimensions in full generality. Joint work with Gudmund Pammer (ETH Zürich) and Walter Schachermayer (Universität Wien).

Monday, November 20, 2023 05:00pm - 06:00pm

Mondi 2 (I01.01.008), Central Building



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