

On aggregation-quantization permutability problem for discrete-time Markov chains

Tuesday 7 July 2026 12:25 (25 minutes)

Given random walk on a graph, the corresponding discrete-time quantum walk can be constructed using the method proposed by Szegedy. On the other hand, given a partition of the set of states of a Markov chain, one can study the corresponding aggregated process. We extend the aggregation technique to the level of quantum Markov chains. We provide conditions under which application of these two operations - Szegedy's quantization and aggregation - give the same result. In particular, we show that the conditions are satisfied in the case of the random walk on graphs equipped with equitable partitions. We illustrate the approach on example of discrete-time classical/quantum walks on N-dimensional hypercube and its connection the Ehrenfests urn model with N particles. We also discuss relation of the example to the Kravtchouk polynomials. The presentation is based on joint work with Artur Siemaszko and Adam Zalewski arXiv:2603.14269.

Presenter: DOLIWA, Adam (University of Warmia and Mazury)