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# SEMINAR: Spoofing channels under sub-exponential resources

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March 28, 2025

11:00 to 12:00

Seminar Room

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The ability to characterise and discern quantum channels is a crucial aspect of noisy quantum technologies. In this work, we explore the problem of distinguishing quantum channels when limited to sub-exponential resources, framed as von Neumann (projective) measurements. We completely characterise equivalence classes of quantum channels with different Kraus ranks that have the same marginal distributions under compatible projective measurements. In doing so, we explicitly identify gauge freedoms which can be varied without changing those compatible marginal outcome distributions, opening new avenues for quantum channel simulation, variational quantum channels, as well as novel adversarial strategies in noisy quantum device certification. Specifically, we show how a Sinkhorn-like algorithm enables us to find the minimum admissible Kraus rank that generates the correct outcome marginals. For a generic  $d$ -dimensional quantum system, this lowers the Kraus rank from  $d^2$  to the theoretical minimum of  $d$ . For up to  $d = 20$ , we numerically demonstrate our findings, for which the code is available and open source. Finally, we provide an analytic algorithm for the special case of spoofing Pauli

**Hosted by:** Prof. Dr. Antonio Acín