Barcelona Analysis Seminar **2022–2023**

URL. https://mat.uab.cat/web/seminarianalisi/

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Online streaming. Click here to join.

Sampling determinantal point processes on a quantum computer

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Determinantal point processes (DPPs) are point processes (loosely speaking, random clouds of points) that were introduced by Macchi as a model in quantum optics the 1970s. Outside of physics, and because they allow the user to model long-range interaction while preserving computational tractability, DPPs have widely spread in statistics and computer science. Most such applications require sampling from a DPP, which can be done in polynomial time on a classical computer. Yet, given their quantum origin, it is natural to wonder whether sampling a DPP on a quantum computer is even easier than on a classical one. We give a partially affirmative answer. More specifically, we focus here on DPPs over a finite state space, and reduce DPP sampling to a problem of fermionic simulation, for which quantum circuits already exist. We then investigate variants of these quantum circuits that are tailored for DPP sampling. This raises interesting questions at the intersection of numerical linear algebra, parallel computing, and quantum circuit design. If time allows it, I will also discuss an extension to Pfaffian point processes, a generalization of DPPs. Joint work with Michaël Fanuel and Alexandre Feller.