« Atelier sur l'information quantique et mécanique statistique quantique » 15 au 19 octobre 2018

"Workshop on Quantum Information and Quantum Statistical Mechanics" October 15-19, 2018

Convergence rates for quantum evolution & entropic continuity bounds in infinite dimensions

Nilanjana Datta *

n.datta@statslab.cam.ac.uk

In this talk we address the following two fundamental questions:

(1) How fast do quantum systems evolve ?

(2) How fast does the entropy of a quantum system increase?

To answer (1), we extend the concept of energy-constrained diamond norms to obtain continuity bounds on the dynamics of both closed and open quantum systems in infinitedimensions, which are stronger than previously known bounds. Examples of infinitedimensional open quantum systems to which our results apply, include, among others, amplifier and attenuator channels, the Jaynes- Cummings model of quantum optics, quantum Brownian motion, and the quantum Boltzmann equation. Infinite-dimensional closed systems to which our results apply are e.g. those whose dynamics is governed by timeindependent Schrodinger operators given by the sum of the (negative) Laplacian and a time-independent potential. Our results also yield new estimates on quantum speed limits for open quantum systems,

To answer (2), we obtain explicit log-Lipschitz continuity bounds for entropies of infinitedimensional quantum systems, and classical capacities of infinite-dimensional quantum channels under energy-constraints. These bounds are determined by the high energy spectrum of the underlying Hamiltonian and can be evaluated using Weyl's law.

This is joint work with Simon Becker.

^{*}Statistical Laboratory, Centre for Mathematical Sciences, University of Cambridge, Wilberforce Road, Cambridge, CB3 0WB, UNITED KINGDOM