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Simulating quantum transport on classical computers: Bridging the high- and low-temperature limits

Tuesday, June 20, 2023 10:00 AM (20 minutes)

Can we efficiently estimate transport coefficients (conductivities etc) in many-body quantum systems using classical computers? Drawing on lessons learned from studying scrambling and entanglement entropy dynamics in generic many-body systems, I propose an upper bound on the computational resources required to simulate transport at high temperatures: CPU time/memory $\sim e^{O(\log(\epsilon^{-1}))^2}$, where ϵ is the desired degree of precision. I'll describe a method (DAOE) achieving this bound. I'll explain why DAOE in its original form fails at low temperatures/extreme filling, and then propose an extension of it which shows encouraging signs of working in these limits.

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