



# Quantum and classical query complexity of functions of matrices



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## Abstract

In this talk, I will introduce a recent work on query complexity of functions of matrices. The problem is as follows: Let  $A$  be a sparse Hermitian matrix,  $f(x)$  be a univariate function. We want to estimate the quantum/classical query complexity of approximating an entry of  $f(A)$ . In [arXiv:1806.01838, STOC 2019], a quantum algorithm is given and the complexity is dominated by the minimal degree of the polynomial that approximates  $f(x)$ . Here I will show you that this is also a lower bound. So the quantum algorithm for this problem is indeed optimal. I will also talk about lower bounds analysis of classical algorithms to show that the quantum-classical separation is exponential. This talk is based on joint work with Ashley Montanaro arXiv:2311.06999 (accepted by STOC 2024).

## Biography

邵长鹏博士，2023年入职中国科学院数学与系统科学研究院，担任副研究员。这之前，在英国布里斯托大学读博士后，主要从事量子算法与复杂度方面的研究。2016年博士毕业于中国科学院大学。在权威期刊 *Communications in Mathematical Physics*, *SIAM Journal on Matrix Analysis and Applications* 上发表过论文，在量子计算权威会议 QIP, TQC 上各做过3次报告。