

中国科学院数学与系统科学研究院

应用数学研究所

华罗庚应用数学青年论坛

报告题目: **Learning Quantum Observables of Low Degrees
from a Logarithmic Number of Random Queries**

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摘 要: A fundamental problem from computational learning theory is to well-reconstruct an unknown function on the discrete hypercubes. One classical result of this problem for the random query model is the low-degree algorithm of Linial, Mansour and Nisan in 1993. This was improved exponentially by Eskenazis and Ivanisvili in 2022 using a family of polynomial inequalities going back to Littlewood in 1930. These inequalities have played an important role in resolving several open problems in functional analysis and harmonic analysis. Recently, quantum analogs of such polynomial inequalities were conjectured by Rouzé, Wirth and Zhang (2022). This conjecture was resolved by Huang, Chen and Preskill (2022) without knowing it when studying learning problems of quantum dynamics. In this talk, I will discuss another proof of this conjecture that is simpler and gives better estimates. As an application, it allows us to recover the low-degree algorithm of Eskenazis and Ivanisvili in the quantum setting. This is based on arXiv:2210.14468, joint work with Alexander Volberg (MSU).