國立中山大學應用數學系
學術演講

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講　題：Improving Quantum state tomography via non-convex Riemannian gradient descent

時　間：2022/12/22（Thursday）14:10 ~ 15:00

地　點：理 SC4009-1 教室

茶　會：13:30

Abstract

The recovery of an unknown density matrix of large size requires huge computational resources. The recent Factored Gradient Descent (FGD) algorithm and its variants achieved state-of-the-art performance since they could mitigate the dimensionality barrier by utilizing some of the underlying structures of the density matrix. Despite their theoretical guarantee of a linear convergence rate, the convergence in practical scenarios is still slow because the contracting factor of the FGD algorithms depends on the condition number κ of the ground truth state. Consequently, the total number of iterations can be as large as $O(\sqrt{\kappa}\ln(\frac{1}{\varepsilon}))$ to achieve the estimation error ε. In this work, we derive a quantum state tomography scheme that improves the dependence on κ to the logarithmic scale; namely, our algorithm could achieve the approximation error ε in $O(\ln(\frac{1}{\kappa\varepsilon}))$ steps. The improvement comes from the application of the non-convex Riemannian gradient descent (RGD). The contracting factor in our approach is thus a universal constant that is independent of the given state. Our theoretical results of extremely fast convergence and nearly optimal error bounds are corroborated by numerical results.

敬 請 公 告！ 歡 迎 參 加！

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校園地圖：http://math.nsysu.edu.tw/var/file/183/1183/img/779/nsysu_math_map.jpg
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