



Snack &

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### Quantum-inspired matrix arithmetic framework for dequantizing quantum machine learning

Monday, April 10, 2023 | 12:30-1:30PM | 3301 Exploratory Hall / Zoom

#### Abstract

In this talk, we will discuss an algorithmic framework for quantum-inspired classical algorithms on close-to-low-rank matrices, generalising the series of results started by Tang's breakthrough quantum-inspired algorithm for recommendation systems [STOC'19]. In particular, we will first see classical algorithms for Singular Value Transformation (SVT) that run in time independent of input dimension under suitable quantum-inspired sampling assumptions that can be realised by low-overhead data structures. Our result for SVT is motivated by quantum linear algebra algorithms and the quantum singular value transformation (SVT) framework of Gilyén, Su, Low, and Wiebe [STOC'19]. Then, since the quantum SVT framework generalizes essentially all known techniques for quantum linear algebra, this result, combined with sampling lemmas from previous work, suffice to generalize all recent results about dequantizing quantum machine learning algorithms. Finally, we will discuss applications of this framework, such as recommendation systems, principal component analysis, supervised clustering, support vector machines, low-rank regression, semidefinite program solving, low-rank Hamiltonian simulation and discriminant analysis.

This talk is based on the joint work ([link](#)) with Andras Gylan, Tongyang Li, Han-Hsuan Lin, Chunhao Wang, and Ewin Tang. The work has been published in STOC 2020 and the Journal of ACM.

**Zoom link:** <https://go.gmu.edu/qcseminar>

#### About the Seminar Series

The Quantum Computing Seminar Series are a series of working seminars organized and hosted by QSEC's quantum computing subgroup on Mondays. These events are free and open to the public. More information is available on QSEC's Computing Events and Mathematical Sciences Department's Quantum Computing Seminars. For any questions, contact [qsec@gmu.edu](mailto:qsec@gmu.edu).

**Light snacks and coffee will be provided at the beginning of the seminar.**