Quantum Computing and Cryptography - 07: Advanced Concepts in Complex Vector Spaces

Length	Micromodule
Collection	NSA NCCP
Updated	March 14, 2019
Contributors	Abhishek Parakh
Academic Levels	Undergraduate, Graduate
Topics	Quantum Computing
Link	https://clark.center/details/aparakh/4bb4f561-dd38-4d8e-9cfe-27bb2d04d286

Description

This micromodule teaches about eigenvalues and eigenvectors and how to compute them. Students learn about Hermitian and unitary matrices and their properties. We discuss the implication of unitary matrices in quantum computing and write Python programs to check for Hermitian and unitary matrices.

Although files are labeled a nanomodule 7, it is categorized as micromodule since it can take more than 1 hour to cover all the theory and exercises.

Email Dr. Abhishek Parakh at aparakh@unomaha.edu for solutions to the problems.

Note: To get started with Jupyter notebooks please follow the userguide available at: https://sites.google.com/unomaha.edu/userguideqcl/

Notes

For solutions for Final Quizzes please contact Dr. Abhishek Parakh at aparakh@unomaha.edu.

Outcomes

- Recognize implication of unitary matrices as transformations in quantum computing.
- Implement Python programs that check if a given matrix is Hermitian or unitary.
- Express meaning of eigenvalues and eigenvectors and compute them.

- Prove properties of Hermitian and unitary matrices.
- Prove properties of unitary and Hermitian matrices.

Alignment

The standards and guidelines this learning object is mapped to

- NICE Workforce Knowledge (2017) - K0052: Knowledge of mathematics (e.g. logarithms, trigonometry, linear algebra, calculus, statistics, and operational analysis).

Links

External links that are associated with this learning object

- User guide