Quantum Computing and Cryptography - 06: Properties and Operations on Vectors and Matrices in Complex Vector Spaces

Length	Micromodule
Collection	NSA NCCP
Updated	March 14, 2019
Contributors	Abhishek Parakh
Academic Levels	Undergraduate, Graduate
Topics	Cryptography, Quantum Computing
Link	https://clark.center/details/aparakh/ba2e2a0e-2301-4588-b87c-7d980e9a2a63

Description

This micromodule teaches the concept of inner product of vectors and matrices and how to compute it. It covers concepts such as norm of a vector, orthogonality and orthonormality of vectors and bases. After compelection of the micromodule students will be able to represent a vector using a giving basis set, compute projection of a vector on another and write Python programs to compute the norm and inner product of vectors and matrices.

Although the uploaded files are named nanomodule, this lesson takes more than one hour to complete with all the exercises hence it is categorized as micromodule.

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

- Combine concepts to write Python programs to determine the norm and inner product of vectors and matrices.
- Calculate the norm of a vector.
- Express a vector using a given basis set.
- Calculate the projection of one vector onto another vector.
- Recognize the definition and properties of inner product of vectors and matrices.
- Calculate the inner product.
- Apply concept of orthogonal and orthonormal vectors and basis.

Alignment

The standards and guidelines this learning object is mapped to

- CAE Cyber Ops (2014) - Discrete Math: Given an algorithm determine the complexity of the algorithm and cases in which the algorithm would/would not provide a reasonable approach for solving a problem
- 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