Qiskit
Fall Fest 2024

Hello Student Leaders,

As an organizer of Qiskit Fall Fest 2024, we wanted to provide as many resources as possible! Please review the below material for an additional collection of educational resources to utilize before and during your campus event.

Let's get started!
- o <u>How to install Qiskit:</u> If you plan to run Qiskit locally, the first step is to install Qiskit.

- o <u>Qiskit Documentation</u>**:** Find documentation for using Qiskit and IBM Quantum hardware.

Beginner:
- o <u>Basics of Quantum Information</u> : This course explains quantum information and computation at a detailed mathematical level. Additionally, covering three examples connected to entanglement.

  - • <u>Single Systems</u>: In this lesson, we will restrict our attention to the comparatively simple setting in which a single system is considered in isolation.

  - • <u>Multiple Systems</u>: In this resource we expand our view to multiple systems, which can interact with one another and be correlated.

- o <u>Quantum Enigmas</u>: In this course, you will dive into the nature of quantum computing, and explore superposition, entanglement, and qubit behavior.

- o <u>Quantum algorithmic foundations</u>: Explore computational advantages of quantum information, including what we can do with quantum computers and their advantages over classical computers.

Qiskit
Fall Fest 2024

Intermediate:
- Variational algorithms: Learn to write variational algorithms: near-term, hybrid-quantum-classical algorithms.

- Transpiled circuits tutorial: This tutorial tests the performance of different transpiler settings.

- How error mitigation makes quantum computers useful: This seminar showcases how error mitigation could allow quantum computers to solve useful problems at a scale.

- CHSH Inequality: Run an experiment on a quantum computer to demonstrate the violation of the CHSH inequality with the Estimator primitive.

Advanced:
- What to do with 100+ qubits?: This panel discussion highlights recent work using 100+ qubits.

- Quantum computing in practice: Learn realistic potential use cases for quantum computing.

- Efficient Long-Range Entanglement: This 1-hour YouTube seminar covers long range entanglement on dynamic circuits.

- Utility-scale Max Cut: Solve utility-scale quantum optimization problems.