

QAMP Spring 2022

Mentee: Tanya Garg

Mentor: Matthew Treinish

Expand qiskit-neko testing



Qiskit-neko



- New effort to add a proper integration test suite to the overall qiskit project.
- Designed to be run in CI to ensure that a proposed change to any qiskit project doesn't break backwards compatibility or break an interface that another qiskit project is currently using.

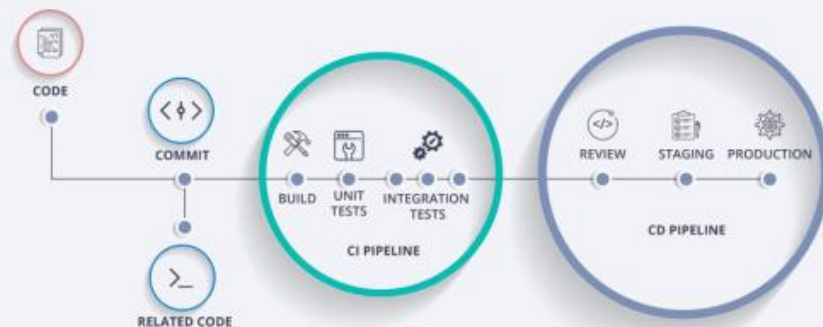
☰ README.md

qiskit-neko

license Apache-2.0

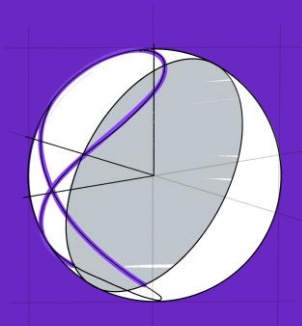
This repository contains integration tests for Qiskit. These tests are used for primarily for two purposes as backwards compatibility testing for Qiskit to validate that changes proposed to any Qiskit project do not break functionality from previous release and to validate that functionality works as expected with different providers. A provider in Qiskit is a package that provides [backend](#) objects that provide an interface to Quantum hardware or a simulator.

Installing qiskit-neko



Initial Problem Statement

- Add tests for different sub sections of qiskit such as circuits, nature, machine learning and visualizations.
- Start running qiskit-neko in CI with proper integration with qiskit.
















Delivered



- Added a few tests covering the qiskit-machine learning classes. Namely,
 - Quantum Neural Networks (Using OPFlow)
 - Quantum Neural Networks (Using TwoLayer)
 - Variational Quantum Classifier
- Added a github action to automate running neko in other major qiskit repositories such as terra and nature

Neko is up and running!

 All checks have passed		Hide all checks
14 successful checks		
	 Coverage report / Coverage (pull_request) Successful in 25m	Details
	 Qiskit Neko Integration Tests / Qiskit Neko Integration Tests (pull_request) Successful in 3m	Details
	 Qiskit.qiskit-terra Successful in 76m — Build #20220706.23 succeeded	Required Details
	 Qiskit.qiskit-terra (Main tests Test Linux Python 3.10) Successful in 41m — Main tests Test Linux Pyth...	Details
	 Qiskit.qiskit-terra (Main tests Test Windows Python 3.10) Successful in 28m — Main tests Test Wind...	Details
	 Qiskit.qiskit-terra (Main tests Test Windows Python 3.7) Successful in 27m — Main tests Test Windo...	Details

Qiskit-neko has been integrated into **qiskit-terra**, **qiskit-aer**, **qiskit-nature**, **qiskit-machine-learning** and **qiskit-experiments**.

Workflow

Basic Prep:

- Understood the code base of qiskit-neko.
- Refined unittest and CI skills through documentations.

Initial PR:

- Initiated and merged (Added ML tests #3) to add tests on qiskit machine learning.
- Added tests related to QNN and VQC based on the tutorials.

Adding Github Action:

- Initiated and merged (Added Action to Run Tests #5) to add a custom action for automated running of neko tests.

Integration with Qiskit

- The repo has been incorporated under the qiskit framework with the addition of the action in other major qiskit repos.

- Not experienced enough with software development practices and github actions.

- Creating threshold testing conditions for qiskit machine learning where circuits are measured probabilistically giving different answers in each iteration.

```
60 qnn1_forward = qnn1.forward(input1, weights1)
61 qnn1_backward = qnn1.backward(input1, weights1)
62
63 self.assertAlmostEqual(qnn1_forward[0][0], 0.08242345, delta=0.1)
64 self.assertAlmostEqual(qnn1_backward[1][0][0], [0.2970094], delta=0.1)
```



