

QAMP 2025

Qiskit-QCBMs

Qiskit Module for Quantum Circuit Born Machines

64



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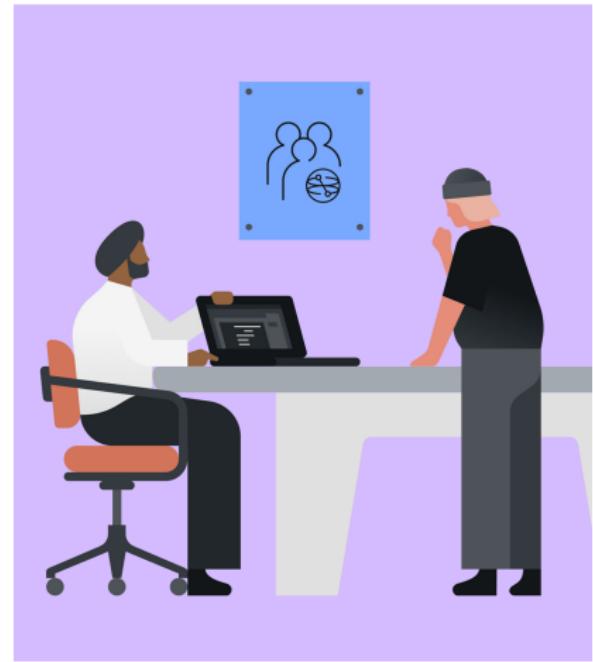
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Speaker name: Jorge Plazas

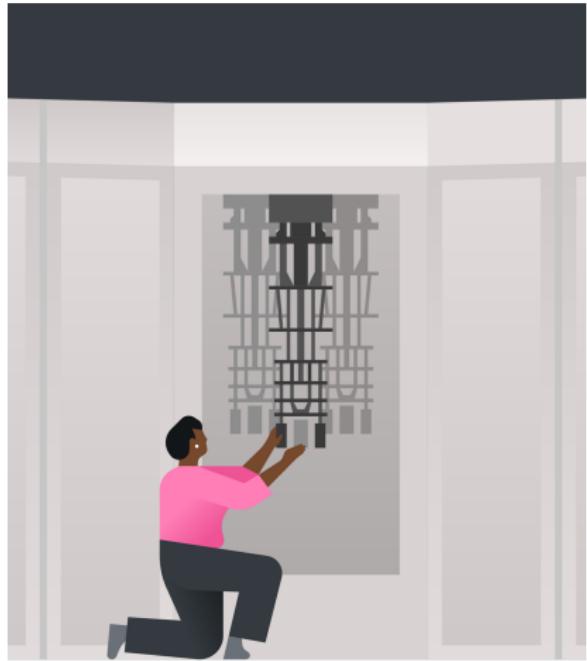
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Mentor: Natalie Hawkins



Agenda

- Scope
- Deliverables
- Progress



Quantum Circuit Born Machines

QCBMs are generative models that use quantum circuits to represent probability distributions.

Distribution of data \rightleftarrows quantum state

$$\pi(X) \sim |\langle X | \psi_\theta \rangle|^2$$



Project # 64

This project aims at developing a set of tools for implementing Quantum Circuit Born Machines using Qiskit.



Deliverables

Minimal Viable Product (MVP):

A jupyter notebook serving as a primer on QCBMs with examples of their implementation within the framework of Qiskit patterns.



Primary Deliverables

- A python module based on Qiskit for the implementation of QCBMs.



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- A set of jupyter notebooks implementing use cases of QCBMs within the qiskit patterns framework.
- A report on performance metrics and comparisons with classical counterparts as benchmarks.



Approach

- Review of the state of the art
Theory & Implementations



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- Review of the state of the art
 - Theory & Implementations
- Recast the above within
 - Qiskit 2.x & Qiskit Patterns



Our methodology so far...

- Implementation of various components as functions.



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- Implementation of various components as functions.
- Various initial experiments.



Next Steps

- Run larger experiments in current hardware.



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- Run larger experiments in current hardware.
- Structure the implemented tools as a module.
- Study scalability of the proposed implementation.



