

# QAMP 2025

## Qiskit-QCBMs

Qiskit Module for Quantum Circuit Born Machines

# 64



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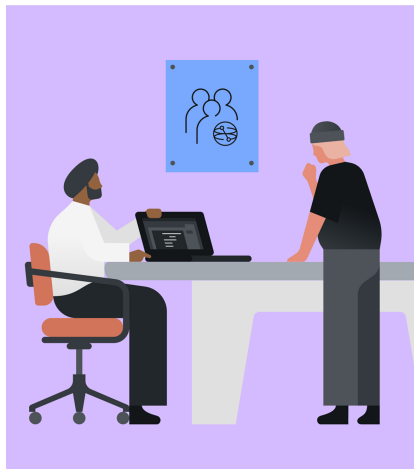
Qiskit-QCBMs

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**Speaker name: Jorge Plazas**

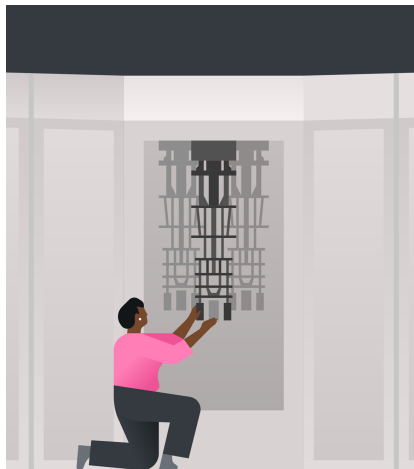
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Mentor: Natalie Hawkins



# Agenda

- Scope
- Deliverables
- Progress



## Quantum Circuit Born Machines

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

Distribution of data  $\Leftrightarrow$  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.



## 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.





