

Quantum Computing for Multi-omics Analyses

ISMB 2026 Tutorial IP7 • July 12 • Lincoln West • 9:00 AM–6:00 PM EDT

9:00–10:45



Foundations and first QML workflow

Lecture

Hands-on

Session I

Welcome · Qiskit fundamentals · Quantum Computing applications in multi-omics ·
A framework for Quantum Machine Learning

10:45 – 11:00



Coffee Break

11:00–1:00



Complexity-aware Benchmarking

Lecture

Hands-on

Session II

Data Complexity Measures · QML Benchmarking ·
Quantum Ensemble Methods for Healthcare and Life Sciences

1:00 – 2:00



Lunch Break

2:00–4:00



Quantum-Classical Graph Representation Learning

Lecture

Hands-on

Session III

Hybrid Quantum-Classical Graph Representation Learning · Implementation Walkthrough ·
Build your own hybrid Quantum-Classical Machine Learning framework

4:00 – 4:15



Coffee Break

4:15–6:00



Read-outs, Q&A, and Future Directions

Lecture

Hands-on

Session IV

Benchmarking tool results read-outs · Q&A ·
Future Directions · Closing Remarks



34th Conference on
Intelligent Systems for Molecular Biology
Washington, DC July 12-16

Know your Hosts



Aritra Bose, PhD
IBM Research



Filippo Utro, PhD
IBM Research



Laxmi Parida, PhD
IBM Research

Learning Outcomes

- Understanding the fundamentals of quantum computing, including learning how to implement algorithms in a quantum computer with quantum gates and circuits using Qiskit.
- Practical experience of pre-processing multi-omics data and preparing it for a quantum hardware experiment.
- Gain experience on quantum algorithms for learning problems.
- Analyze machine learning methods on multi-omics data, understand their shortcomings and review the impact of data complexity measures on ML models.
- How to apply QML models on multi-omics data.
- Learn design of experiments for biomedical data using quantum computers by gaining an in-depth knowledge of quantum-classical hybrid workflows.
- Understand when to apply QML models and benchmark it with classical ML models.

Tutorial Materials

- All tutorial materials are available here:
https://ibm.github.io/QBioCode/workshops/ISMB_2026.html
- Datasets used in this tutorial are available in the data directory.
- You can find each session's materials in the designated section in this page.