



Early Access Summer School

Attendee Guide

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QUICKLINKS

Key Locations

[QGSS21 Discord Server](#)

[Event Website](#)

About



Welcome to the second-annual Qiskit Global Summer School hosted by IBM Quantum, focused on Quantum Machine Learning. We are excited to have you join us for a 2-week dive into quantum computing through daily lectures and lab sessions, as well as a vibrant community set up for you to meet other students and collaborate together to solve problems. Through education and open science, we aim to build and shape a diverse, equitable, and inclusive quantum workforce. We're thrilled to have you join us on this journey.

Please read through this Attendee Guide to find answers about the structure, setup, agenda, and resources that accompany the Summer School. This is not a passive course - active participation is key to making it a success. Grab a notebook and a pen, and find your favorite chair. The Qiskit Global Summer School is just about here.

We appreciate your support in keeping this experience for registered attendees only, and welcome your feedback and suggestions for any improvement. Please do not share the lecture and lab materials outside the attendees of the Qiskit Global Summer School.

Schedule – Week 1

JUNE 14

Monday

10:30 AM EDT
Early Access Summer
School Welcome & Kickoff

11:30 AM EDT
Lecture 1.1: Vector Spaces,
Tensor Products, and Qubits

2:00 PM EDT
Lecture 1.2: Introduction to
Quantum Circuits

JUNE 15

Tuesday

8:00 AM EDT
Lecture 2.1: Simple
Quantum Algorithms I

2:00 PM EDT
Lecture 2.2: Simple
Quantum Algorithms II

JUNE 16

Wednesday

8:00 AM EDT
Lecture 3.1: Noise in
Quantum Computers

2:00 PM EDT
Lab 1: Introduction to
Quantum Computing
Algorithms and Operations

JUNE 17

Thursday

8:00 AM EDT
Lecture 4.1: Introduction to
Classical Machine Learning

2:00 PM EDT
Lecture 4.2: Advanced
Classical Machine Learning

JUNE 18

Friday

8:00 AM EDT
Lecture 5.1: Building a
Quantum Classifier

11:30 AM EDT
Lecture 5.2: Introduction to the
Quantum Approximate Optimization
Algorithm and Applications

2:00 PM EDT
Lab 2: Introduction to
Variational Algorithms

Schedule – Week 2

JUNE 21

Monday

10:30 AM EDT

Lecture 6.1: From Variational Classifiers to Linear Classifiers

2:00 PM EDT

Lecture 6.2: Quantum Feature Spaces and Kernels

JUNE 22

Tuesday

8:00 AM EDT

Lecture 7.1: Quantum Kernels in Practice

2:00 PM EDT

Lab 3: Introduction to Quantum Kernels and Support Vector Machines

JUNE 23

Wednesday

8:00 AM EDT

Lecture 8.1: Introduction and Applications of Quantum Models

11:30 AM EDT

Lecture 8.2: Barren Plateaus, Trainability Issues, and How to Avoid Them

2:00 PM EDT

Lab 4: Introduction to Training Quantum Circuits

JUNE 24

Thursday

8:00 AM EDT

Lecture 9.1: Introduction to Quantum Hardware

11:30 AM EDT

Lecture 9.2: Hardware Efficient Ansatzes for Quantum Machine Learning

2:00 PM EDT

Lab 5: Introduction to Hardware Efficient Ansatzes for Quantum Machine Learning

JUNE 25

Friday

8:00 AM EDT

Lecture 10.1: Advanced QML Algorithms: Quantum Boltzmann Machines and Quantum Generative Adversarial Networks

11:30 AM EDT

Lecture 10.2: The Capacity and Power of Quantum Machine Learning Models & the Future of Quantum Machine Learning

Links and passwords to join will be distributed daily in [#lectures](#) and [#lab-exercises](#)

Labs & Lectures

The summer school is made up of a total of 18 lectures, 5 lab sessions & application exercises, in addition to the daily Live Q&A Sessions. **Participation and completion of all labs and lectures are required in order to receive a certificate of completion from the Summer School**, with the optional activities available to enhance your Summer School experience.

The schedule is not fixed, aside from final lab submission deadlines, and **all students can participate on the schedule that works best for them**. Lectures and lab sessions will all be recorded and available for live participation and post viewing, as well as the daily Q&A sessions.

Students should anticipate a minimum time commitment of 30 hours for the full Summer School, but we recommend planning on 41 hours of participation, with additional time for discussion and collaboration with other students.

Lectures

Duration: ~60 minutes

- Live Q&A will be hosted following each lecture - questions can be asked live or submitted on Discord
- Be an active audience member - take notes along with the lecturers!

Labs

Duration: ~45 minutes

- Demonstrating lecture material with hands-on exercises on quantum programming using Qiskit
- Pre-recorded session is accompanied by problem set exercise

Submit questions in advance (or live) via the discord channel [#live-lecture-questions](#). If a question is not answered in the live Q&A, mentors and lecturers will be able to answer your question in our Discord server!

Certificates



Lab work will be assigned throughout the Summer School as Jupyter notebook exercises. The notebooks must be completed and submitted following the Summer School **no later than Tuesday, June 29th (11:59 PM EDT)** with a **cumulative average score of 75% or higher** in order to receive a certificate.

IMPORTANT NOTE! You have the option to submit your notebook multiple times - only the highest score will contribute to your cumulative average.

Support & Collaboration

A channel will be available that will be filled with IBMers and mentors to answer questions throughout the weekdays of the Summer School course. Students are also strongly recommended to set up or join a “study group” to foster group-work and building connections throughout the school.

Labs will not be reviewed during the lecture(s), so take the time to sit down and review your work. For the best experience, work with your study group to view lab session content & application exercise.

Solutions will be posted the following weekday at 1:30 PM EDT for all Students to access and review.

Pass/Fail Certification

You cannot reduce your score by submitting multiple times - only the highest score is kept. All lab work exercises must be completed and received no later than 11:59 PM EDT on Tuesday, June 29th.

Students must achieve cumulative/average 75% across notebook submissions to get a certificate.

Discord will be used for all Summer School event communications, updates, study groups, lab work, Q&A, and more.

Study Groups will form and collaborate in the text/video channel places, and mentors will be able to see active groups and join to provide lab guidance and support. Students will be enabled to “raise their hand” to get support in their group - notifying mentors direct!

CORE Channels

#welcome

Get started here for first steps when you join the server.

#announcements

Follow this channel for all live announcements and updates.

#conduct-guidelines

Review the IBM Quantum Community Code of Conduct and other guidelines - thank you for supporting an inclusive and welcoming community throughout the course!

ESSENTIAL Commands

!schedule

Get the schedule for the course.

!gethelp

Get helpful tips for when you need help but aren't sure where to go.

!raisehand

Let our mentors and support know directly for insights in ongoing conversations.

!channels

Get a list of easily-linked server channels and resources.

Resources

Quantum Computing

[Textbook] Quantum Computation and Quantum Information by Nielsen & Chuang

[Buy Here](#)

Qiskit Textbook

The Qiskit Textbook is a free digital open-source textbook that will teach you the concepts of quantum computing while you learn to use Qiskit

[Read Here](#)

Classic Machine Learning

[Book] Deep Learning by Ian Goodfellow et al

[Buy Here](#)

Intro to QC Course

The Qiskit Global Summer School 2020 coursework, lab, and lecture materials are now available online

[Watch Here](#)

Pre-Requisites

Minimal prerequisites are required for the Qiskit Global Summer School. If you know how to multiply two matrices, and have some programming experience in Python, you are ready for the Summer School.

You can brush up on Python programming before attending the lectures by using the Qiskit Textbook. To make the most out of these lectures, you may also consider looking through the linear algebra prerequisites section of the Qiskit Textbook.

[Python](#)

[Linear Algebra](#)

IBM Quantum & Qiskit

Qiskit

Prepare for the Summer School by reviewing the documentation and installing Qiskit

IBM Quantum Tools

Learn quantum programming and how to use our tools with step-by-step tutorials and guides

IBM Quantum Community Code of Conduct

In our collective mission to continue to promote and encourage an inclusive and welcoming global quantum community, The IBM Quantum Community Code of Conduct is available for download and review [here](#).

We appreciate everyone's support in this mission, and ask that any observed code of conduct violations or inappropriate behavior are reported [here](#).

[Read the Code of Conduct](#)

Live Moderation & Incident Reporting

During the course within Discord, you can also submit anonymous Code of Conduct violations or offensive/inappropriate content using one of these commands:

r!report [message]

This will send a normal report to the admins. It will also display a confirmation message that the report was sent.

r!sreport [message]

This will send a silent report to the admins. It will not display a confirmation message in the channel, making it publicly-anonymous.

Make sure to include a link to the reported message (Select the message you are reporting and "Copy Message Link" for admins to review).

Join us on Discord!

We will see you soon!