

# Qiskit Hackathon at World of Quantum

June 27-28



## Attendee Guide

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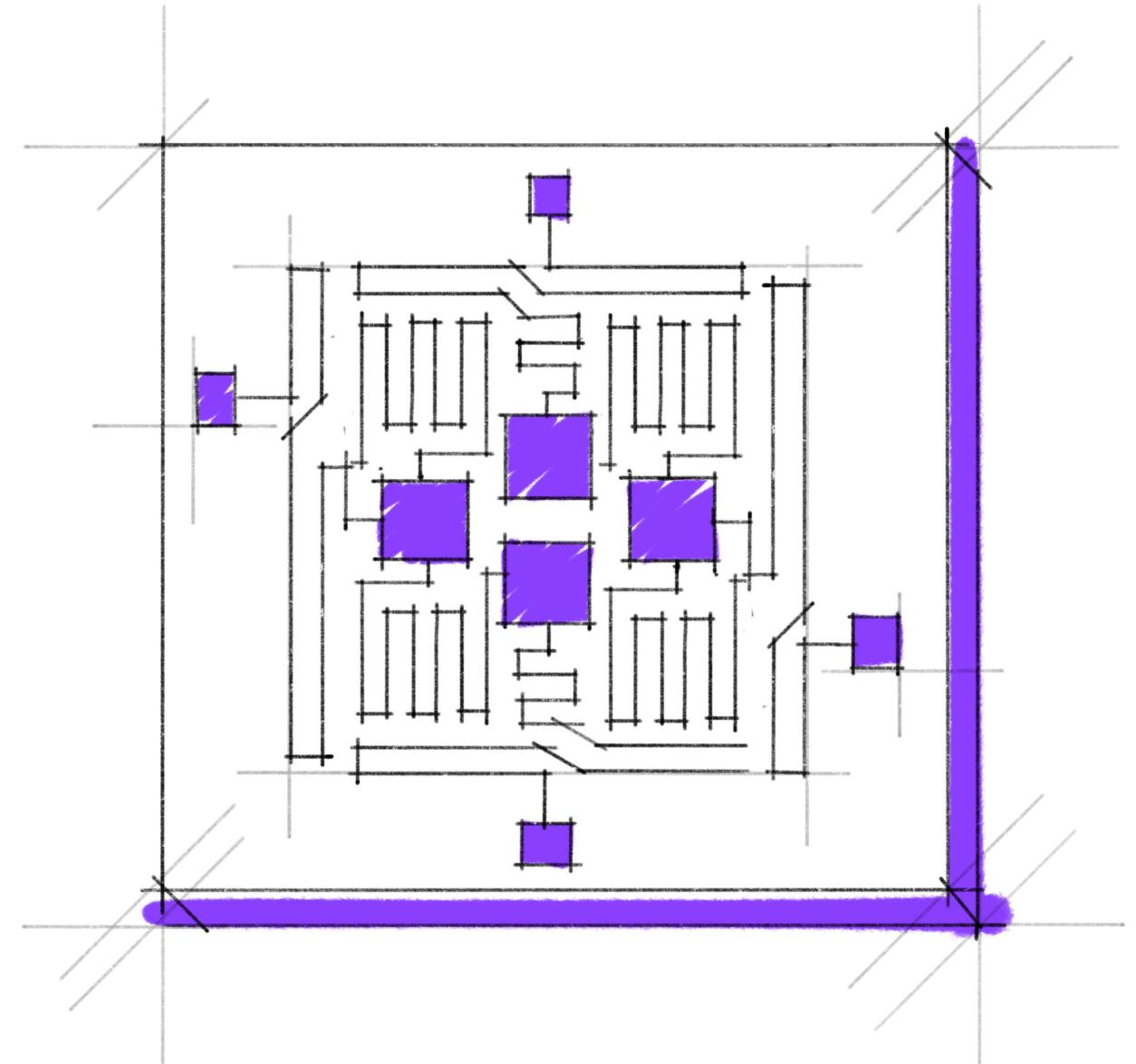
# About

Welcome to Qiskit Hackathon at World of QUANTUM!

We are excited to welcome you to our second hackathon in Germany and to see what amazing projects you create.

Please read through this Attendee Guide to find answers about the structure, setup, agenda, and resources for the hackathon.

We'll see you at the Qiskit Hackathon at World of QUANTUM!



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# Schedule

## Pre-Event

Introduction to Quantum Computing with Qiskit [[Watch replay](#)]

## 27 June

Tuesday

10:00 – 10:45	Check-In at the Hackathon Space
11:00 – 11:20	Welcome Note on main stage at World of QUANTUM
11:30 – 13:30	Lunch, team formation and guidelines in the Hackathon Space
13:30	Start of the Hacking Phase in the Hackathon Space
18:30	Dinner
24:00	Midnight Snack

*Snacks, drinks, and coffee will be available throughout the entire hackathon*

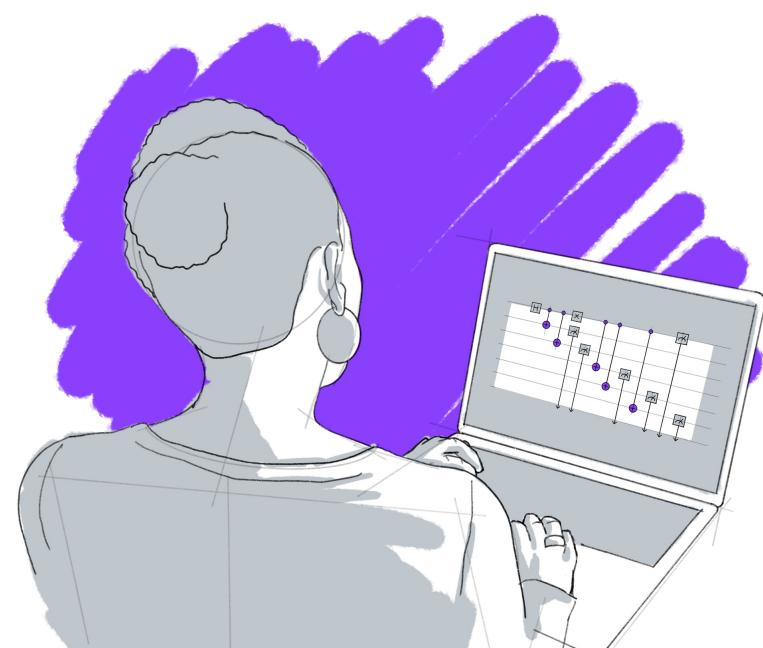
Between 20:00 (27 June) and 08:00 (28 June) you may ask questions in the Qiskit Slack Channel [#woq23-hackathon-support](#) for remote assistance. [[Click here to join Qiskit Slack, if needed.](#)]

## 28 June

Wednesday

08:00	Breakfast
12:00	Lunch
13:30	End of the Hacking Phase and start of the Judging Phase
15:00 – 16:25	Optional Presentations in the hackathon space
16:30 – 17:00	Closing Ceremony on main stage at World of QUANTUM

*Note: Time zone is CET*



## Code of Conduct

The Qiskit Hackathon at World of QUANTUM is committed to maintaining the highest level of enjoyment, accessibility, and inclusivity by maintaining an environment of respect, empathy, and compassion for others. In order to support that, we ask that each attendee review the [Qiskit Community Code of Conduct](#) before the event, and be familiar with our community standards to join us in maintaining a safe and welcoming event for all.



# Useful Information

## What to bring

We recommend bringing the below to make the most of your hackathon experience:

- Laptop with charger
- Phone charger
- Germany electric adapter *if needed*
- Notebook and pen
- Comfortable clothing
  - Jumper/jacket as fair halls can be slightly cold
- Re-usable water bottle

## Food and beverage

- Food and beverages will be provided by the organizers throughout the hackathon.
- Please refer to the Schedule on page 03 for expected mealtimes.
- Food restrictions have been taken into account, but we recommend you bring your own food items if you are concerned about the available offerings.

## Staying overnight

- Hackathon attendees are welcome to stay overnight in the hackathon space if desired.
  - If you plan on staying overnight, we recommend you plan accordingly with any items you might need such as blankets, pillows, sleeping bag and personal toiletries.
- Your hackathon ticket also allows you to leave and enter the venue throughout the night if needed.
- A security guard will be monitoring the space throughout the night.



# Hackathon Format and Projects

Full details on Hackathon format and projects can be found below.

## Challenge Format

The challenge is to design and implement an algorithm which can implement a class of states in an efficient manner, taking real hardware into account.

Your algorithm should be compared to a “naive” approach of implementing the given state. What is important is not how fast your algorithm to prepare the state runs, but how good the quantum state would be on an actual Quantum Device. This means the depth for a given hardware layout should be not be too big, and the error rate when preparing the state (on a noisy simulator) should be low.

The idea here is not to only prepare a single state, but to write an algorithm which works for a class of states. I.E. Preparing a GHZ state with N qubits for any N not only for a specific N like 27.



## List of Possible States

*Below is a selection of some states we prepared that you can use, however, feel free to use other states if you think they are interesting.*

### Highly Entangled States

Generalized GHZ State

Generalized W State

### Encodings

Mixer Hamiltonian

Amplitude Encoding

### Random States

Real Randomness

Free Randomness?



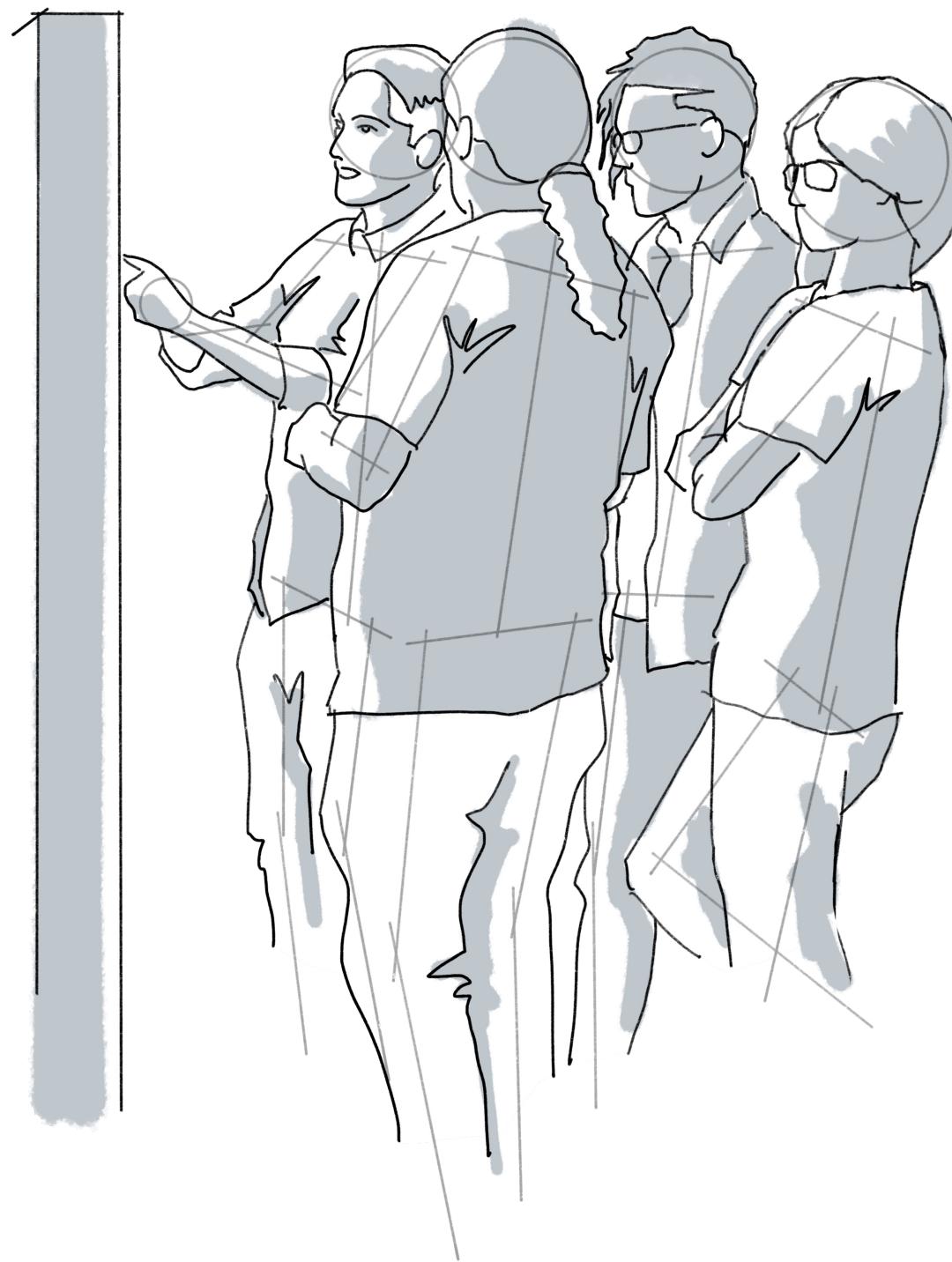
# Team Formation

## Team Formation

Once you've reviewed the challenge format, you should connect with other attendees to form a group!

**Group up in teams of a minimum of 4 or maximum of 6 members.**

If you are interested in a topic based on the challenge format, **write it on one of the boards** so that others can join your team. Interested in joining a team? Check out the topics on the boards and **add your name on a post-it note**.



## Roles

To make it easier for you to organize your team, we have listed some roles which might be distributed among the team. This is a suggestion & is not required to be used. Of course, it's still fundamental to discuss, brainstorm, and help the rest of the team, even if you use these roles.

### Lector

Rewrites text to be easier to understand and better to follow

### Mathematician

Comes up with formulas and theories.

### Planner

Brings everything together, plans & has an overview of the lecture

### Scientific Visualization

Makes illustrations/ animations to help understand the idea and the improvements

### Coder

Writes efficient Qiskit code implementing the theory



# Project Submission

This is what you are required to submit in order to be eligible for the judging phase.

## Jupyter Notebook

To make it easy for the judges we request you to submit a single Jupyter Notebook on a GitHub page containing all the content you want to be judged.

It should be able to be viewed directly online and contain the following parts:

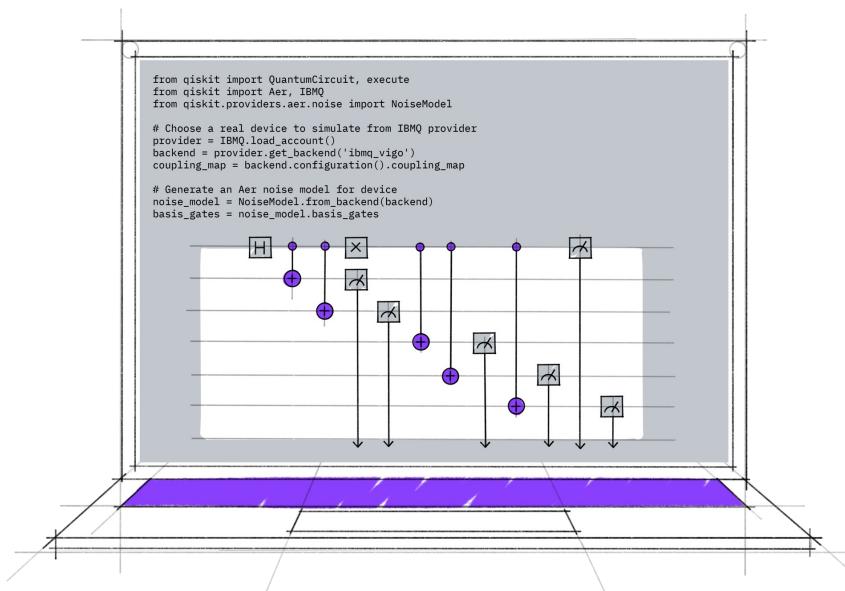
- A description of the set of states you want to prepare.
- A short introduction on why these states are interesting, and what the challenges are in preparing them.
- An explanation of your idea on how to prepare these states in a good/better way.
- If possible, use visualization to make the explanation easier to understand.
- Runnable Python code using Qiskit which prepares this state both in a “simple” way and in your improved way.
- A results section where you compare your improved way of preparation with the default one, comparing one or more of the following factors: depth, number of entangling gates, error rate of the state (on a noisy simulator).

Teams can do an **optional** presentation to be eligible for a **Community Choice Award**.

Presentations will occur at 15:00 on 28 June and should be a maximum of 3 minutes/3 slides.

Presentation slides must be submitted by 14:00 on 28 June to the organizers.

[Here is an example of a Project Submission for your review.](#)



**Note: Your Jupyter Notebook  
must use Qiskit.**



# Judging Criteria

Below is the criteria our expert panel of judges will be using to select the top team.

## Originality and Uniqueness (40%)

- The idea is original and shows promise over other possible implementations.
- There are no factual errors in the material. Your code prepares the correct states.
- How general is the idea? Can it be applied to a wide variety of states?

## Structure (30%)

- The Jupyter notebook is easy to understand.
- The structure of the notebook makes sense.
- It would be easy to modify the code.

## Results (30%)

- You show clear improvements over a naive/simple implementation.
- Your results show improvements in theory and with noise (on the simulator).
- The results are taking real hardware into consideration.

## Awards and Prizes



### First Place Winning Team

**1<sup>st</sup> Place Plaque**

**2500€ for Team**

**Exclusive Quantum Swag**



### Community Choice Award

**Qiskit Mug**

**Exclusive Stickers**



### Active Participants

**Quantum Swag**

Selected by team of Judges

Participants will choose a team based on an *optional* presentation

To recognize your hard work in the Hackathon



# Meet your Mentors!

Mentors will be available throughout the Hackathon to provide guidance and assist with any questions



**Marcel  
Pfaffhauser**  
Quantum  
Community



**Elisa Bäumer**  
Quantum  
Community



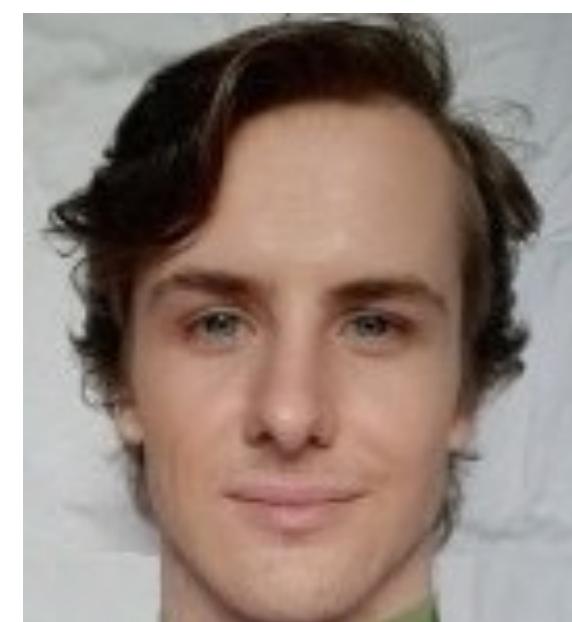
**Fabio  
Scafirimuto**  
Quantum  
Community



**Manuel Wirth**  
Quantum  
Community



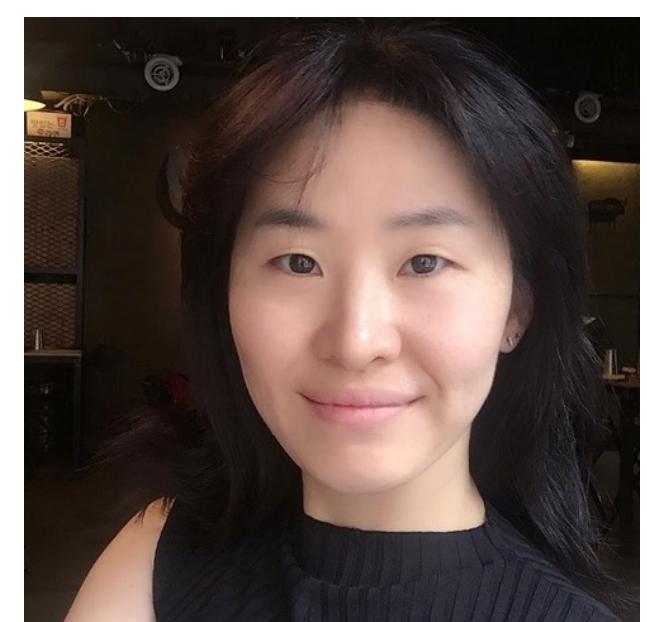
**Eddybrando  
Vásquez**  
Quantum  
Community



**Floyd Creevey**  
Quantum  
Community



**\*James Weaver**  
Quantum  
Community



**\*Sophy Shin**  
Quantum  
Community

\* These mentors will be available via slack [#woq23-hackathon-support](#) for the overnight hours to support you as needed.



# Resources

## The Necessities

Install these software packages before the event:

- [Python 3.7 or later](#)
- [Jupyter notebook](#)
- [Qiskit](#)
- Suggested Tool: [Anaconda](#)

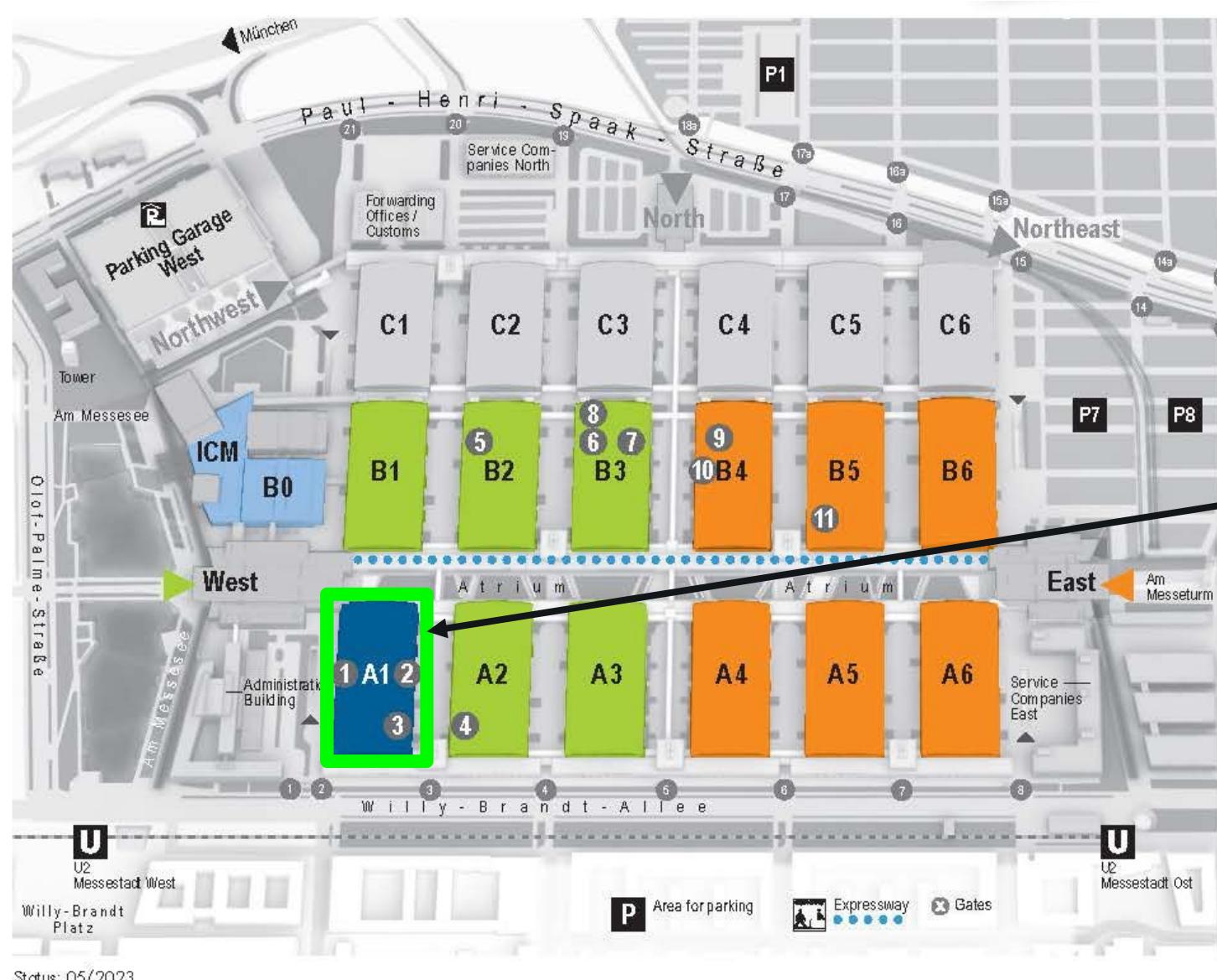
For installing Qiskit, you can follow the instructions provided [here](#) or watch a [video here](#).

## Qiskit Resources

Top Qiskit resources for you to review:

- [Contributing to Qiskit \(required for code contributions!\)](#)
- [Qiskit tutorials](#)
- [Qiskit textbook](#)
- [Qiskit.org](#)
- [IBM Quantum Challenge Spring 2023](#)

## Map of the Venue



- 1 Forum World of QUANTUM
- 2 Forum Quantum Science & Industry
- 3 Qiskit Hackathon @ World of QUANTUM
- 4 Forum Lasers and Optics

- 5 Forum Biophotonics and Medical Applications
- 6 Forum Laser Materials Processing
- 7 Special Show: Photons in Production

- 8 Career Center & Job Board
- 9 Start-up Arena
- 10 career now
- 11 Vision Expert Huddles

### LASER World of PHOTONICS 50

- A2 Lasers and optoelectronics, integrated photonics, optical information and communication
- A3 Lasers and laser systems for production engineering, sensors, test and measurement, optical measurement systems, imaging
- B1 Optics, manufacturing technology for optics
- B2 Lasers and optoelectronics, biophotonics and medical engineering
- B3 Lasers and laser systems for production engineering

### WORLD OF PHOTONICS CONGRESS

### WORLD OF QUANTUM

- A1 Laser systems, subsystems and components for quantum technology, quantum computing and simulation, quantum communication and cryptography, quantum sensing & imaging

### automatica

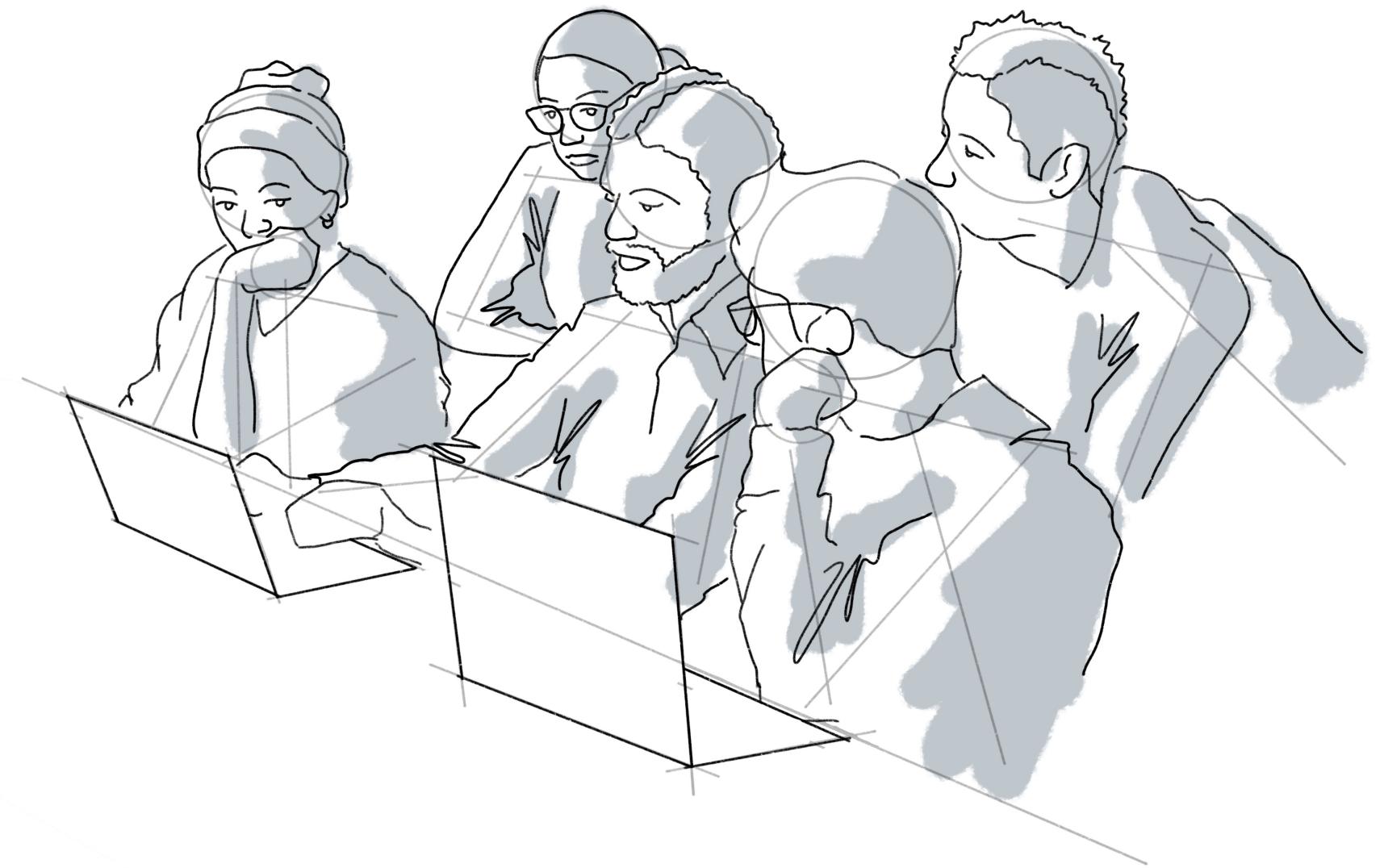
- B6 Industrial robots, drive technology, control systems technology and industrial communications, software and cloud computing
- B5 Machine vision, sensor technology, supply technology, industrial robots
- B4 Industrial robots (incl. collaborative, mobile), professional service robotics, Start-up Arena, career now
- A6 Assembly and handling technology
- A5 Assembly and handling technology, positioning systems
- A4 Machine vision, safety and security technology, supply technology, industrial robots (incl. collaborative, mobile), professional service robotics



# Stay connected!

 Join the [Qiskit Slack Community](#) & the dedicated event channel [#woq23-hackathon-support](#)

 Follow us on [Twitter](#)



If you have any questions, please reach **ask the mentors in-person** or **post in the [#woq23-hackathon-support](#)** Slack channel.