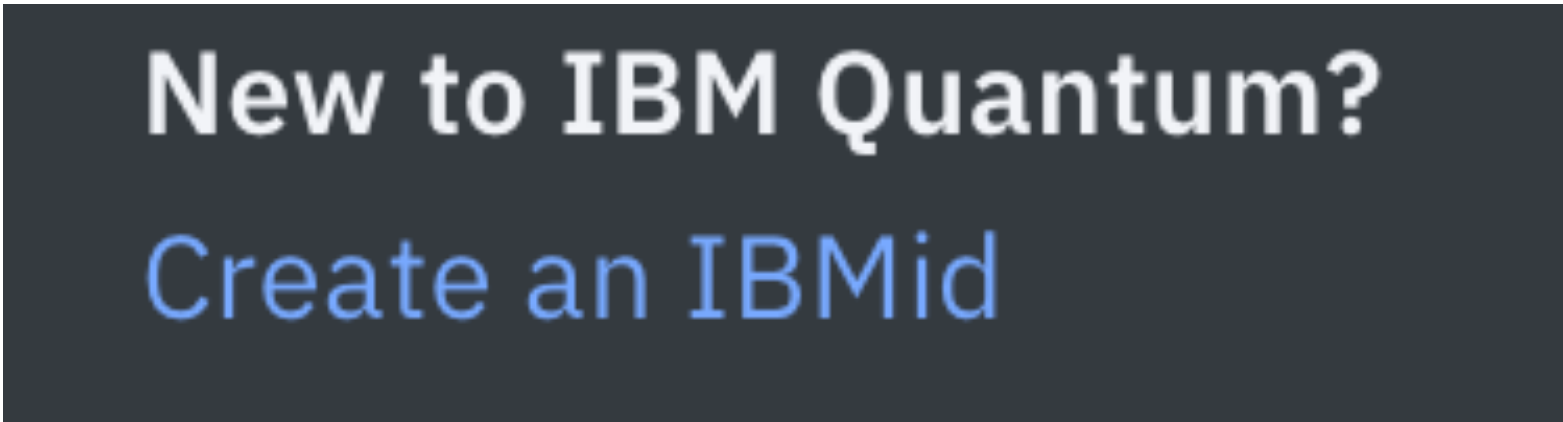


Preparation for hands-on exercise

Go to <https://quantum.ibm.com/>

If you don't have IBM account, please follow the instructions to create an IBMid



New to IBM Quantum?
[Create an IBMid](#)

Once you have the account, sign in to IBM Quantum

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API Token

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Completed jobs

Job ID	Status	Created	Completed	Compute resource
cqdxtnjgepgg008fc860	⌛ Cancelled	About 12 hours ago	About 12 hours ago	ibm_cusco
cqdxk8xfejeg0085x230	✅ Completed	About 13 hours ago	About 13 hours ago	ibm_cusco
cqdxeargtagg008qrgrs0	✅ Completed	About 13 hours ago	About 13 hours ago	ibm_cusco
cqd7rpaxdecg008w5s1g	⌛ Cancelled	1 day ago	1 day ago	ibm_cusco
cqd4hfnxftxg00897bx0	⌛ Cancelled	1 day ago	1 day ago	ibm_cusco

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Completed jobs

Job ID	Status	Created	Completed
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cqdxk8xfejeg0085x230	Completed	About 13 hours ago	About 13 hours ago
cqdxeargtagg008qrgs0	Completed	About 13 hours ago	About 13 hours ago
cqd7rpaxdecg008w5s1g	Cancelled	1 day ago	1 day ago
cqd4hfnxftxg00897bx0	Cancelled	1 day ago	1 day ago

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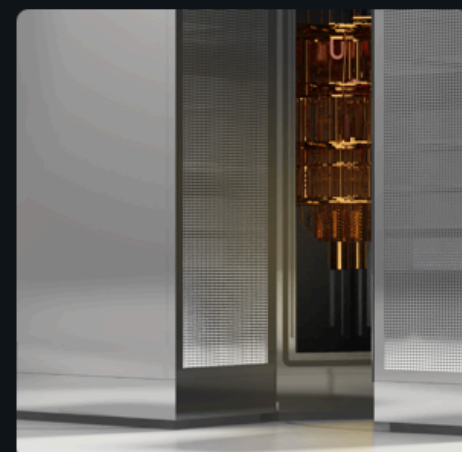


In case you need your API token,
you can copy it here

No need to do that if you use only
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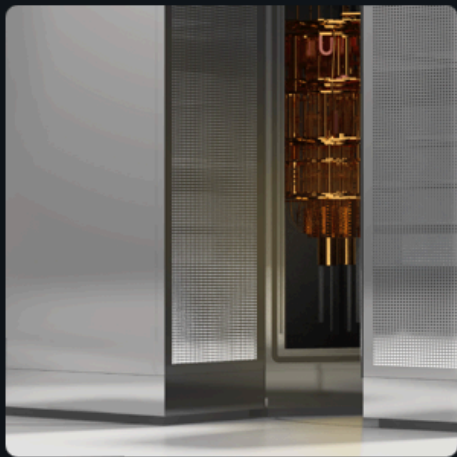
Completed jobs

Job ID	Status	Created	Completed	Compute resource
cqdxtnjgepgg008fc860	⌛ Cancelled	About 12 hours ago	About 12 hours ago	ibm_cusco
cqdxk8xfejeg0085x230	✅ Completed	About 13 hours ago	About 13 hours ago	ibm_cusco
cqdxeargtagg008qrgs0	✅ Completed	About 13 hours ago	About 13 hours ago	ibm_cusco
cqd7rpaxdecg008w5s1g	⌛ Cancelled	1 day ago	1 day ago	ibm_cusco
cqd4hfnxftxg00897bx0	⌛ Cancelled	1 day ago	1 day ago	ibm_cusco

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We use IBM Quantum Lab for hands-on

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File

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Tabs

Settings

Help

Launcher



Notebook



Qiskit v1.0.0
(ipykernel)



Get started with
Grover's



Qiskit v1.0.0
(ipykernel)



Console

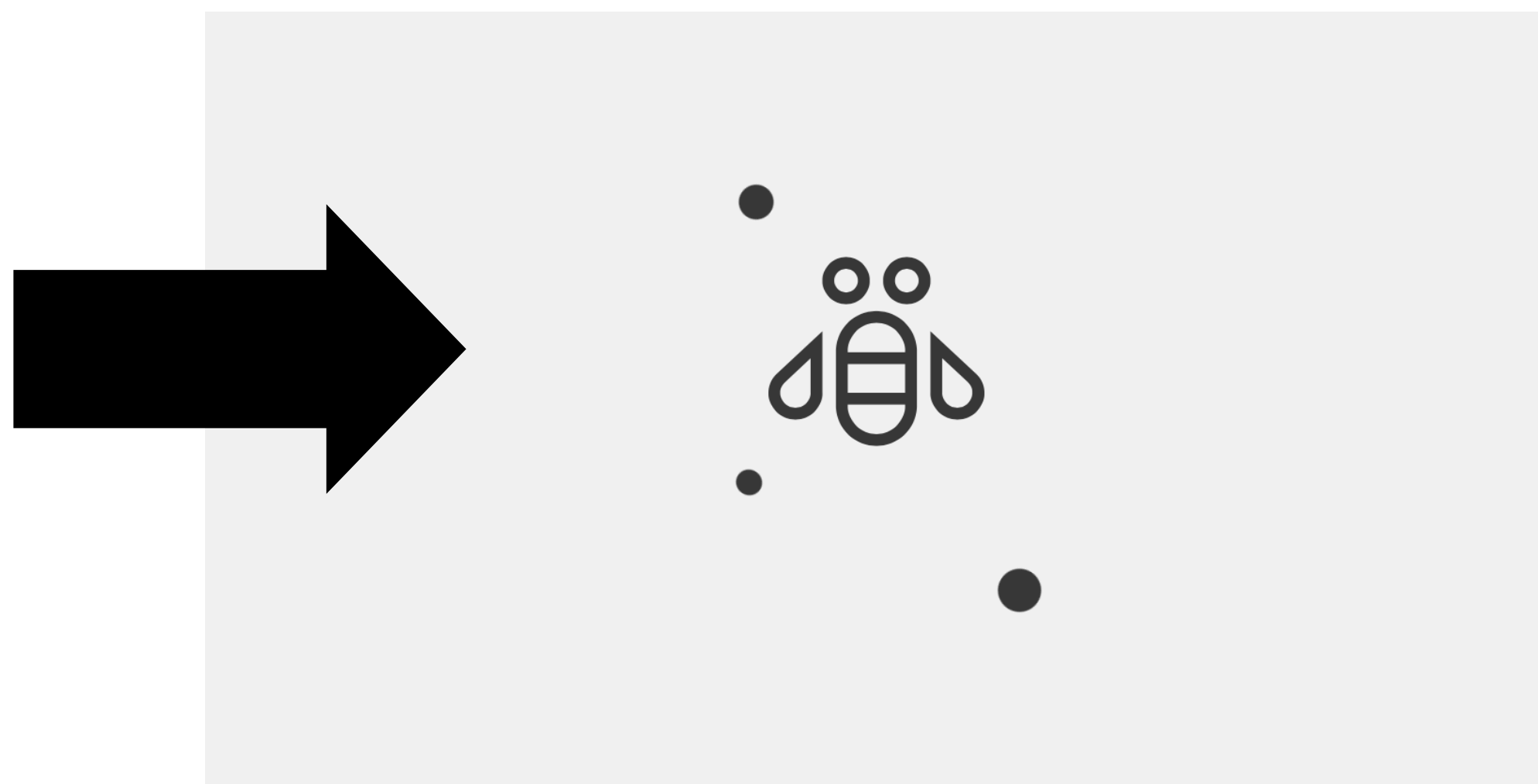
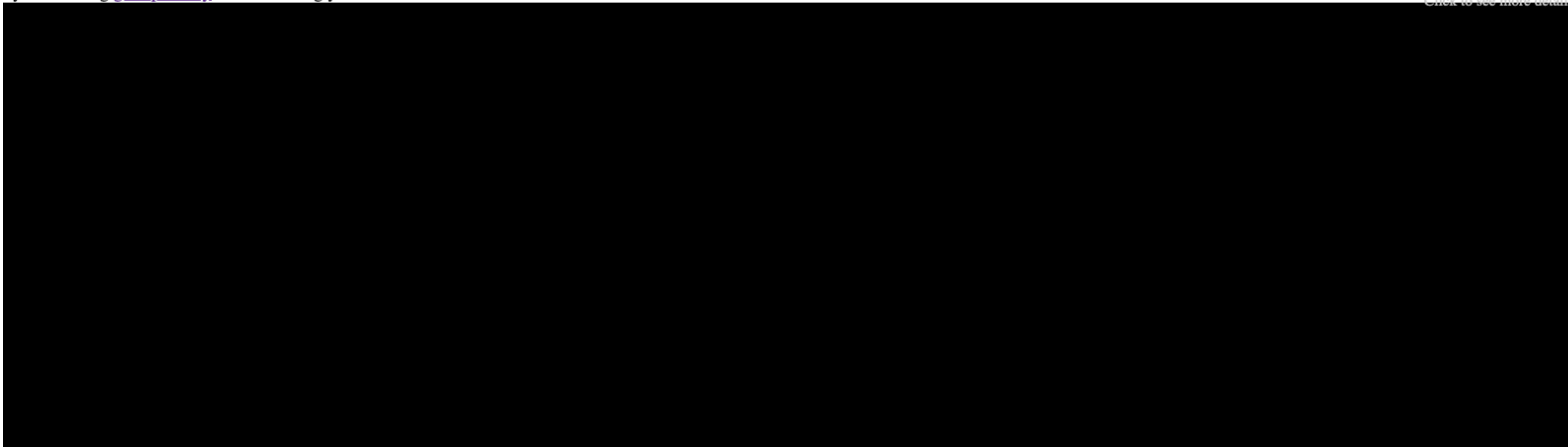


Qiskit v1.0.0
(ipykernel)

At the beginning of the lecture, please click the link below, that will upload the hands-on materials to IBM Quantum Lab

<https://cern.ch/aertr>

After clicking on the link, you will see...



The page like this should appear

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Dropdown icon

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Name	Last Modified
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ds	4 days ago
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qc_workbook	4 days ago
hands-on-preparation.pdf	11 minutes ago
Lec1.ipynb	19 hours ago

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kmi-school-2024

Notebook

Qiskit v1.0.0 (ipykernel)

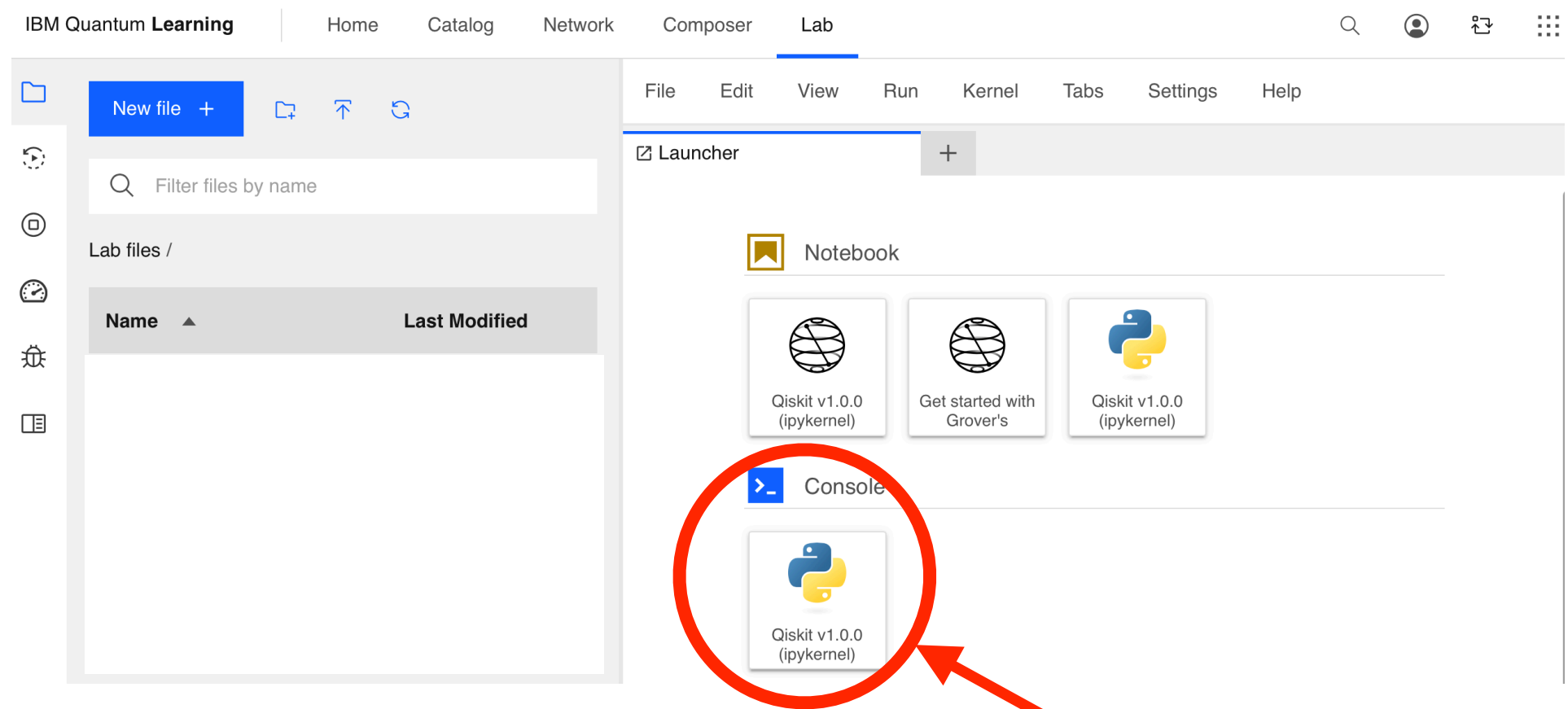
Get started with Grover's

Qiskit v1.0.0 (ipykernel)

Console

Qiskit v1.0.0 (ipykernel)

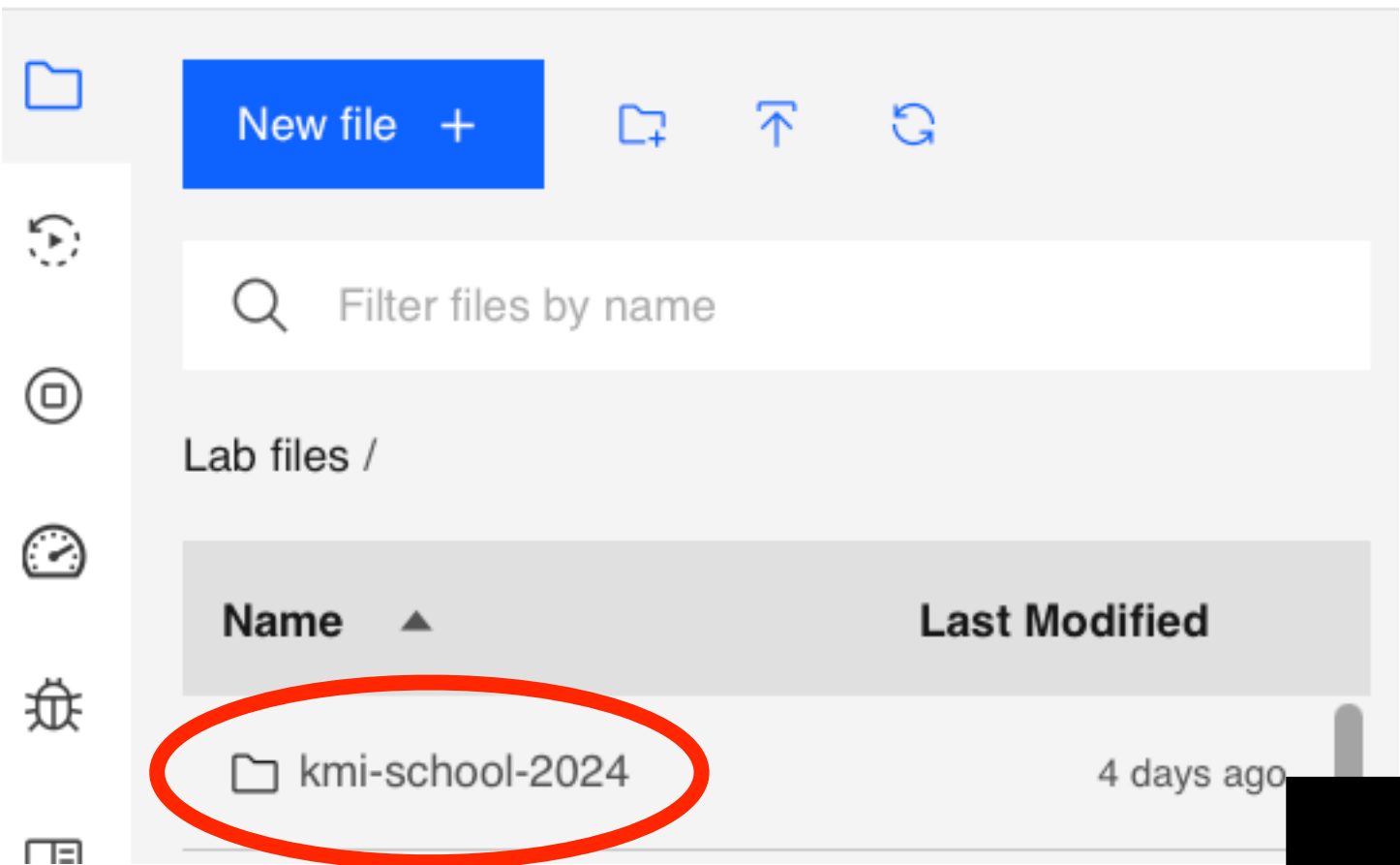
If this does not work for you, you can try the following



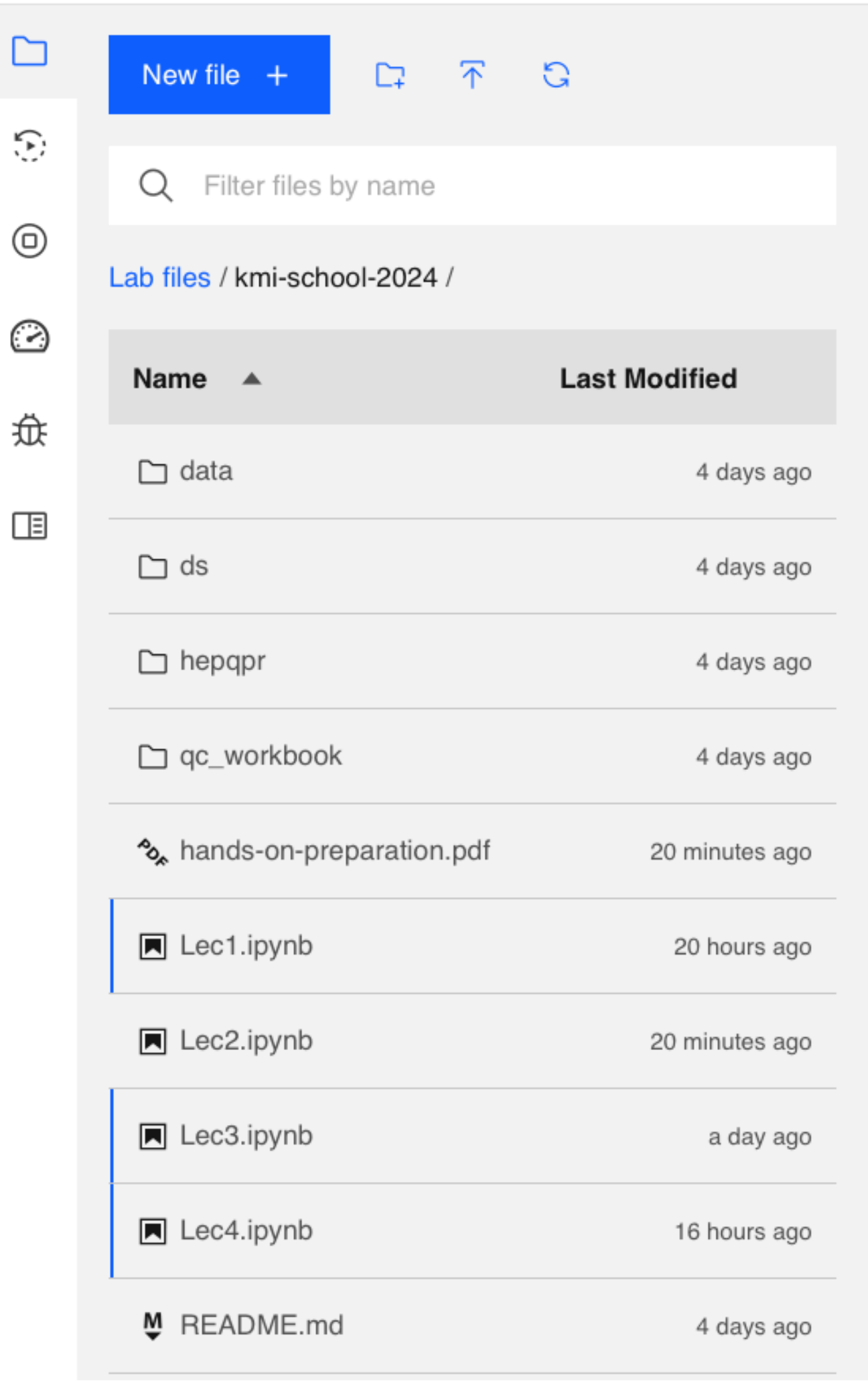
Open a terminal window from here



git clone the material at the bottom of the terminal



Double click on kmi-school-2024



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File Edit View Run Kernel Tabs Settings Help

Lec1.ipynb

Hands-on Exercise (1)

```
[1]: # Import everything
import sys
import numpy as np
import matplotlib.pyplot as plt
from IPython.display import Math
from qiskit import QuantumCircuit, QuantumRegister, ClassicalRegister, transpile
#from qiskit.tools.monitor import job_monitor
from qiskit_aer import AerSimulator
from qiskit_ibm_provider import IBMProvider, least_busy

sys.path.append('/home/jovyan/kmi-school-2024')
from qc_workbook.show_state import statevector_expr
```

Lab files / kmi-school-2024 /

Name	Last Modified
data	3 days ago
ds	3 days ago
hepqpr	3 days ago
qc_workbook	3 days ago
Lec1.ipynb	3 hours ago
Lec3.ipynb	12 hours ago

Jupyter notebook for hands-on:
Lec1-5.ipynb for 5 lectures

Double-click to open in the right window

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ds	3 days ago
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qc_workbook	3 days ago
Lec1.ipynb	3 hours ago
Lec3.ipynb	12 hours ago

Lec1.ipynb

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Markdown ▾

▶

Qiskit v1.0.0 (ipykernel)

▶ Hands-on Exercise (1)

[1]:

Import everything
import sys
import numpy as np
import matplotlib.pyplot as plt
from IPython.display import Math
from qiskit import QuantumCircuit, QuantumRegister, ClassicalRegister, transpile
#from qiskit.tools.monitor import job_monitor
from qiskit_aer import AerSimulator
from qiskit_ibm_provider import IBMProvider, least_busy

sys.path.append('/home/jovyan/kmi-school-2024')
from qc_workbook.show_state import statevector_expr

To process code in a cell:
Select the cell and click on ▶
or Shift+Enter

If you restart the kernel, all processed information is lost, so you have to start from the beginning

11

Quantum Computing Workbook

We have been preparing an English version of Quantum Computing Workbook developed by ICEPP

Go to <https://utokyo-icepp.github.io/qc-workbook/en>



Several topics still missing in English version
Working in progress...



Japanese version:

<https://utokyo-icepp.github.io/qc-workbook>