



INTRODUCTION TO QUANTUM COMPUTING

Hands-on

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Download and configure *forward2*

- Usernames:

a08trc##

Password:

pa1vcpaP

change password: use command "passwd"

login: ssh a08trc##@login.marconi.cineca.it

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Jorge Machaddo	01
Sergey Rykovanov	02
Amin Cheikhi	03
Kevin Obrejan	04
Micaela Fonseca	05
Yorgos Sofianatos	06
Karim Hasnaoui	07
Angela Stallone	08
Felix Bangerter	09
Luca Graziani	10
Valentina Di Salvatore	11
Alexei Sytov	12
Darshana Jayakumari	13
EMANUELE FALBO	14
Alessandro Di Domizio	15
Ana Jambrina Gomez	16
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Leticia Tituaña	18
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Download and configure *forward2*

- On your **local machine**, run

```
git clone https://gitlab.hpc.cineca.it/dottavi1/introduction-to-  
qc-school.git
```

```
cd introduction-to-qc-school/forward2
```

- In order to use `forward2` (a script that allows you to run jupyter notebooks on your local machine using Marconi's environment) you need to pair your keys. To do that, run

```
ssh-keygen (leave everything blank)
```

```
ssh-copy-id a08trc##@login.marconi.cineca.it
```

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- Now log on Marconi with your username

```
ssh a08trc##@login.marconi.cineca.it
```

- Here you have to complete the pairing process

```
ssh-keygen  
ssh-copy-id localhost
```

- And to download the repository again (this time on the **remote** machine)

```
git clone https://gitlab.hpc.cineca.it/dottavil/introduction-to-qc-school.git
```

- Write down the address of the folder you just downloaded. If you haven't moved from home, it should be

```
/marconi/home/usertrain/a08trc##/introduction-to-qc-school
```

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- Now go back on your **local** machine, go to the **local** dir "*introduction-to-qc-school*", enter into the *forward2* directory and type

```
./forward2 -u a08trc## -r marconi -p your-port-number env-name  
/marconi/home/usertrain/a08trc##/introduction-to-qc-school/dir-name/
```

where

```
a08trc## -----> complete with your number  
your-port-number -----> use 32000 + your number  
env-name -----> for first lesson, use "mps"  
dir-name -----> for first lesson, use "mps-jupyter"
```

wait for an URL (or until the program opens a web page with the notebook)
if the URL is not working, just return to your bash and quit the job by
pressing `ctrl-c` (and confirming with yes). Now just relaunch it.

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- Lesson 1:
 `dir-name` = mps-jupyter
 `env-name` = mps
- Lesson 2:
 `dir-name` = IntroQCschool-Qiskit
 `env-name` = qiskitpulser
- Lesson 3:
 `dir-name` = quantumannealer-notebooks
 `env-name` = quantum-annealers
- Lesson 4:
 `dir-name` = IntroQCschool-Pulser
 `env-name` = qiskitpulser
- Lesson 5:
 `dir-name` = GPQML-notebooks
 `env-name` = gpqml

Instruction for local environments

- If you want to use your local computer, you have to install these requirements. I recommend to create a virtual environment for every package.

Prerequisites: Python 3 (tested on 3.8.5)

Instructions for QISKIT-PULSER ENVIRONMENT (Lesson 2 and Lesson 4)

```
python3 -m venv qiskitpulser-env
source ./qiskitpulser-env/bin/activate
pip install --upgrade pip
pip install jupyter
pip install qiskit[visualization]
pip install pulser
pip install matplotlib
```

launch:

```
jupyter notebook path/of/the/notebook/notebookname.ipynb
```


Instruction for local environments

- If you want to use your local computer, you have to install these requirements. I recommend to create a virtual environment for every package.

Prerequisites: Python 3 (tested on 3.8.5)

Instructions for QUANTUM ANNEALING ENVIRONMENT (Lesson 3 and part of Lesson 5)

```
python3 -m venv ocean-env
source ./ocean-env/bin/activate
pip install --upgrade pip
pip install jupyter
pip install dwave-ocean-sdk
pip install matplotlib
```

launch:

```
jupyter notebook path/of/the/notebook/notebookname.ipynb
```

Instruction for local environments

- If you want to use your local computer, you have to install these requirements. I recommend to create a virtual environment for every package.

Prerequisites: Python 3 (tested on 3.8.5)

Instructions for QUANTUM MACHINE LEARNING ENVIRONMENT (Lesson 5)

```
python3 -m venv qml-env
source ./qml-env/bin/activate
pip install --upgrade pip
pip install jupyter
pip install matplotlib
pip install seaborn
pip install qiskit[visualization]
pip install qiskit-machine-learning
pip install tensorflow==2.4.1
pip install -U tensorflow-quantum
```

launch:

```
jupyter notebook path/of/the/notebook/notebookname.ipynb
```