Quantum Computing and Robotic Science Workshop
Sessions 2 & 4
Software recommendations

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In order to participate in the hands-on sessions, please perform the following steps prior to the workshop:

- **Create an account to access IBM's cloud-based quantum computers**

  If you don't already have an IBM account to access the cloud-based quantum computers, please visit `https://quantum-computing.ibm.com/login` and click on the link *Create an IBMid account*. Fill in and submit the registration form to obtain an account. Creating an IBM account is free of charge.

  Shortly after submitting the registration form, you will receive an email which confirms that your IBMid has been activated. Once you got this email, you can visit `https://quantum-computing.ibm.com/login` again and log in with your IBMid. You will now see a web-based user interface that allows you to create and run small quantum algorithms on IBM's public quantum computers.

  Note: It may happen that you get an *IBM Security Verify* error message in the browser window after you submitted the registration form. Usually, you can ignore this error message. The important thing is that you receive the registration confirmation by email.

- **Install the python package `qiskit` on your computer**

  IBM offers a python package, called `qiskit`, which provides a python interface to design complicated quantum circuits and to access many more features of the quantum computers that are not available in the simple web-based user interface. To make sure that all participants have compatible versions of python and qiskit, it is recommended to perform the following steps, which are a modified version of the *official qiskit installation guide*:

  - Visit `https://www.anaconda.com/products/individual`, download the latest version of anaconda and install it. Binaries are available for all major operating systems free of charge.
  - Create a new environment called *py3.7_qiskit0.23.1* based on python 3.7 by typing the following command in a terminal:

    ```
    conda create -n py3.7_qiskit0.23.1 python=3.7
    ```
  - Once the installation is complete, activate the environment by typing:

    ```
    conda activate py3.7_qiskit0.23.1
    ```
  - Add some more necessary python packages to this environment:

```
conda install matplotlib numpy jupyter
```

– Since `qiskit` is not available in the conda repositories, use `pip` to install it:

```
pip install qiskit==0.23.1
```

– Register the new python environment in jupyter:

```
ipython kernel install --user --name=py3.7_qiskit0.23.1
```

- **Save your IBM token locally**

  Finally, we need make your IBM credentials known to `qiskit`. This step will allow you to access the cloud-based quantum computers via python.

  – Visit `https://www.quantumtheory-bruder.physik.unibas.ch/people/martin-ko ppenhoefer/quantum-computing-and-robotic-science-workshop.html`, download the jupyter notebook `store_account_information_locally.ipynb`, and save it to your hard drive.

  – Open a new terminal (or switch to your home directory in the terminal used in the previous step) and launch a jupyter kernel by typing the command:

  ```
  jupyter notebook
  ```

  This will open a new window in your web browser that displays your folder tree.

  – Navigate in this folder tree to the folder containing the downloaded notebook and click on the notebook. This will open the notebook in a new browser window.

  – Log in to `https://quantum-computing.ibm.com`. Click on the icon in the upper right corner of the screen to open the menu *My Account*. Use the blue button *Copy token* to copy your IBM token.

  – Follow the instructions in the notebook `store_account_information_locally.ipynb` to save the token in your local python installation.