

# Experiment 1

## Aim

Installation of Anaconda3 and Qiskit, and linking IBMQ account to Qiskit.

## Theory

### **Qiskit:**

Qiskit is an open-source quantum computing framework developed by IBM that provides a user-friendly interface for developing and executing quantum algorithms. It allows users to create quantum circuits using Python, and provides access to a variety of quantum algorithms and tools. Qiskit also allows users to simulate quantum circuits on classical computers, and to execute quantum circuits on real quantum devices through the IBMQ platform.

### **IBM Quantum:**

The IBMQ platform provides access to a network of quantum devices and simulators that can be used to execute quantum circuits developed in Qiskit. The devices available on the IBMQ platform range from small-scale devices with a few qubits to larger-scale devices with dozens of qubits. The availability of real quantum devices on the IBMQ platform allows users to test and experiment with real quantum computing hardware, which is essential for advancing the field of quantum computing.

### **Anaconda:**

Anaconda3 is a data science platform that provides an easy way to manage Python packages and environments, and is necessary to create a dedicated environment for running Qiskit. By following the installation instructions, users can install Anaconda3, create a new environment for Qiskit, and install Qiskit into the environment.

## Lab Exercise

### Installation Steps:

1. First install Python 3 on the machine from <https://www.python.org/downloads/>
2. Go to the Anaconda website <https://www.anaconda.com/products/individual> and download the Anaconda3 installer for your operating system. Follow the instructions to install Anaconda3 on your computer.
3. Make an account on IBMQ from <https://www.ibm.com/account/in/en/> and Login to this account.

The screenshot shows the IBM Quantum dashboard. At the top, it says "Welcome, Janakar Patel". Below this, there are two main sections: "IBM Quantum Composer" (with "Launch Composer" button) and "IBM Quantum Lab" (with "Launch Lab" button). A sidebar on the left provides statistics: 2 Primitive programs and 5 Prototype programs. Another sidebar at the bottom says "Run on circuits & programs via IBM Quantum compute resources" and has a "View all" link. In the center, there's a "Recent jobs" section showing 0 Pending and 3 Completed jobs, with a note "No pending jobs". On the right side, there's a "Recent notifications" sidebar listing several items:

- Service Alert: Planned retirement ibm\_oslo and ibm\_geneva (15 days ago)
- Service Alert: Temporary service deterioration (27 days ago)
- Service Alert: All 70 systems have now been made broadly accessible (2 months ago)
- Quantum News: IBM Quantum Awards: Open Science Prize (3 months ago) | Learn more
- Service Alert: Planned maintenance: ibmq\_mumbai and ibmq\_kolkata (4 months ago)
- Service Alert: Planned system retirements: ibmq\_montreal and ibmq\_toronto (4 months ago)

4. Next type “pip install qiskit” in Anaconda prompt to install qiskit.
5. Next type “jupyter notebook” in Anaconda prompt and run following code to link your IBMQ account to Jupyter notebook.
6. Do the following code steps in jupyter notebook

```
In [2]: import qiskit
In [3]: qiskit.__qiskit_version__
Out[3]: {'qiskit-terra': '0.22.4', 'qiskit-aer': '0.11.2', 'qiskit-ignis': None, 'qiskit-ibmq-provider': '0.19.2', 'qiskit': '0.39.5', 'qiskit-nature': None, 'qiskit-finance': None, 'qiskit-optimization': None, 'qiskit-machine-learning': None}
In [4]: from qiskit import IBMQ
In [5]: IBMQ.save_account('2d491a0a44bdd5ec696a4b09fb6de02f0345758ae91dd7b7be352675c82000e0fb025')
        configrc.store_credentials:WARNING:2023-04-27 15:36:04,209: Credentials already present.
        Set overwrite=True to overwrite.
In [6]: IBMQ.load_account()
Out[6]: <AccountProvider for IBMQ(hub='ibm-q', group='open', project='main')>
In [ ]:
```

## Conclusion

In summary, setting up Anaconda3 and Qiskit as well as connecting the IBMQ account to Qiskit is a critical first step in delving into the exciting world of quantum computing. A user-friendly interface for creating and running quantum algorithms on actual quantum devices and simulators is offered by the open-source quantum computing framework Qiskit. The IBMQ quantum computing platform, on the other hand, gives users access to a network of quantum devices and simulators that can be accessed through Qiskit. The availability of Qiskit and IBMQ makes it simpler for academics and developers to investigate this fascinating topic. Quantum computing has the potential to revolutionise many fields of science, from cryptography to drug discovery. Overall, the successful installation of Anaconda3, Qiskit, and linking of the IBMQ account is an important step towards unlocking the potential of quantum computing.