

Integrating Quantum Concepts into Cybersecurity

Activity 1b: Qiskit (Quantum Information Science Kit)

We note that Qiskit is an open-source framework for quantum computation in the cloud via the IBM Q Experience project. It consists of 4 main parts:

- Terra – set of tools for writing and compiling quantum programs involving circuits and pulses
- Aer – optimised C++ simulator for circuits, together with tools for simulating errors that occur when performing on real devices
- Aqua – a library of cross-domain quantum algorithms upon which applications may be built. Extensible in that it allows for quantum algorithms to be added. Currently allows for experiments in chemistry, AI, optimisation and finance on near – term quantum computers
- Ignis – a framework for understanding and mitigating noise in quantum systems

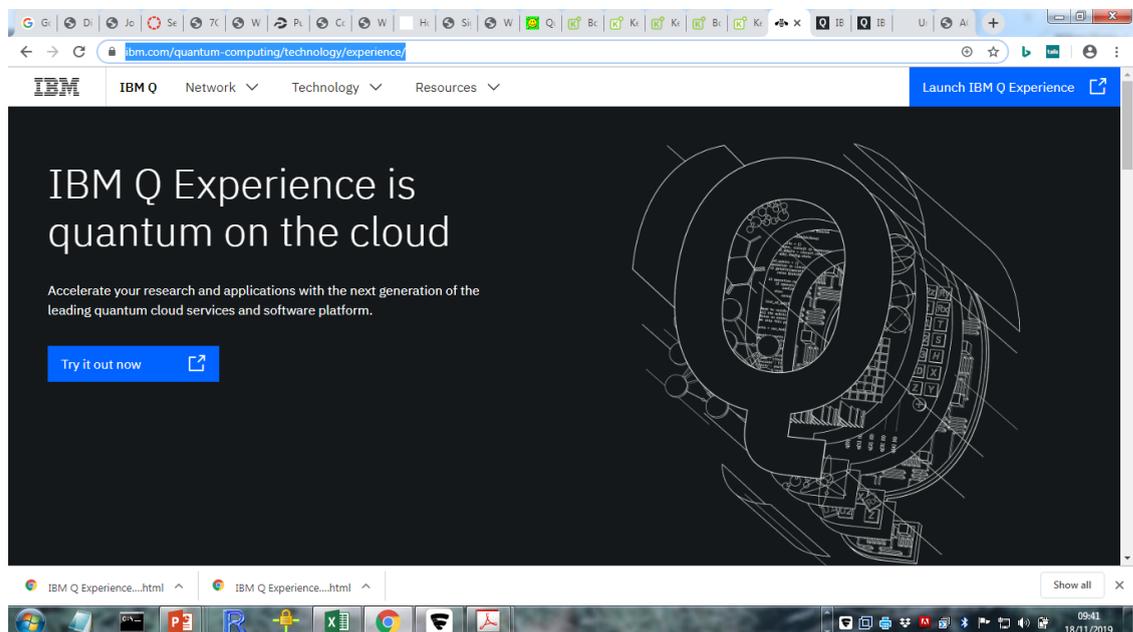
<https://qiskit.org>

We also note that Qiskit

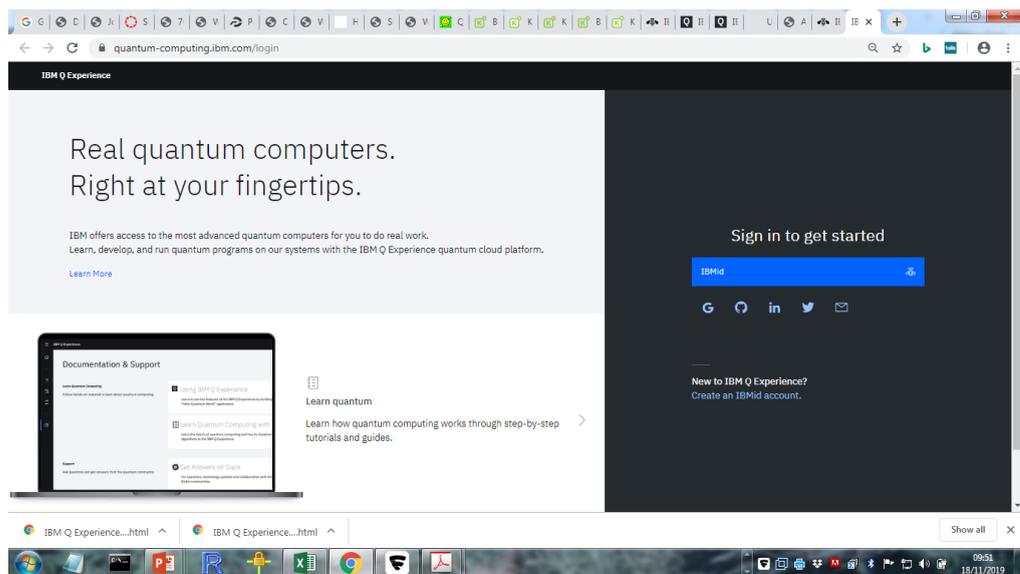
- is part of the IBM Q Experience
- is available from IBM, or for example GitHub
- can be run in the cloud or on your computer via an additional Python library

Part 1 – Gaining access to Qiskit via the IBM Q Experience

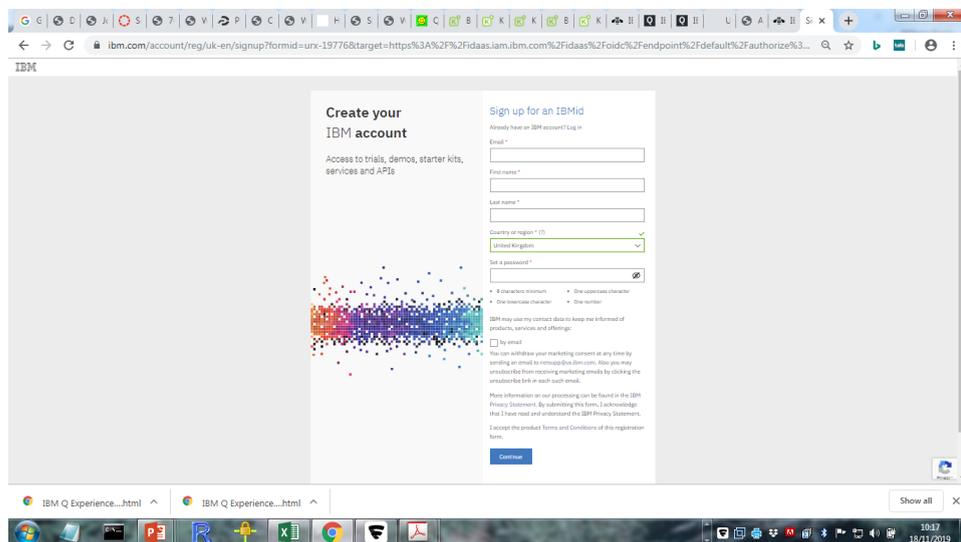
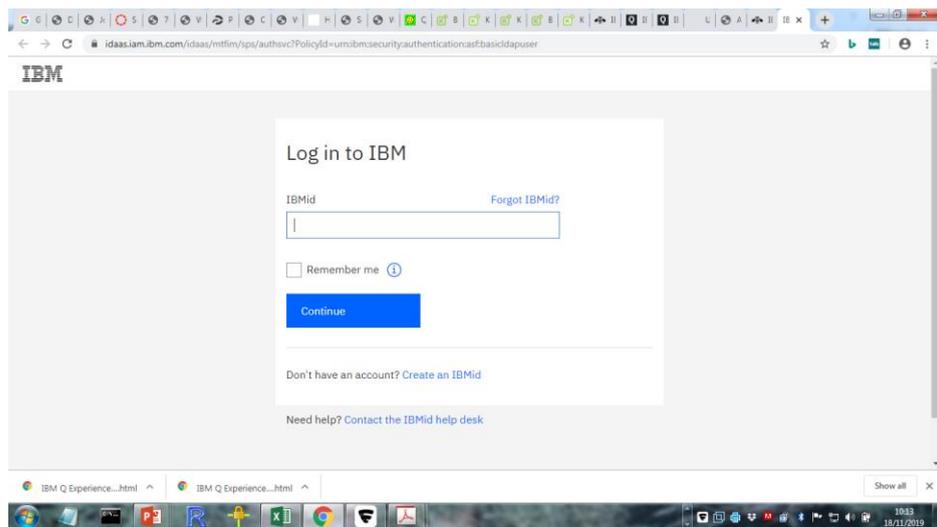
- Using a browser of your choice go to the IBM Q Experience page found at: <https://www.ibm.com/quantum-computing/technology/experience/>
- You should obtain a window similar to the one given below:



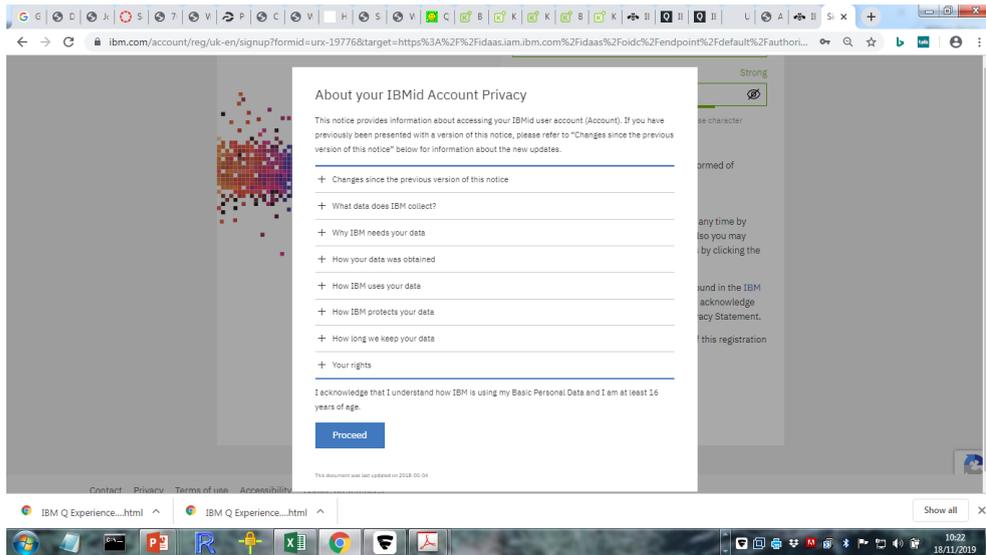
1. Select the 'Try it out now' option or the 'Launch IBM Q Experience' option. You will be asked to login or create a new account



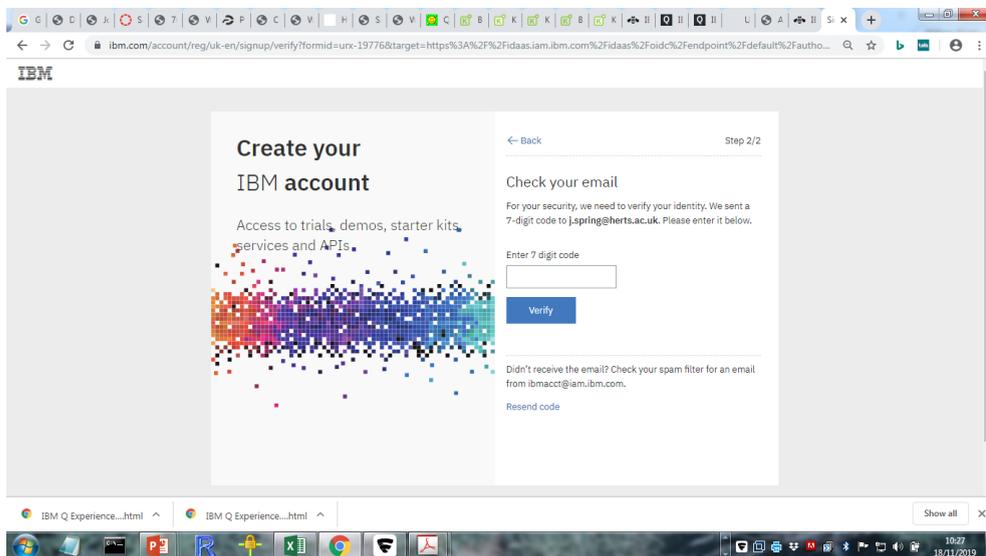
2. In going through the login process you should obtain the following 2 windows:



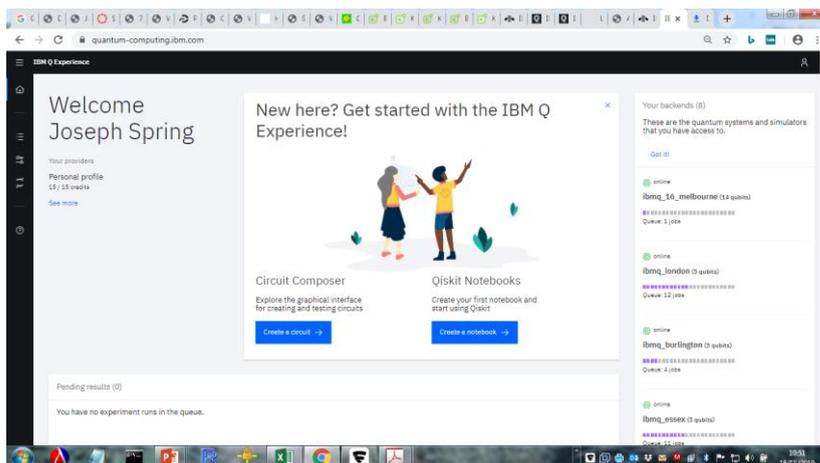
3. Followed by:



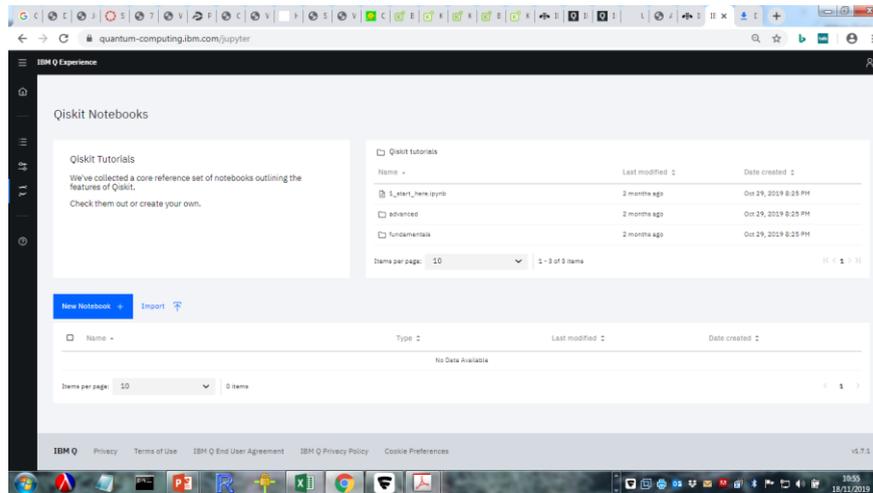
4. And:



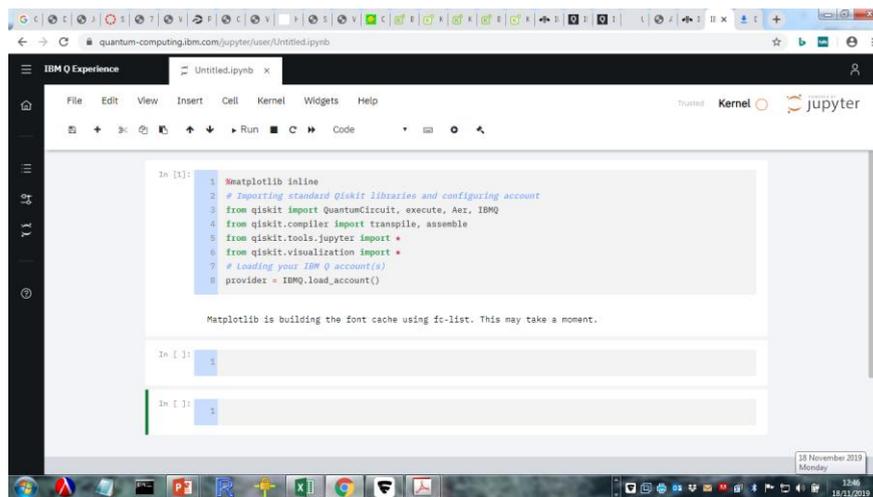
5. Check your email for the activation code which you should copy and paste into the above window on your computer
6. This will take you to a window asking a small number of questions such as your organisation, your level of quantum knowledge and why you want to use IBM Q Experience. Once you have completed this you should obtain the following:



- Today we will start with the 'Create a Notebook' option which we will use with Qiskit. You should obtain the following:



- Select the 'New Notebook' option to obtain the following work window:



We can now begin to write Qiskit programs