SciNet Jupyter Hub for Researchers

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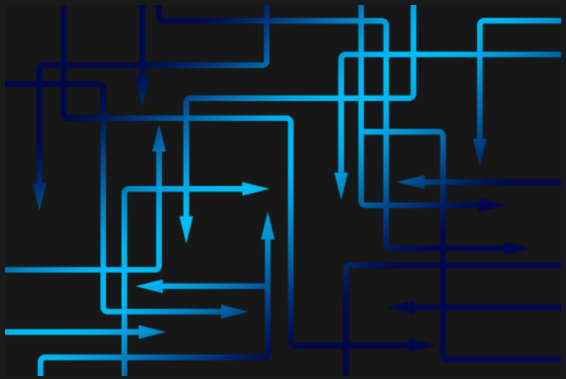
Common computational research scenario

1. Get a research idea
2. You roughly know what computation it needs
3. *Prototype/development:*
   - You write your computation or analysis code
   - Try: It does not work
   - Try a small case: still does not work
   - Debug code line-by-line (repeat)
4. Fix performance bottlenecks.
5. Need more resources: SciNet
   - *preprocess* (prep data)
   - test small case
   - submit large computations
   - *postprocess* results
6. Write paper/thesis

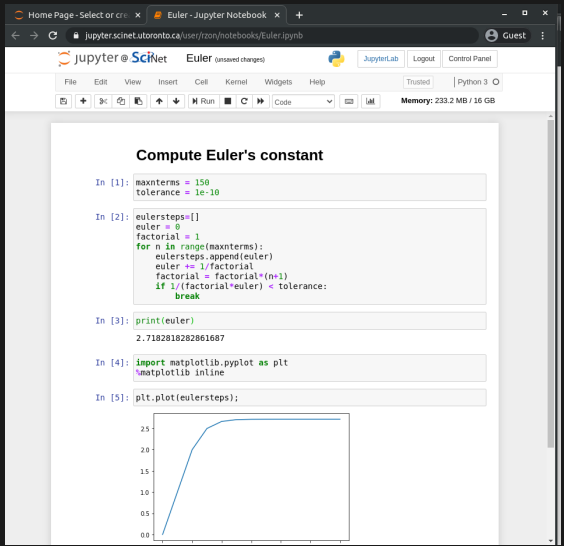


Many steps are easier in an interactive environment.

1

Jupyter = Interactive Research Computing

Interactive computing with Jupyter Notebooks



Supports different languages: **Ju**lia, **Py**thon, **R**.

Interface runs in your webbrowser

Computation can run elsewhere.

- Notebook consists of cells which can have code or text and output.
- You can jump around in the notebook, and execute different cells:
- You can rerun parts of your code.
- You can add text portions, making your notebook more like an article.

2

Large Scale Research Computing = SciNet

Large compute = shared compute

- **Demand for computing and storage** beyond the desktop comes from all fields of research.
- Better use of research money is to have **shared national resources** that are always busy.
- In general, that means large **computer clusters** doing **batch processing** using the **command line** and **non-interactive applications**.
- In Canada: national resources coordinated by **Compute Canada** ($\rightarrow$ **NDRIO**).

SciNet HPC Consortium

- A special department at UofT hosting:
  - Niagara 80,000 supercomputer
  - Mist 200+ GPU cluster (with SOSCIP)
- With scientific computing specialists.
- Training+education: **https://scinet.courses**
- User support: **support@scinet.utoronto.ca**

www.scinethpc.ca/getting-a-scinet-account

- Get a Compute Canada account, PI first (**ccdb.computecanada.ca**).
- Opt-in to Niagara.
- Read **docs.scinet.utoronto.ca/index.php/Niagara_Quickstart**.
- Attend "Intro to Niagara" session.

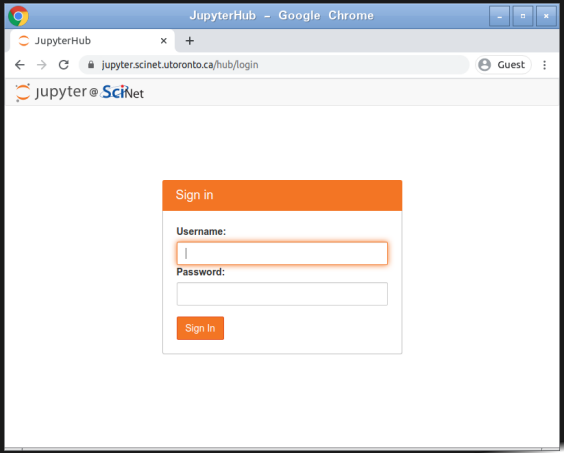
3

Jupyter Hub = Easy Interactive Access to Niagara

SciNet's Jupyter Hub

https://jupyter.scinet.utoronto.ca

- Log in with your Compute Canada username and password.
- No need to install your own jupyterhub and setup port forwarding.
- Shared resource with other researchers.



SciNet's Jupyter Hub Features

https://jupyter.scinet.utoronto.ca

- Work with your data on Niagara.
- Work with your virtual environments on Niagara.
- Share notebooks with collaborators.
- Python 3.8.3, R 3.4.3 and 4.0.2, Julia 1.5.2.
- Single-click to Jupyter Lab.
- Software modules can be loaded.
- Some limits: 16GB RAM, 6 hours of CPU time.

For teaching?

- UofT has a **separate JupyterHub** for teaching, https://jupyter.utoronto.ca.
- No access to SciNet data, but can login with UTORID: no need for students to get extra accounts.
- Also has a desktop and RStudio.
- Each student runs in a virtual machine isolated from all others.

Need a teaching cluster?

If, instead of Jupyterhub, you actually want to teach using a cluster environment in your course, SciNet has a Teach cluster that you can use as well.

SciNet JupyterHub Links

Get an account:

https://www.scinethpc.ca/getting-a-scinet-account

JupyterHub for research:

https://jupyter.scinet.utoronto.ca

Documentation:

https://docs.scinet.utoronto.ca

Training:

https://scinet.courses

Question about anything SciNet: support@scinet.utoronto.ca