PY410 / 505
Computational Physics 1

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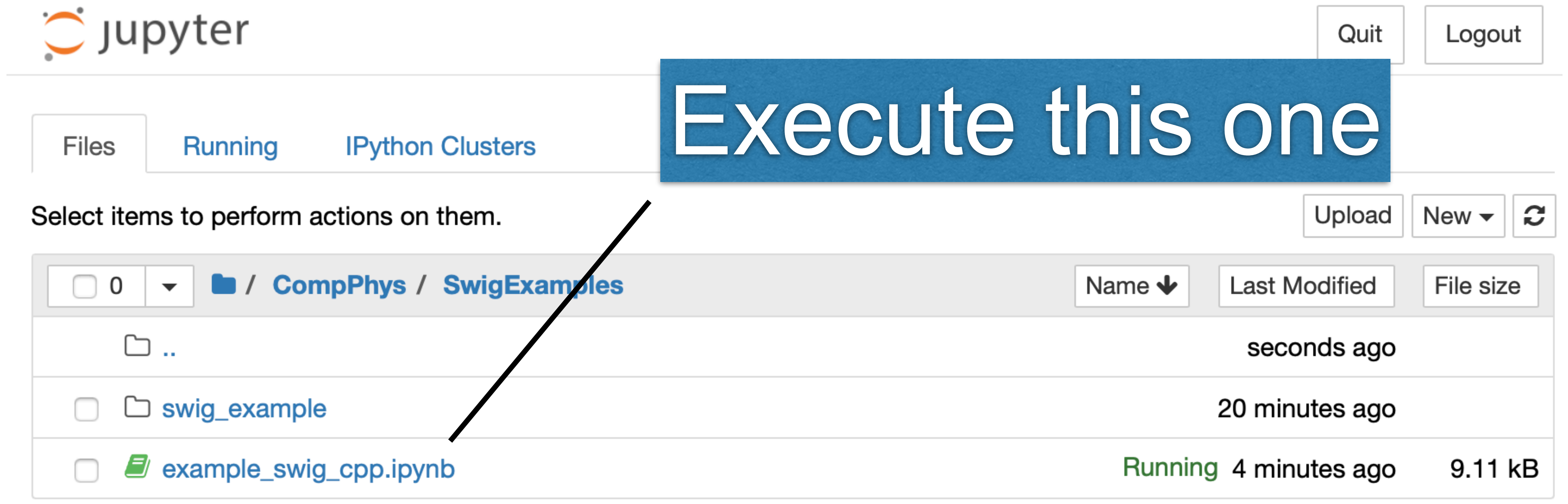
C++ and python

- We've now looked at how to do C++ and python separately
  - (Technically we also looked at them together, since numpy is written in C++, but more on that later)
- How can we put them together?
- Lots of options out there
  - We'll use SWIG for a concrete example
  - http://www.swig.org
  - Tutorial: http://www.swig.org/tutorial.html
- We're also going to use Jupyter for this for an additional bit of fun!

C++ and python… with JUPYTER!

- Then click through to “CompPhys/SwigExamples” and you get something like this:

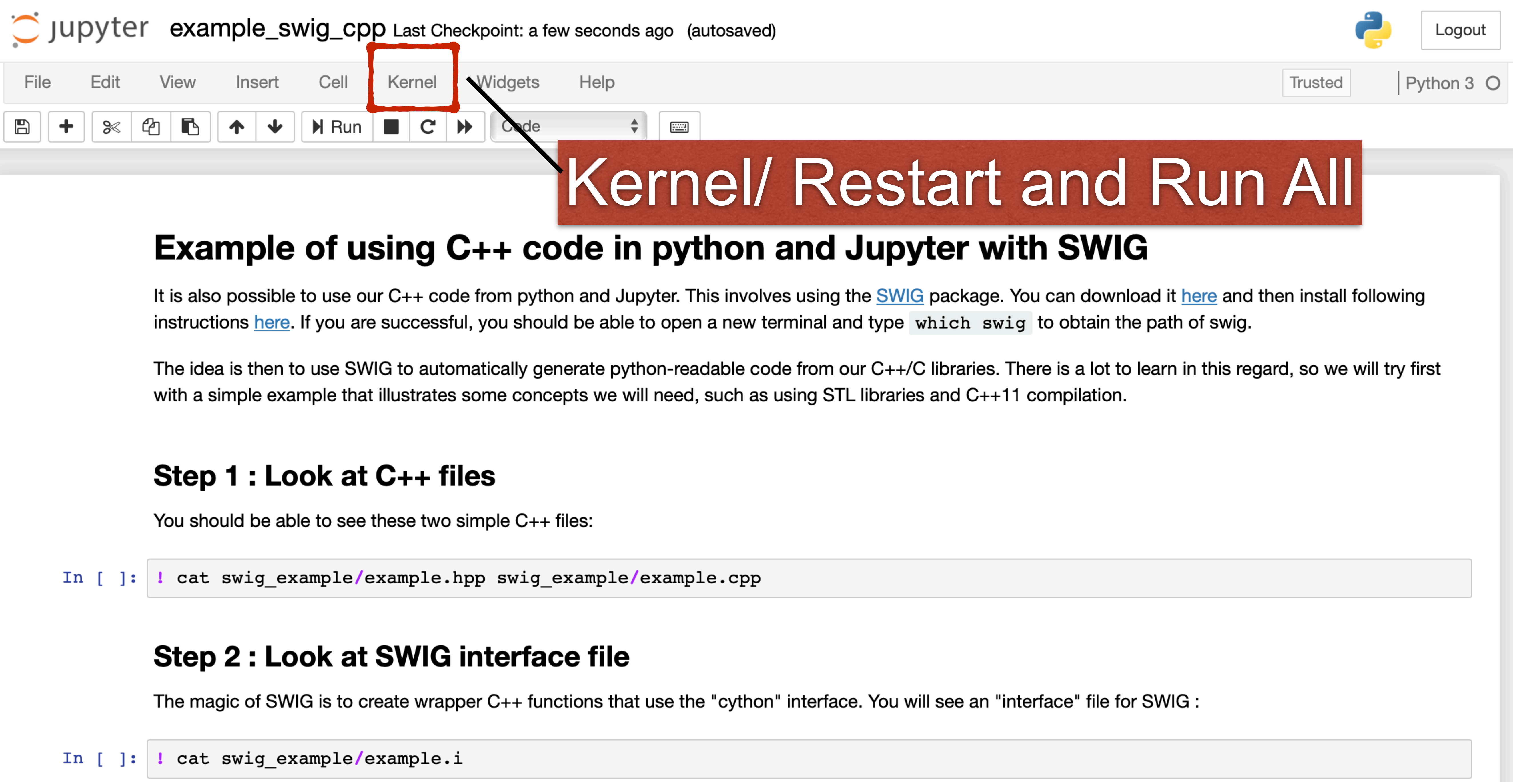


Select items to perform actions on them.

0 / CompPhys / SwigExamples		Name	Last Modified	File size
..			seconds ago	
swig_example			20 minutes ago	
example_swig_cpp.ipynb	Running		4 minutes ago	9.11 kB

C++ and python… with JUPYTER!

- Should look something like this:


jupyter
example_swig_cpp Last Checkpoint: a few seconds ago (autosaved)
Logout
File
Edit
View
Insert
Cell
Kernel
Widgets
Help
Trusted
Python 3
Run
Code
Kernel/ Restart and Run All

Example of using C++ code in python and Jupyter with SWIG

It is also possible to use our C++ code from python and Jupyter. This involves using the SWIG package. You can download it here and then install following instructions here. If you are successful, you should be able to open a new terminal and type `which swig` to obtain the path of swig.

The idea is then to use SWIG to automatically generate python-readable code from our C++/C libraries. There is a lot to learn in this regard, so we will try first with a simple example that illustrates some concepts we will need, such as using STL libraries and C++11 compilation.

Step 1 : Look at C++ files

You should be able to see these two simple C++ files:

```
In [ ]: ! cat swig_example/example.hpp swig_example/example.cpp
```

Step 2 : Look at SWIG interface file

The magic of SWIG is to create wrapper C++ functions that use the "cython" interface. You will see an "interface" file for SWIG :

```
In [ ]: ! cat swig_example/example.i
```