



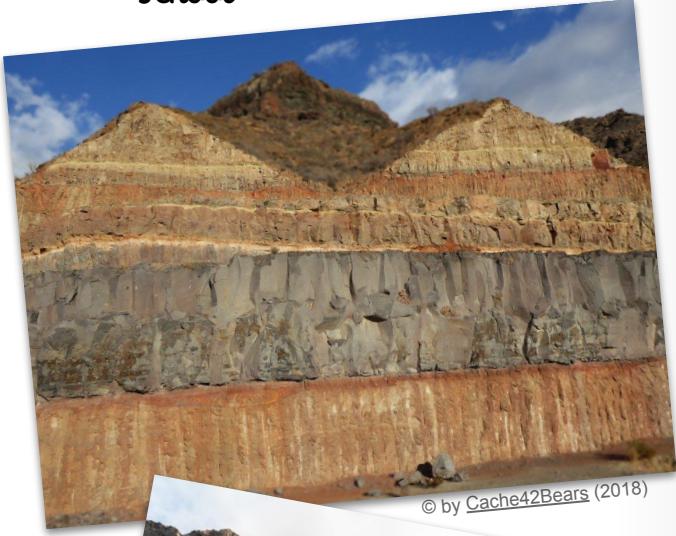
Once upon a time ...

or

Immersive Learning

EDUCACIÓN  
David Pérez-Suárez

School

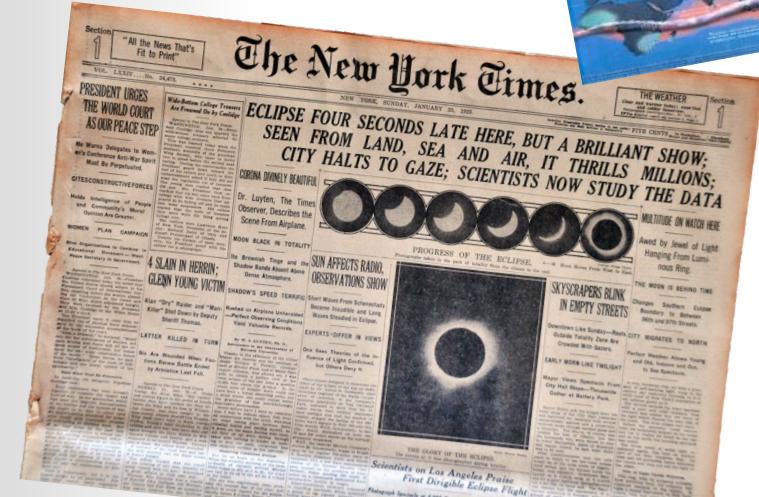
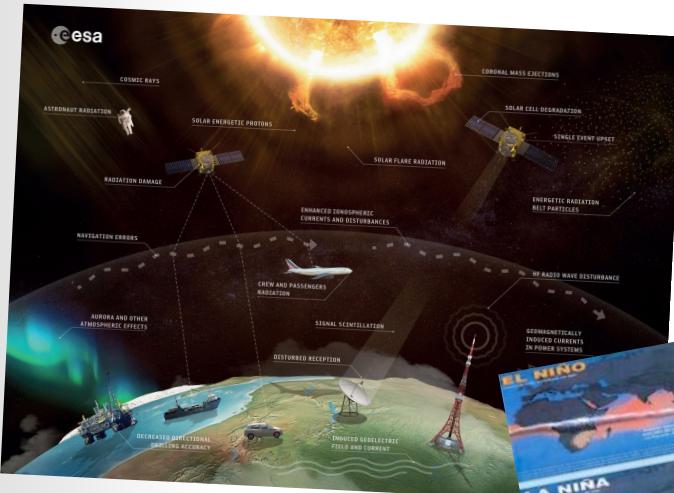


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| Dreamstime.com

University



# Greg Wilson



PLOS COMPUTATIONAL BIOLOGY

EDUCATION

Ten quick tips for teaching programming

Neil C.C. Brown<sup>a\*</sup>, Greg Wilson<sup>b\*</sup>

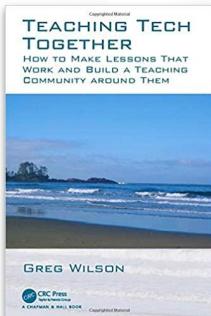
<sup>a</sup> Department of Informatics, King's College London, London, United Kingdom, <sup>b</sup> DataCamp, Toronto, Ontario, Canada

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This is a PLOS Computational Biology Education paper.

For more information about this preprint:

<https://doi.org/10.1371/journal.pcbi.1013000>



# James Hetherington



MPHY0021: RESEARCH SOFTWARE ENGINEERING WITH PYTHON



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## Introduction

In this course, you will move beyond programming, to learn how to construct reliable, readable, efficient research software in a collaborative environment. The emphasis is on practical techniques, tips, and technologies to effectively build and maintain complex code. This is a intensive, practical course.

Introduction to Python  
Research Data in Python  
Version Control  
Testing  
Software Projects  
Construction and

The Unix Shell

The Unix shell has been around longer than most of its users have been alive. It has survived because it's a powerful tool that allows users to perform complex and powerful tasks, often with just a few keystrokes or lines of code. It helps users automate repetitive tasks and easily combine smaller tasks into larger, more powerful workflows.

Use of the shell is fundamental to a wide range of advanced computing tasks, including high-performance computing. These lessons will introduce you to this powerful tool.

### Prerequisites

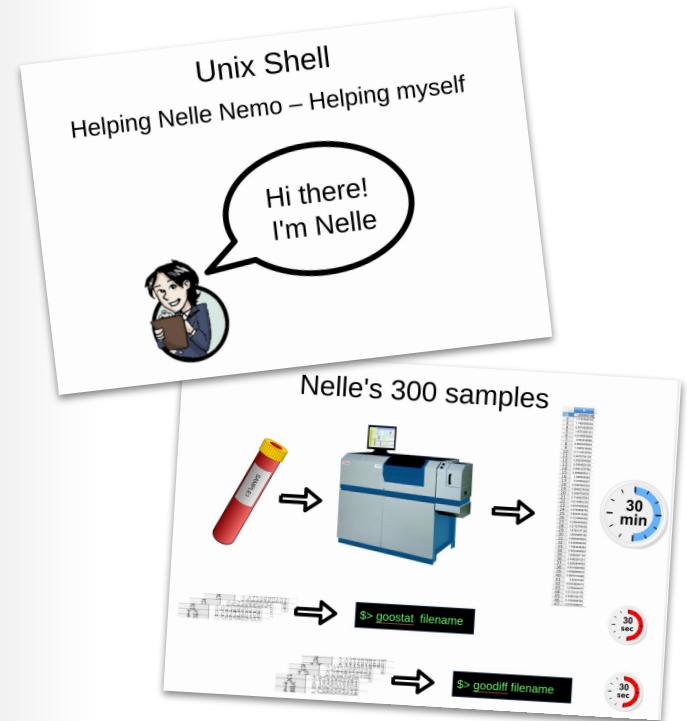
This lesson guides you through the basics of file systems and the shell. If you have stored files on a computer at all and recognize the word "file" and either "directory" or "folder" (two common words for the same thing), you're ready for this lesson.

If you're already comfortable manipulating files and directories, searching for files with `grep` and `find`, and writing simple loops and scripts, you probably want to explore the next lesson: [shell-extras](#).

## Nelle's Pipeline: A Typical Problem

Nelle Nemo, a marine biologist, has just returned from a six-month survey of the [North Pacific Gyre](#), where she has been sampling gelatinous marine life in the [Great Pacific Garbage Patch](#). She has 1520 samples that she's run through an assay machine to measure the relative abundance of 300 proteins. She needs to run these 1520 files through an imaginary program called `goostats.sh` she inherited. On top of this huge task, she has to write up results by the end of the month so her paper can appear in a special issue of [Aquatic Goo Letters](#).

The bad news is that if she has to run `goostats.sh` by hand using a GUI, she'll have to select and open a file 1520 times. If `goostats.sh` takes 30 seconds to run each file, the whole process will take more than 12 hours of Nelle's attention. With the shell, Nelle can instead assign her computer this



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## Exercise: a Maze Model.

Work with a partner to design a data structure to represent a maze using dictionaries and lists.

- Each place in the maze has a name, which is a string.
- Each place in the maze has zero or more people currently standing at it, by name.
- Each place in the maze has a maximum capacity of people that can fit in it.
- For each place in the maze, you can go from that place to a few other places, using a direction like 'up', 'north', or 'sideways'

Create an example instance, in a notebook, of a simple structure for your maze:

- The living room can hold 2 people. James is currently there. You can go outside to the garden, or upstairs to the bedroom, or north to the kitchen.
- From the kitchen, you can go south to the living room. It fits 1 person.
- From the garden you can go inside to living room. It fits 3 people. Sue is currently there.
- From the bedroom, you can go downstairs. You can also jump out of the window to the garden. It fits 2 people.

Make sure that your model:

- Allows empty rooms.
- Allows you to jump out of the upstairs window, but not to fly back up.
- Allows rooms which people can't fit in.

```
house = {
    'living' : {
        'exits' : {
            'north' : 'kitchen',
            'outside' : 'garden',
            'upstairs' : 'bedroom'
        },
        'people' : ['James'],
        'capacity' : 2
    },
    'kitchen' : {
        'exits' : {
            'south' : 'living',
            'upstairs' : 'bedroom'
        },
        'people' : [],
        'capacity' : 1
    },
    'bedroom' : {
        'exits' : {
            'downstairs' : 'living',
            'outwindow' : 'garden'
        },
        'people' : [],
        'capacity' : 2
    },
    'garden' : {
        'exits' : {
            'inside' : 'living'
        },
        'people' : ['Sue'],
        'capacity' : 3
    }
}
```

# Finding bugs in history #25

[Open](#) dpshelio opened this issue on 5 Nov 2021 · 2 comments

UCL-MPHY0021-21-22 / Travel-guide (Public)

Code Issues Pull requests Actions Projects Wiki Security Insights

main branch 0 tags

dpshelio Merge pull request #32 from QINGRANLU/qingran ... 2d5ea12 on 28 Oct 2021 106 commits

- ci
- github/worlds
- africa
- asia
- europe
- north\_america
- oceania
- south\_america
- README.md
- README.md

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ISPR

Clear current search query, filters, and sorts

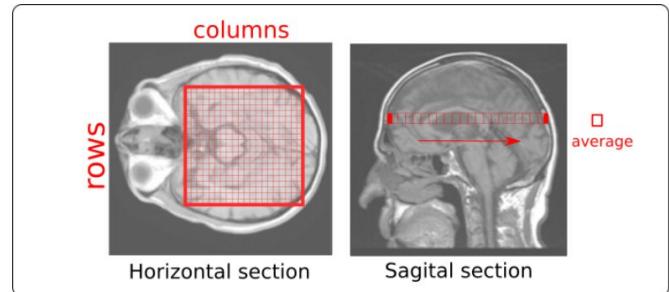
- 12 Open 26 Closed
- Author Label Projects Milestones Reviews Assignee Sort
- Yuki x #38 opened on 2 Dec 2021 by zengzayuan
- Add Korea - Lotte World ✓ #37 opened on 13 Nov 2021 by hyozen
- Yaru-Lotte World x #36 by hyozen was closed on 13 Nov 2021
- korea ✓ #35 by hyozen was closed on 13 Nov 2021
- Korea x #34 by hyozen was closed on 13 Nov 2021
- JJ\_shi-Jeuxerice ✓ #33 opened on 30 Oct 2021 by JJ-SH
- add to china ✓ #32 by QINGRANLU was merged on 28 Oct 2021 · Approved
- commit for north africa ✓ #31 opened on 27 Oct 2021 by Tengart · Changes requested
- Yahhh x #30 opened on 20 Oct 2021 by Trinilli



dpshelio commented on 5 Nov 2021 · edited by stepfiatek

Contributor

Charlene Bultoc has just started a post-doc at an important neuro-science institute. She is doing research on a new methodology to analyse signals in our brains detected through a combination of CT and MRI. Using image processing techniques she can simplify the whole dataset into a grid of 20x20 arrays.



Her theory is that the average of such signals through the sagittal plane is constant over time, so she has written some software to calculate this. She decided to write that software in Python so she could share it (via GitHub, `sagittal_average`) with people from other labs. She didn't know as much Python when she started as she does now, so you can see that evolution in her program.

Charlene is an advocate of reproducibility, and as such she has been keeping track of what versions she's run for each of her results. "That's better than keeping just the date!" you can hear her saying. So for each batch of images she processes she creates a file `versions.txt` with a content like:

```
scikit-image == 0.16.2
scikit-brain == 1.0
git://git.example.com:brain_analysis.git@dfc801d7db41bc8e4dea104786497f3eb09ae9e0
git://github.com:UCL-MPHY0021-21-22/sagittal_average.git@d8bc3ebaecd0cc7a2872da4c81d30b56f9b746ad
numpy == 1.17
```

With that information she can go and run the same analysis again and again and be as reproducible as she can.

However she's found that `sagittal_average` has a problem... and she needs to re-analyse all the data since that bug was

## Creating a 🐍📦 #36

[Open](#) dpshelio opened this issue on 25 Nov 2021 · 0 comments

dpshelio commented on 25 Nov 2021 • edited by stepplatek • [Contributor](#) • ...

Help Charlene to create [her repository](#) into a package (remember to commit after each step).

1. Choose who in your team is sharing now! (make sure you've got a [fork](#) and a local copy of Charlene's repository)
2. Add a `.gitignore` file to the repository to avoid adding artefacts created by python or your text editor. You can use [gitignore.io](#) to generate a file for your needs.
3. Modify the repository directory structure to [make sagittal\\_average as an installable package](#) (don't forget to add empty `__init__.py` files, but there is no need to add the `.md` files yet!).
4. Add a `setup.py` file with the information needed.
5. Try to install it by running `pip install -e .` from the command line, in the filesystem location where the `setup.py` is.
6. Share your solution as a pull request to Charlene's repository mentioning this issue (by including the text `Addresses UCL-MPHY0021-21-22-RSE-Classwork#36` in the pull request description), remember to mention your team members too! (with `@github_username`)
7. Congratulations, you've created a Python package! Now, let's see what can be improved about it in the subsequent issues!

UCL-MPHY0021-21-22 / [sagittal\\_average](#) (Public)

[Code](#) [Issues](#) [Pull requests](#) 8 [Actions](#) [Projects](#) [Wiki](#) [Security](#) [Insights](#)

[main](#) [branches](#) [tags](#) [Go to file](#) [Code](#) • ...

Charlene Bultoc Makes the file Pep8 compliant and fixessome typos on docs d8bc3eb on 17 Nov 2019 24 commits

<a href="#">brain_average.csv</a>	Adds input and output data for future testing	3 years ago
<a href="#">brain_sample.csv</a>	Adds input and output data for future testing	3 years ago
<a href="#">sagittal_brain.py</a>	Makes the file Pep8 compliant and fixessome typos on docs	3 years ago



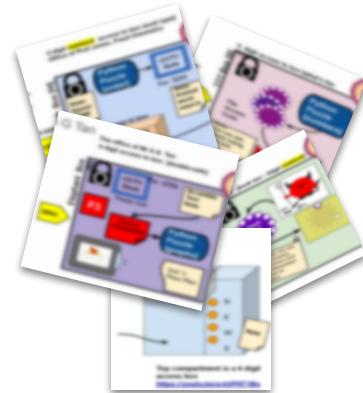
dpshelio and Charlene Bultoc [docs] Adds sphinx extensions ... e677c08 on 30 Nov 2021 36 commits

<a href="#">docs</a>	[docs] Adds sphinx extensions	8 months ago
<a href="#">sagittal_average</a>	Moves the executing script as a shell command accessible from anywhere...	8 months ago
<a href="#">.gitignore</a>	Adds a gitignore file for python artefacts	8 months ago
<a href="#">.travis.yml</a>	Adds travis configuration file	8 months ago
<a href="#">CITATION.md</a>	Adds the three important files	8 months ago
<a href="#">LICENSE</a>	Adds the three important files	8 months ago
<a href="#">README.md</a>	Adds the three important files	8 months ago
<a href="#">setup.py</a>	Adds dependencies for this library	8 months ago

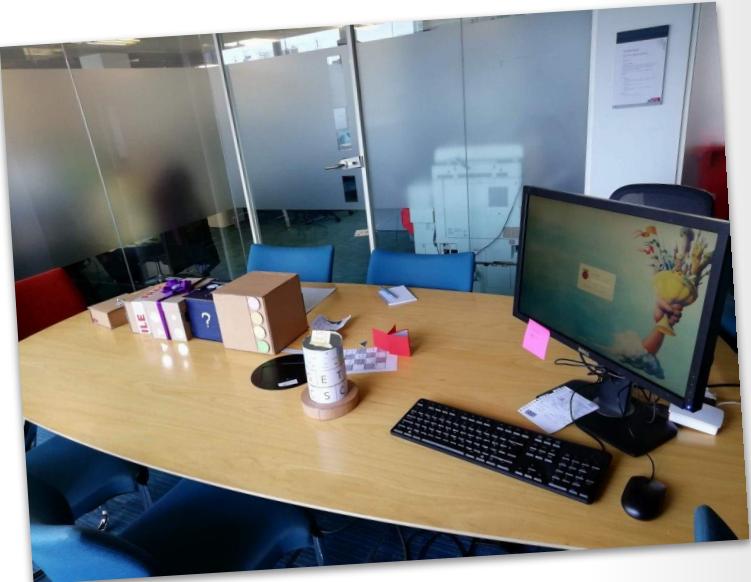
And then ...



# a escape room



a escape room (with real students!)



Online version... on the making

It was a real challenge (almost three weeks of full-time work)  
but also a very rewarding experience and I learnt a ton :)  
Thanks for such a great module and such an enriching learning  
experience!

Thank you to the MPHY0021 team for being  
great teachers and making us to enjoy the  
lectures. I think that it was the best coding  
lecture course I have attended.

Thank you all for teaching such an amazing module -  
UCL would have highest student satisfaction in the  
world if all modules were like this.

Thank you teachers, this is a bravo class!

## Summary:

- Tell a story
- Let them be part of the story

The  
End