Learning Python 3 using “Python for Everybody” with nanoHUB Jupyter Notebooks

“The most popular programming course in the world, since 2014”

Overview

This tutorial provides instructions on how to use the free Jupyter notebooks in nanoHUB to do the coding exercises in the free online course, “Python for Everybody” (https://www.py4e.com/) by Charles Severance. This course is available in several formats (Video, audio, text) and on different platforms (this p4e course, Coursera, EdX, FutureLearn, and others).

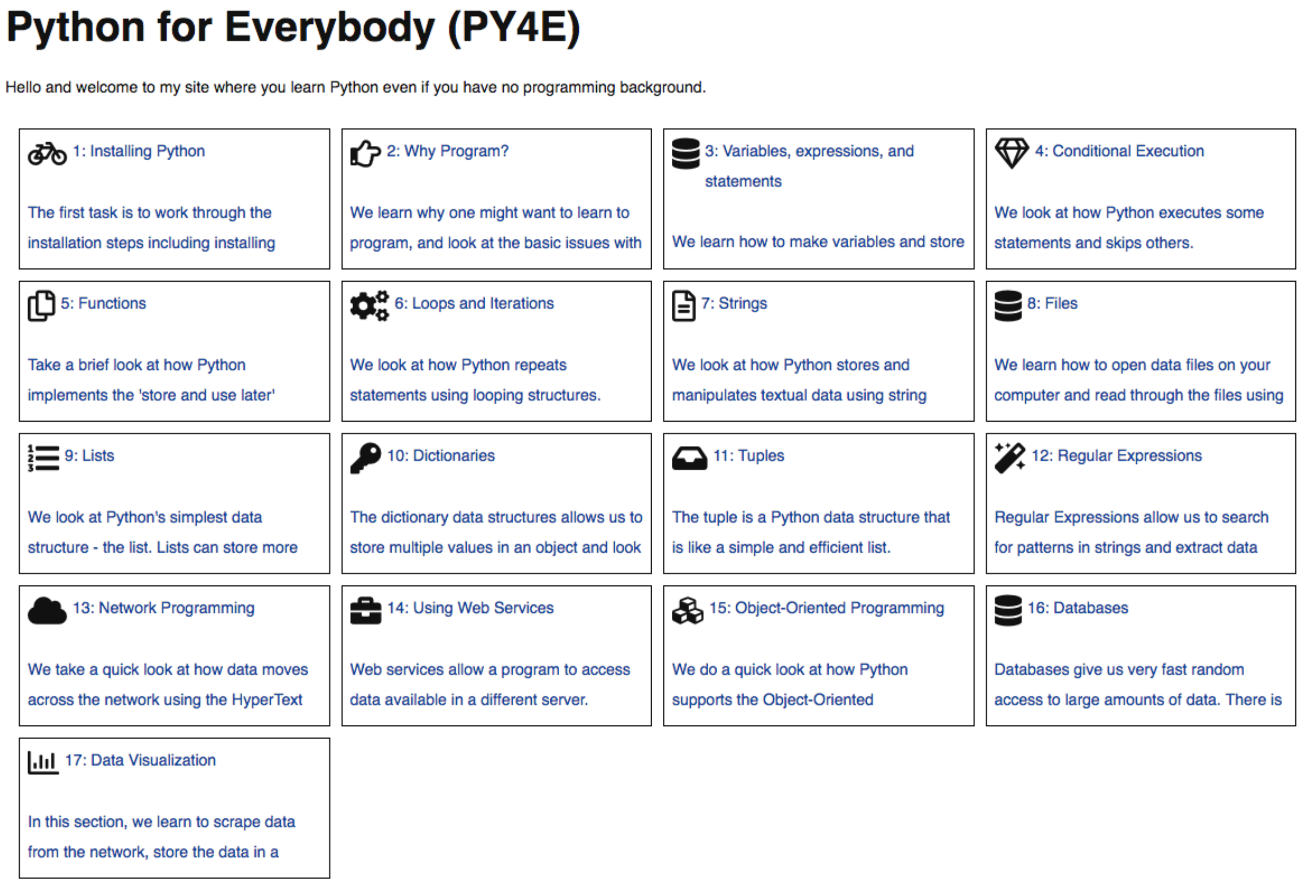
Python For Everybody course

The online py4e.com course provides:

- Video Instruction
  - Links are provided in each chapter
  - YouTube Playlist
  - iTunes Video
  - Amazon Prime Video
- Audio Instruction
  - iTunes Audio
  - Google Play Audio
- Lecture slides and Handouts
  - Links are provided in each chapter
  - .pptx lecture downloads
- Textbook
  - Link is provided in each chapter
  - Book: Python for Everybody (Severance) (html online)
  - Free Textbook (pdf)
- Sample Code
  - Sample Code ZIP
  - Individual Files
- Autograded Exercises
  - Make a free py4e account (via a gmail account) and log in to access the gradebook, autograder, and discussion forums.
- Quora - Question and Answer site
  - https://quorasessionwithchuckseverance.quora.com/
- Live meetings- online office hours with Dr. Chuck
  - https://www.dr-chuck.com/live/

This document follows a combination of the free online course: **https://www.py4e.com/**, and the online libretext book Book: Python for Everybody (Severance). The online course provides videos, slides exercises and an autograder, while the libretext book structures the same material in smaller, clearly numbered chunks, which are a convenient way to refer to specific coding exercises. This document will provide you with instructions for using Jupyter notebooks in nanoHUB to complete the exercises. Once completed, your solutions can be transferred to the online course autograder. The autograder gives you feedback on your code, which is extremely helpful for your learning.

Go to py4e, log in, and click on the **Lessons** menu to see a layout of all of the chapters, as shown in Figure 1. Since Python is already available in Jupyter notebooks in nanoHUB, you can skip chapter 1 and start with chapter 2: Why Program?



Python for Everybody (PY4E)

Hello and welcome to my site where you learn Python even if you have no programming background.

1: Installing Python
The first task is to work through the installation steps including installing

2: Why Program?
We learn why one might want to learn to program, and look at the basic issues with

3: Variables, expressions, and statements
We learn how to make variables and store

4: Conditional Execution
We look at how Python executes some statements and skips others.

5: Functions
Take a brief look at how Python implements the 'store and use later'

6: Loops and Iterations
We look at how Python repeats statements using looping structures.

7: Strings
We look at how Python stores and manipulates textual data using string

8: Files
We learn how to open data files on your computer and read through the files using

9: Lists
We look at Python's simplest data structure - the list. Lists can store more

10: Dictionaries
The dictionary data structures allows us to store multiple values in an object and look

11: Tuples
The tuple is a Python data structure that is like a simple and efficient list.

12: Regular Expressions
Regular Expressions allow us to search for patterns in strings and extract data

13: Network Programming
We take a quick look at how data moves across the network using the HyperText

14: Using Web Services
Web services allow a program to access data available in a different server.

15: Object-Oriented Programming
We do a quick look at how Python supports the Object-Oriented

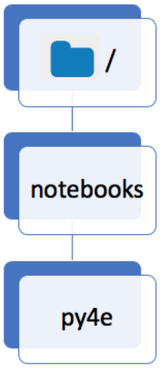
16: Databases
Databases give us very fast random access to large amounts of data. There is

17: Data Visualization
In this section, we learn to scrape data from the network, store the data in a

Figure 1: Table of contents for the Python for Everybody course at www.py4e.com

Setting up your nanoHUB account

Register for a free nanoHUB account if you don't yet have one at https://nanohub.org/register/ . It is easy to log in using your Google account. You can also use another email address or sign in with your institutional email account if it is part of incommon. **Important:** If you create an account using another email address, you must respond to the confirmation email to complete the registration process.



If you have a nanoHUB account and have forgotten your password, click on the forgotten password link. If you need more help, click on the "Help" link in the top right corner of the nanoHUB page to ask for help in accessing your account.

Set up a file hierarchy for Jupyter notebooks in nanoHUB

Follow the instructions in this nanoHUB resource **Setting up Your nanoHUB File Structure in Jupyter Notebooks** to set up your nanoHUB **dashboard** and **file system**.

In the tutorial, you will add modules to your nanoHUB dashboard and then launch https://nanohub.org/tools/jupyter. Within your home directory, you will create a notebooooks subdirectory for all of your Jupyter notebooks. In the notebooks directory, create a directory called py4e. Each lesson in this course will go in a sub folder under the /notebooks/py4e folder.

The Jupyter Dashboard, Notebook and Terminal

When you launch Jupyter notebooks in nanoHUB, you will have access to three types of Jupyter window.

- The **Dashboard** is a friendly interface to navigate through your files and directories and upload and download files.
- The **Notebook** is where you will create and run your code.
- The **Terminal** is a more advanced Linux interface to your nanoHUB file system.

More details on these three windows are here: **The Juypter Dashboard, Notebook and Terminal**

Running Python scripts in Jupyter Notebooks

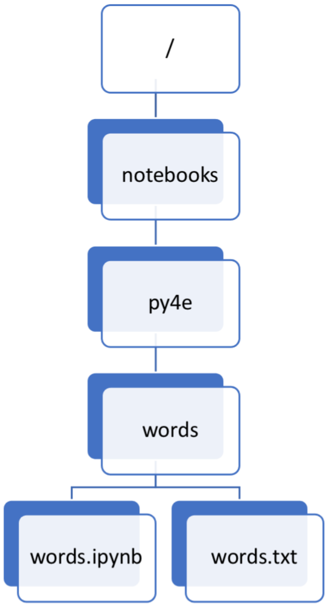
There are a few differences between running a python script as demonstrated in the py4e course, and running python3 code in a Jupyter notebook. One of the differences is in the filenames used. Python scripts end in **.py** whereas Jupyter notebook filenames end in **.ipynb** (for ipython notebook; i = interactive). Another difference is that Jupyter notebooks divide code into cells that can be run individually, rather than having to run the entire python script.

Follow this nanoHUB tutorial, **Running a Python 3 Script in a nanoHUB Jupyter Notebook**, to complete Exercise 1.8 Writing a program, using an .ipynb notebook in nanoHUB instead of a .py script.

Creating text and notebook files in Jupyter notebooks

This section will show how to create the file structure and set up the documents you need for the word counting exercise in Py4e Chapter 1.9 *What is a Program?*

For this exercise, you will create a subdirectory called **words**, then create a text file called words.txt and a jupyter notebook file called words.ipynb within this directory. This is the file structure we are trying to build:



Get the files words.py and words.txt here: http://www.py4e.com/code3/

1. Create the words.txt file:
   a. Create a new text file in Jupyter notebooks in nanoHUB
   b. Copy and paste the text from words.txt into this untitled.txt file
      i. See the text here (look for the correct file in this list and click to open it): http://www.py4e.com/code3/
      ii. Here is a direct link. See how the path is set up: https://www.py4e.com/code3/words.txt

    c. Rename this file in nanoHUB as words.txt
    d. Save the file
2. Create the words.ipynb file:
    a. Create a new python3 file in Jupyter notebooks in nanoHUB
    b. Copy and paste the text (code) from words.py into a new code cell in this untitled.ipynb file
        i. See the text here (look for the correct file and click to open it): http://www.py4e.com/code3/
        ii. https://www.py4e.com/code3/words.py

    c. Rename the file in nanoHUB as words.ipynb
    d. Save the file

Importing and Exporting files into your nanoHUB filespace

- Use the upload button next to the New dropdown menu (on the right) in the Jupyter Dashboard.
- Use the file export menu in the File dropdown menu (on the left)
- If you are familiar with sftp, you can also use that method. See the nanoHUB FAQ for more instructions: https://nanohub.org/kb/tips/managefiles

This should be enough instruction to get you started!

If there are other things that should be added to these instructions, let me know by adding a question or review for this nanoHUB resource: https://nanohub.org/resources/35214/questions