

SETTING UP THE NUMPY LIBRARY ENVIRONMENT IN A PYTHON PROGRAM

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Abstract: This article describes how to configure the Numpy library environment for working with arrays in the graphics mode of the Python programming language and plotting graphs of mathematical functions.

Keywords: Data science, data, analysis, Numpy, engineer, array, python, matplotlib, library.

Numpy is a library for the Python programming language, used in almost all disciplines and fields. The Numpy library is considered the universal standard for working with numerical data in Python. Numpy users range from novice coders to experienced researchers engaged in cutting-edge scientific research and development.

The Numpy library covers working with multidimensional arrays and matrix data. It provides efficient ways to work with the same n-dimensional array object, the ndarray. NumPy allows you to perform various mathematical operations on arrays at high speed. It is a Python library that provides a range of procedures for multidimensional array objects, various derivative objects, and fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selection, and insertion/extraction.

At the heart of the NumPy package is the ndarray object. This involves n-dimensional arrays of the same data type, with many operations performed in compiled code for performance. There are several important differences between NumPy arrays and standard Python sequences:

NumPy arrays, unlike Python lists (which can grow dynamically), have a fixed size when created. Resizing an array creates a new array and deletes the original.

- The elements in a NumPy array must all be of the same data type, and therefore the same size in memory. Exception: Python (including NumPy) can have arrays of objects, which allows you to create arrays of elements of different sizes.
- NumPy arrays facilitate advanced mathematical and other operations on large amounts of data. Typically, such operations are performed more efficiently and with less code than can be done using Python's built-in arrays.
- A large number of scientific and mathematical packages based on Python use NumPy arrays; although they typically support Python-serial input, they convert such input to NumPy arrays before processing, and often output NumPy arrays. In other words, to effectively use much of today's scientific/mathematical software based on Python,

(perhaps most) it is not enough to know how to use Python's built-in sequence types - you also need to know how to use NumPy arrays [1].

Installing Python and the NumPy library

Step 1. Installing Python

The first step in the NumPy installation process is to install Python. Before you can get NumPy, you need to have the latest version of Python installed on your system. Read and follow the steps below to learn how to install Python on Windows [2].

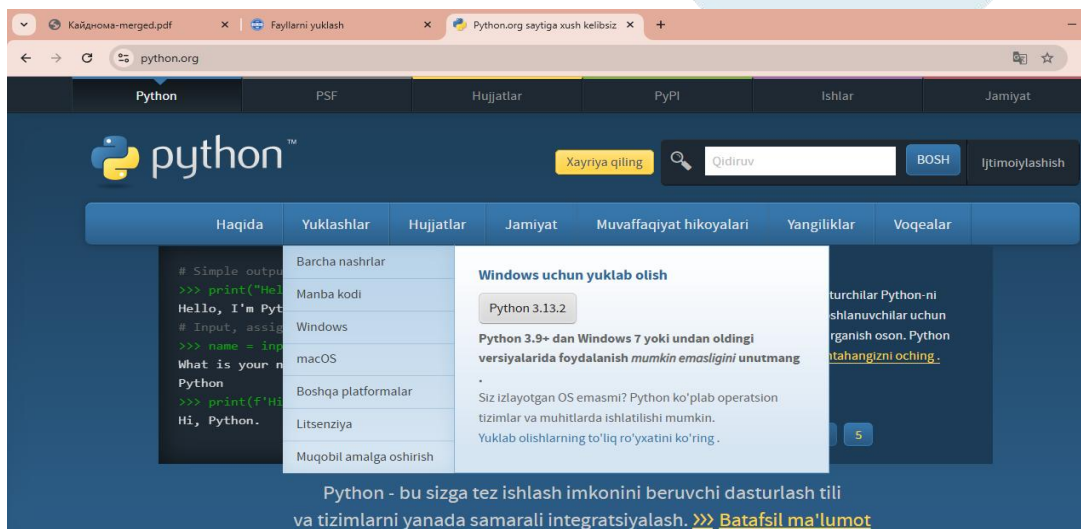
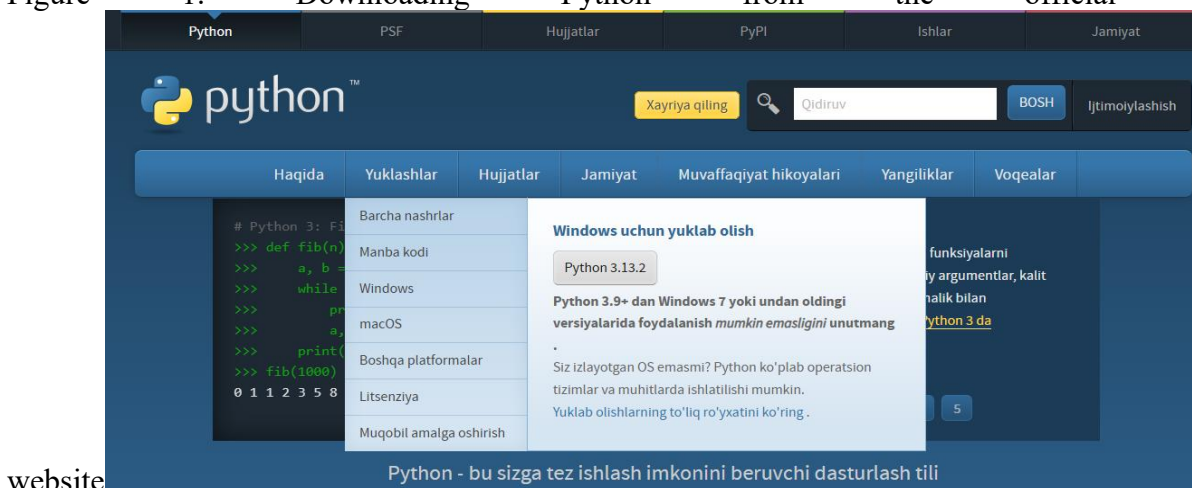


Figure 1. Downloading Python from the official Python



website

Figure 2. Installing Python.exe

So, when we go to the official website python.org, the program option that corresponds to our operating system and device will appear on the main screen. The latest version of the program will have the latest changes. Then it is better to choose the latest version. Right now, one of the screens offers us the python 3.13.2 version, so we will install this version on the device.

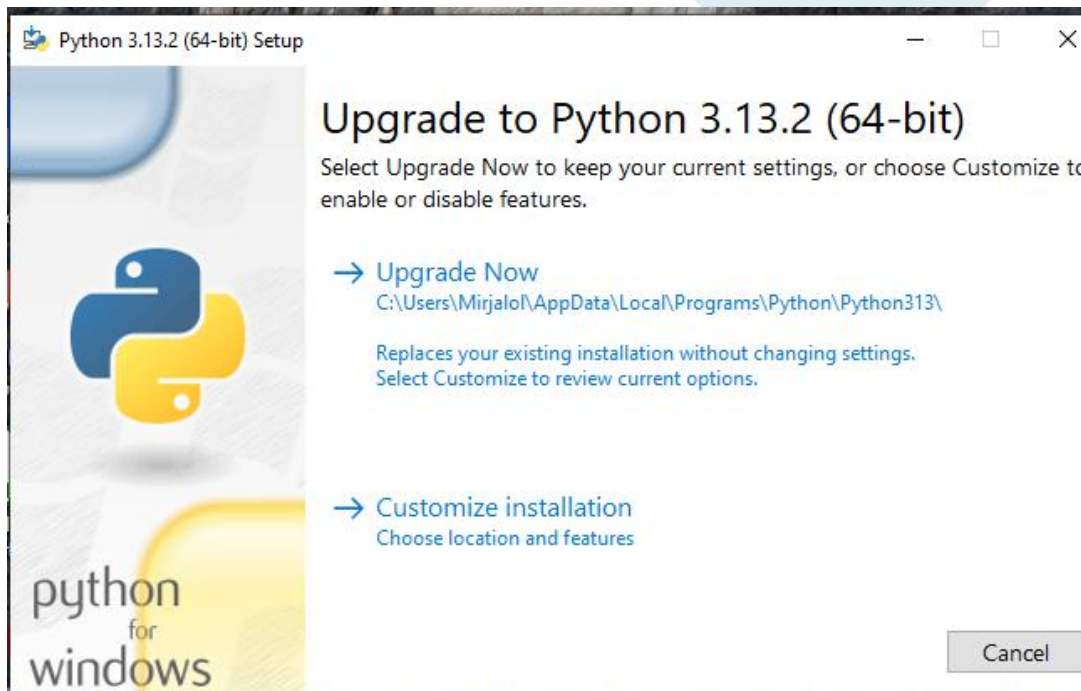
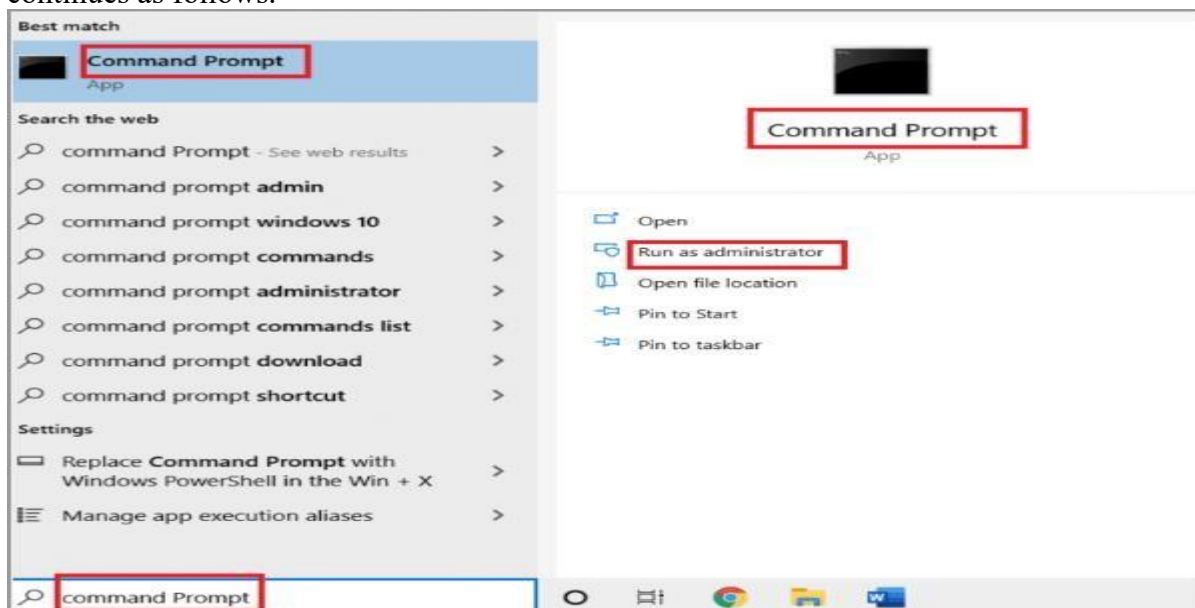


Figure 3. Now click on the install option.

During the installation process, we will see a window like the one above and select the required options from this window and select “Install Now” and the installation process will begin. After this process, if we see that the installation has been completed successfully, it means that the program has been installed on our device. We can close the window by clicking the “Close” button. Finally, as shown, you will receive a message that the installation was successful. Click the Close option

Step 2. Installing Numpy

Our next step will be to install the Numpy library on the device. In this case, we will search for “Command Prompt” in the computer search box and run it as an administrator. The sequence continues as follows.



Figure

4.

Figure 4. Press the Windows key, enter the command line and click Run as Administrator. When launched, we issue the `pip install numpy` command to install the Numpy library. After a while, it will automatically start loading the library itself. We can observe the installation process as follows. To check if Numpy is installed, we issue the `numpy -version` command in this "black window". It will then display the installed version on the screen. We see that numpy 1.22.3 is displayed on the screen.

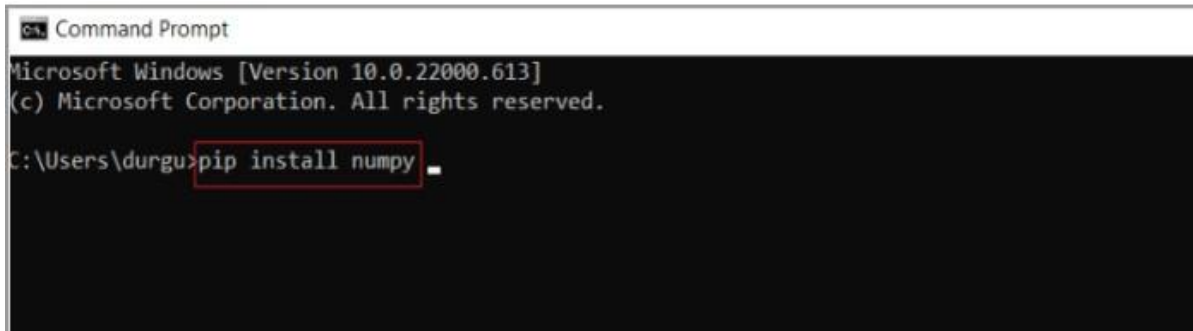


Figure 5.

To start the NumPy installation, type `pip install numpy` and press Enter.

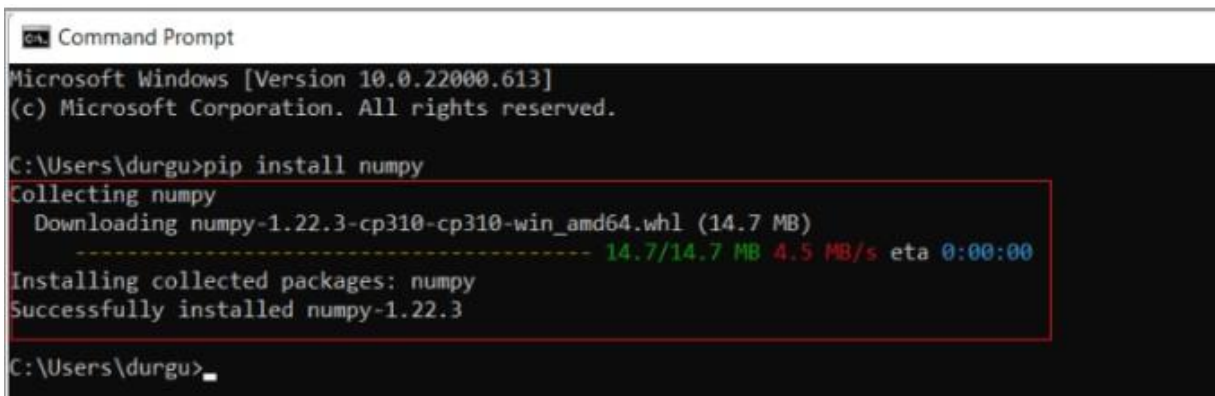
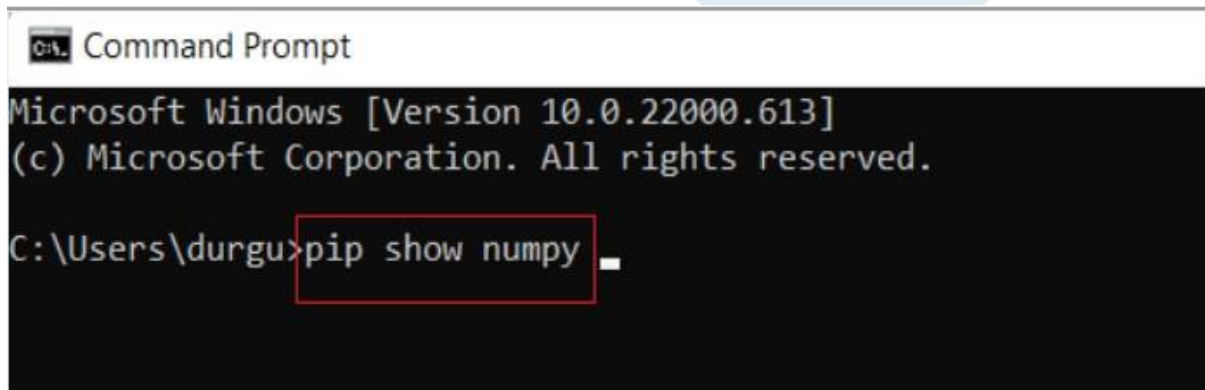


Figure 6.

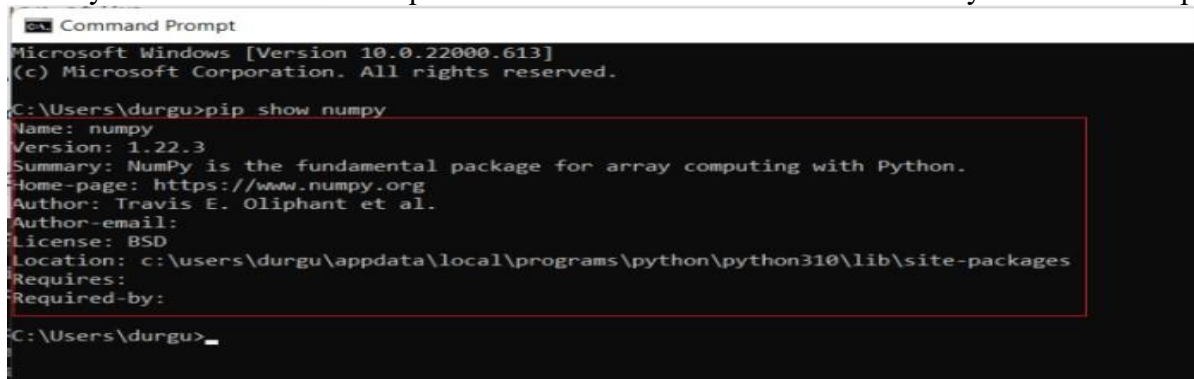
The download and installation of the NumPy package will start and finish automatically. You will see the message: `numpy (-version)` installed successfully

Step 3: Verify NumPy installation In the next step, we can see where Numpy is installed and detailed information about the installation. To do this, we can enter the command `pip show numpy` in the "black window".



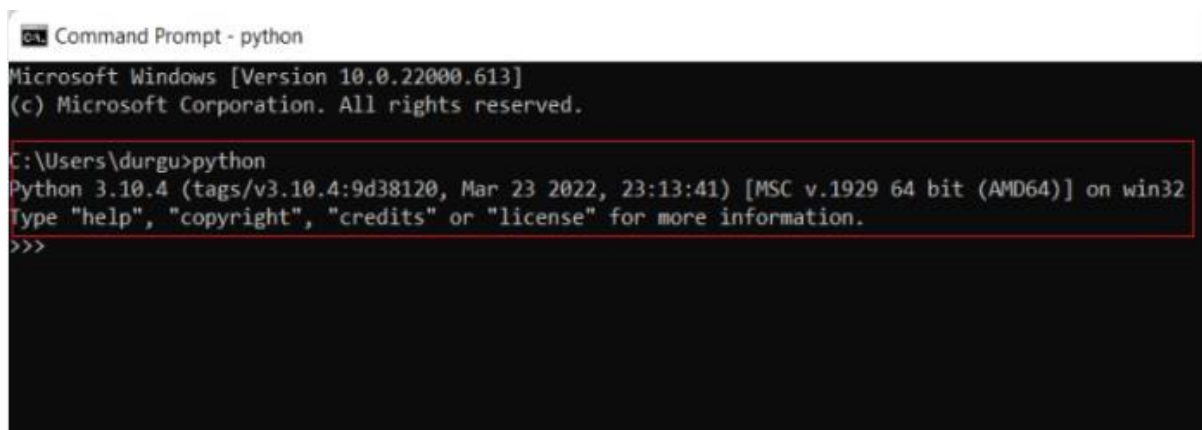
```
Command Prompt
Microsoft Windows [Version 10.0.22000.613]
(c) Microsoft Corporation. All rights reserved.
C:\Users\durgu>pip show numpy
```

Figure 7. Launch the command prompt and type pip show numpy and press Enter to verify that NumPy is part of the Python packages



```
Command Prompt
Microsoft Windows [Version 10.0.22000.613]
(c) Microsoft Corporation. All rights reserved.
C:\Users\durgu>pip show numpy
Name: numpy
Version: 1.22.3
Summary: NumPy is the fundamental package for array computing with Python.
Home-page: https://www.numpy.org
Author: Travis E. Oliphant et al.
Author-email:
License: BSD
Location: c:\users\durgu\appdata\local\programs\python\python310\lib\site-packages
Requires:
Required-by:
C:\Users\durgu>
```

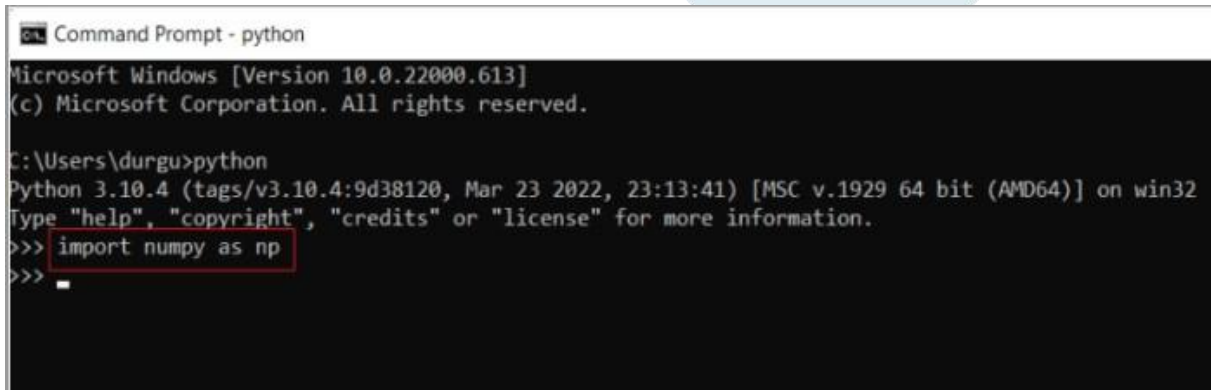
Figure 8. The output shows you where the NumPy version is stored on your system Step 4: Import the NumPy package You can import the NumPy library to verify whether it was installed successfully or not. To do the same, read and follow the next steps [4].



```
Command Prompt - python
Microsoft Windows [Version 10.0.22000.613]
(c) Microsoft Corporation. All rights reserved.
C:\Users\durgu>python
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

Figure 9. Type Python at the command prompt and press Enter to create a Python environment.

In the browser, we will try to import the Numpy library to check whether it is installed or not. To import, we will need to issue the import numpy command. And we have successfully imported the numpy library.



```
Command Prompt - python
Microsoft Windows [Version 10.0.22000.613]
(c) Microsoft Corporation. All rights reserved.

C:\Users\durgu>python
Python 3.10.4 (tags/v3.10.4:9d38120, Mar 23 2022, 23:13:41) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as np
>>>
```

Figure 10. Now type import numpy as the np command and press Enter.

You have now successfully imported the NumPy library package and can use its functions and classes for various NumPy objects [3].

References:

1. Python for Data Analysis – Wes McKinney

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3. Eshtemirov S. Nazarov F. Algoritmash va dasturlash asoslari. O‘quv qo‘llanma. Samarqand 2019. -208 b.

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