



合肥大學  
HEFEI UNIVERSITY



# Programming with Python

## Getting Started

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Hefei, Anhui, China

应用优化研究所  
人工智能与大数据学院  
合肥大学  
中国安徽省合肥市

# Programming with Python



This is a course on programming with the Python language at Hefei University (合肥大学).

The website with the teaching material of this course is <https://thomasweise.github.io/programmingWithPython> (see also the QR-code at the bottom right). There, you can find the course book and these slides. The repository with the example Python programs can be found at <https://github.com/thomasWeise/programmingWithPythonCode>.



# Outline



1. Introduction
2. Installing Python
3. Installing PyCharm
4. Our First Program
5. Python in the Terminal
6. Obtaining the Examples
7. Summary





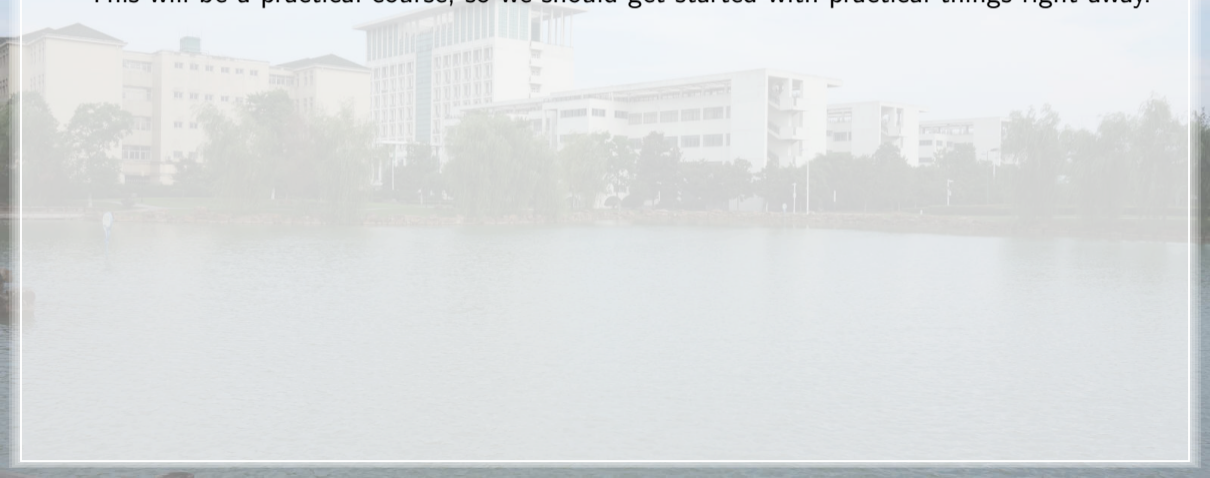
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- We will also discuss how to write a simple program in a Python editor and how we can run Python programs.



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- Indeed, we provide a big load of example programs in this course, based on which we will discuss the different aspects of Python programming.

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- Indeed, we provide a big load of example programs in this course, based on which we will discuss the different aspects of Python programming.
- So, finally, we will also check how you can download these example programs.

# Software Needed for Python Software Development



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- I will provide examples and instructions for both Ubuntu and Microsoft Windows<sup>2</sup>.



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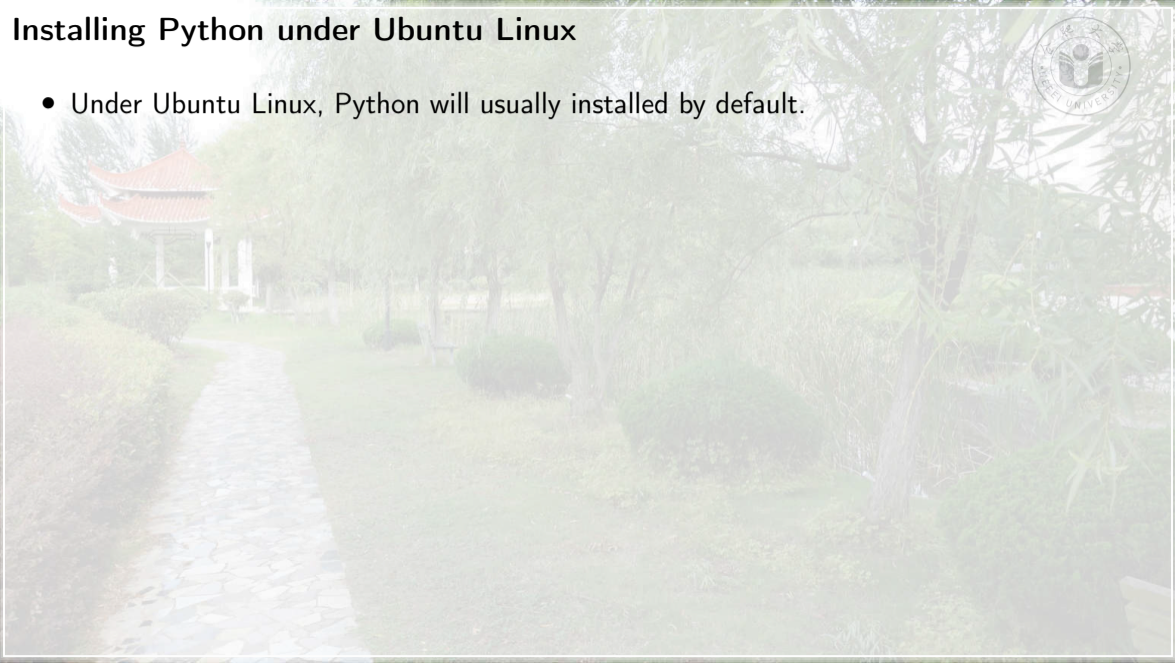
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  1. the official Python setup and usage page <https://docs.python.org/3/using><sup>6</sup>,
  2. the Python Downloads at <https://www.python.org/downloads>, and
  3. the Python 3 Installation & Setup Guide at <https://realpython.com/installing-python>

# Installing Python under Ubuntu Linux

- Under Ubuntu Linux, Python will usually installed by default.



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```
tweise@weise-laptop: ~  
tweise@weise-laptop:~$ python3 --version  
Python 3.10.12  
tweise@weise-laptop:~$
```

to open a Linux terminal, press **Ctrl** + **Alt** + **T**

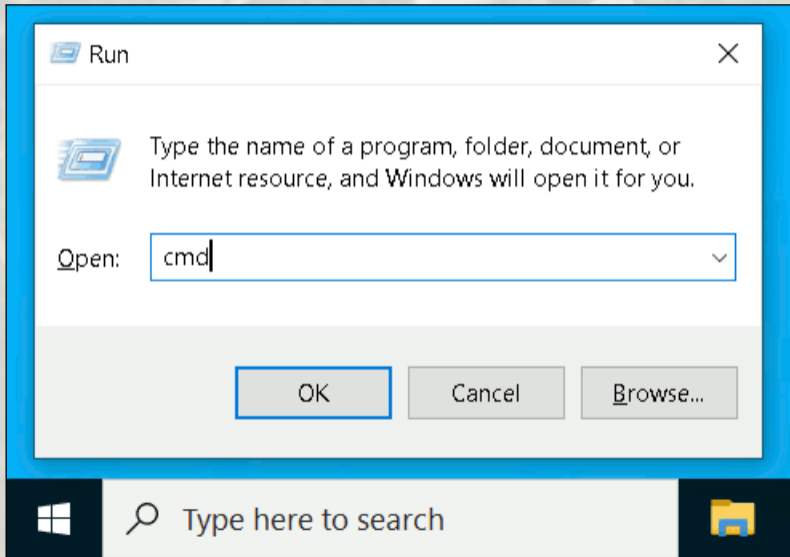




# Installing Python under Windows

- Under Windows, Python might not be installed by default.



# Installing Python under Windows



to open a Windows terminal, press  + **R**, type in `cmd`, and hit 

# Installing Python under Windows



```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.19045.4529]
(c) Microsoft Corporation. All rights reserved.

C:\Users\tweise>python3 --version
Python was not found; run without arguments to install from
the Microsoft Store, or disable this shortcut from Settings
> Manage App Execution Aliases.

C:\Users\tweise>_
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# Installing Python under Windows



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AI Hub

Python 3.12  
Python Software Foundation

Get

4.1 ★ Average Ratings

155 Ratings

What's New

Library

Help

### Screenshots

```
Microsoft Windows [Version 10.0.22631.3593]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Pythonista>python3.12
Python 3.12.4 (tags/v3.12.4:8e8808a, Jun 6 2024, 19:30:16) [MSC v.1940 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
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### Description

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

The Python interpreter and the extensive standard library are freely available in source or binary form

# Installing Python under Windows



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Downloading...

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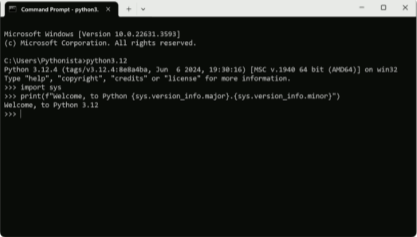
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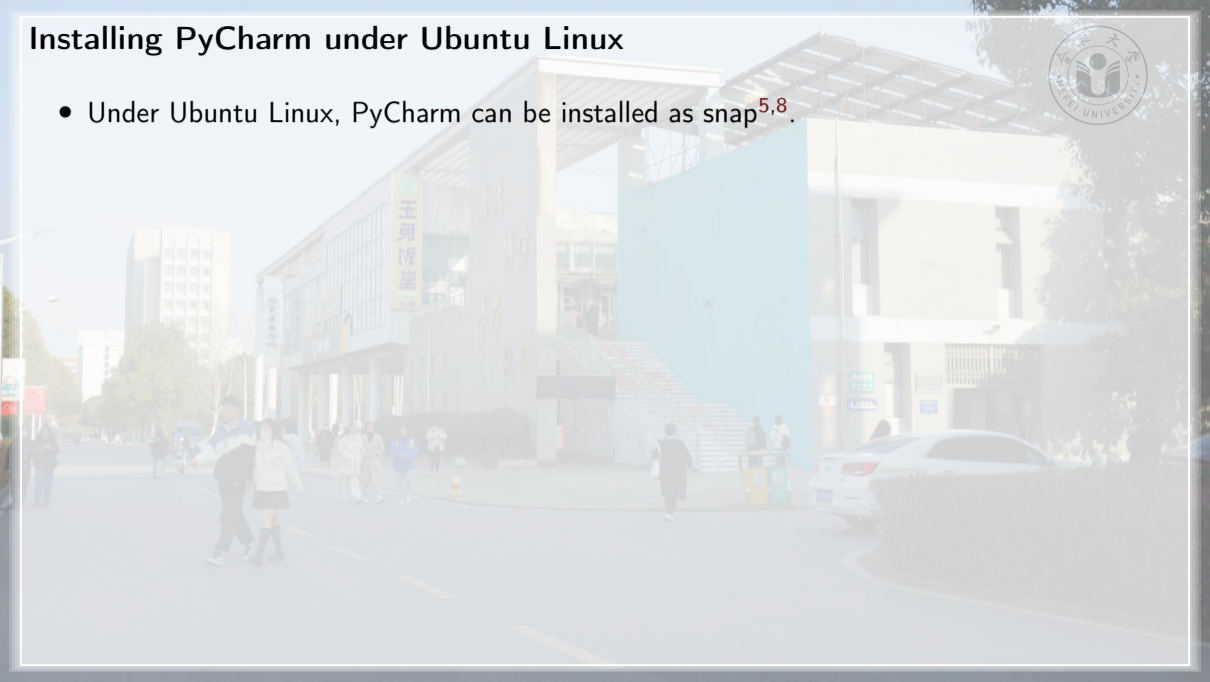
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- The installation guide for PyCharm can be found at <https://www.jetbrains.com/help/pycharm/installation-guide.html>.

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tweise@weise-laptop: ~  
tweise@weise-laptop:~$ sudo snap install pycharm-community --classic
```

to open a Linux terminal, press **Ctrl** + **Alt** + **T**

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[sudo] password for twaise:  
Download snap "pycharm-community" (388) from channel "stable" \
```



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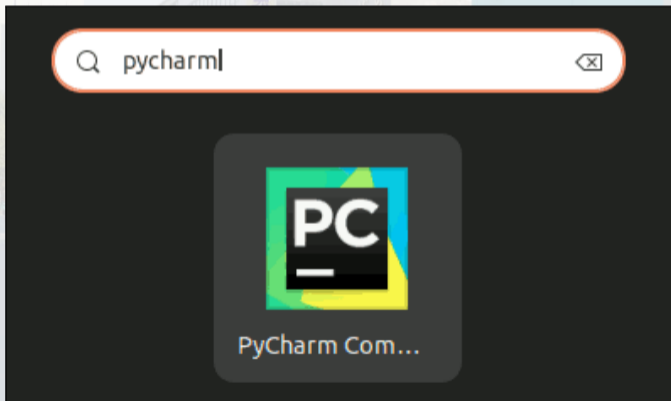



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[sudo] password for twaise:  
pycharm-community 2024.1.3 from jetbrains ✓ installed  
twaise@weise-laptop:~$
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Open the launcher by pressing  and type in `pycharm`



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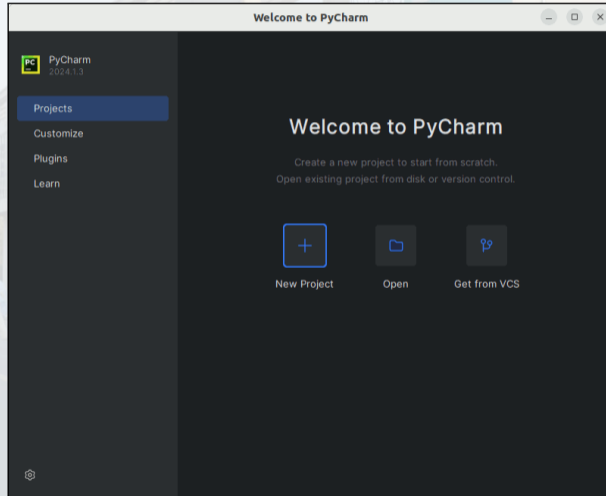
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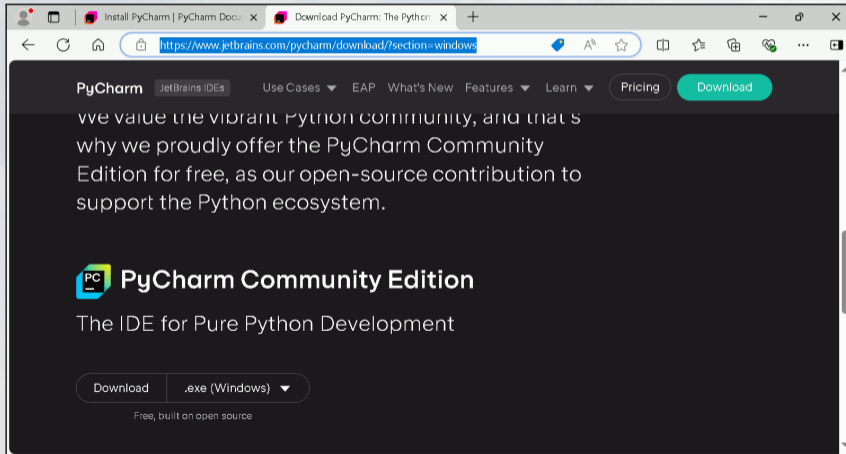


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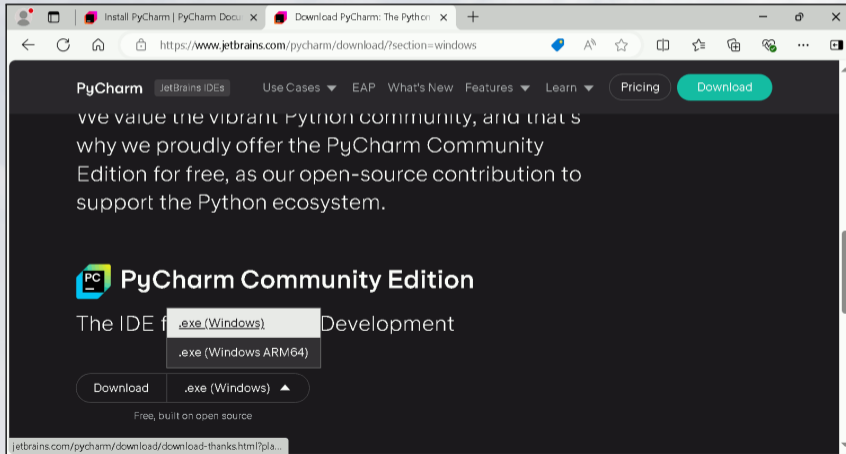
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The screenshot shows a web browser window with the URL <https://www.jetbrains.com/pycharm/download/?section=windows>. The page content includes the PyCharm logo, navigation links for 'JetBrains IDEs', 'Use Cases', 'EAP', 'What's New', 'Features', and 'Learn', and buttons for 'Pricing' and 'Download'. The main text reads: 'We value the vibrant Python community, and that's why we proudly offer the PyCharm Community Edition for free, as our open-source contribution to support the Python ecosystem.' Below this is the 'PyCharm Community Edition' logo and the text 'The IDE for Pure Python Development'. At the bottom, there is a 'Download' button with a dropdown menu showing '.exe (Windows)' selected, and a note that says 'Free, built on open source'.

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pycharm-community-2024.1.3.exe  
2.1 MB/s - 6.3 MB of 458 MB, 4 mins left

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## Thank you for downloading PyCharm!

Your download should start shortly. If it doesn't, please use the [direct link](#).

Download and verify the file [SHA-256 checksum](#).

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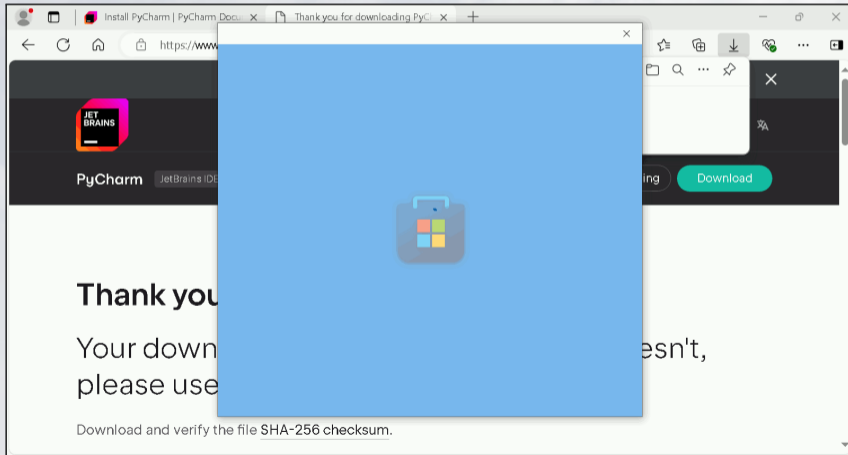
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A screenshot of a web browser displaying the JetBrains website's download page for PyCharm Community Edition 2024.1.3. The browser's address bar shows the URL <https://www.jetbrains.com/pycharm/download/download-thanks.html?platfo...>. The page content includes the JetBrains logo, navigation links for 'Developer Tools', 'Team Tools', and 'Education', and a prominent 'Download' button. Below the navigation, the text reads: 'Thank you for downloading PyCharm! Your download should start shortly. If it doesn't, please use the direct link.' At the bottom, it says 'Download and verify the file [SHA-256 checksum](#).' A 'Downloads' window is open in the browser, showing the file 'pycharm-community-2024.1.3.exe' with an 'Open file' button.

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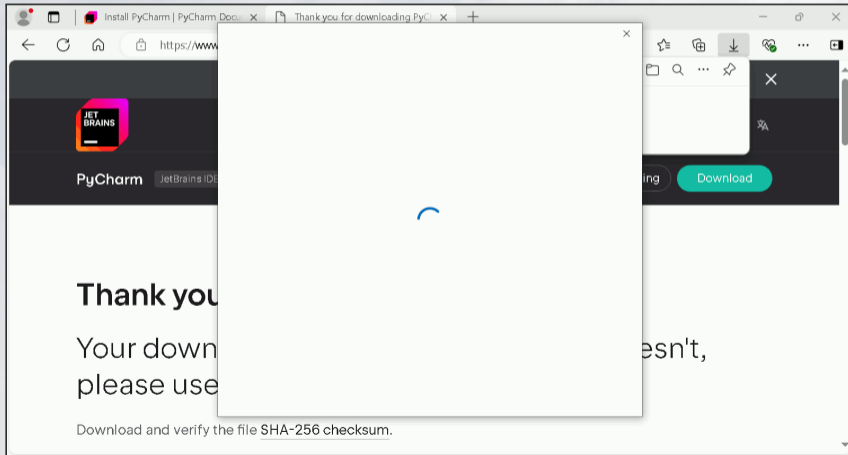
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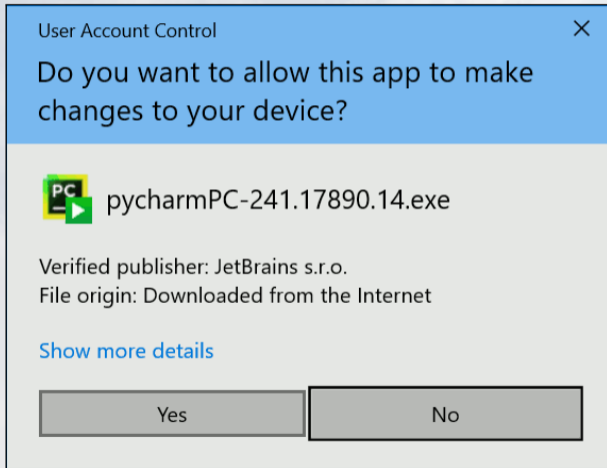
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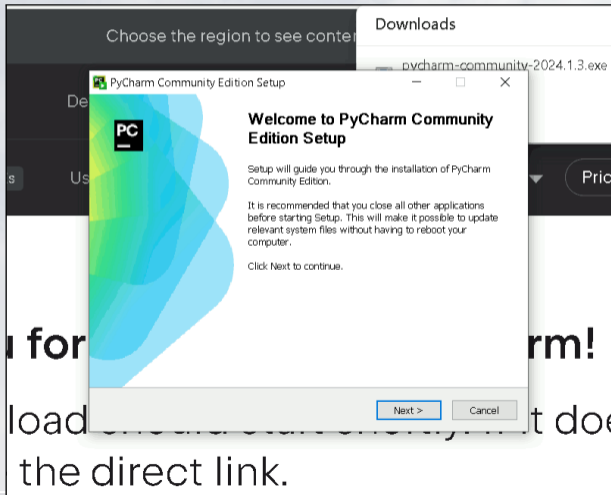
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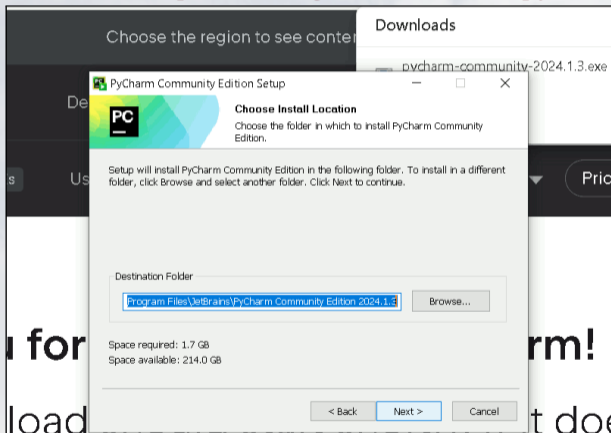
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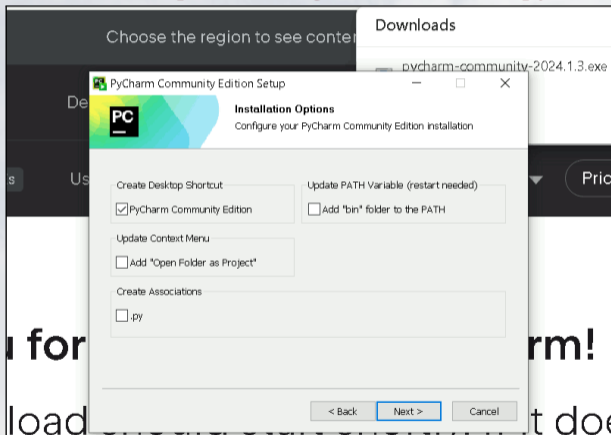


load the direct link.

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for

load

the direct link.

rm!

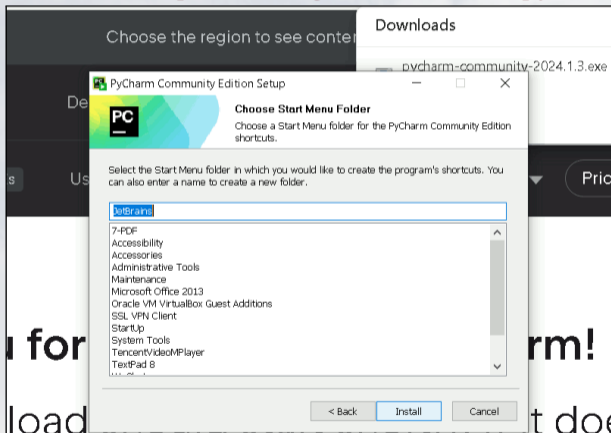
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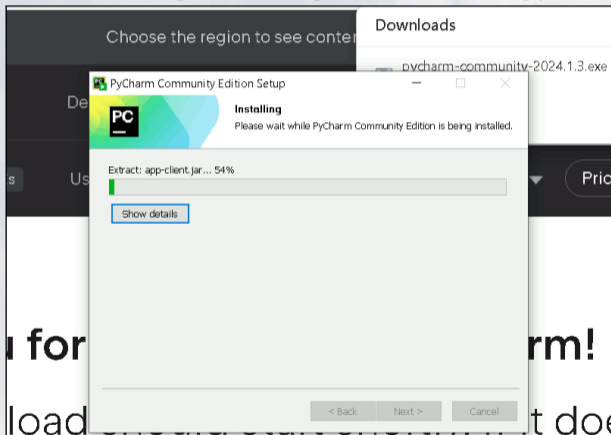


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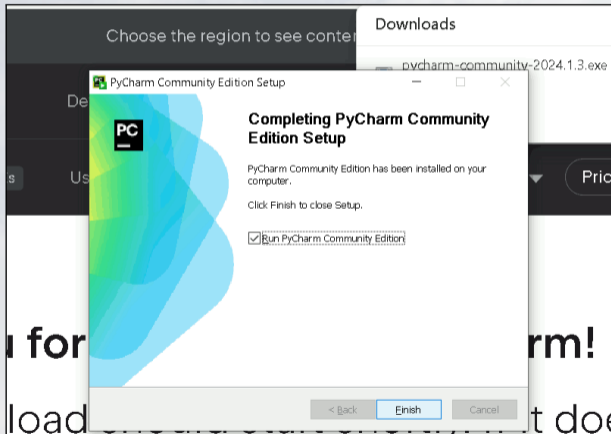


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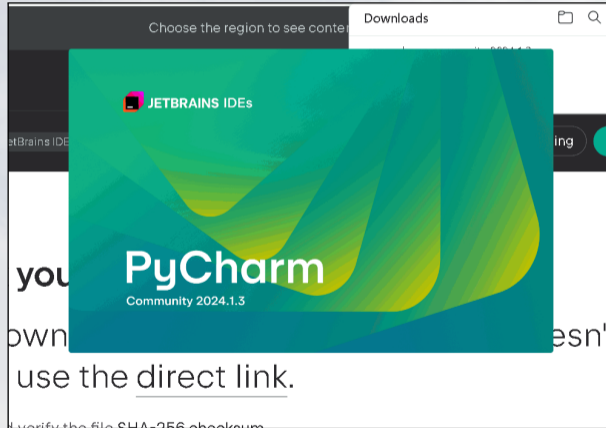


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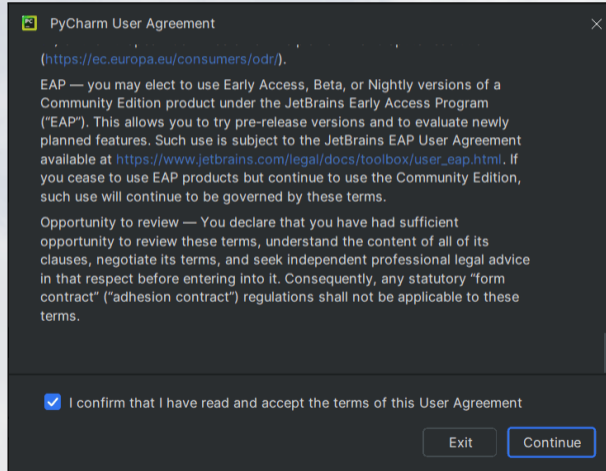
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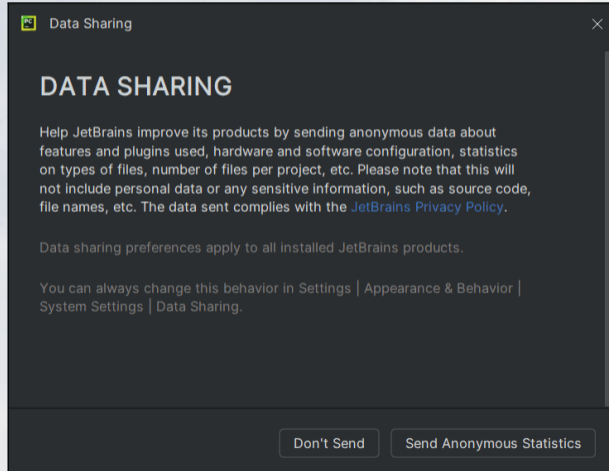
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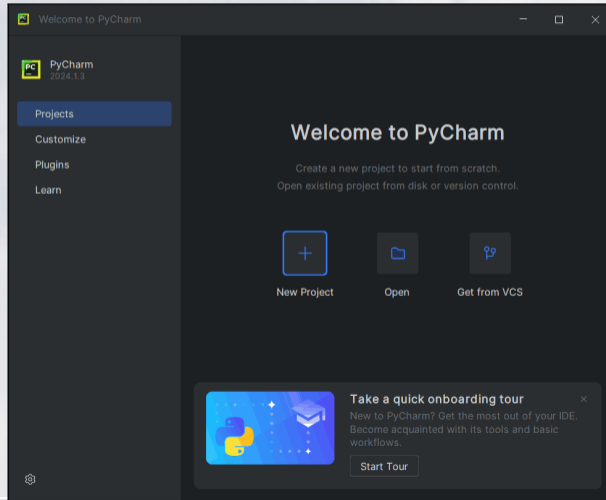
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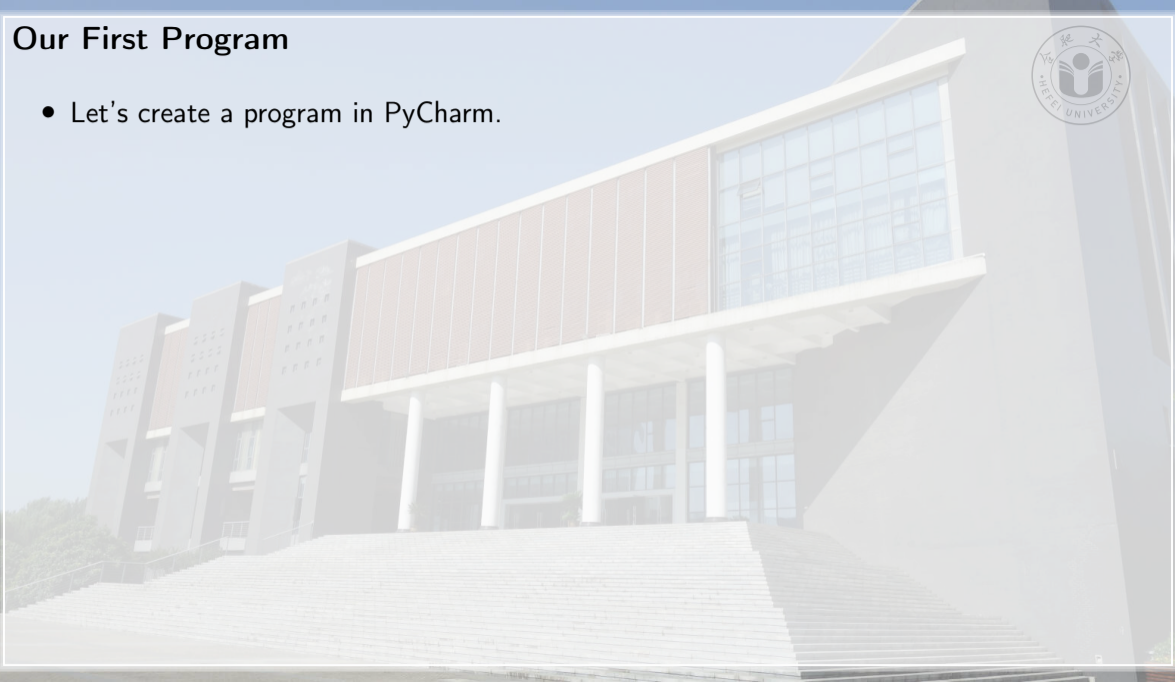
# Our First Program





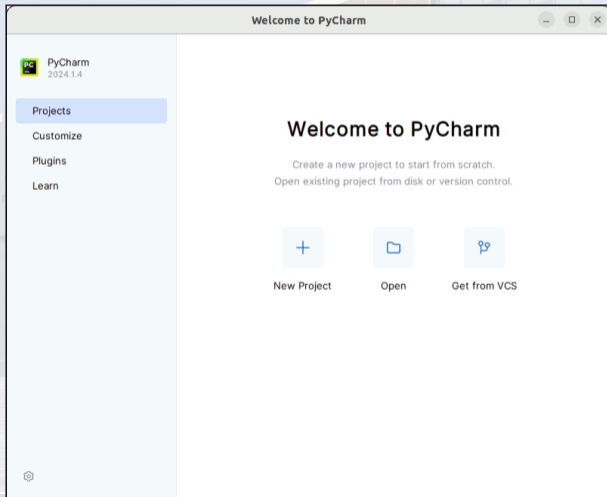
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- Let's create a program in PyCharm.



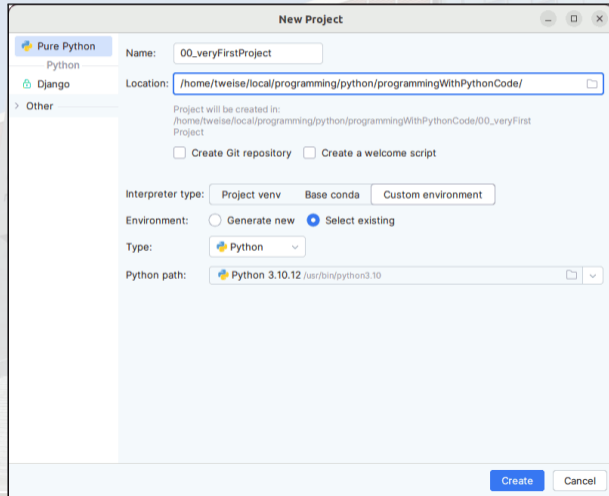
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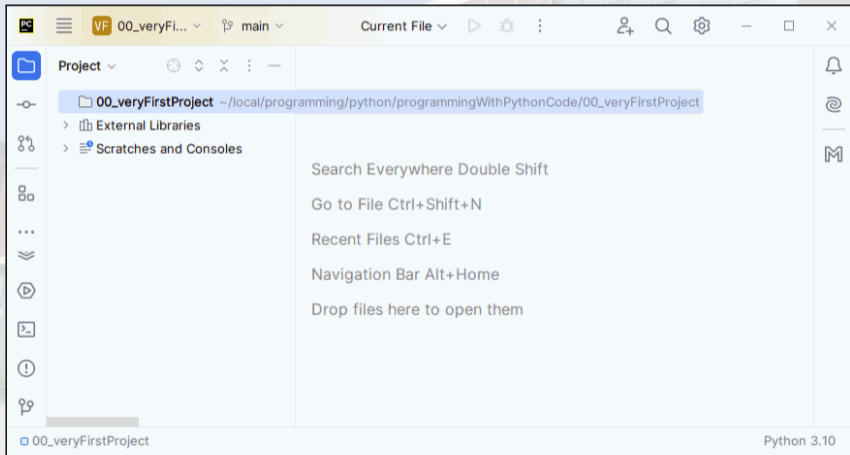
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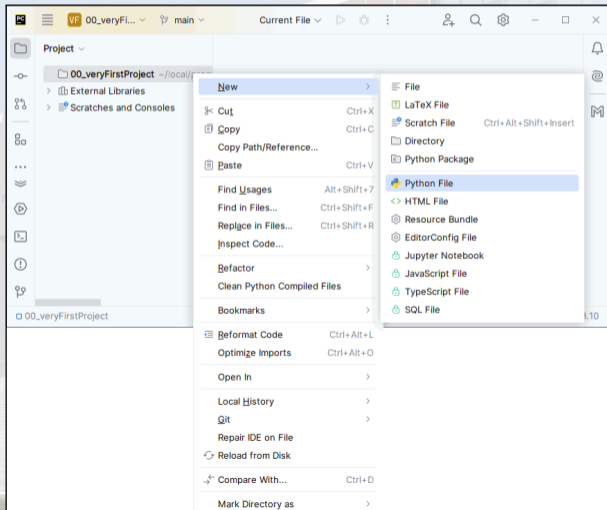
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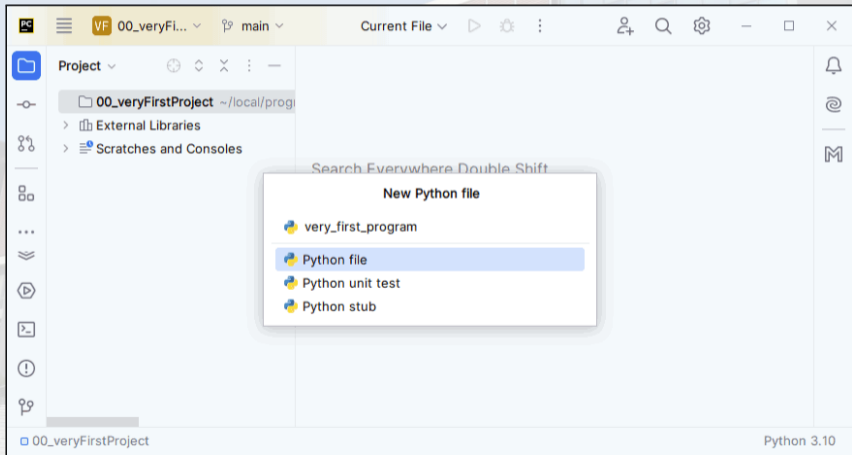
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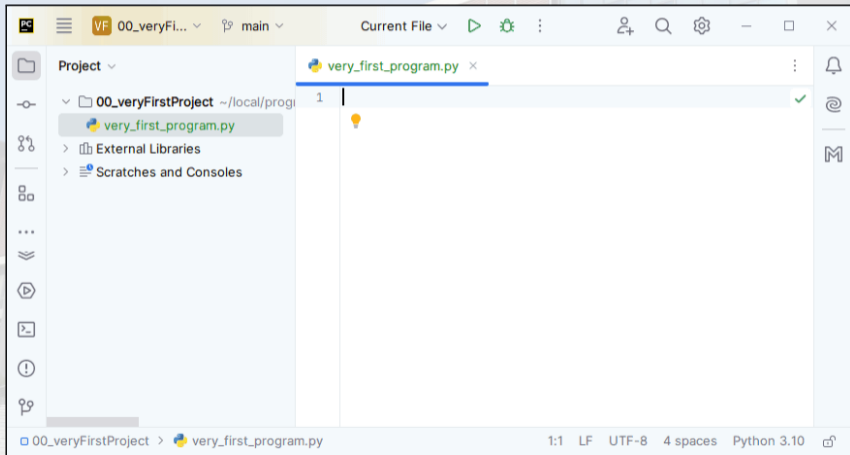


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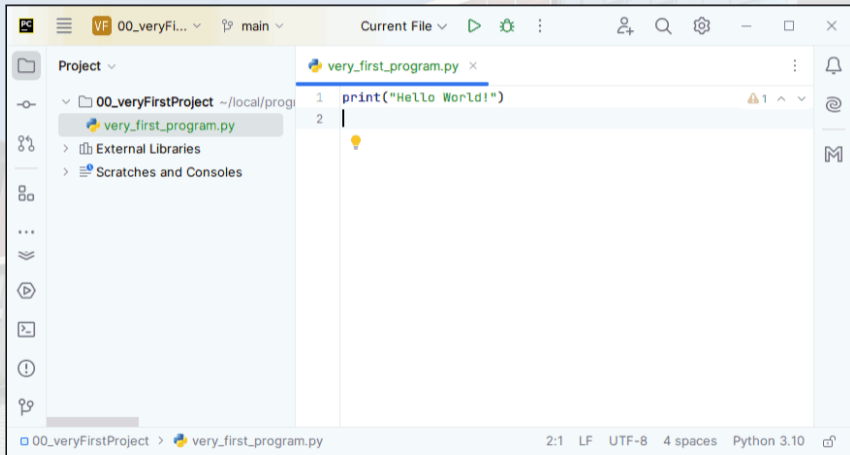
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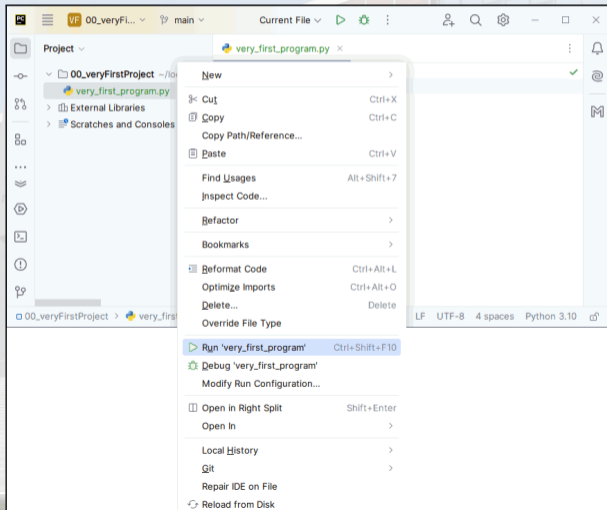




# Our First Program



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# Our First Program



- Let's create a program in PyCharm.

A screenshot of the PyCharm IDE interface. The top toolbar shows the 'Run' button (a green play icon) and other standard window controls. The left sidebar displays the project structure for '00\_veryFirstProject', with 'very\_first\_program.py' selected. The main editor window shows the code for 'very\_first\_program.py' with two lines: '1 print("Hello World!")' and '2'. A green checkmark is visible at the end of the first line. Below the editor is the 'Run' console, which shows the command '/usr/bin/python3.10 /home/tweise/local/programming/python/programmingWithPythonCode/00\_veryFi' and the output 'Hello World!'. Below the output, it states 'Process finished with exit code 0'. The bottom status bar indicates the current file is 'very\_first\_program.py' and the Python version is 'Python 3.10'.

```
1 print("Hello World!")
2
```

Run very\_first\_program x

/usr/bin/python3.10 /home/tweise/local/programming/python/programmingWithPythonCode/00\_veryFi  
Hello World!

Process finished with exit code 0

00\_veryFirstProject > very\_first\_program.py 2:1 LF UTF-8 4 spaces Python 3.10



# Python in the Terminal



# Ways to Execute a Python Program



- There are at least four ways to run a Python program:



# Ways to Execute a Python Program



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  1. We can enter the program into a Python file in the PyCharm IDE and then run it from there.

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  4. We can use the Python console inside a terminal. We can then enter separate Python instructions and run them there.
- We already did option 1., now let's try the others.

# Execute a python Program in the Terminal



- Open a terminal by pressing **Ctrl** + **Alt** + **T** under Ubuntu Linux; under Windows press **Windows** + **R**, type in `cmd`, and hit **↵**.

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```
tweise@weise-laptop: ~
tweise@weise-laptop:~$ cd local/programming/python/programmingWithPythonCode/00_veryFirstProject/
```

# Execute a python Program in the Terminal



- Open a terminal by pressing **Ctrl** + **Alt** + **T** under Ubuntu Linux; under Windows press **Windows** + **R**, type in `cmd`, and hit **Enter**.

```
tweise@weise-laptop: ~/local/programming/python/programmingWithPythonCode/00_veryFirstProject
tweise@weise-laptop:~$ cd local/programming/python/programmingWithPythonCode/00_veryFirstProject/
tweise@weise-laptop:~/local/programming/python/programmingWithPythonCode/00_veryFirstProject$ python3 very_first_program.py
```

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- Open a terminal by pressing **Ctrl** + **Alt** + **T** under Ubuntu Linux; under Windows press **Windows** + **R**, type in `cmd`, and hit **Enter**.

```
tweise@weise-laptop: ~/local/programming/python/programmingWithPythonCode/00_veryFirstProject
tweise@weise-laptop:~$ cd local/programming/python/programmingWithPythonCode/00_veryFirstProject/
tweise@weise-laptop:~/local/programming/python/programmingWithPythonCode/00_veryFirstProject$ python3 very_first_program.py
Hello World!
tweise@weise-laptop:~/local/programming/python/programmingWithPythonCode/00_veryFirstProject$
```

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- Open a terminal by pressing `Ctrl` + `Alt` + `T` under Ubuntu Linux; under Windows press `Windows` + `R`, type in `cmd`, and hit `↵`.


```
1 print("Hello World!")
```

```
↓ python3 veryFirstProject.py ↓
```

```
1 Hello World!
```


# Entering Commands in the Python Console inside PyCharm



- We can also directly enter programs into the PyCharm Python console (press ) and execute them step-by-step.


# Entering Commands in the Python Console inside PyCharm

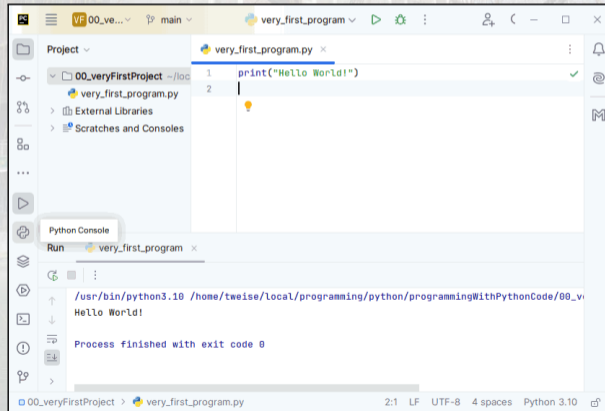


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The screenshot displays the PyCharm IDE interface. The top toolbar shows the 'Run' button (a green play icon). The main editor window shows a file named `very_first_program.py` with the following code:

```
1 print("Hello World!")  
2 |
```


Below the editor is the 'Python Console' window, which shows the output of the executed code:

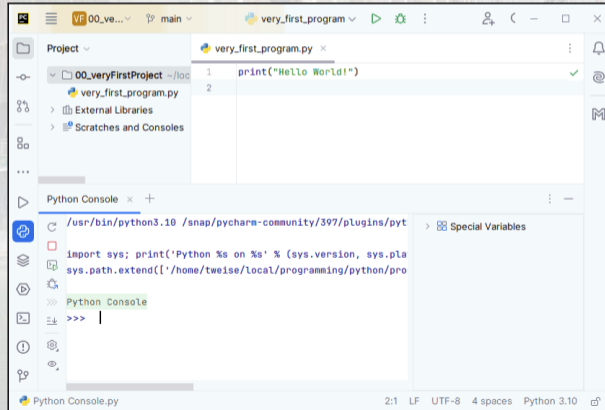
```
Run very_first_program x  
  
/usr/bin/python3.10 /home/tweise/local/programming/python/programmingWithPythonCode/00_v  
Hello World!  
  
Process finished with exit code 0
```

The status bar at the bottom indicates the current file is `very_first_program.py`, the cursor is at line 2:1, the encoding is UTF-8, and the Python version is 3.10.

# Entering Commands in the Python Console inside PyCharm



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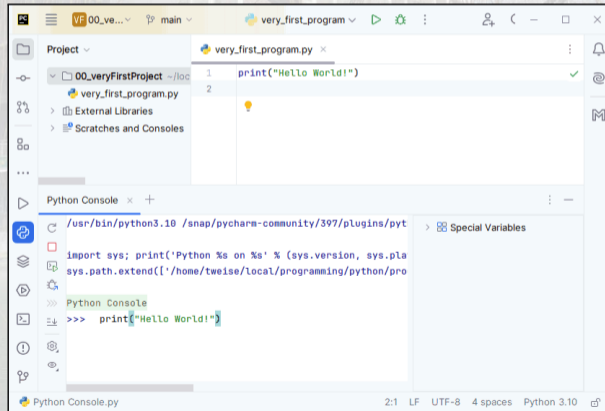
```
1 print("Hello World!")
```

The Python Console is open at the bottom, showing the command prompt `>>> |`. The console's title bar indicates the path `/usr/bin/python3.10 /snap/pycharm-community/397/plugins/pyt`. The status bar at the bottom shows the current line is 2:1, using LF line endings, UTF-8 encoding, 4 spaces for indentation, and Python 3.10.

# Entering Commands in the Python Console inside PyCharm



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The screenshot displays the PyCharm IDE interface. The top toolbar shows the Python console icon (a blue square with a white Python logo). The main editor window shows a file named `very_first_program.py` with the following code:

```
1 print("Hello World!")
```


The Python Console at the bottom shows the execution of the code. The console output is:

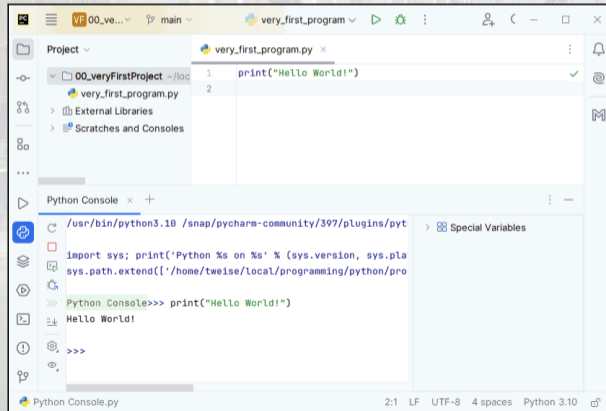
```
>>> print("Hello World!")
```

The console also shows the Python environment path: `/usr/bin/python3.10 /snap/pycharm-community/397/plugins/pyt` and the Special Variables panel.

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```

The Python Console at the bottom shows the execution of the code:

```
/usr/bin/python3.10 /snap/pycharm-community/397/plugins/pyt > Special Variables  
  
import sys; print('Python %s on %s' % (sys.version, sys.pla  
sys.path.extend(['/home/tweise/local/programming/python/pro  
  
>>> Python Console>>> print("Hello World!")  
Hello World!  
  
>>>
```

The status bar at the bottom indicates the current settings: Python Console.py, 2:1 LF UTF-8 4 spaces Python 3.10.

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- ...or we can open a Python console in a terminal.





# Entering Commands in the Python Console in a Terminal



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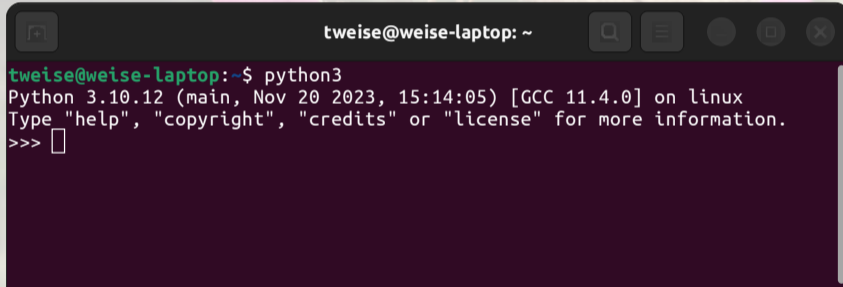
A terminal window with a dark background. The title bar shows 'tweise@weise-laptop: ~'. The prompt is 'tweise@weise-laptop:~\$' and the command 'python3' is being entered, followed by a cursor. The window has standard Linux window controls (minimize, maximize, close) and a search icon.

```
tweise@weise-laptop: ~  
tweise@weise-laptop:~$ python3
```

# Entering Commands in the Python Console in a Terminal



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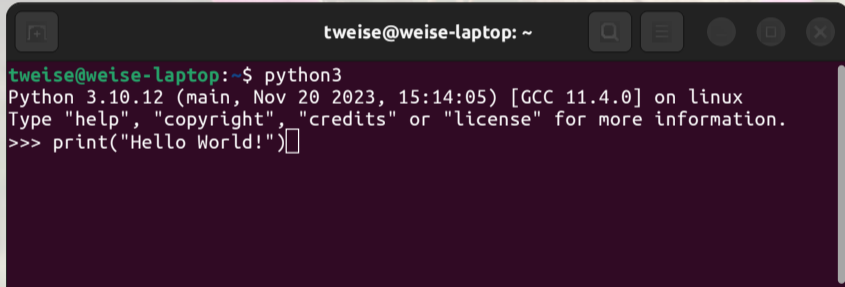
A terminal window with a dark background and light text. The title bar reads 'tweise@weise-laptop: ~'. The terminal content shows the command 'python3' being executed, followed by the Python version and system information, and the interactive prompt '>>>' with a cursor.

```
tweise@weise-laptop: ~  
tweise@weise-laptop:~$ python3  
Python 3.10.12 (main, Nov 20 2023, 15:14:05) [GCC 11.4.0] on linux  
Type "help", "copyright", "credits" or "license" for more information.  
>>> █
```

# Entering Commands in the Python Console in a Terminal



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A terminal window with a dark background and light text. The title bar reads 'tweise@weise-laptop: ~'. The terminal content shows the execution of 'python3', the Python version and system information, and a successful execution of a print statement.

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Hello World!  
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tweise@weise-laptop:~$
```

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**Best Practice** The only proper way to run a Python application in a productive scenario is in the terminal.

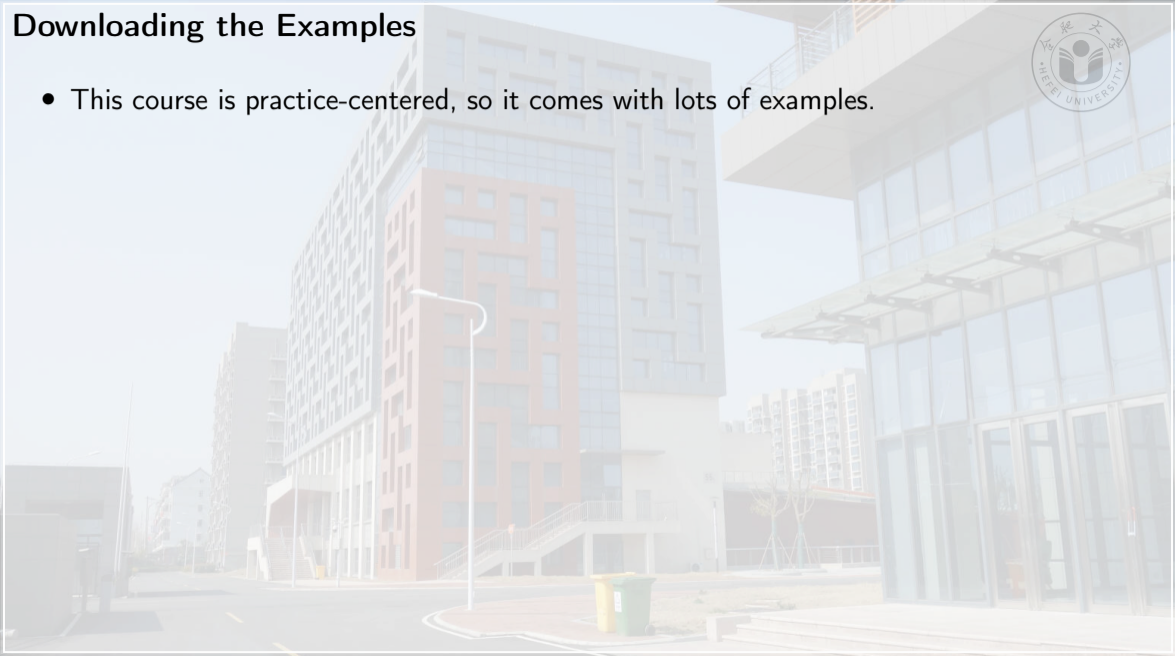


## Obtaining the Examples



## Downloading the Examples

- This course is practice-centered, so it comes with lots of examples.





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GitHub - thomasWeise/programmingWithPythonCode: The program code of the examples of the book "Programming with Python"

thomasWeise / programmingWithPythonCode

<https://github.com/thomasWeise/programmingWithPythonCode/archive/refs/heads/main.zip>

Code Issues Pull requests Actions Projects Security

main 1 branch Tags Go to file

thomasWeise Improvements 4921d 12 hours ago 115 Commits

00_verifyProject	changed directory names back	12 hours ago
01_variables	improved output	
02_collections	replaced "example for" with "example of"	
03_conditionals	replaced "example for" with "example of"	
04_loops	fixed location for function examples	
05_functions	fixed example	
06_exceptions	improvements	12 hours ago
scripts	hopefully improved output	last month
.gitignore	first example program added	5 months ago
LICENSE	initial commit	5 months ago
README.md	fixed link to our school	2 months ago
make_venv.sh	improved examples for exceptions	5 days ago
requirements-dev.txt	Updated and Unified Scripts	2 months ago

Releases: No releases published

Packages: No packages published

Languages: Python 78.5%, Shell 21.5%

# Clone Repository in PyCharm



- You can also clone the repository

<https://github.com/thomasWeise/programmingWithPythonCode> in PyCharm.

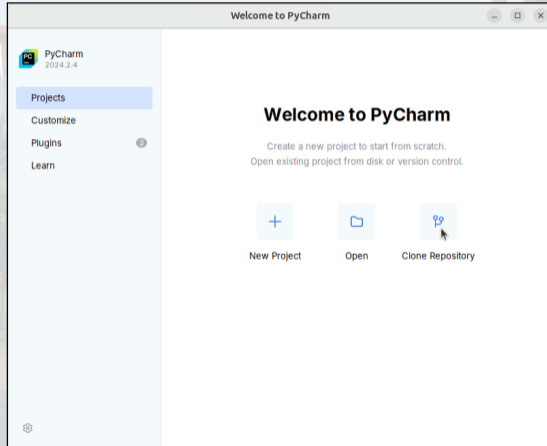


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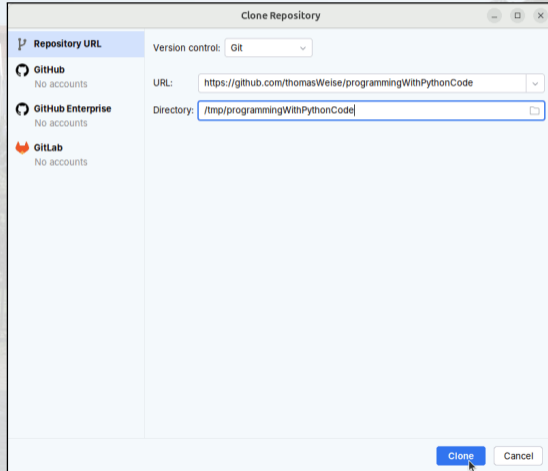


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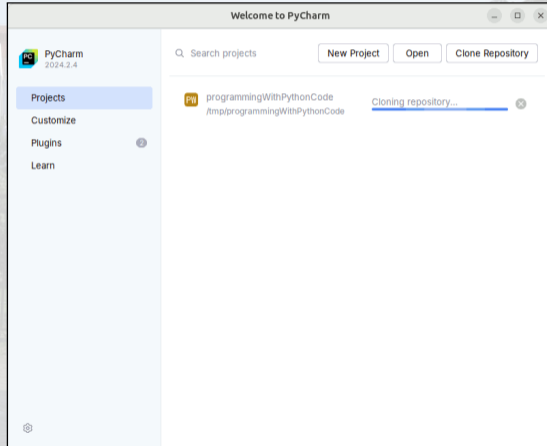


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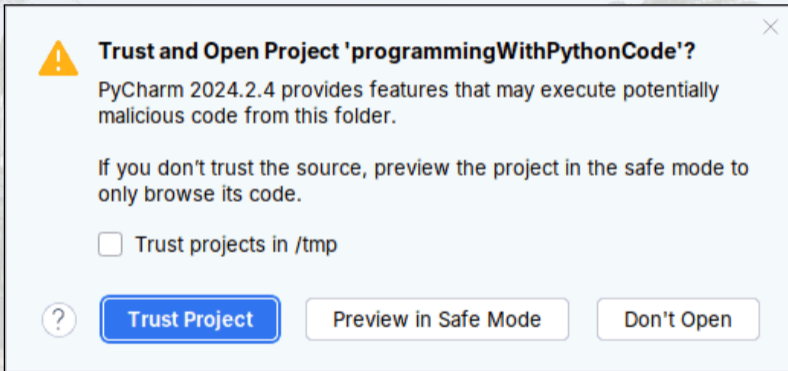




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```
1 | # Example Programs for the Book "Programming with Python"
2 |
3 | Here we provide all the example programs and codes for our book
4 |
5 | ## 1. Structure
6 |
7 | 1. A [Very First Project](...)
8 | 2. [Variables](...)
9 | 3. [Collections](...)
10 | 4. [Scripts](...)
11 |
12 | ## 2. License
13 | Copyright (C) 2023-2024 [Thomas Weise](...) (汤卫思教授)
14 |
15 | The book "[Programming with Python](...)" is released under the
16 | The code in this repository is provided as open source software
17 |
18 | ## 3. Contact
19 | If you have any questions or suggestions, please contact
20 | [Thomas Weise](...) (汤卫思教授)
```





## Summary



# Summary



- The optimization algorithms we consider in this lecture are **randomized**.



谢谢您门  
Thank you



# References I



- [1] Daniel J. Barrett. *Efficient Linux at the Command Line*. Sebastopol, CA, USA: O'Reilly Media, Inc., Feb. 2022. ISBN: 978-1-0981-1340-7 (cit. on pp. 11–23).
- [2] Ed Bott. *Windows 11 Inside Out*. Hoboken, NJ, USA: Microsoft Press, Pearson Education, Inc., Feb. 2023. ISBN: 978-0-13-769132-6 (cit. on pp. 11–23).
- [3] David Clinton and Christopher Negus. *Ubuntu Linux Bible*. 10th ed. Bible Series. Chichester, West Sussex, England, UK: John Wiley and Sons Ltd. Chichester, West Sussex, England, UK: John Wiley and Sons Ltd.: John Wiley and Sons Ltd., Nov. 10, 2020. ISBN: 978-1-119-72233-5 (cit. on pp. 11–23).
- [4] Michael Hausenblas. *Learning Modern Linux*. Sebastopol, CA, USA: O'Reilly Media, Inc., Apr. 2022. ISBN: 978-1-0981-0894-6 (cit. on pp. 11–23).
- [5] Prague, Czech Republic: JetBrains. *pycharm-community: PyCharm Community Edition*. London, England, UK: Canonical Ltd., Dec. 12, 2024. URL: <https://snapcraft.io/pycharm-community> (visited on 2025-01-01) (cit. on pp. 45–52).
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- [7] Anna Skoulikari. *Learning Git*. Sebastopol, CA, USA: O'Reilly Media, Inc., May 2023. ISBN: 978-1-0981-3391-7 (cit. on pp. 11–23).
- [8] *Snap Documentation*. London, England, UK: Canonical Ltd., 2025. URL: <https://snapcraft.io/docs> (visited on 2025-01-01) (cit. on pp. 45–52).
- [9] Linus Torvalds. “The Linux Edge”. *Communications of the ACM (CACM)* 42(4):38–39, Apr. 1999. New York, NY, USA: Association for Computing Machinery (ACM). ISSN: 0001-0782. doi:10.1145/299157.299165 (cit. on pp. 11–23).
- [10] Mariot Tsitoara. *Beginning Git and GitHub: Version Control, Project Management and Teamwork for the New Developer*. New York, NY, USA: Apress Media, LLC, Mar. 2024. ISBN: 979-8-8688-0215-7 (cit. on pp. 11–23).
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- [12] Martin Yanev. *PyCharm Productivity and Debugging Techniques*. Birmingham, England, UK: Packt Publishing Ltd, Oct. 2022. ISBN: 978-1-83763-244-2 (cit. on pp. 11–23).