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# Python Introduction

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# Outline

- The Python Programming Language
- Installing from python.org
- IPython and Jupyter Notebook
- Google Colab
- Anaconda – DS Toolkit
- Spyder IDE
- PyCharm IDE
- Python in Visual Studio
- Homework

# The Python Programming Language

- YouTube Video from **Programming with Mosh**

*What is Python? Why Python is So Popular?*

<https://youtu.be/Y8Tko2YC5hA>

# Introduction

- Python is an **interpreted, high-level, general-purpose** programming language.
- Created by Guido van Rossum and first released in **1991**.
- Python's design philosophy emphasizes **code readability**.
- Its language constructs and **object-oriented** approach aim to help programmers write **clear, logical** code for small and large-scale projects.

# Features and Philosophy

- **Features**

- Batteries Included
- Everything is an Object
- Interactive Shell
- Cross Platform

- **Philosophy**

- Beautiful is better than ugly
- Explicit is better than implicit
- Simple is better than complex
- Complex is better than complicated
- Readability counts

# Python Resources

- **Official documentation:** <https://docs.python.org>
- **Tutorials:** <https://www.learnpython.org/>
- **Python Books**
  1. **A Whirlwind Tour of Python**, by Jake VanderPlas, <https://learning.oreilly.com/library/view/a-whirlwind-tour/9781492037859/> (short)
  2. **Python for Everybody**, by Charles R. Severance, <https://py4e.com/book.php> (medium)
  3. **Fundamentals of Python Programming**, by Richard Halterman, <https://freecomputerbooks.com/Fundamentals-of-Python-Programming-by-Richard-Halterman.html> (long)

# Outline

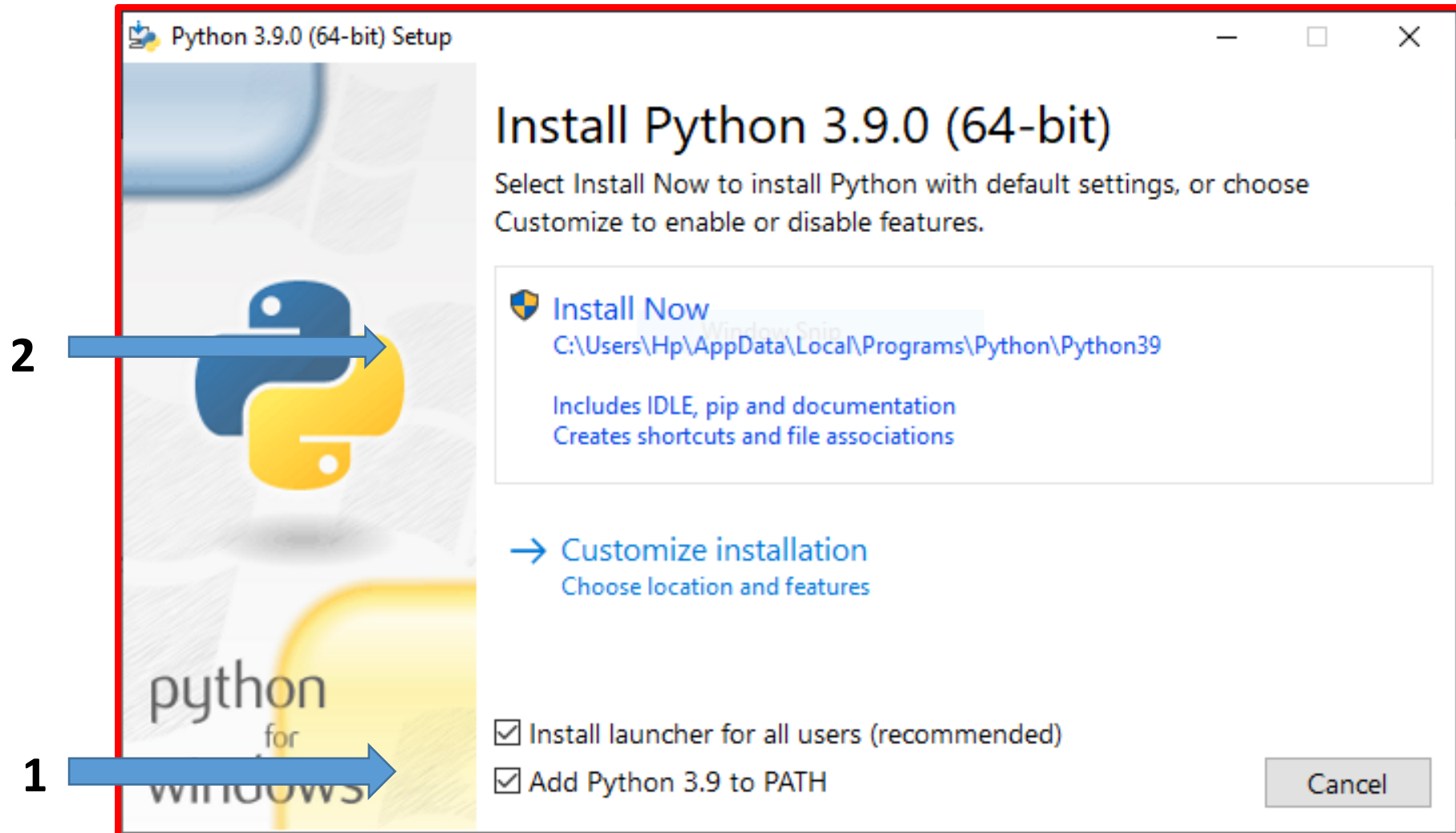
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# Installation from python.org

- Install Python 3 from <https://www.python.org/downloads/>
- The latest version in October 2022 is 3.11.0
- For using TensorFlow, you need a 64-bit Python version, e.g., <https://www.python.org/ftp/python/3.11.0/python-3.11.0-amd64.exe>
- For TensorFlow 1.6 and newer, your processor must support AVX (i3, i5, ...). Otherwise use TensorFlow 1.5.



# When installing Python, check the “Add to PATH” option



# Installing Python Packages

- From your OS command prompt, check the **options** of the package installing system by:

```
C:\>pip help
```

- **Check** the installed packages using:

```
C:\>pip list
```

- **Install** needed packages through:

```
C:\>pip install --upgrade jupyter matplotlib numpy  
pandas scipy scikit-learn
```

# Executing Python Code

- **Starting** and using Python Interpreter

- **Creating** a Python script file

```
# file: test.py
print("Running test.py")
x = 5
print("Result is", 3 * x)
```

- **Running** the script file

```
PS C:\Users\Hp> python
Python 3.9.0 (tags/v3.9.0:9cf6752, Oct 5 2020,
Type "help", "copyright", "credits" or "license"
>>> x = 5
>>> print(3 * x)
15
>>> exit()
PS C:\Users\Hp>
```

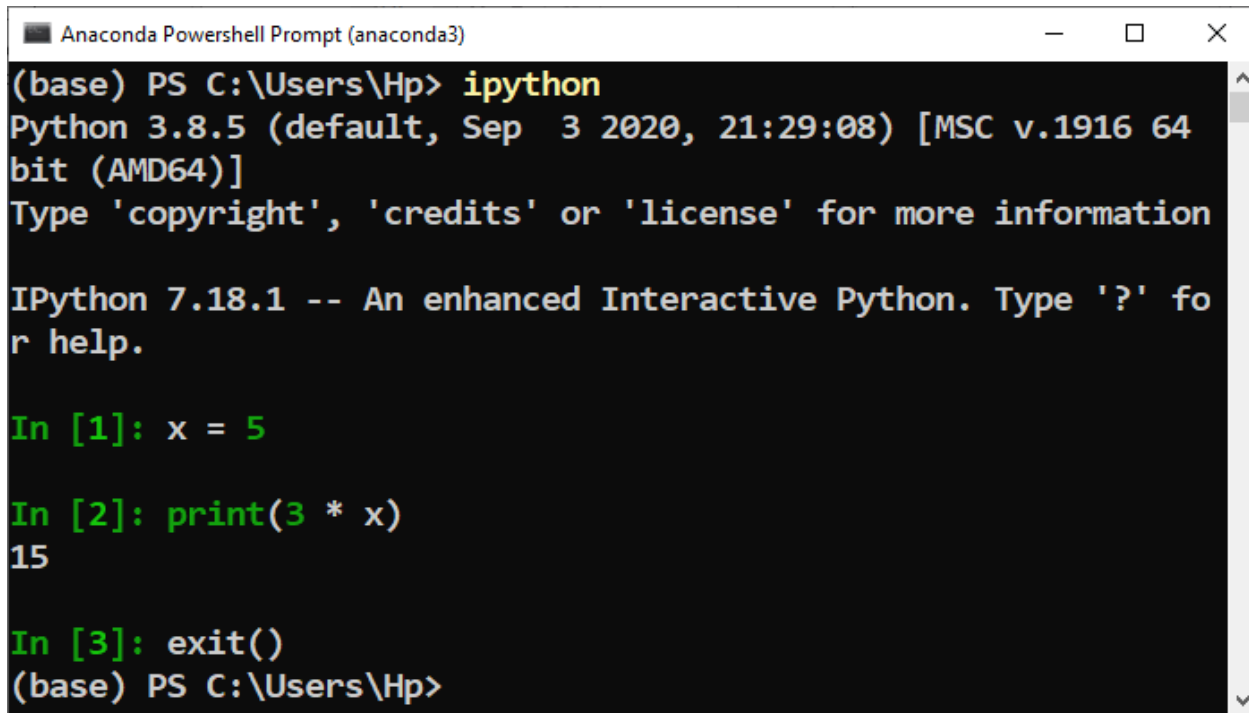
```
PS C:\Users\Hp> python test.py
Running test.py
Result is 15
PS C:\Users\Hp>
```

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# IPython

- **Interactive Python shell**
- It provides a more useful shell environment to execute python code in REPL (Read Eval Print Loop).
- It makes it **more interactive** by adding features like:
  - **Syntax highlighting**
  - **Code completion**
  - **?, %run, %paste, %timeit, %reset**
- IPython also comes with other tools like **Jupyter Notebooks**.



```
Anaconda Powershell Prompt (anaconda3)
(base) PS C:\Users\Hp> ipython
Python 3.8.5 (default, Sep  3 2020, 21:29:08) [MSC v.1916 64
bit (AMD64)]
Type 'copyright', 'credits' or 'license' for more information
IPython 7.18.1 -- An enhanced Interactive Python. Type '?' fo
r help.

In [1]: x = 5

In [2]: print(3 * x)
15

In [3]: exit()
(base) PS C:\Users\Hp>
```

# Jupyter Notebook

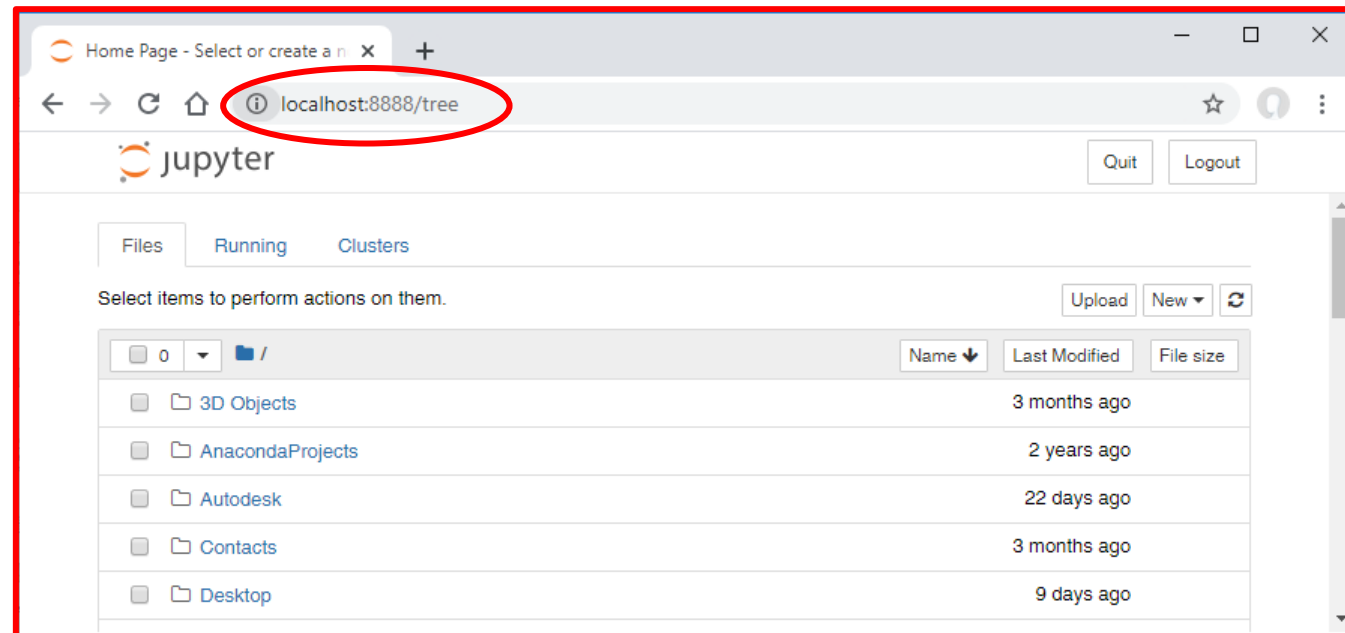
- The Jupyter Notebook is an open-source **web application** that allows you to create and share **documents** that contain live **code**, **equations**, **visualizations** and narrative **text**.
- **Website**: <http://jupyter.org/>
- **Tutorial** on Jupyter's website: <https://jupyter-notebook.readthedocs.io/en/stable/notebook.html>

# Starting Jupyter Notebook

- To **start** Jupyter notebooks server from your OS command prompt enter:

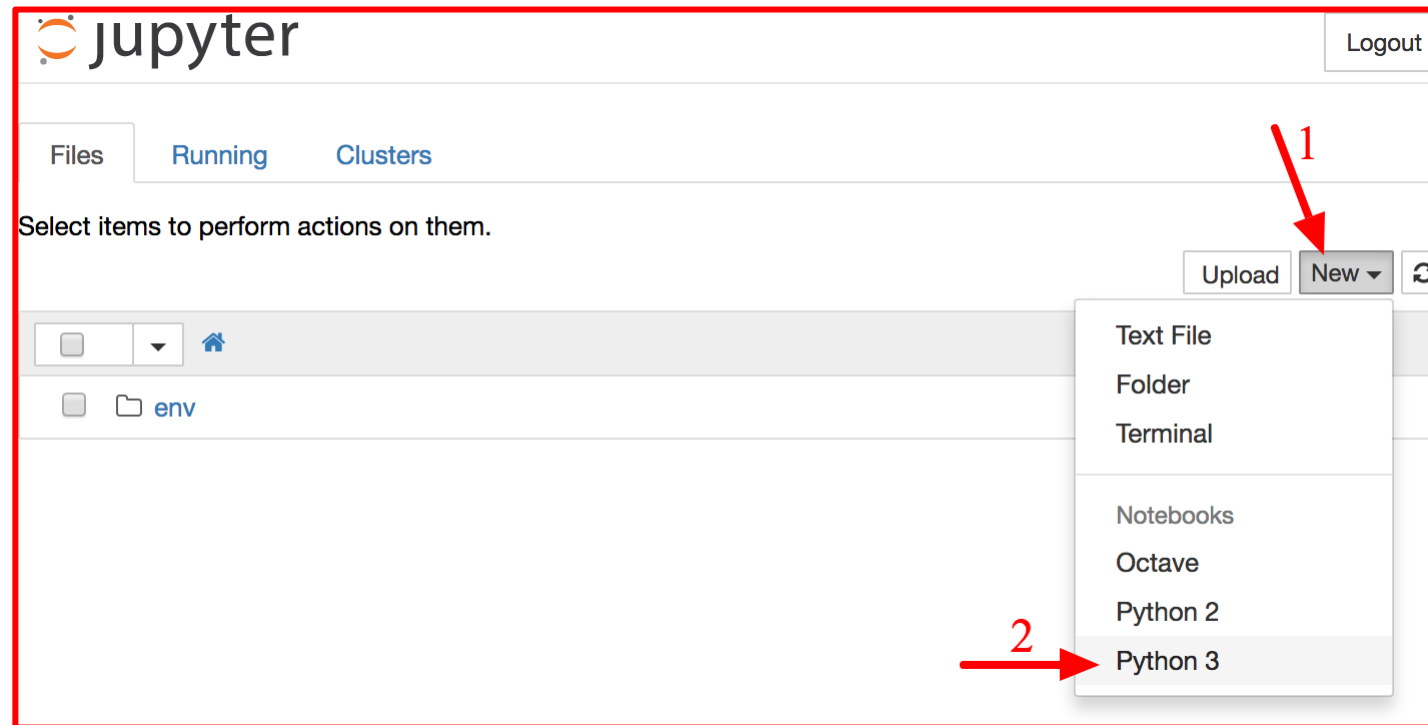
**C:\>jupyter notebook**

- Then **browse** to <http://localhost:8888/>.



# Creating Python Notebook

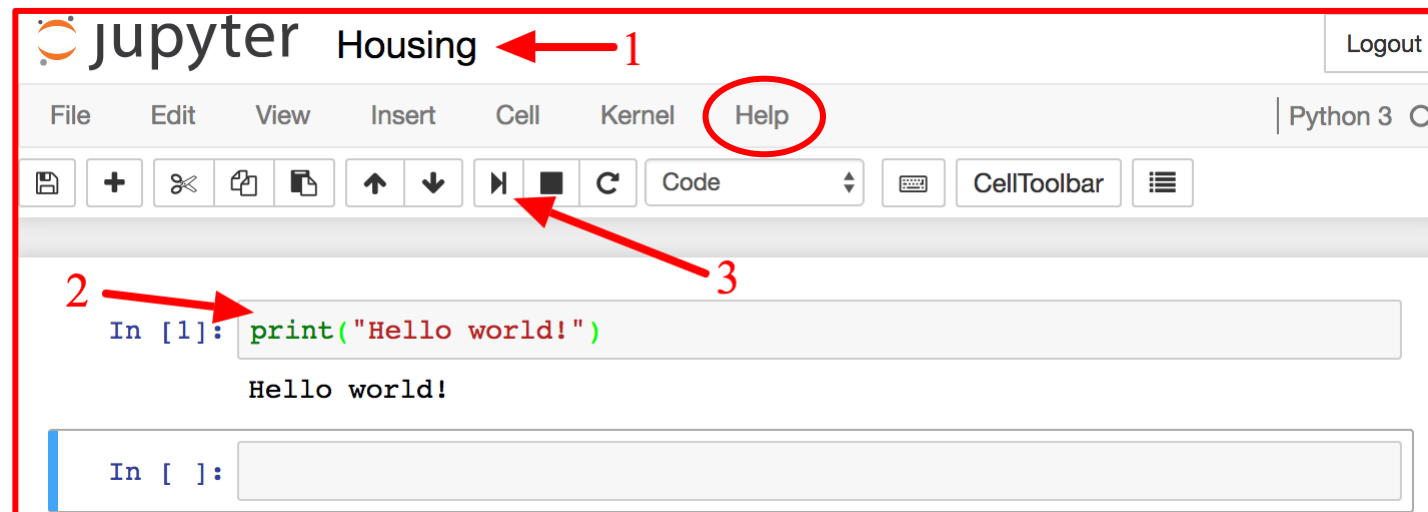
- Click on the **New** button and select the appropriate Python version.





# Working with Notebooks

- A notebook contains a list of **cells**. Each cell can contain executable **code** or formatted **text**.
- To change the notebook **name**, click on the title bar.
- Type **`print("Hello world!")`** in the first cell, and click on the **play** button. The result is displayed below the cell.
- Check the **User Interface Tour** from Jupyter's Help menu.



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# Google Colab

- **Colaboratory** is a **free** Jupyter notebook environment that requires no setup and runs entirely in the **cloud**.  
With **Colaboratory** you can write and execute code, save and share your analyses, and access powerful **computing resources**, all for free from your browser.

<https://colab.research.google.com/>

- Check the **introduction** in <https://colab.research.google.com/notebooks/intro.ipynb#>

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# Anaconda – DS Toolkit

- **The recommended toolkit**

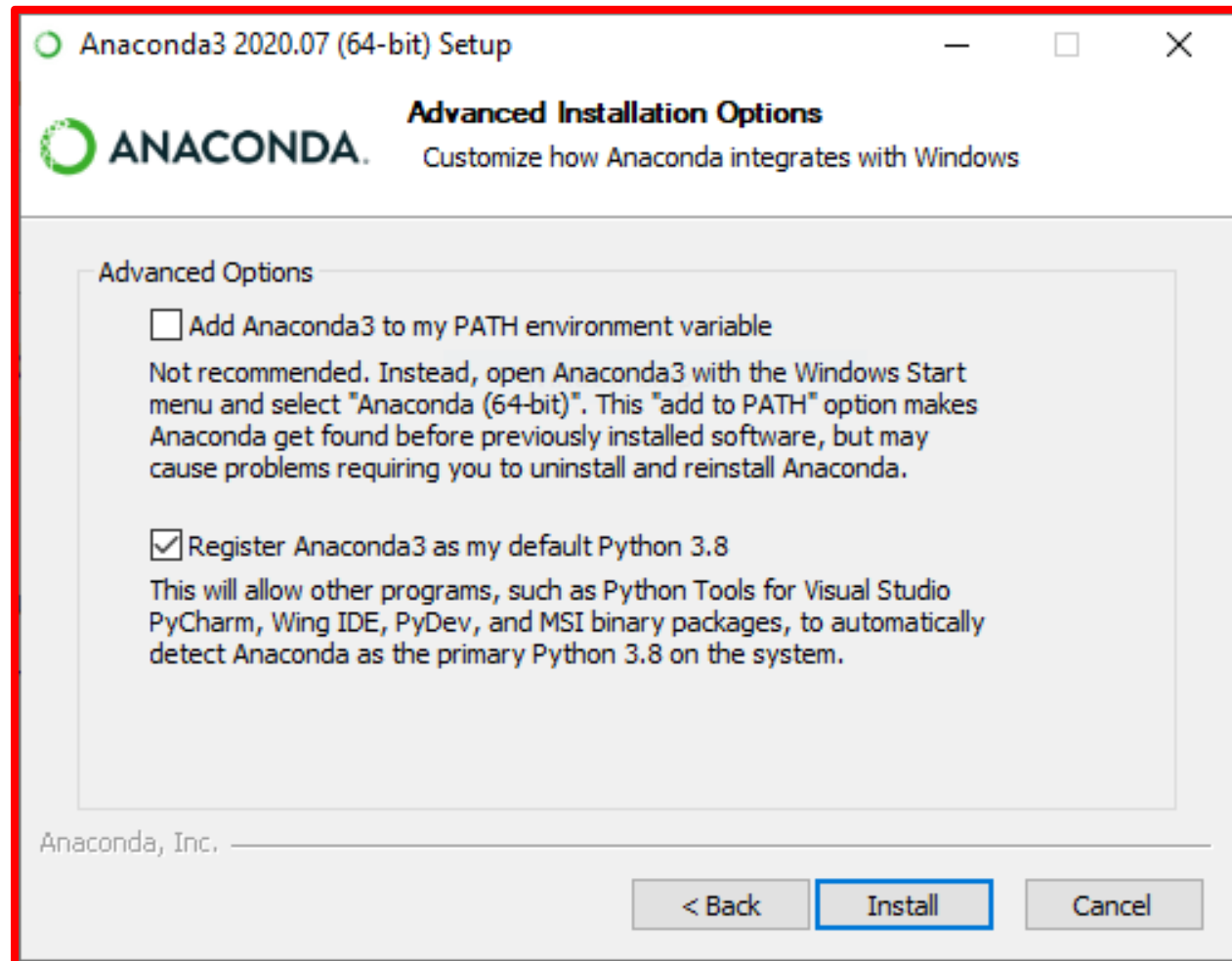
- Download packages
- Manage environments
- Access Python applications and help

- **Install** the 64-bit version

- <https://www.anaconda.com/products/individual>

- **Tutorial**

- <https://docs.anaconda.com/navigator/tutorials/index.html>



# Conda from the Powershell

```
Anaconda Powershell Prompt (anaconda3)
(base) PS C:\Users\Hp> conda update --all
Collecting package metadata (current_repodata.json): done
Solving environment: done

# All requested packages already installed.

(base) PS C:\Users\Hp> conda --version
conda 4.9.0
(base) PS C:\Users\Hp> conda info --envs
# conda environments:
#
base                * C:\Users\Hp\anaconda3
First_Project       C:\Users\Hp\anaconda3\envs\First_Project
ML_env              C:\Users\Hp\anaconda3\envs\ML_env

(base) PS C:\Users\Hp> conda activate ML_env
(ML_env) PS C:\Users\Hp> python test.py
Running test.py
Result is 15
(ML_env) PS C:\Users\Hp>
```

# Anaconda Navigator

The screenshot displays the Anaconda Navigator desktop application. The interface is divided into a left sidebar and a main content area. The sidebar contains navigation options: Home, Environments, Learning, and Community. Below these are promotional banners for NUMFOCUS and a 'Donate' button. The main content area shows a grid of application tiles for the 'base (root)' environment. Each tile includes an icon, the application name, version number, a brief description, and a 'Launch' button. The applications listed are: CMD.exe Prompt (0.1.1), Datalore, IBM Watson Studio Cloud, JupyterLab (2.2.6), Jupyter Notebook (6.1.4), Powershell Prompt (0.0.1), PyCharm Professional (2020.2.3), and Qt Console (4.7.7). A 'Sign in' button is visible in the top right corner of the application window.

Applications on  Channels

Application	Version	Description
CMD.exe Prompt	0.1.1	Run a cmd.exe terminal with your current environment from Navigator activated
Datalore		Online Data Analysis Tool with smart coding assistance by JetBrains. Edit and run your Python notebooks in the cloud and share them with your team.
IBM Watson Studio Cloud		IBM Watson Studio Cloud provides you the tools to analyze and visualize data, to cleanse and shape data, to create and train machine learning models. Prepare data and build models, using open source data science tools or visual modeling.
JupyterLab	2.2.6	An extensible environment for interactive and reproducible computing, based on the Jupyter Notebook and Architecture.
Jupyter Notebook	6.1.4	Web-based, interactive computing notebook environment. Edit and run human-readable docs while describing the
Powershell Prompt	0.0.1	Run a Powershell terminal with your current environment from Navigator activated
PyCharm Professional	2020.2.3	A Full-fledged IDE by JetBrains for both Scientific and Web Python development. Supports HTML, JS, and SQL.
Qt Console	4.7.7	PyQt GUI that supports inline figures, proper multiline editing with syntax highlighting, graphical calltips, and more.

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# Spyder IDE

The screenshot displays the Spyder IDE interface for Python 3.8. The main editor window shows a Python script named `temp.py` with the following code:

```
1 x = 3
2 y = 4
3 z = x * y
4 print(z)
```

The cursor is positioned at line 4, column 1. The Variable explorer on the right shows the current state of the program's variables:

Variable	Type	Size	Value
x	int	1	3
y	int	1	4
z	int	1	12

The Console window at the bottom shows the IPython console output, indicating that the program has executed successfully:

```
ipdb> continue
> c:\users\hp\.spyder-py3\temp.py(4)<module>()
  1 x = 3
  2 y = 4
  3 z = x * y
1----> 4 print(z)

ipdb> |
```

The status bar at the bottom indicates that the LSP Python service is ready, the environment is conda: base (Python 3.8.5), and the current cursor position is Line 4, Col 1. The status bar also shows the encoding (ASCII), line endings (CRLF), read/write permissions (RW), and memory usage (Mem 76%).

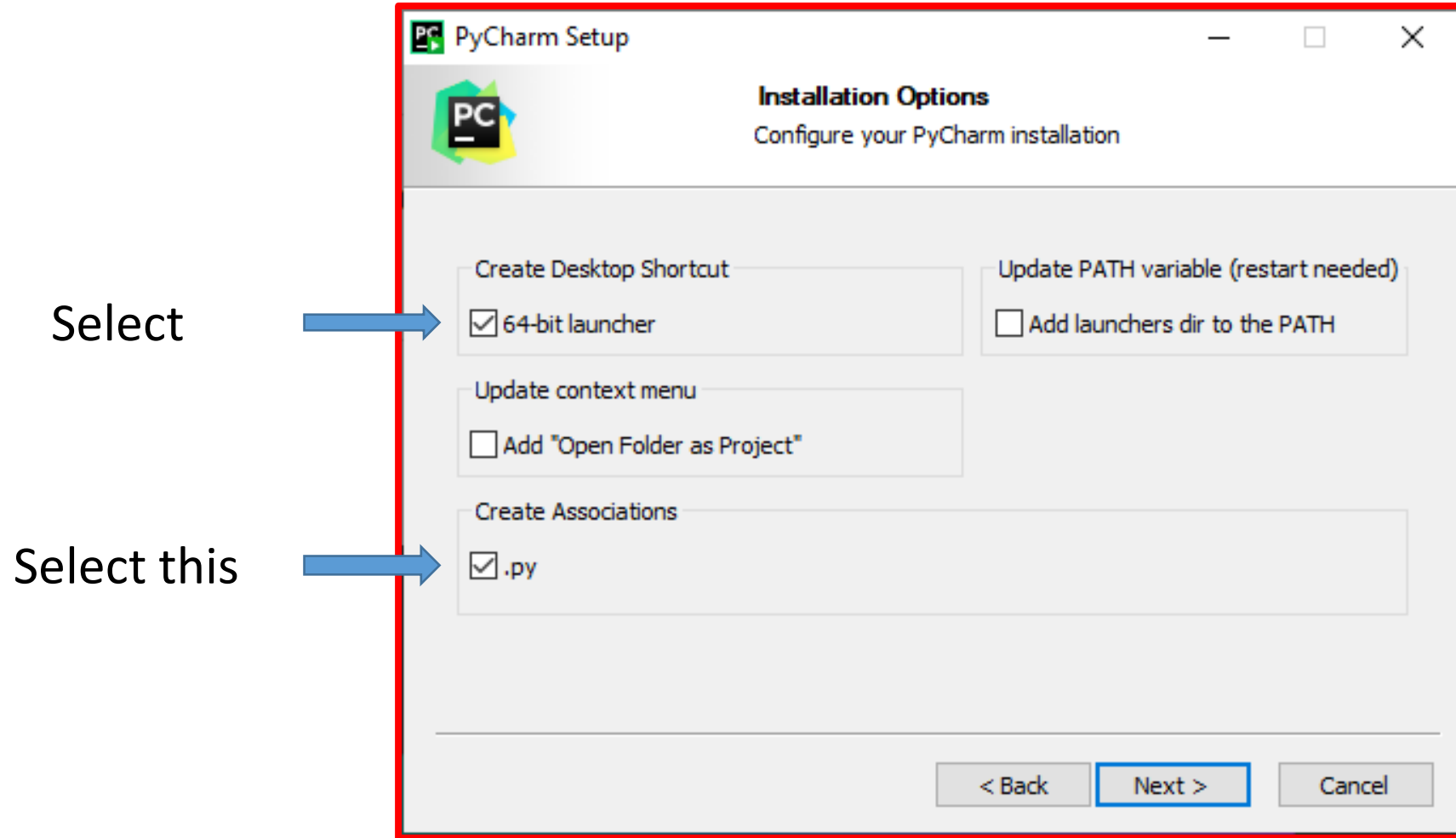
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# PyCharm IDE

- **PyCharm** is a powerful Python IDE. Install it from <https://www.jetbrains.com/pycharm/>
- Install the free **Community** version.
- Students can also install the **Professional** version for free. You need university email address.
- Read the first two steps of **First Steps** at <https://www.jetbrains.com/help/pycharm/first-steps.html>

# PyCharm Installation



# PyCharm Installation

- Check the following **tutorial** to learn how to **connect PyCham** to an **Conda environment**:
  - <https://docs.anaconda.com/anaconda/user-guide/tasks/pycharm/>

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# 1. Start Visual Studio and select **Create a new project**

Visual Studio 2019

Open recent

Get started

Clone or check out code  
Get code from an online repository like GitHub or Azure DevOps

Open a project or solution  
Open a local Visual Studio project or .sln file

Open a local folder  
Navigate and edit code within any folder

**Create a new project**  
Choose a project template with code scaffolding to get started

Continue without code →

Today

- PythonApplication2.sln 2/6/2020 1:30 PM  
C:\Users\abandah\source\repos\PythonApplication2

This month

- TestingForComputerSkills.sln 1/24/2020 7:16 PM  
C:\Users\abandah\source\repos\TestingForComputerSkills

This month

- PythonApplication1.sln 1/16/2020 8:33 PM  
C:\Users\abandah\source\repos\PythonApplication1

2. Select the language **Python** and **Python Application**, then click **Next**.

Create a new project

Search for templates (Alt+S) Clear all

Python All platforms All project types

Recent project templates

- Python Application Python
- Console App C++

**Python Application**  
A project for creating a command-line application  
Python Windows Linux macOS Console

Web Project  
A project for creating a generic Python web project  
Python Windows Linux macOS Web

Django Web Project  
A project for creating an application using the Django web framework. It features sample pages that use the Twitter Bootstrap framework for responsive web design.  
Python Windows Linux macOS Web

Flask Web Project  
A project for creating an application using the Flask web framework with the Jinja template engine. It features sample pages that use the Twitter Bootstrap framework for responsive web design.  
Python Windows Linux macOS Web

Back Next



3. Enter a name for your project then press **Create**.

# Configure your new project

Python Application Python Windows Linux macOS Console

Project name

PythonApplication3

Location

C:\Users\abandah\source\repos ...

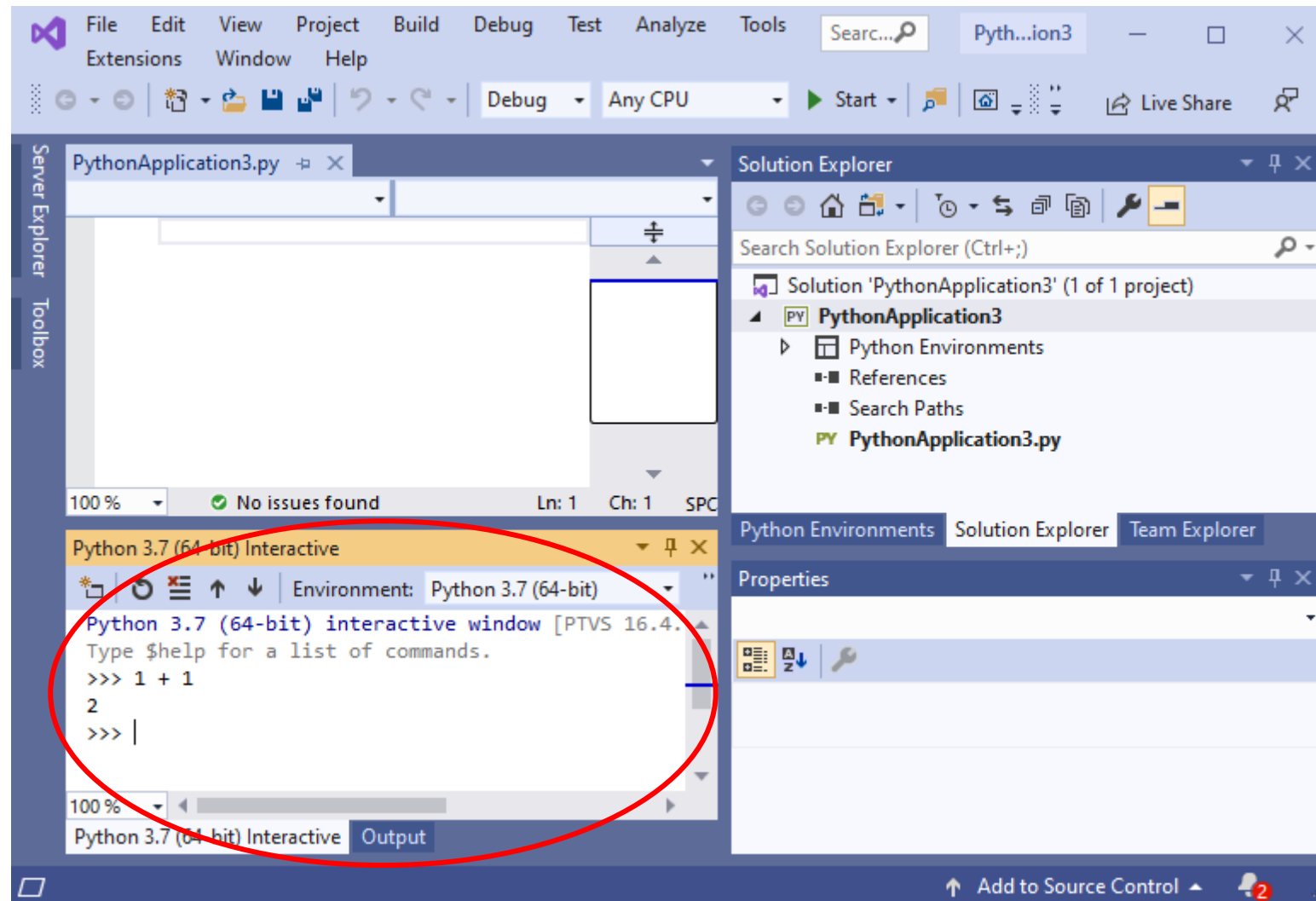
Solution name ⓘ

PythonApplication3

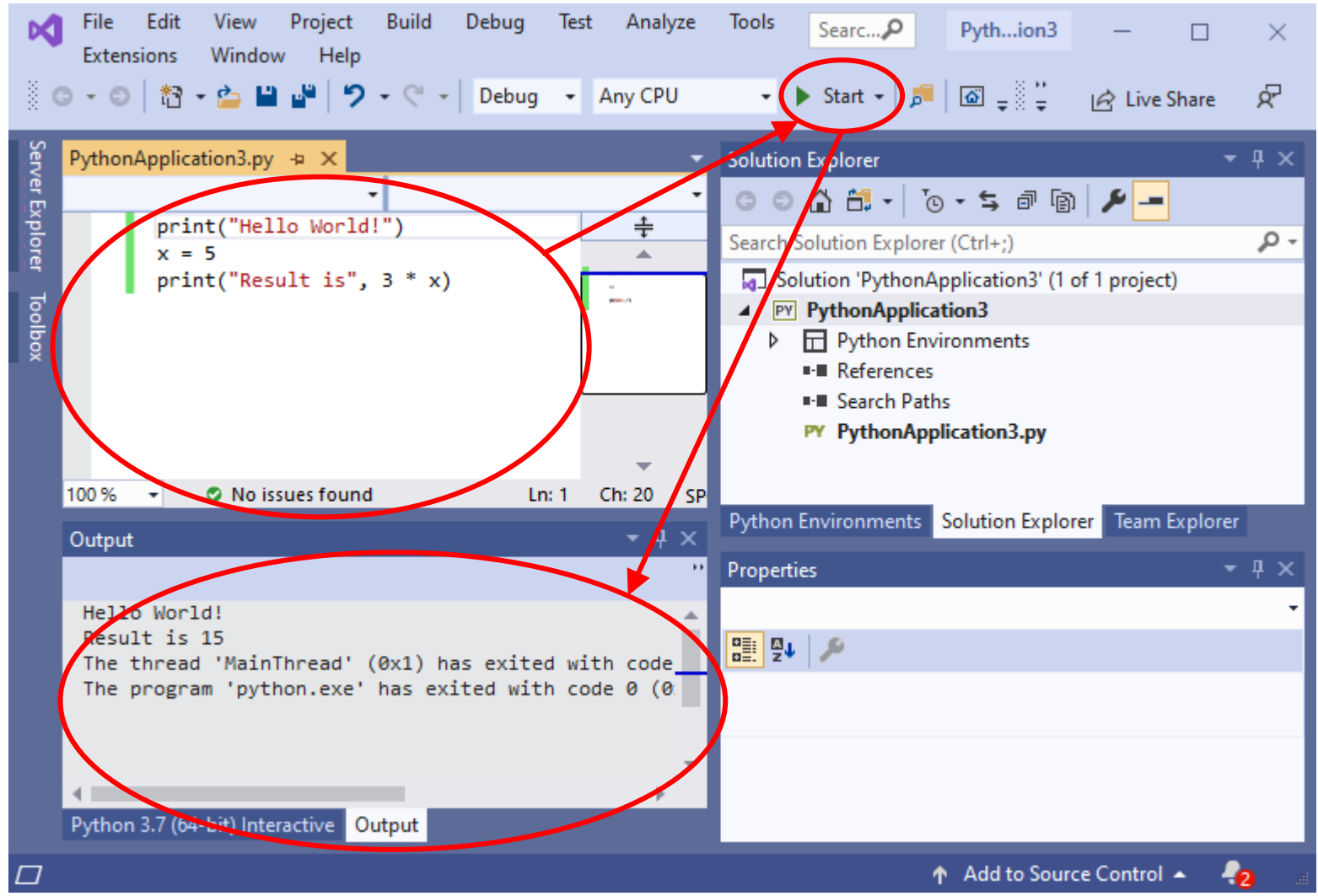
Place solution and project in the same directory

Back Create

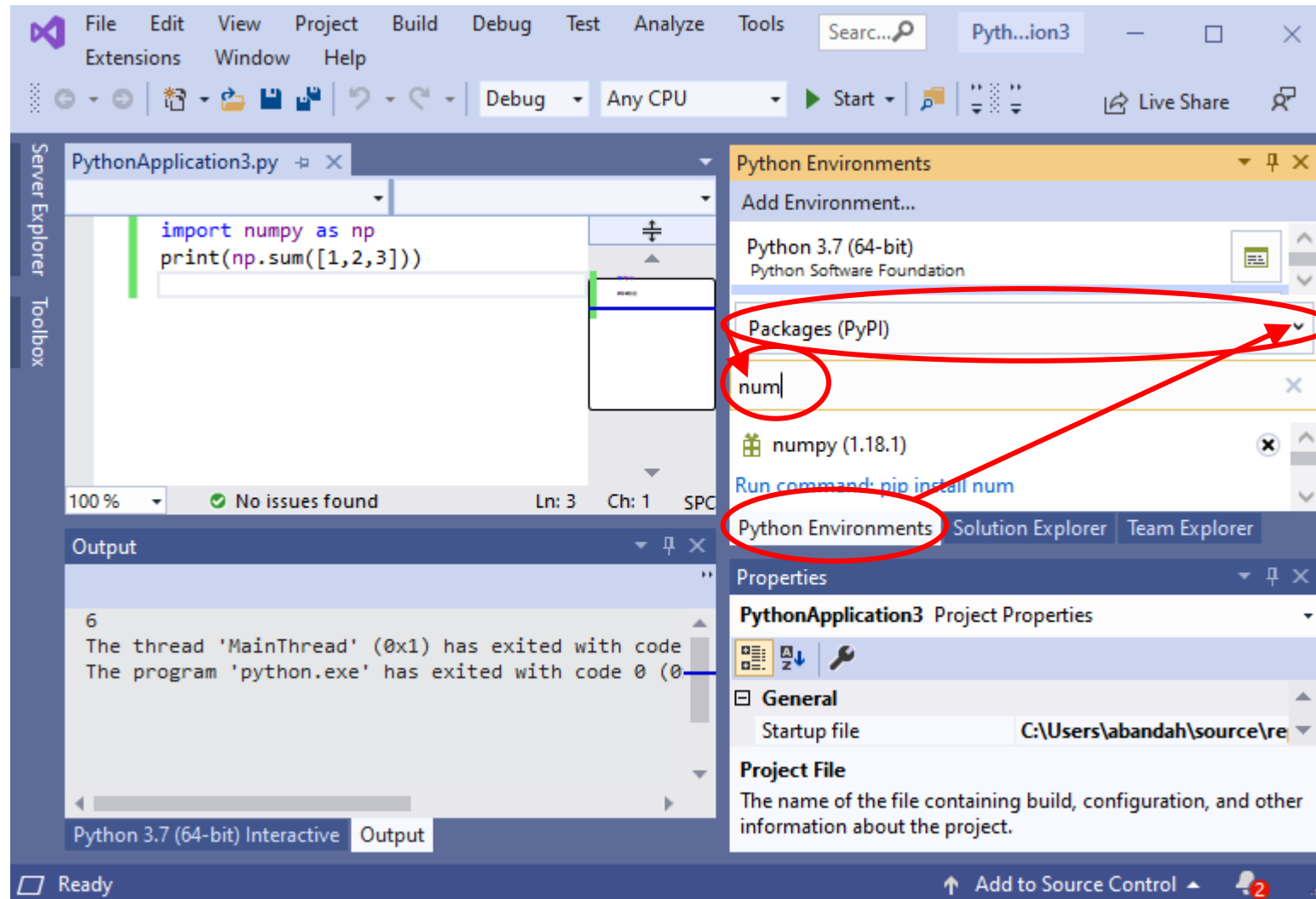
4. You can directly enter and run Python code in the **Python Interactive** window.



5. You can enter your Python program in the **Editor** window and execute it by clicking **Start**. The output appears in the **Output** window.



6. To install or list packages, select the **Python Environments** and **Packages (PyPI)**, then enter the name of the package in the **search box**.



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# Homework 1 - Toolkits

1. **Read** all **tutorials** suggested in this presentation.
2. **Install Anaconda**.
3. Open Anaconda prompt and **update** it.
4. From Anaconda prompt, **execute** a Python **script file**.
5. From Anaconda Navigator, launch **Jupyter Notebook** and experiment with entering and executing code and text cells.
6. Create a new **Conda environment** and install in it the package **numpy**.
7. Install **PyCharm** and create a **new project** that uses the created Conda environment and **execute** the following code:

```
import numpy as np
a= np.random.random(10)
print(a)
```

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