PYTHON

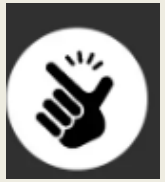
AGENDA

- What is Python?
- Features of Python
- Installation of Python
- Basics of Python
  - Data Types
  - Operators
  - Flow Control
  - Functions
  - File Handling

What is Python?

- Created by **Guido Van Rossum** in 1989
- Inspired by his favourite show's (Flying Circus) creator '**Monty Python**'
- **High level**, **Interpreted language** with **easy syntax** and **dynamic semantics**.

Features of Python



Simplicity

Open Source

Portability

Embeddable and Extensible

Interpreted

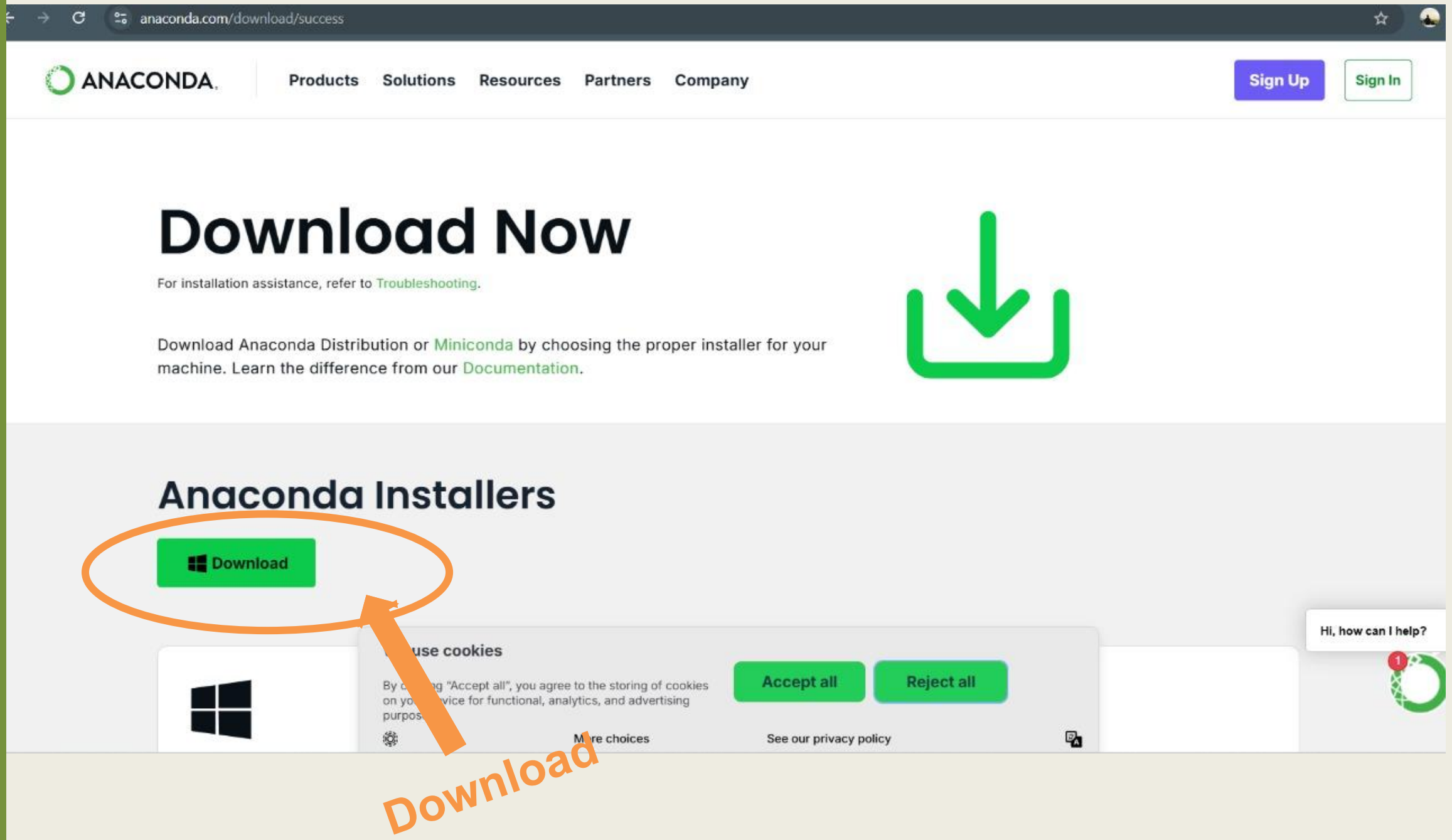
Huge Libraries

Object Orientation

Installing Python

Anaconda official site:

https://www.anaconda.com/download/success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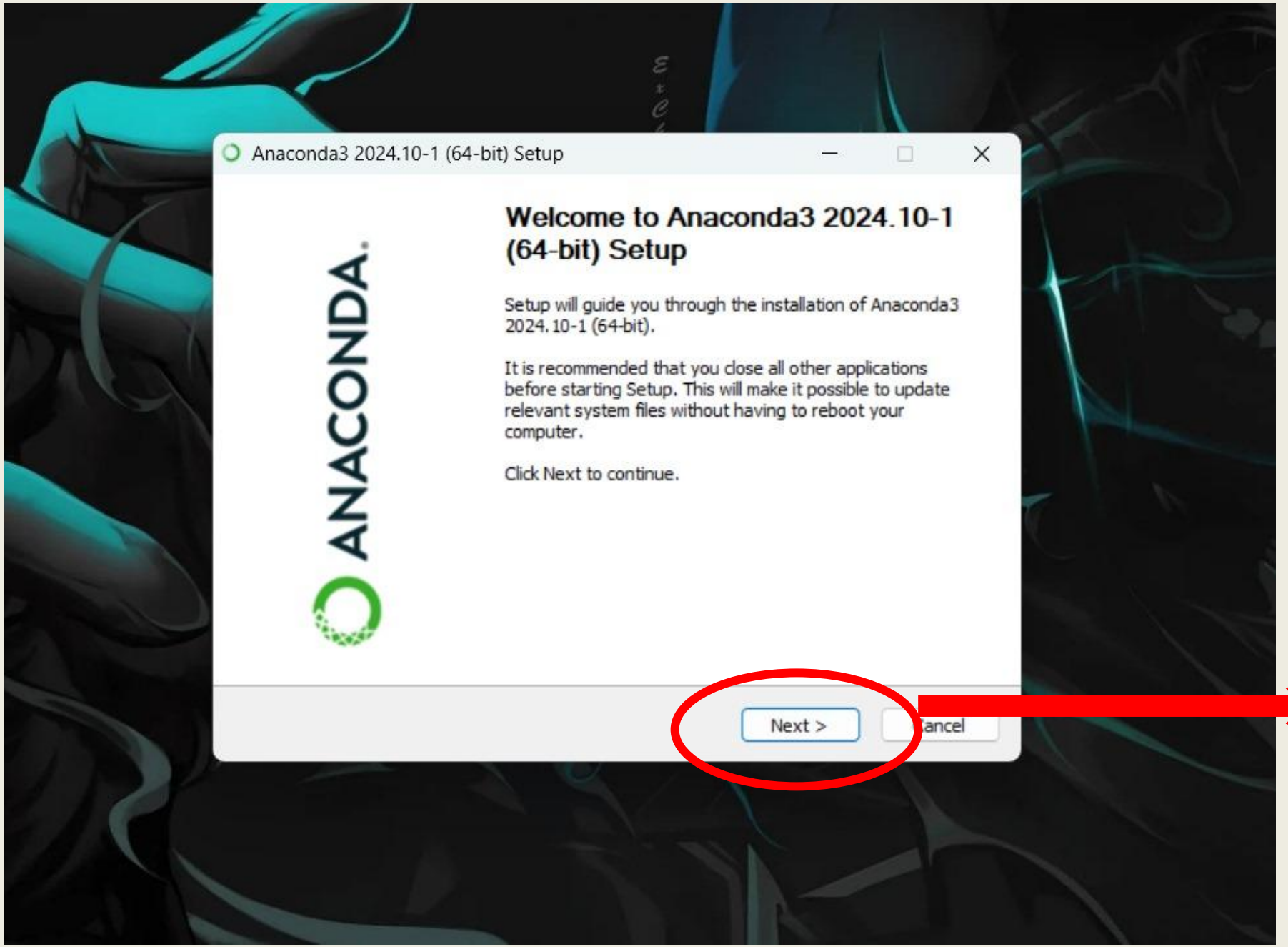
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ANACONDA.
Welcome to Anaconda3 2024.10-1 (64-bit) Setup
Setup will guide you through the installation of Anaconda3 2024.10-1 (64-bit).
It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.
Click Next to continue.
Next >
Cancel
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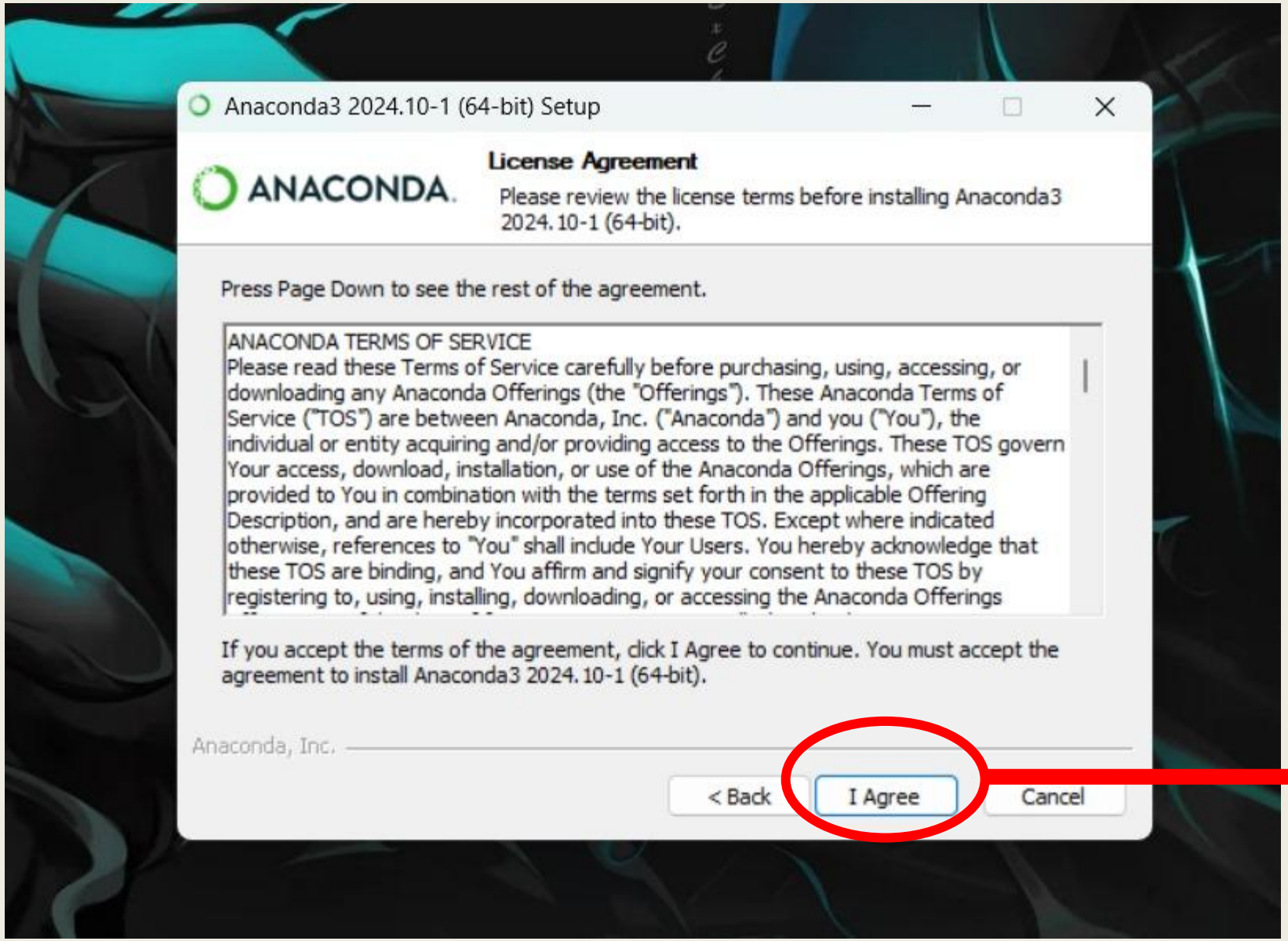
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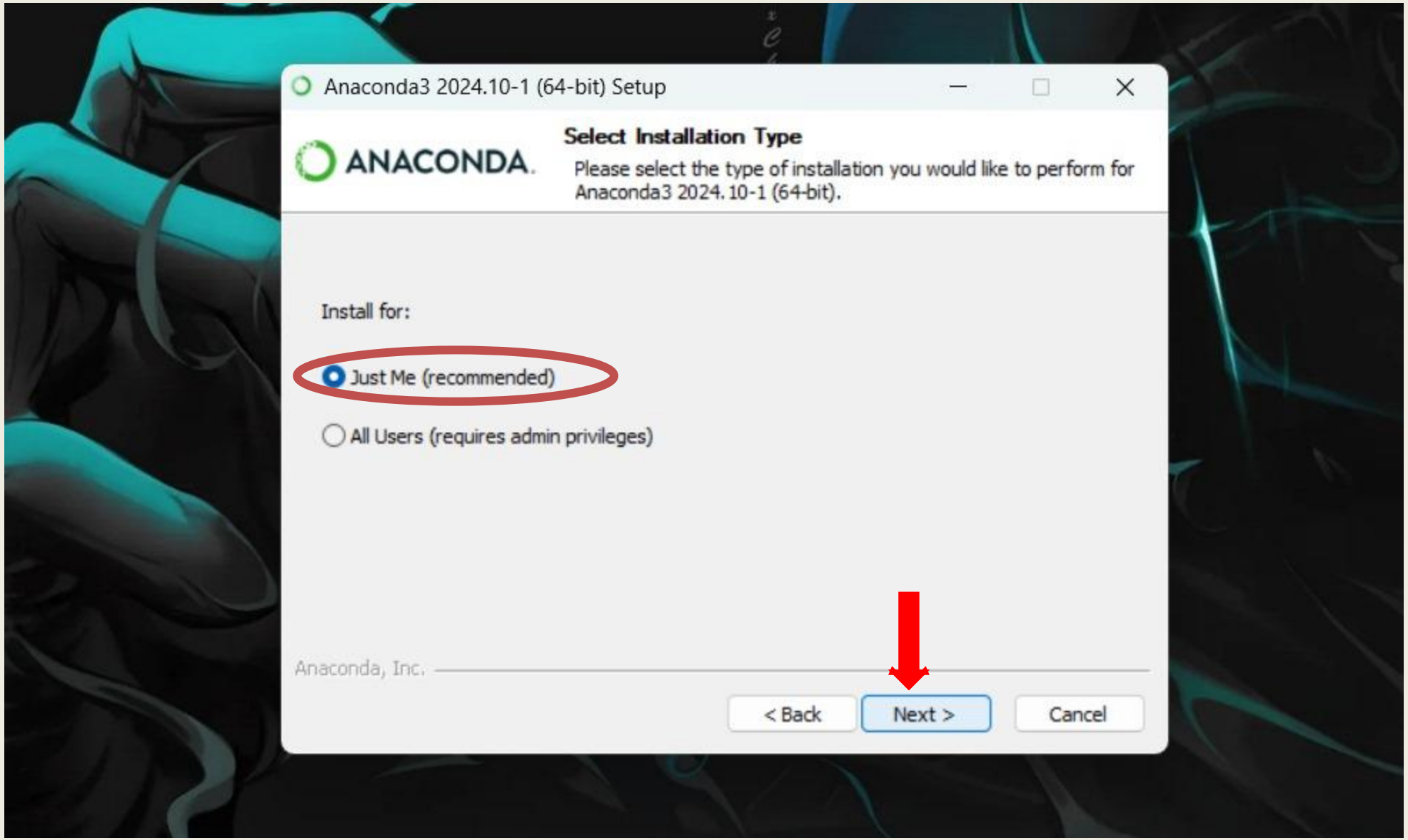
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Please select the type of installation you would like to perform for Anaconda3 2024.10-1 (64-bit).
Install for:
Just Me (recommended)
All Users (requires admin privileges)
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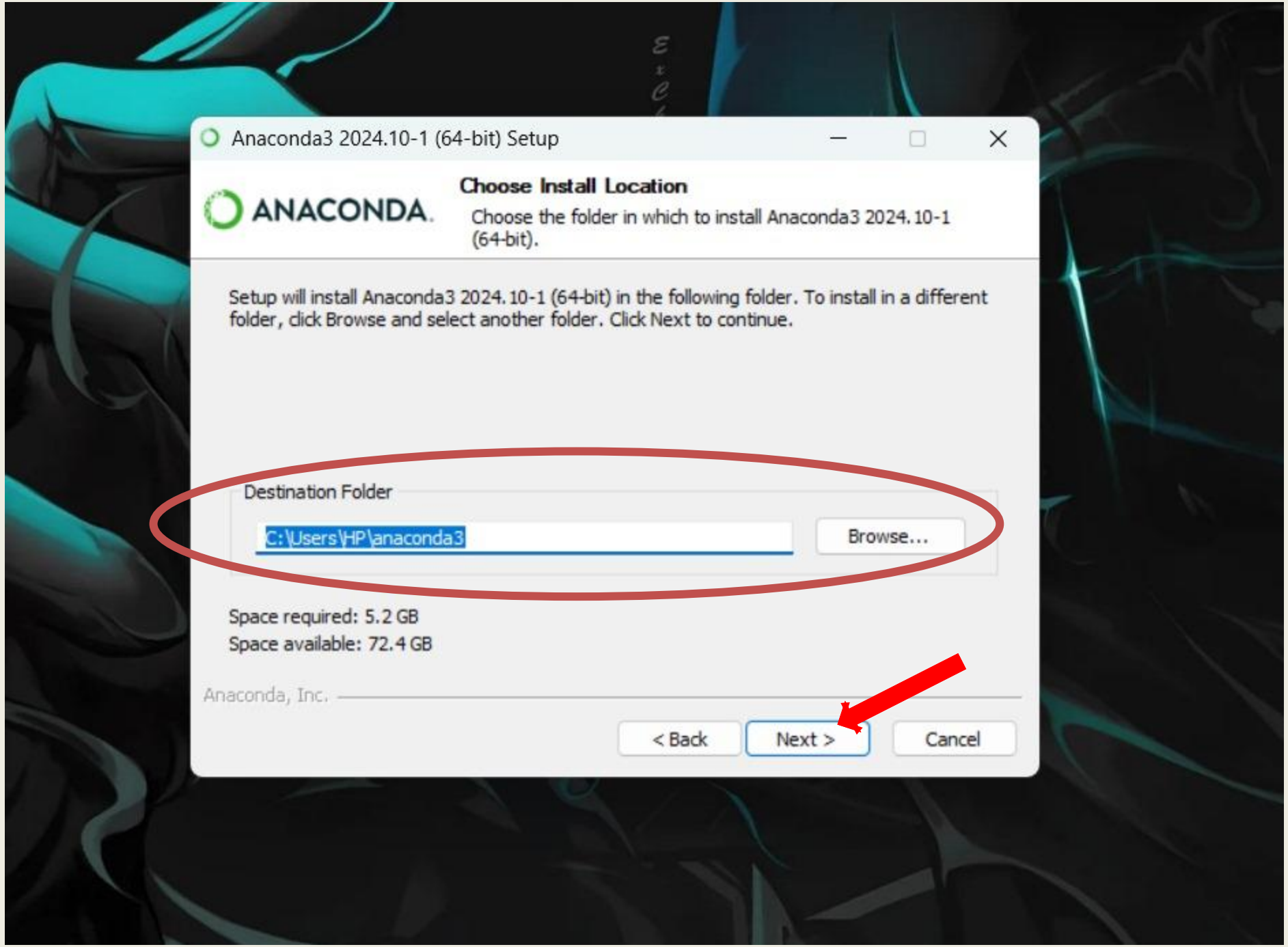
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Choose Install Location
Choose the folder in which to install Anaconda3 2024.10-1 (64-bit).
Setup will install Anaconda3 2024.10-1 (64-bit) in the following folder. To install in a different folder, click Browse and select another folder. Click Next to continue.
Destination Folder
C:\Users\HP\anaconda3
Browse...
Space required: 5.2 GB
Space available: 72.4 GB
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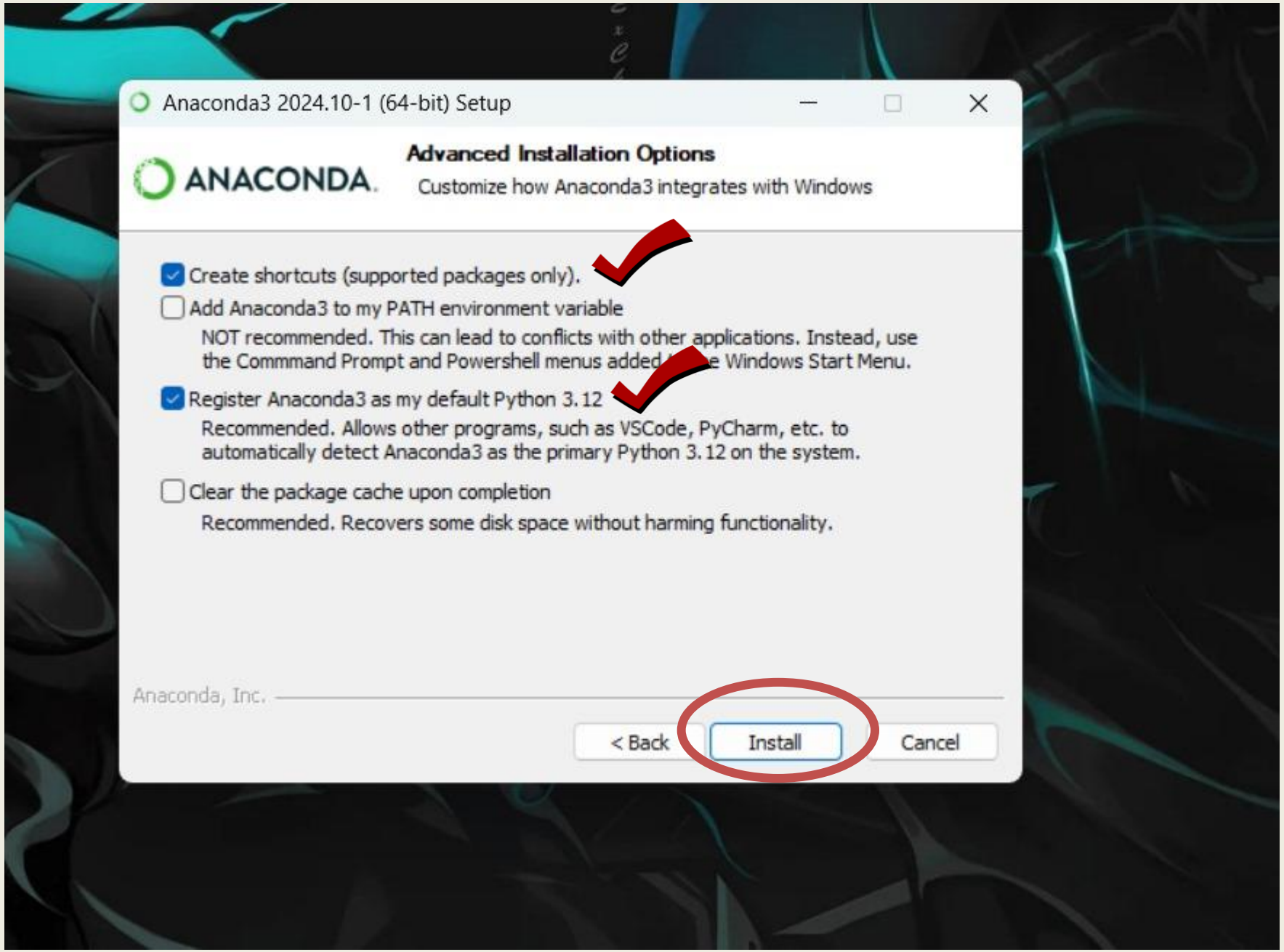
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Customize how Anaconda3 integrates with Windows
Create shortcuts (supported packages only).
Add Anaconda3 to my PATH environment variable
NOT recommended. This can lead to conflicts with other applications. Instead, use the Commmand Prompt and Powershell menus added
Windows Start Menu.
Register Anaconda3 as my default Python 3.12
Recommended. Allows other programs, such as VSCode, PyCharm, etc. to automatically detect Anaconda3 as the primary Python 3.12 on the system.
Clear the package cache upon completion
Recommended. Recovers some disk space without harming functionality.
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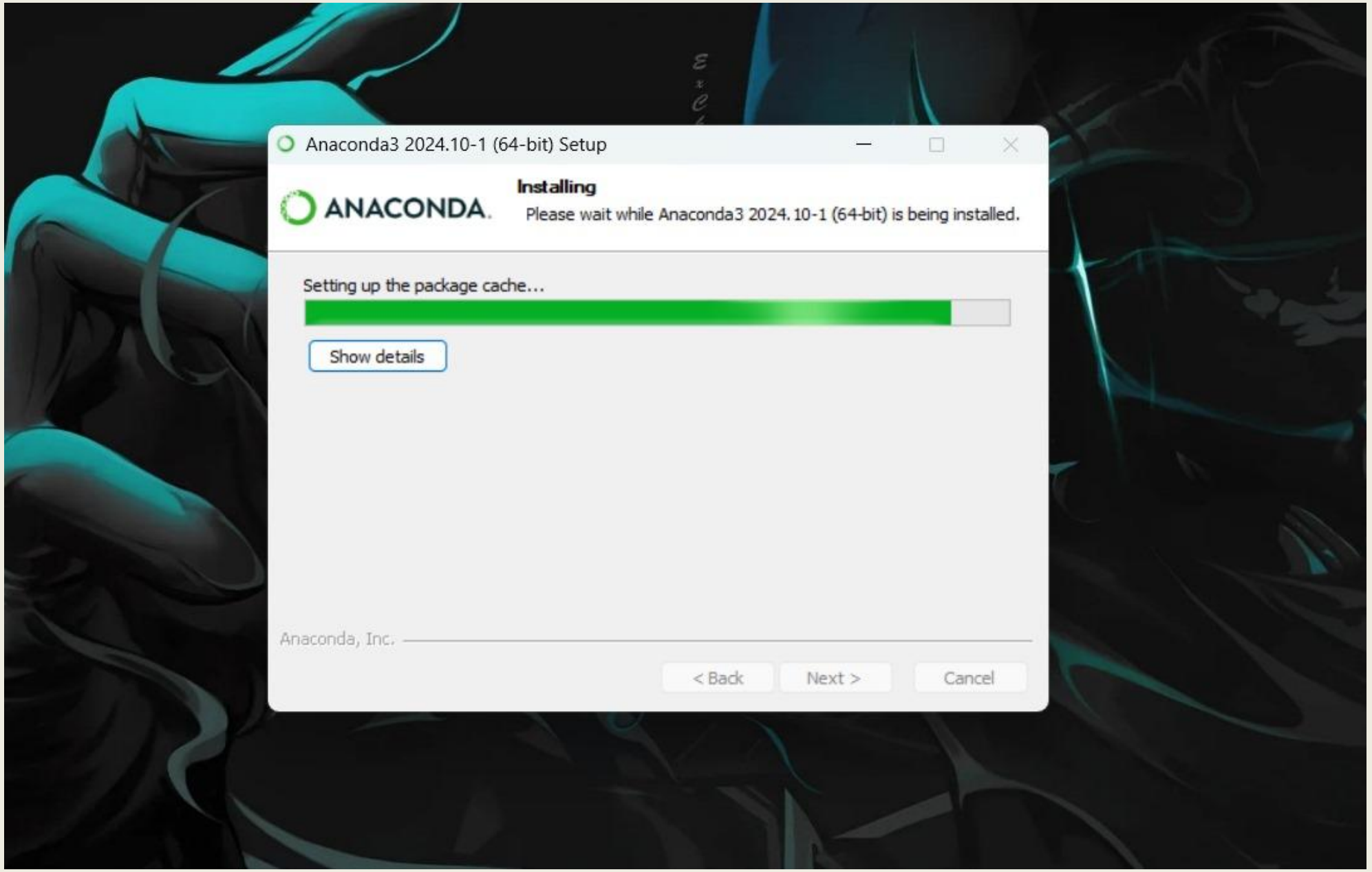
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Installing
Please wait while Anaconda3 2024.10-1 (64-bit) is being installed.
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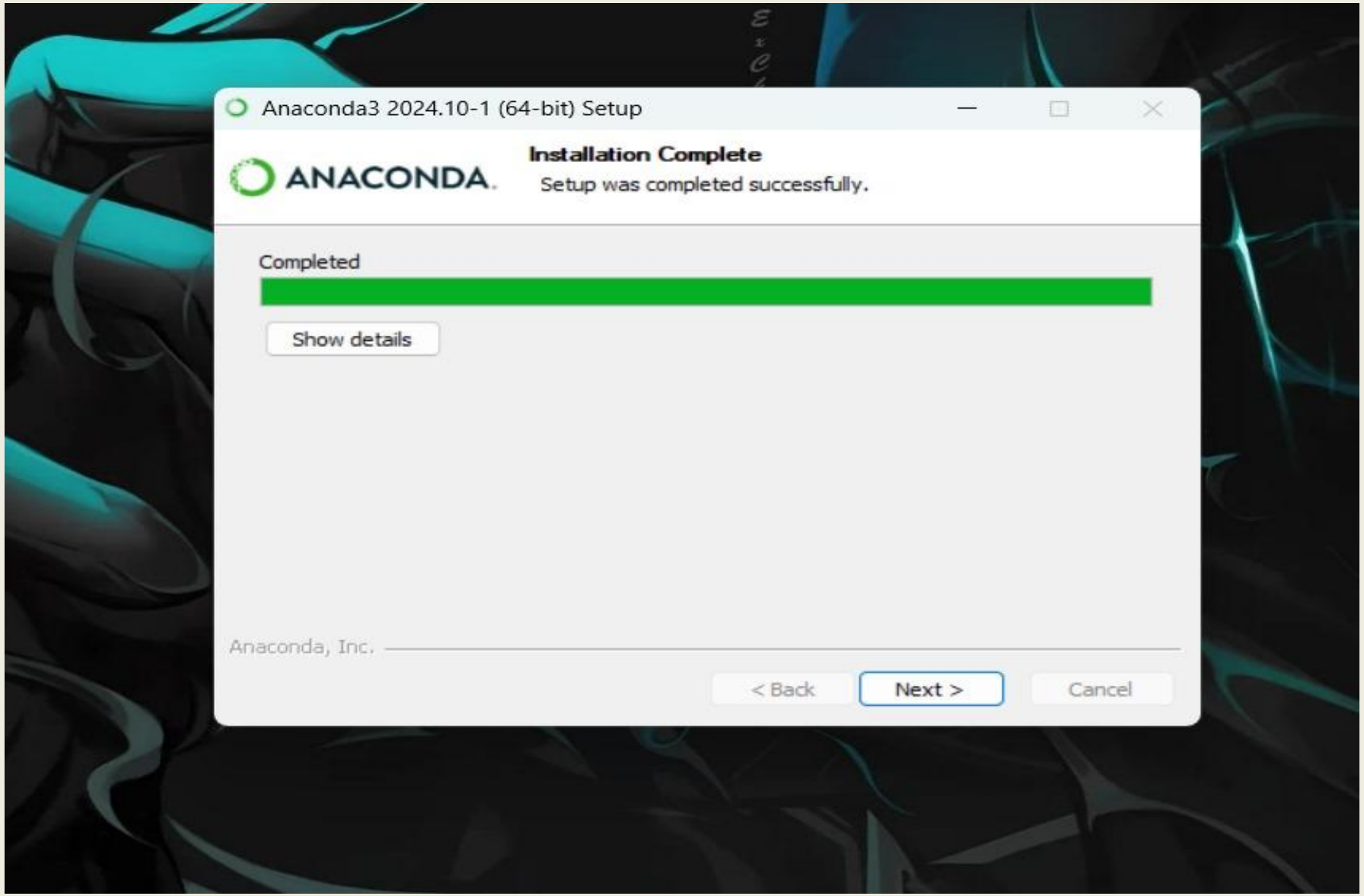
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Installation Complete
Setup was completed successfully.
Completed
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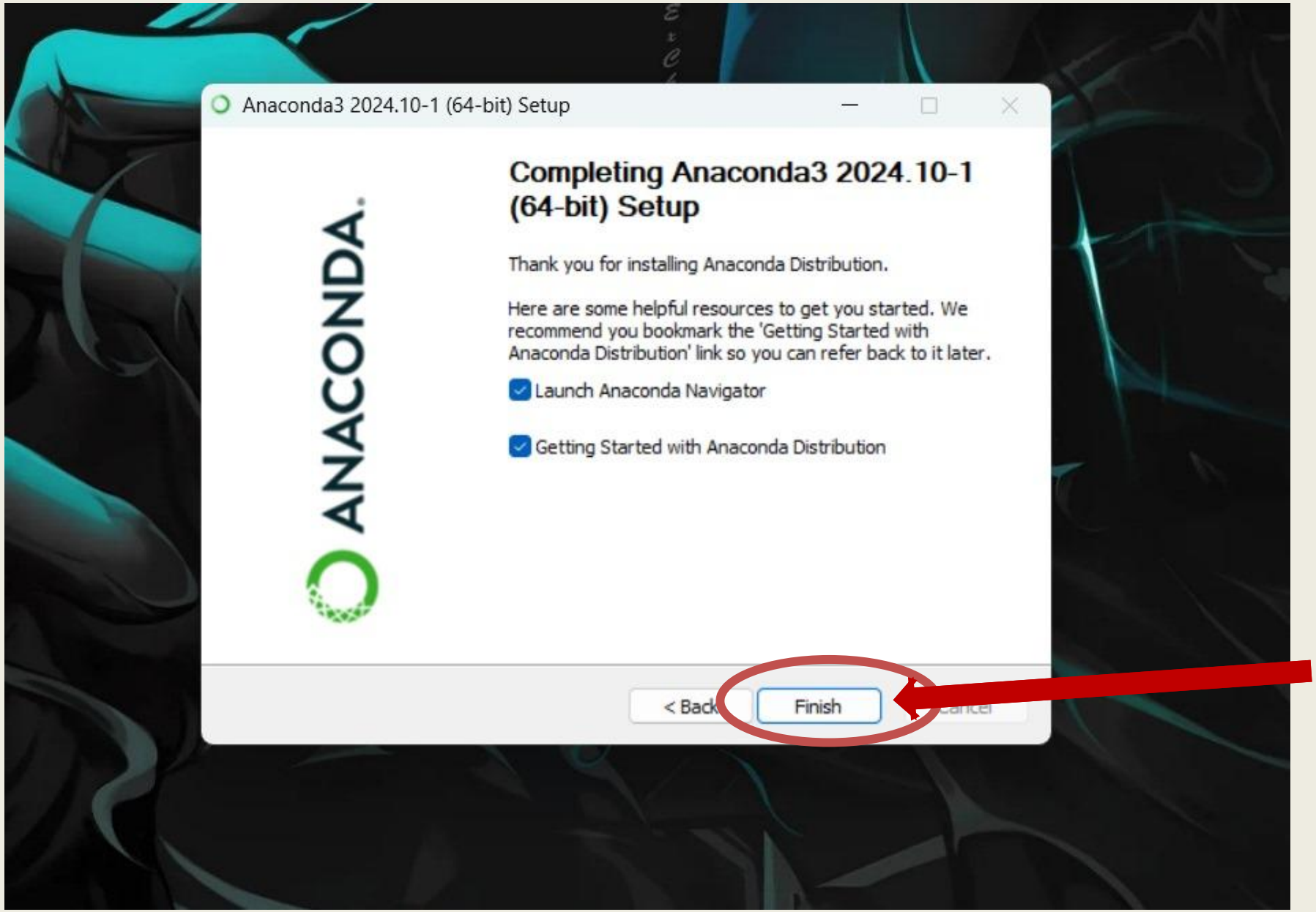
Anaconda3 2024.10-1 (64-bit) Setup
Completing Anaconda3 2024.10-1 (64-bit) Setup
Thank you for installing Anaconda Distribution.
Here are some helpful resources to get you started. We recommend you bookmark the 'Getting Started with Anaconda Distribution' link so you can refer back to it later.
Launch Anaconda Navigator
Getting Started with Anaconda Distribution
ANACONDA.
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Finish
Finish

Creation of Virtual Environment

https://www.geeksforgeeks.org/set-up-virtual-environment-for-python-using-anaconda/

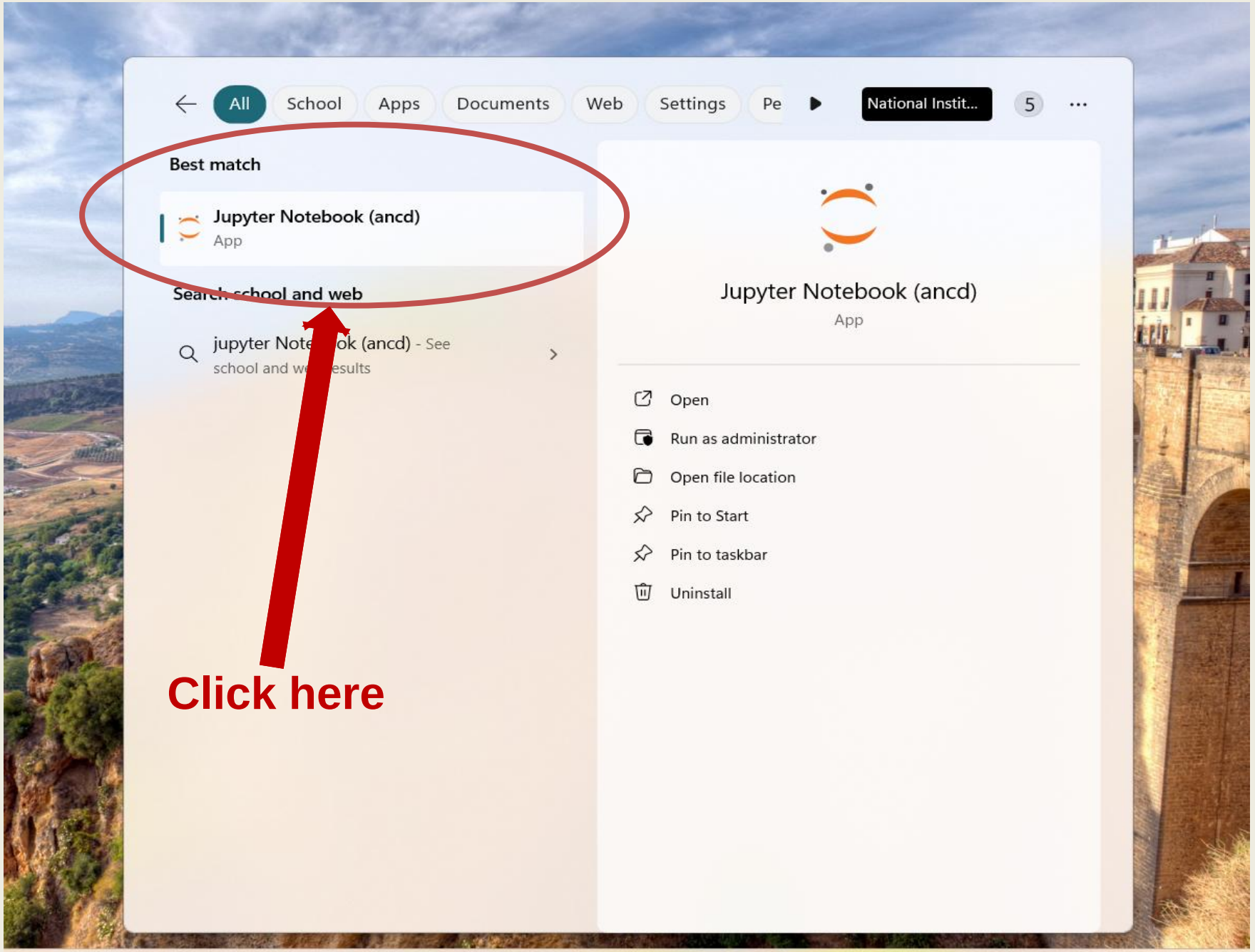
Creation of Virtual Environment

```
# Create a new environment called "myproject" with Python 3.8
conda create -n myproject python=3.8

# Activate the "myproject" environment
conda activate myproject

# Navigate to your project directory
cd path/to/your/project

# Start coding using your Python script
python your_script.py
```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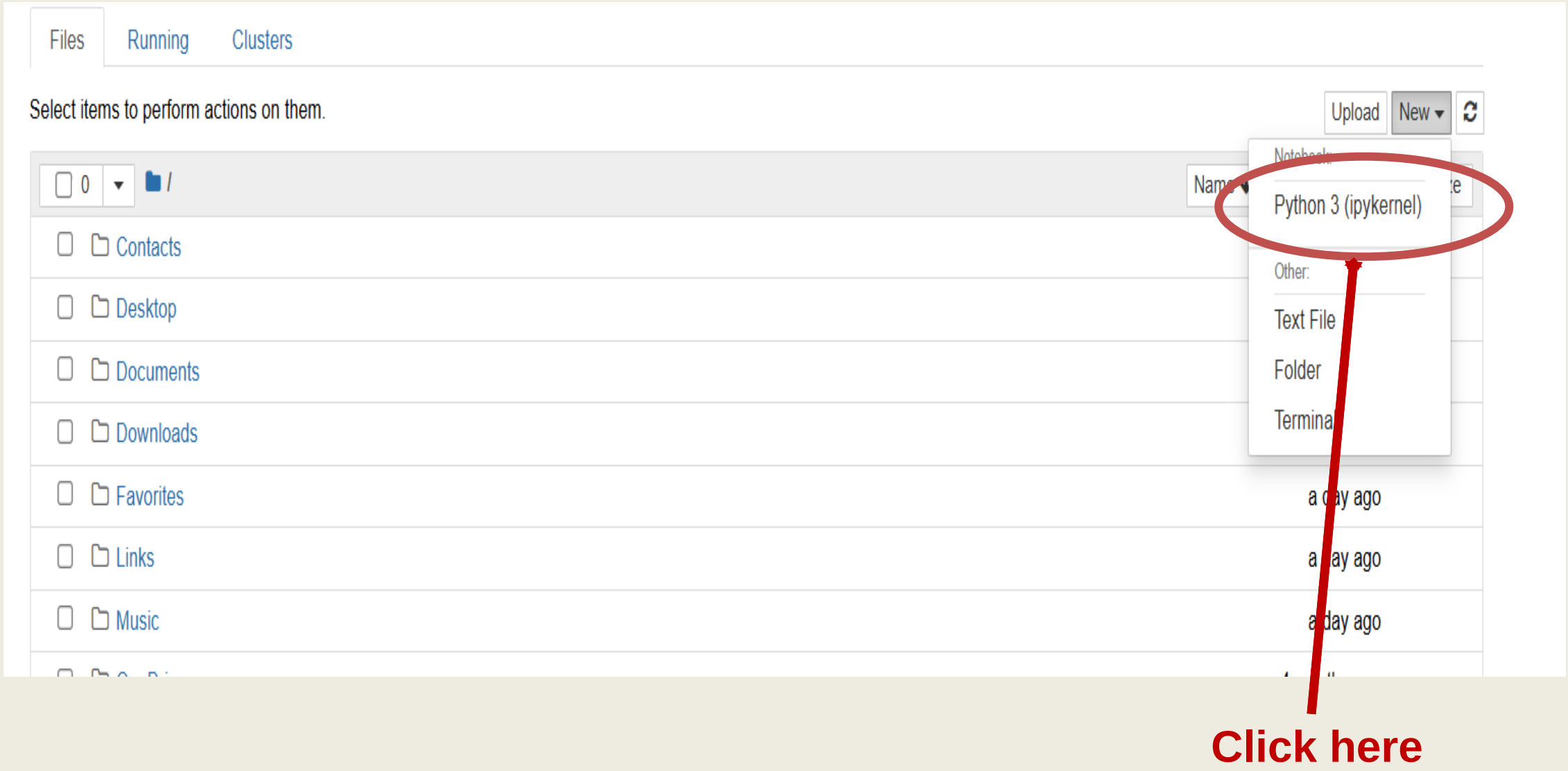
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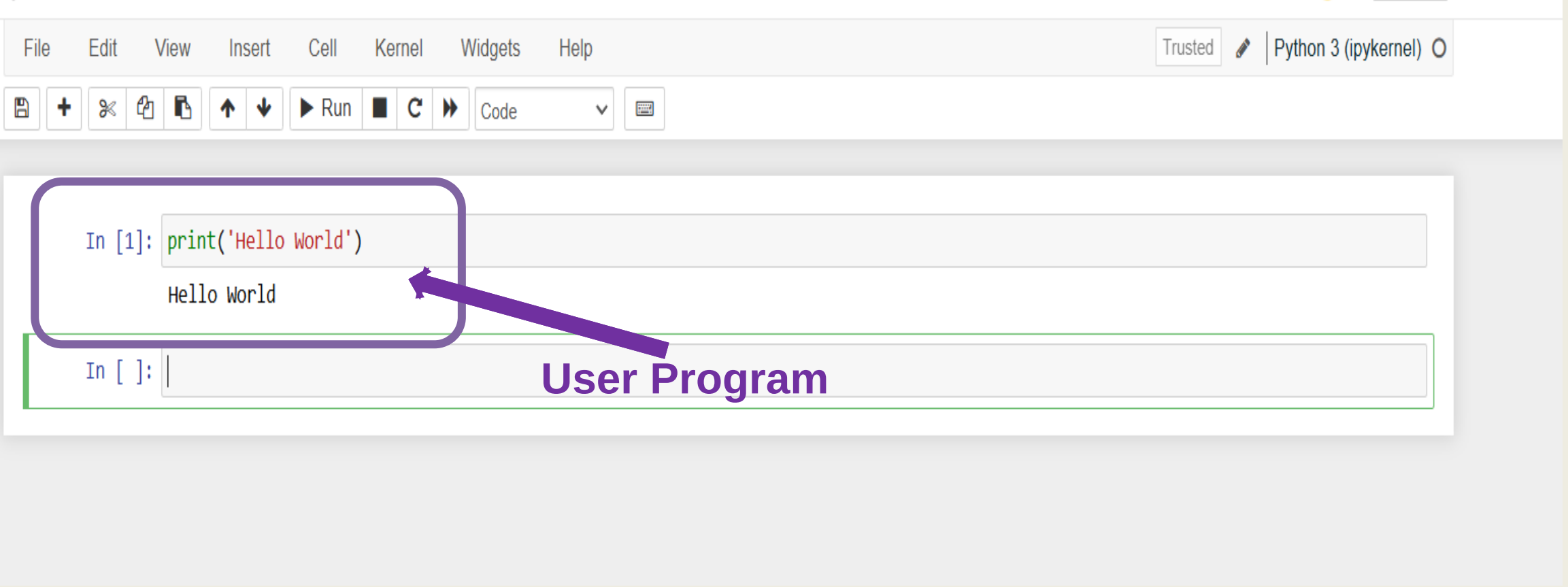


- Python program communicates its results to user using print
- Python 3 uses input to read user input as a string (str)

In [2]:
```
a = 10
b = 20
c = a+b
print('The addition of a and b is: %d' %c)
```

```
The addition of a and b is: 30
```

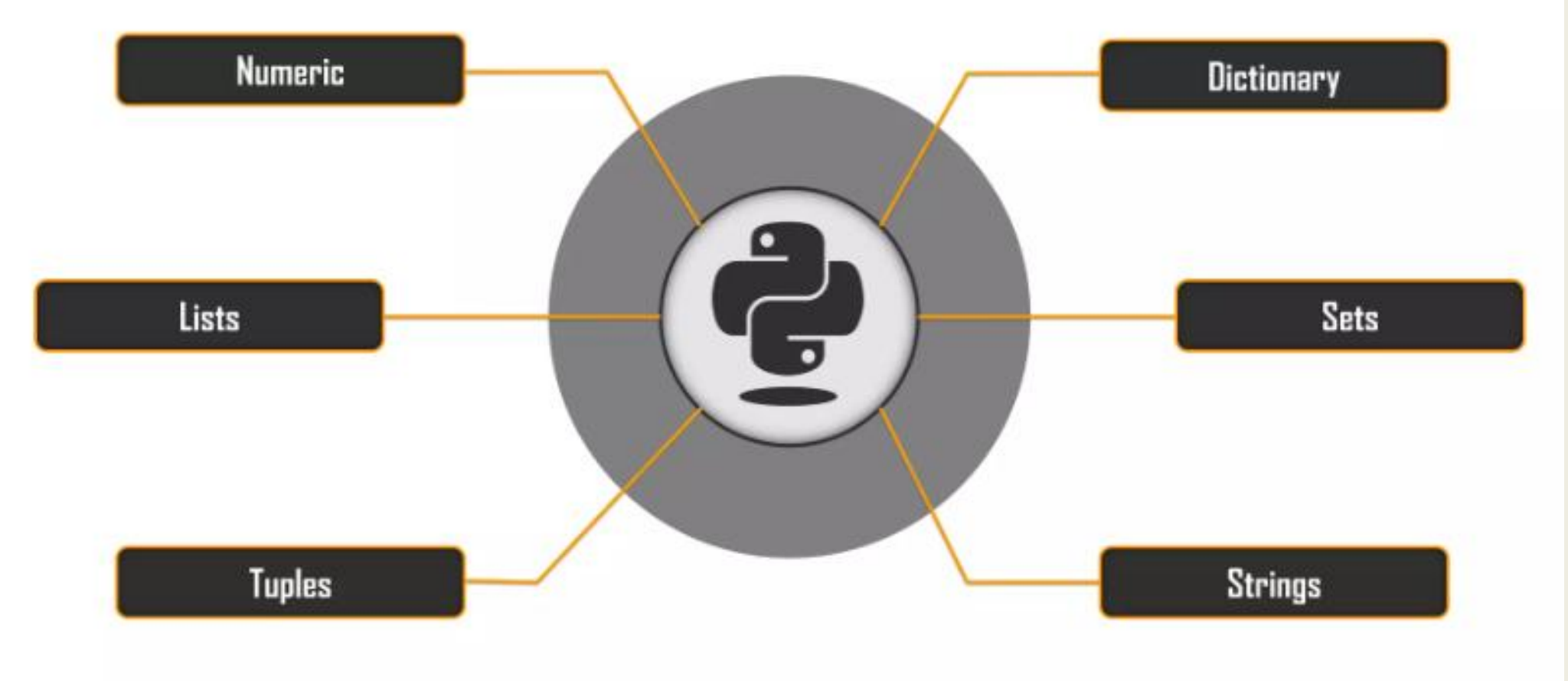
In [3]:
```
a = 10
b = 20
print('The addition of a and b is: %d' %(a+b))
```

```
The addition of a and b is: 30
```

Elements of Python

- A Python program is a sequence of **definitions** and **commands (statements)**
- Commands manipulate **objects**
- Each object is associated with a **Type**
- **Type:**
  - A set of values
  - A set of operations on these values
- **Expressions**: An operation (combination of objects and **operators**)

DATATYPES



1. Numeric

- Numeric Datatypes are used to store numerical values in the variables.
- These are **not mutable**.

Types	Examples
Integer	1, 5, 356
Float	3.142
Complex	10+3j

```
In [4]: int(2)
Out[4]: 2

In [5]: float(2.3)
Out[5]: 2.3

In [6]: int(asd)
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
~\AppData\Local\Temp\ipykernel_23324\1830309894.py in <module>
----> 1 int(asd)

NameError: name 'asd' is not defined
```

Type Conversion

- Conversion of value of one type to other
- We are used to int ↔ float conversion in Math
  - ✓Integer 2 is treated as float 2.0 when a real number is expected
  - ✓Float 2.5 is truncated as 2 for integer contexts
- Type names are used as type converter functions

```
In [8]: int(2.5)
Out[8]: 2

In [9]: float(2)
Out[9]: 2.0

In [10]: str(2333)
Out[10]: '2333'

In [ ]:
```

```
In [11]: age = input('How old are you ? ')

         How old are you ? 24

In [13]: print('In 5 years, your age will be', int(age) + 5)

         In 5 years, your age will be 29

In [ ]:
```

2. Lists

- Lists can have heterogeneous datatypes in them.
- These are **mutable**.
- Ordered sequence of values.
- Written as a sequence of comma-separated values between square brackets.

```
In [14]: lst = [1,2,3,4,5]

In [15]: lst
Out[15]: [1, 2, 3, 4, 5]

In [17]: type(lst)
Out[17]: list
```

More Operations on Lists

- L.append(x)
- L.extend(seq)
- L.insert(i, x)
- L.remove(x)
- L.pop(i)
- L.pop()
- L.index(x)
- L.count(x)
- L.sort()
- L.reverse()

x is any value, seq is a sequence value (list, string, tuple, …),
i is an integer value

3. Tuples

- A tuple consists of a number of values separated by commas.

```
In [18]: t = 'Intro to python' , 'Shreeharsha', 101

In [19]: t
Out[19]: ('Intro to python', 'Shreeharsha', 101)
```

- Empty and Singleton tuples
- Tuples can be nested
- Tuples can be concatenated, repeated, indexed and sliced.

```
In [20]: course = 'Python', 'Program', 101

In [21]: student = 'MachineLearning', 34,course

In [22]: empty = ()

In [27]: len(empty)
Out[27]: 0

In [30]: len(student)
Out[30]: 3

In [31]: len(course)
Out[31]: 3
```

4. Dictionaries

- Dictionaries are used to hold key:value pairs.
- These are mutable.

```
In [32]: mydict = {'Name' : 'Shreeharsha' , 'Surname' : 'Dash'}

In [33]: mydict
Out[33]: {'Name': 'Shreeharsha', 'Surname': 'Dash'}
```

Operation	Meaning
len(d)	Number of key:value pairs in d
d.keys()	List containing the keys in d
d.values()	List containing the values in d
k in d	True if key k is in d
d[k]	Value associated with key k in d
d.get(k, v)	If k is present in d, then d[k] else v
d[k] = v	Map the value v to key k in d (replace d[k] if present)
del d[k]	Remove key k (and associated value) from d
for k in d	Iterate over the keys in d

5. Sets

- An unordered collection with no duplicate elements
- Supports
  - membership testing
  - eliminating duplicate entries
  - Set operations: union, intersection, difference, and symmetric difference.

```
In [35]: A = set('acads')
         B = set('institute')

In [36]: A
Out[36]: {'a', 'c', 'd', 's'}

In [37]: B
Out[37]: {'e', 'i', 'n', 's', 't', 'u'}
```

6. Strings

- Strings in Python have type str
- They represent sequence of characters
  - ✓Python does not have a type corresponding to character.
- Strings are enclosed in single quotes(') or double quotes(“)
  - ✓Both are equivalent
- Backslash (\) is used to escape quotes and special characters

Indexing

- Strings can be indexed.
- Negative indices start counting from the right.
- Negatives indices start from -1.

```
In [38]: name = 'Acads'

In [39]: name[-1]
Out[39]: 's'

In [40]: name[-5]
Out[40]: 'A'

In [41]: name[-2]
Out[41]: 'd'
```

Slicing

- To obtain a substring
- s[start:end] means substring of s starting at index start and ending at index end-1
- s[0:len(s)] is same as s
- Both start and end are optional
  - If start is omitted, it defaults to 0
  - If end is omitted, it defaults to the length of string
- s[:] is same as s[0:len(s)], that is same as s

OPERATORS

- Arithmetic

+	-	*	//	/	%	**

- Comparison

==	!=	>	<	>=	<=

- Assignment

=	+=	-=	*=	//=	/=	%=	**=

- Logical

and	or	not

- Bitwise

&	|	^	~	>>	<<

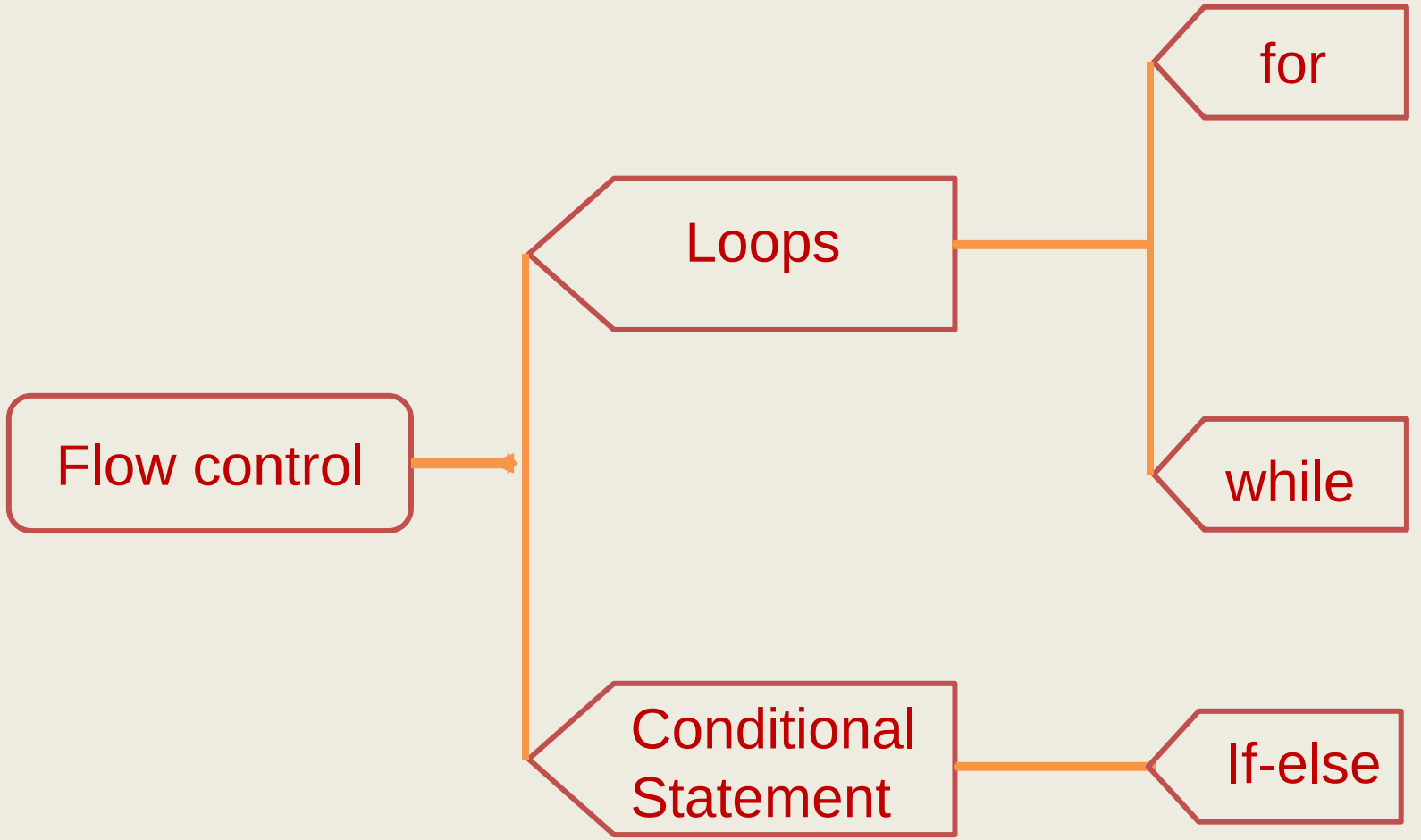
- Membership

in	not in

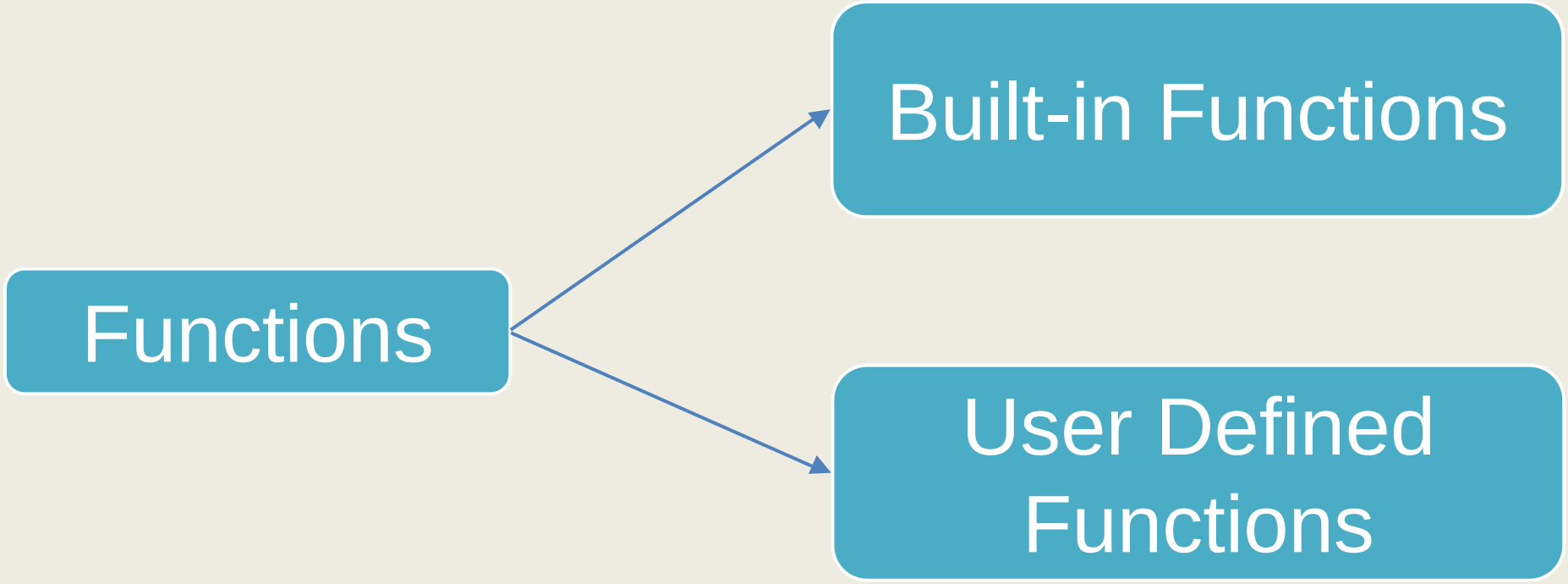
- Identity

is	is not

FLOW CONTROL



FUNCTIONS



FILE HANDLING

- Files are persistent storage
- Allow data to be stored beyond program lifetime
- The basic operations on files are
  - ✓ open, close, read, write
- Python treat files as sequence of lines
  - ✓sequence operations work for the data read from files

Python Libraries

Many popular Python toolboxes/libraries:

- NumPy
- SciPy
- Pandas
- SciKit-Learn

Visualization Libraries

- matplotlib
- Seaborn

Numpy

- Introduces objects for multidimensional arrays and matrices, as well as functions that allow to easily perform advanced mathematical and statistical operations on those objects

- Provides vectorization of mathematical operations on arrays and matrices which significantly improves the performance

- Many other python libraries are built on NumPy

Link: http://www.numpy.org/

SciPy

- collection of algorithms for linear algebra, differential equations, numerical integration, optimization, statistics and more

  - ✓ part of SciPy Stack
  - ✓ built on NumPy

Link: https://www.scipy.org/scipylib/

Pandas

- adds data structures and tools designed to work with table-like data (similar to Series and Data Frames in R)
- provides tools for data manipulation: reshaping, merging, sorting, slicing, aggregation etc.
- allows handling missing data

Link: http://pandas.pydata.org/

SciKit-Learn

- provides machine learning algorithms: classification, regression, clustering, model validation etc.

- built on NumPy, SciPy and matplotlib

Link: http://scikit-learn.org/

Matplotlib

- python 2D plotting library which produces publication quality figures in a variety of hardcopy formats
- a set of functionalities similar to those of MATLAB
- line plots, scatter plots, barcharts, histograms, pie charts etc.
- relatively low-level; some effort needed to create advanced visualization

Link: https://matplotlib.org/

Seaborn

- based on matplotlib
- provides high level interface for drawing attractive statistical graphics

Link: https://seaborn.pydata.org/

THANK YOU