



Mansoura University
Faculty of Computers and Information
Department of Information
Technology Second Semester-
2022-2023

- **Digital image processing** is the use of a digital computer to process digital images through



algorithms.

Noisy Image



Denoised Image



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- Noise Removal

Noisy Image



Denoised Image



•Edge Detection



•Contrast Adjustment



Low Contrast

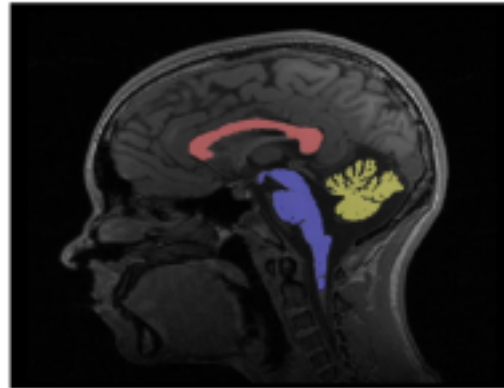
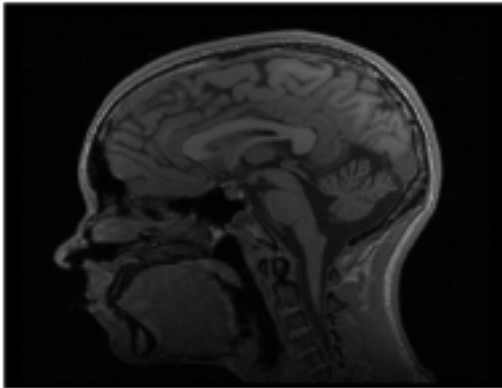


Original Contrast



High Contrast

- Region detection and segmentation



- Image Compression



Original, 2.1MB



JPEG Compression, 308KB (15%)

- Image Inpainting

Damaged Image



Restored Image



real-time Computer Vision which supports Deep Learning frameworks that aids in image and video processing. In Computer Vision, the principal element is to extract the pixels from the image to study the objects and thus understand what it contains. Below are a few key aspects that Computer Vision seeks to recognize in the photographs:

- ❖ **Object Detection:** The location of the object.
- ❖ **Object Recognition:** The objects in the image, and their positions.
- ❖ **Object Classification:** The broad category that the object lies in.
- ❖ **Object Segmentation:** The pixels belonging to that object.

🌐 Python is a general purpose programming language created by Guido Van Rossum. Python is most praised for its elegant syntax and readable code, if you are just beginning your programming career python suits you best. With python you can do everything from GUI development, Web application, System administration tasks, Financial calculation, Data Analysis, Visualization and list goes on.

Python applications:

- ❖ data science
- ❖ developing applications with graphical UIS
- ❖ writing network-based software
- ❖ interacting with database
- ❖ Scrape data from website
- ❖ Game Development

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▪ **Python is interpreted language.**

Yes, python is interpreted language, when you run python program an interpreter will parse python program line by line basis, as compared to compiled languages like C or C++, where compiler first compiles the program and then start running.

Python is Dynamically Typed.

In python you don't need to define variable data type ahead of time, python automatically guesses the data type

of the variable based on the type of value it contains.

□ For e.x `myvar = "Hello Python"`

In the above line "Hello Python" is assigned to `myvar` , so the type of `myvar` is **string**. Note that in python you do not need to end a statement with a semicolon (;) . Suppose little bit later in the program we assign `myvar` a value of 1.

□ For e.x `myvar = 10` so `myvar` is of type **int**.

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Python is strongly typed.

If you have programmed in php or javascript. You may have noticed that they both convert data of one data type to other data type automatically.

For example in JavaScript

□ `1 + "2"` will be "12", here 1 will be converted to string and concatenated to "2" , which results in "12" , which is a string.

In Python automatic conversions are not allowed,

□ so: `1 + "2"` will produce an error.

▪ **Write less code and do more.**

Python codes are usually 1/3 or 1/5 of the java code. It means we can write less code in Python to achieve the

same thing as in Java.

In python to read a file you only need 2 lines:

❏ with open("myfile.txt") as f:

❏ print(f.read()) 10

🏠 Step I: login python website.

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www.python.org
Welcome to Python.org
The official home of the Python Programming Language.

Search python.org

Downloads
Windows - Mac OS X - Python 3.7.9 - Python 3.8.3 - Python 3.8.2

Python For Beginners
Python for Programmers - Books - Editors - ...

Tutorial
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Documentation
Python's documentation, tutorials, and guides are constantly ...

Python Docs
Tutorial - Standard Library - Installing Python Modules - ...

Python Software Foundation
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python More images

Python
High-level programming language

Python is an interpreted, high-level and general-purpose programming language. Created by Guido van Rossum and first released in 1991, Python's design philosophy emphasizes code readability with its notable use of significant whitespace. [Wikipedia](#)

Typing discipline: Duck, dynamic, gradual (since 3.5)

Stable release: 3.8.6 / 24 September 2020; 6 days ago

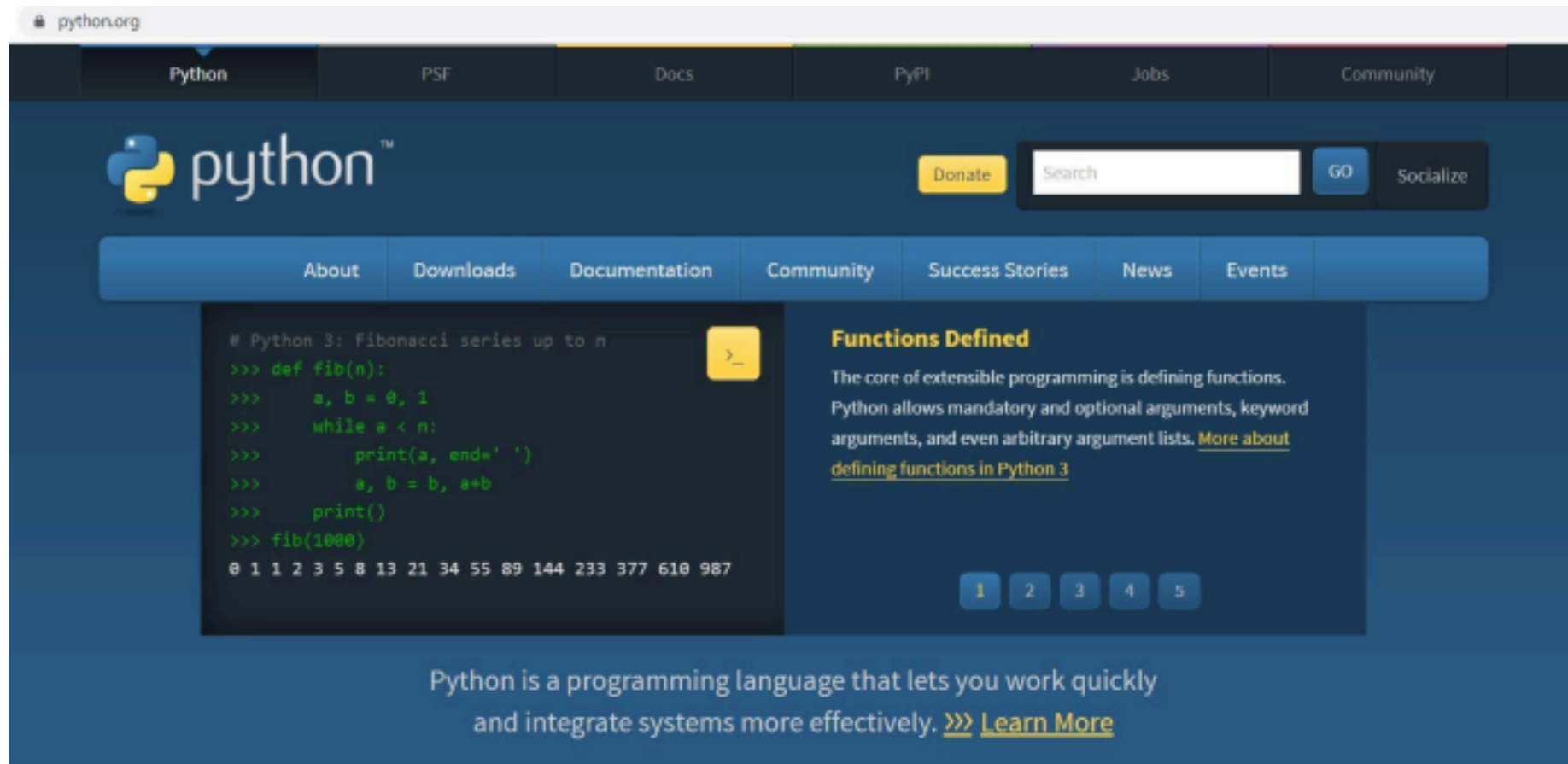
Preview release: 3.9.0rc2 / 17 September 2020; 13 days ago

Designed by: Guido van Rossum

OS: Linux, macOS, Windows Vista (and newer) and more

||

👁 Step2: scroll down in page.



The image shows the Python.org homepage. At the top, there is a navigation bar with links for Python, PSF, Docs, PyPI, Jobs, and Community. Below this is a large blue banner featuring the Python logo and the word "python" in a large, white, sans-serif font. To the right of the logo is a yellow "Donate" button, a search bar with a "GO" button, and a "Socialize" button. Below the banner is a horizontal row of blue buttons for "About", "Downloads", "Documentation", "Community", "Success Stories", "News", and "Events". The main content area is divided into two columns. The left column contains a code editor with a dark background, showing a Python script for calculating the Fibonacci series up to n. The right column has a section titled "Functions Defined" with a brief explanation of functions in Python and a link to "More about defining functions in Python 3". At the bottom of the page, there is a blue banner with the text "Python is a programming language that lets you work quickly and integrate systems more effectively. >>> [Learn More](#)".

python.org

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```
# Python 3: Fibonacci series up to n
>>> def fib(n):
>>>     a, b = 0, 1
>>>     while a < n:
>>>         print(a, end=' ')
>>>         a, b = b, a+b
>>>     print()
>>> fib(1000)
0 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987
```

Functions Defined

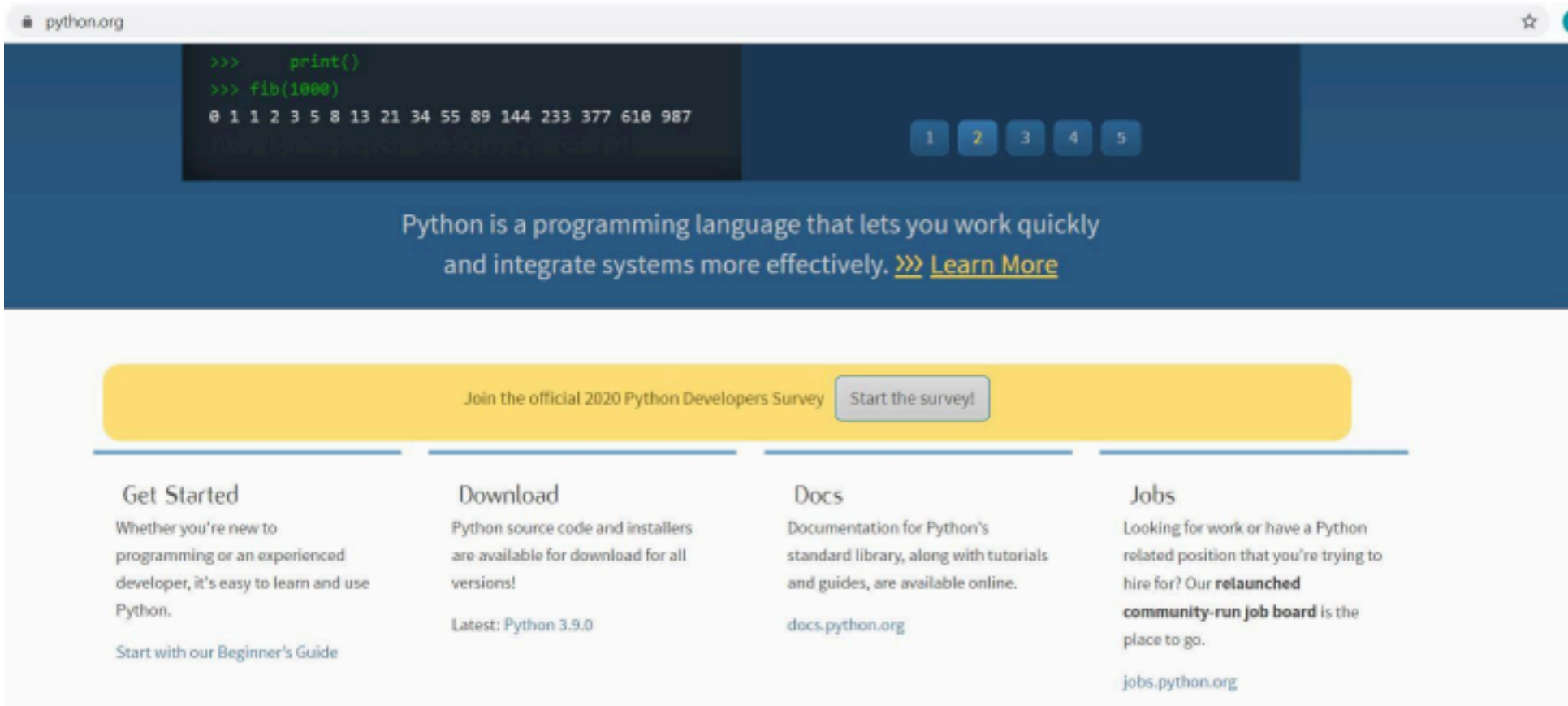
The core of extensible programming is defining functions. Python allows mandatory and optional arguments, keyword arguments, and even arbitrary argument lists. [More about defining functions in Python 3](#)

1 2 3 4 5

Python is a programming language that lets you work quickly and integrate systems more effectively. >>> [Learn More](#)

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🌐 Step3: click on all downloads.



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🌐 Step4: choose all releases.

About	Downloads	Documentation	Community	Success Stories	News
Applications	All releases	Docs	Community Survey	Arts	Python News
Quotes	Source code	Audio/Visual Talks	Diversity	Business	PSF Newsletter
Getting Started	Windows	Beginner's Guide	Mailing Lists	Education	Community News
Help	Mac OS X	Developer's Guide	IRC	Engineering	PSF News
Python Brochure	Other Platforms	FAQ	Forums	Government	PyCon News
	License	Non-English Docs	PSF Annual Impact Report	Scientific	
Events	Alternative Implementations	PEP Index	Python Conferences	Software Development	Contributing
Python Events		Python Books	Special Interest Groups		Developer's Guide
User Group Events		Python Essays	Python Logo		Issue Tracker
Python Events Archive			Python Wiki		python-dev list
User Group Events Archive			Merchandise		Core Mentorship
Submit an Event			Community Awards		Report a Security Issue
			Code of Conduct		

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🔗 Step5: .choose python version (3.7.6)

python.org/downloads/

3.6	security	2016-12-23	2021-12-23	PEP 494
3.5	end-of-life	2015-09-13	2020-09-05	PEP 478
2.7	end-of-life	2010-07-03	2020-01-01	PEP 373

Looking for a specific release?

Python releases by version number:

Release version	Release date	Click for more	
Python 3.9.0	Oct. 5, 2020	Download	Release Notes
Python 3.8.6	Sept. 24, 2020	Download	Release Notes
Python 3.5.10	Sept. 5, 2020	Download	Release Notes
Python 3.7.9	Aug. 17, 2020	Download	Release Notes
Python 3.6.12	Aug. 17, 2020	Download	Release Notes
Python 3.8.5	July 20, 2020	Download	Release Notes
Python 3.8.4	July 13, 2020	Download	Release Notes
Python 3.8.3	June 28, 2020	Download	Release Notes

View older releases

🕒 Step6: choose your suitable installer for your computer.



 Step7: start install.





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 Step 10: finish installation.



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 Step I I: try the IDLE python 3.7.6



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 Step I: login in pycharm website.



🔒 Step2: click on download.



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 Step3: click on other versions link.



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 Step4: choose pycharm version 2019.3.3.



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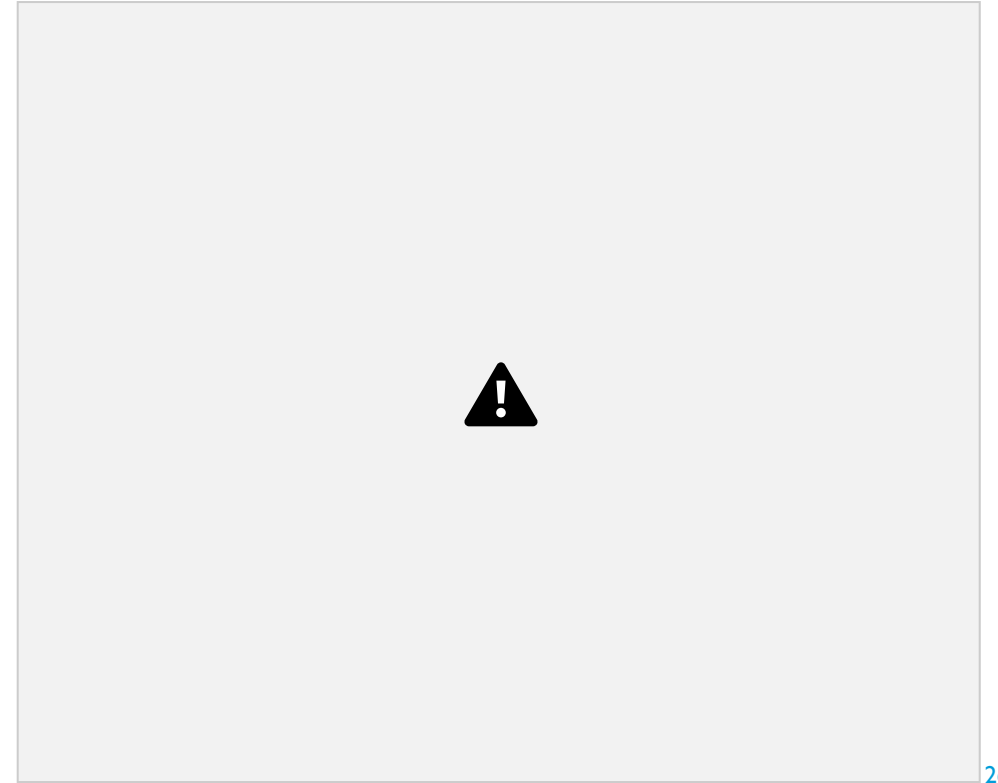
 Step5: start installation.

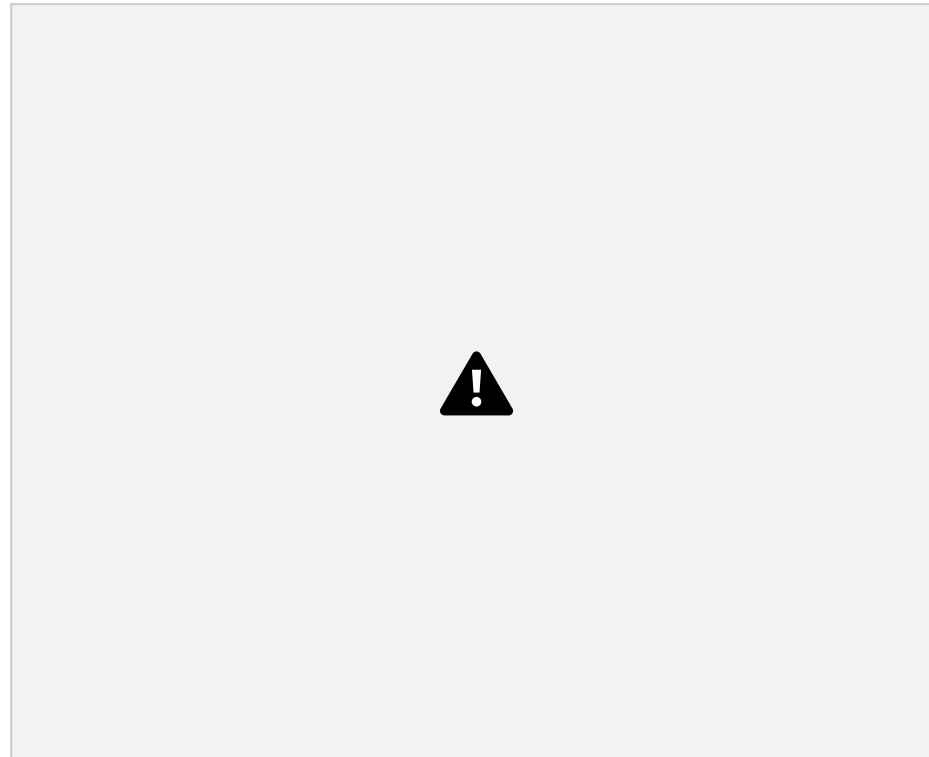


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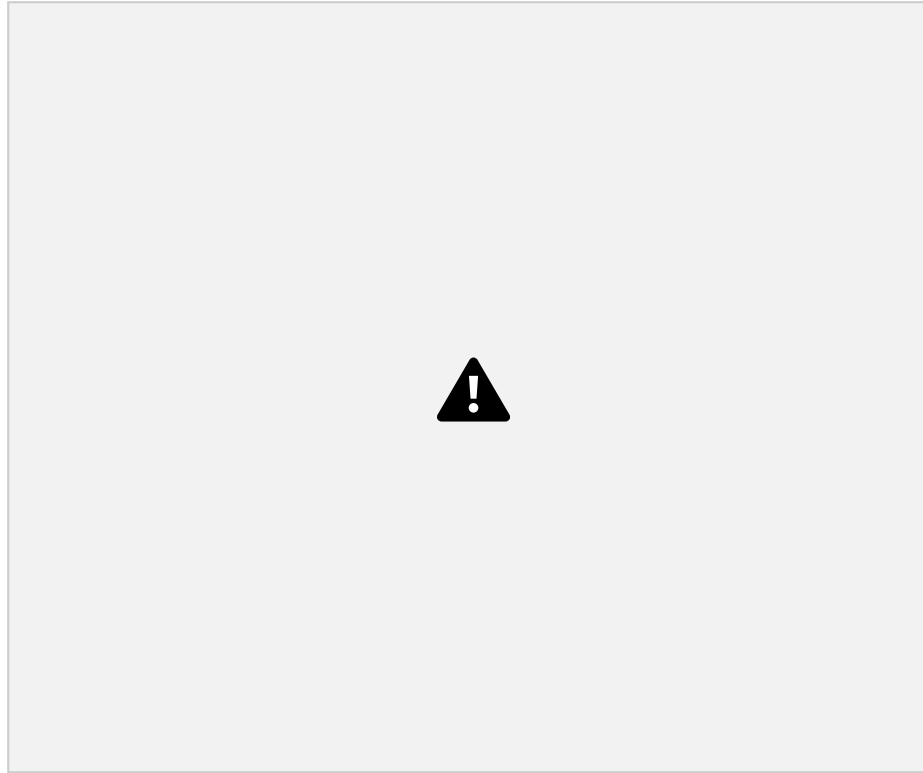
 Step6: complete the installation.

 Step7: complete the installation.

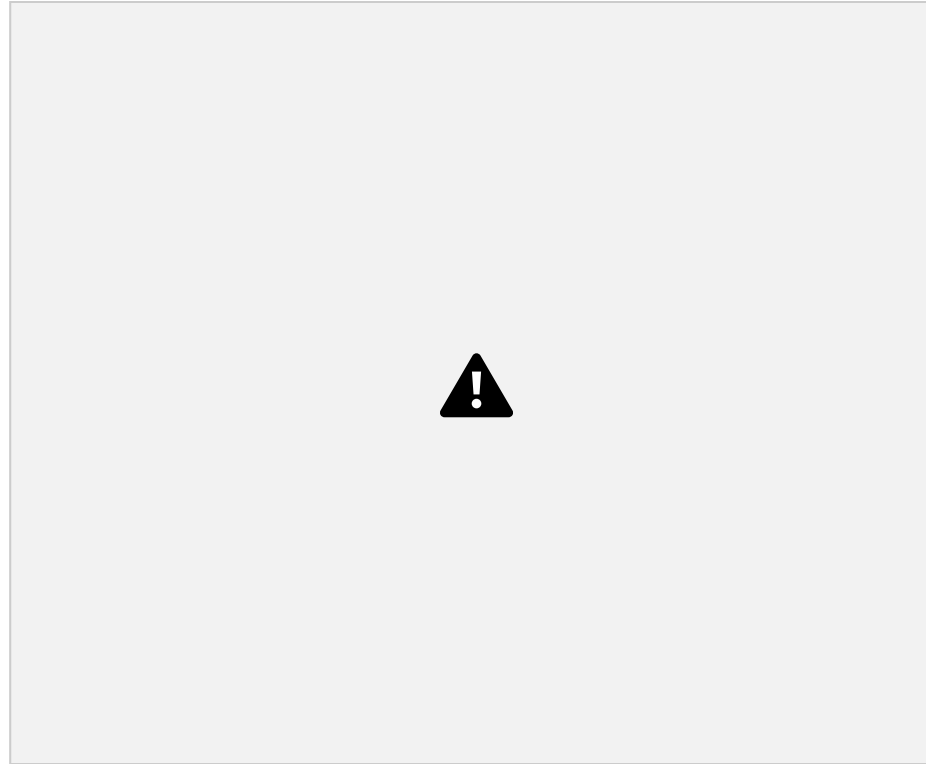




 Step8: complete the installation.



 Step9: complete the installation.



 Step 10: finish the installation.



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- Numpy is a very popular library for easily creating single, multidimensional array and matrices. It has a large collection of the mathematical function for performing an operation on these arrays.

- **How to Install Numpy in Pycharm ?**

Step 1: Go to the File and click on Settings.

Step 2: You will see > Project: your_project_name.

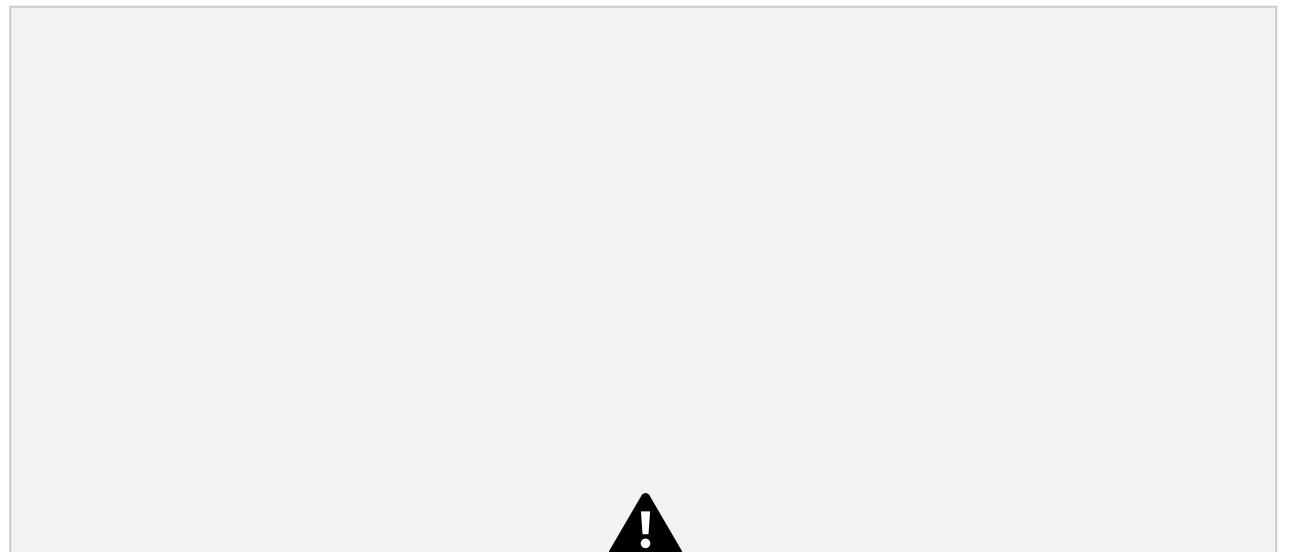
Click on it. You will see two option one is **Project Interpreter** and other **Project Structure**.



Step 3: Click on the Project Interpreter.

You will see all the packages installed.

🔔 Step 4: You will see the + button. Click on it and search for the numpy in the search field. You will see the numpy package as the left side and its description, version on the right side.



🔧 Step 5: Selecting numpy click on the Install Package on the left bottom. It will install the packages. If you are unable to install and got an error. Then go to terminal first upgrade pip using the command.



Example (1) Example (2)





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- **OpenCV** is a huge open-source library for computer vision, machine learning, and image processing. OpenCV supports a wide variety of programming languages like Python, C++, Java, etc. It can process images and videos to identify objects, faces, or even the handwriting of a human. When it is integrated with various libraries, such as Numpy which is a highly optimized library for numerical operations.
- The first OpenCV version was 1.0. OpenCV is released under a BSD license and hence it's free for both **academic** and **commercial** use.

- In this course, OpenCV version was 4.0.
- Packages for standard desktop environments (Windows, macOS, almost any GNU/Linux distribution) Option 1 - Main modules package: `pip install opencv-python`
Option 2 - Full package (contains both main modules and contrib/extra modules): `pip install opencv-contrib`

python 36

- 🔗 Follow the same previous steps in installing the numpy library but choose **opencv-python library**.
- 🔗 Another way to install opencv library, use the commend line

```
pip install opencv-python  
pip install opencv-contrib-python
```

🔧 To check if OpenCV is correctly installed, just run the following commands to perform a version check:

```
>>>import cv2  
>>>print(cv2.__version__)
```

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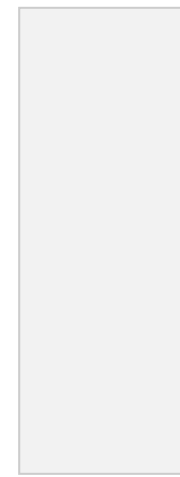
❖ The imread() function loads image from the specified file and returns it. The syntax is:

cv2.imread(filename, mode of image read)

filename: Name of the file to be loaded

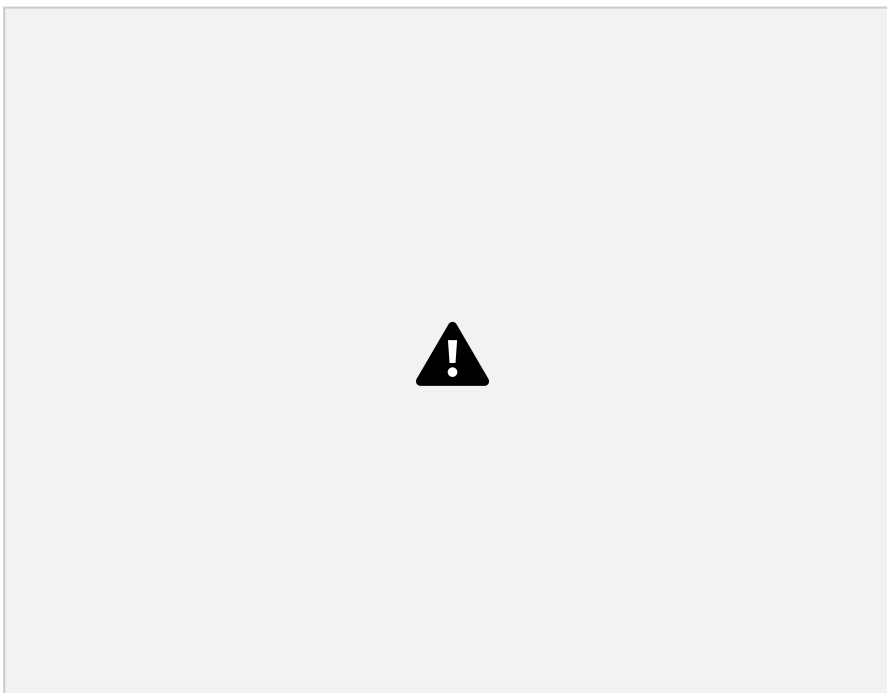
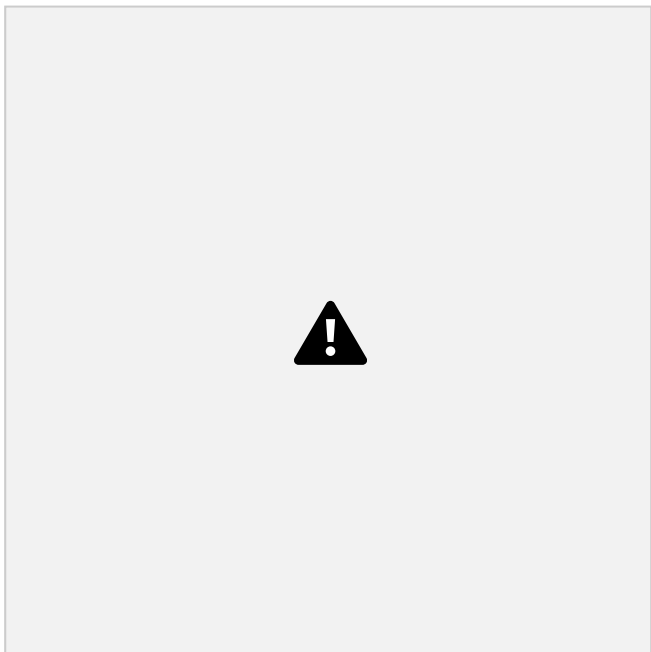
Mode of image read:





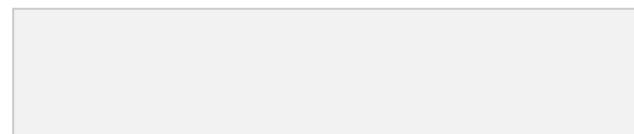
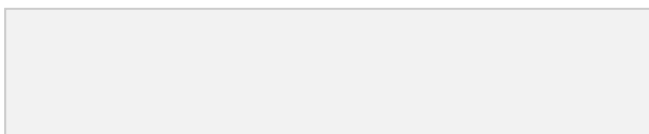
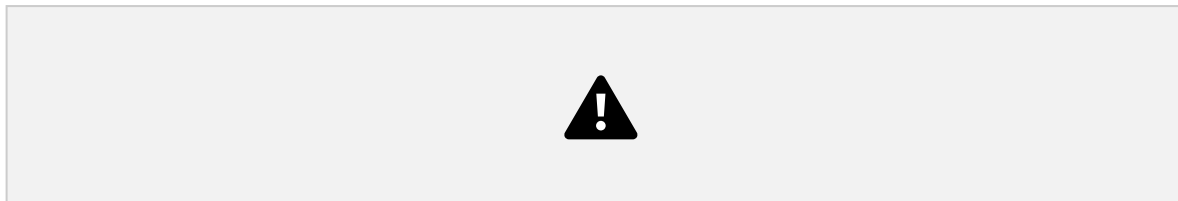
4
|

 Code: Output:



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Example(1): Code Example(2): Code





Output: Output:



 Example(3): Code Example(4): Code



 Output:



Output:

 Save image in project or in another location in your computer.

