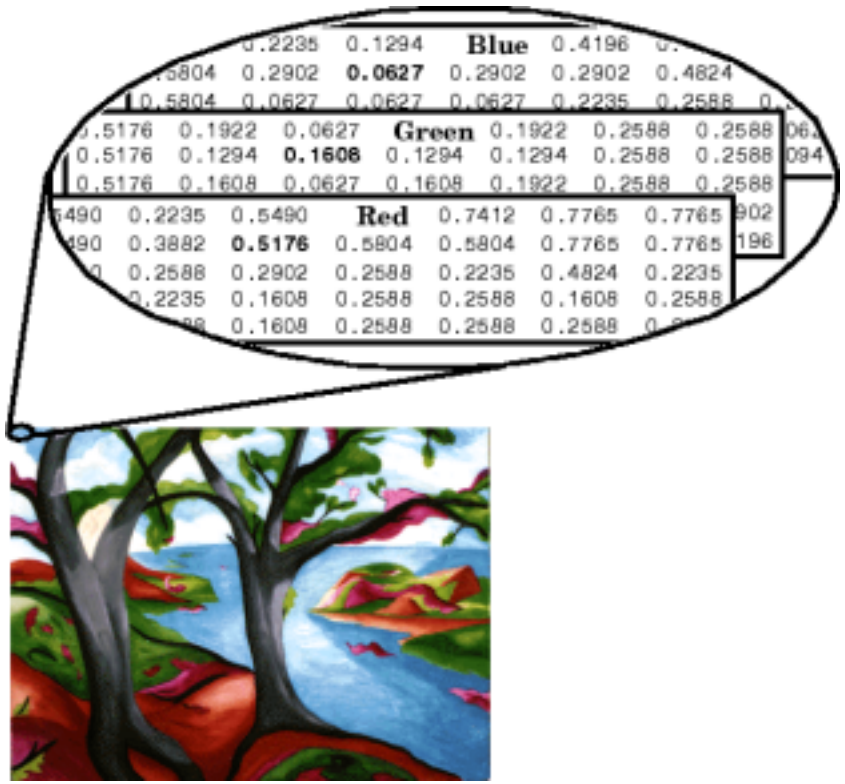
Mansoura University
Faculty of Computers and Information
Department of Information Technology Second Semester-
2022-2023

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



- **Noise Removal**

Noisy Image

Denoised Image

- **Edge Detection**

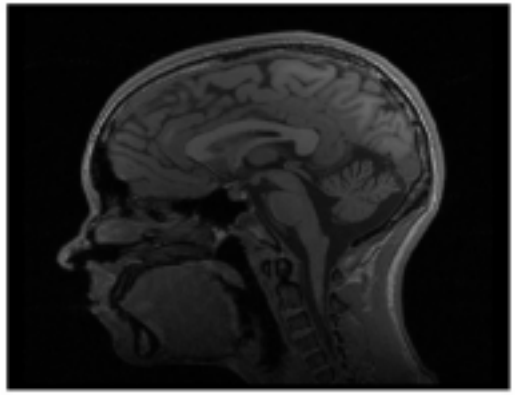
- **Contrast Adjustment**

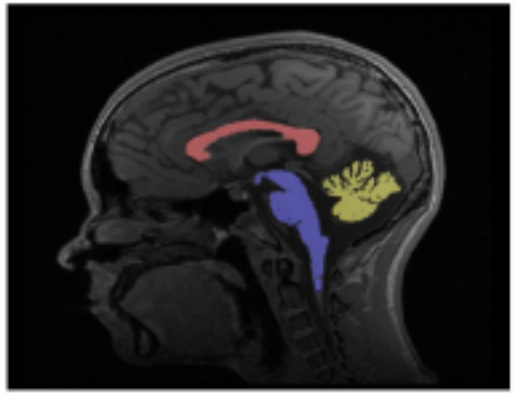
Low Contrast

Original Contrast

High Contrast

- **Region detection and segmentation**





- **Image Compression**

Original, 2.1MB

JPEG Compression, 308KB (15%)

- **Image Inpainting**

Damaged Image

Restored Image

- [OpenCV (Open Source Computer Vision)](), a cross-platform and free to use library of functions is based on

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

- **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**.

- **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.**

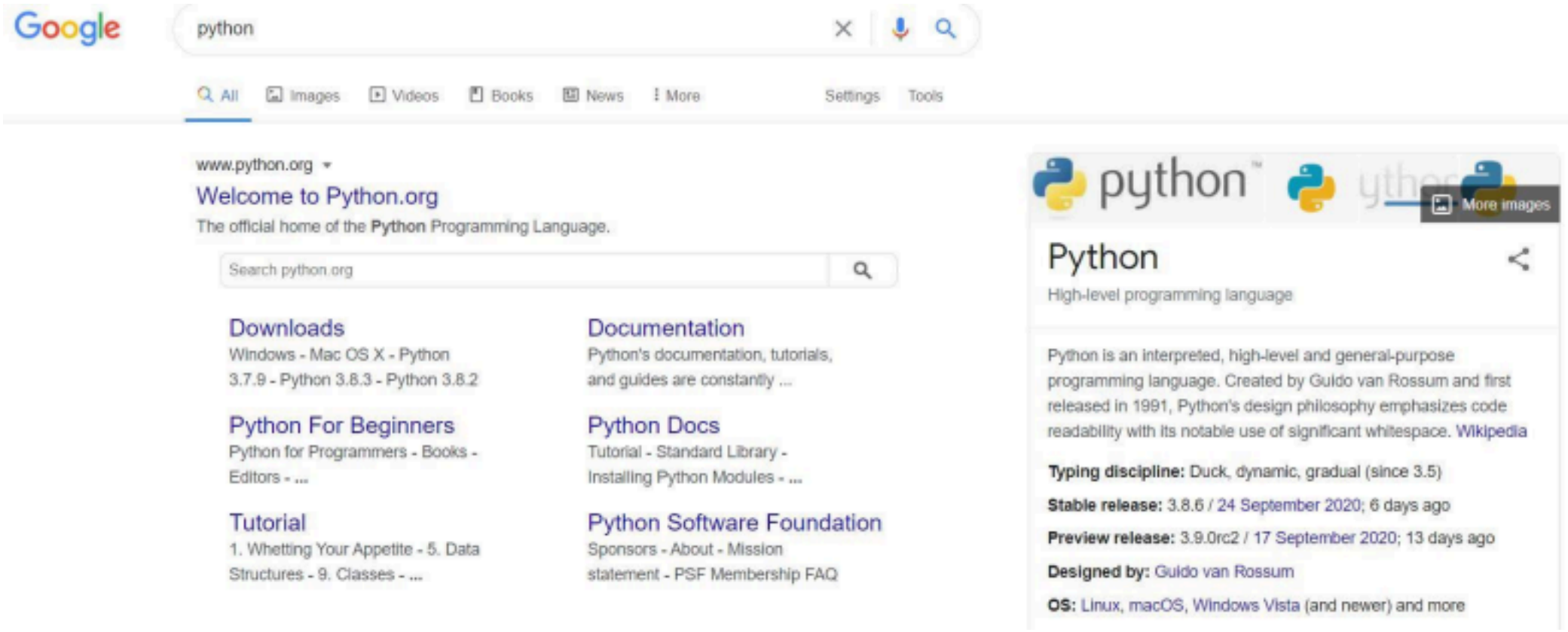
  Python codes are usually 1/3 or 1/5 of the java code. It means we can write less code in Python to achieve the

same thing as in Java.

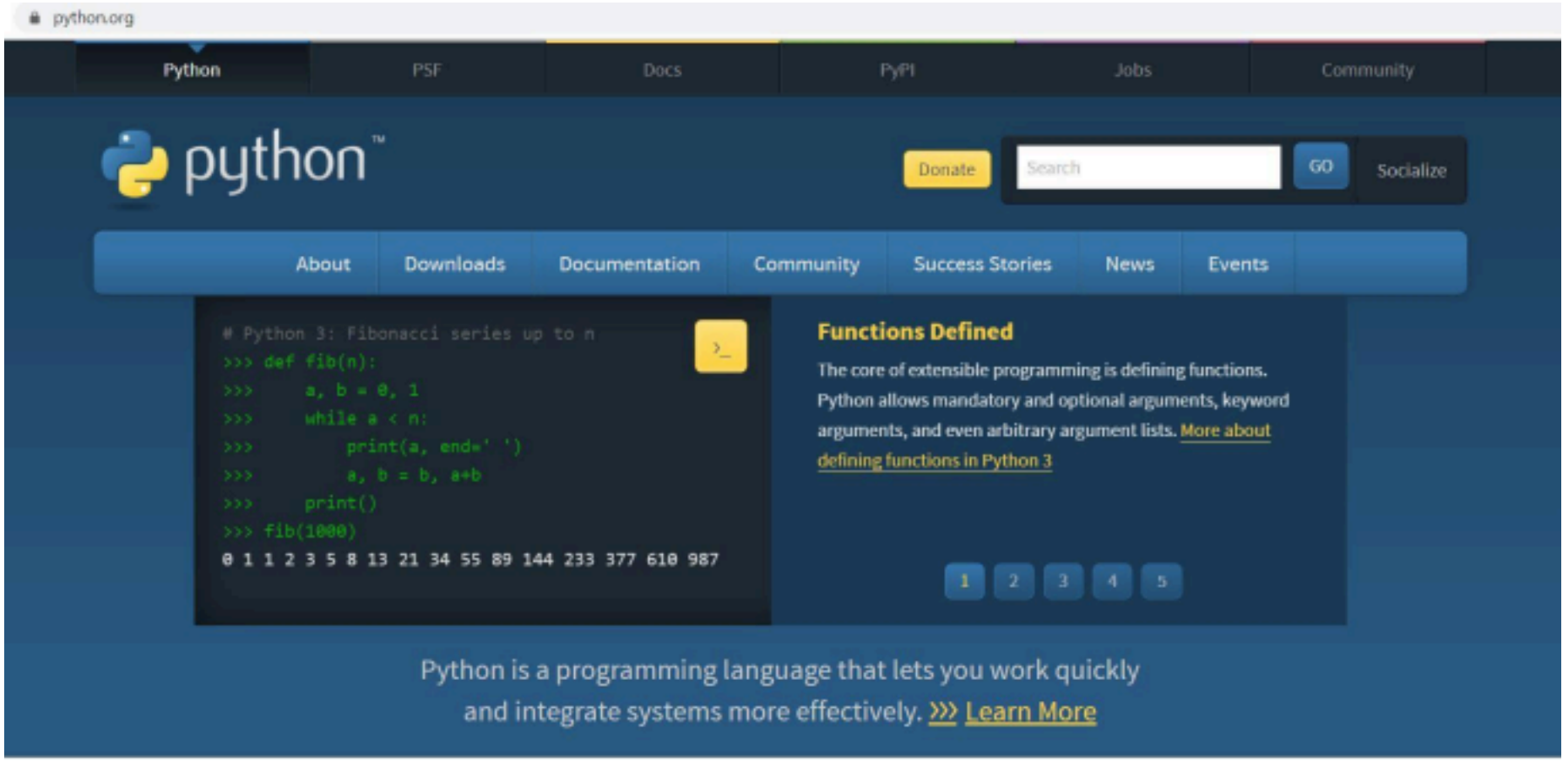
In python to read a file you only need 2 lines:

- with open("myfile.txt") as f:
- print(f.read())

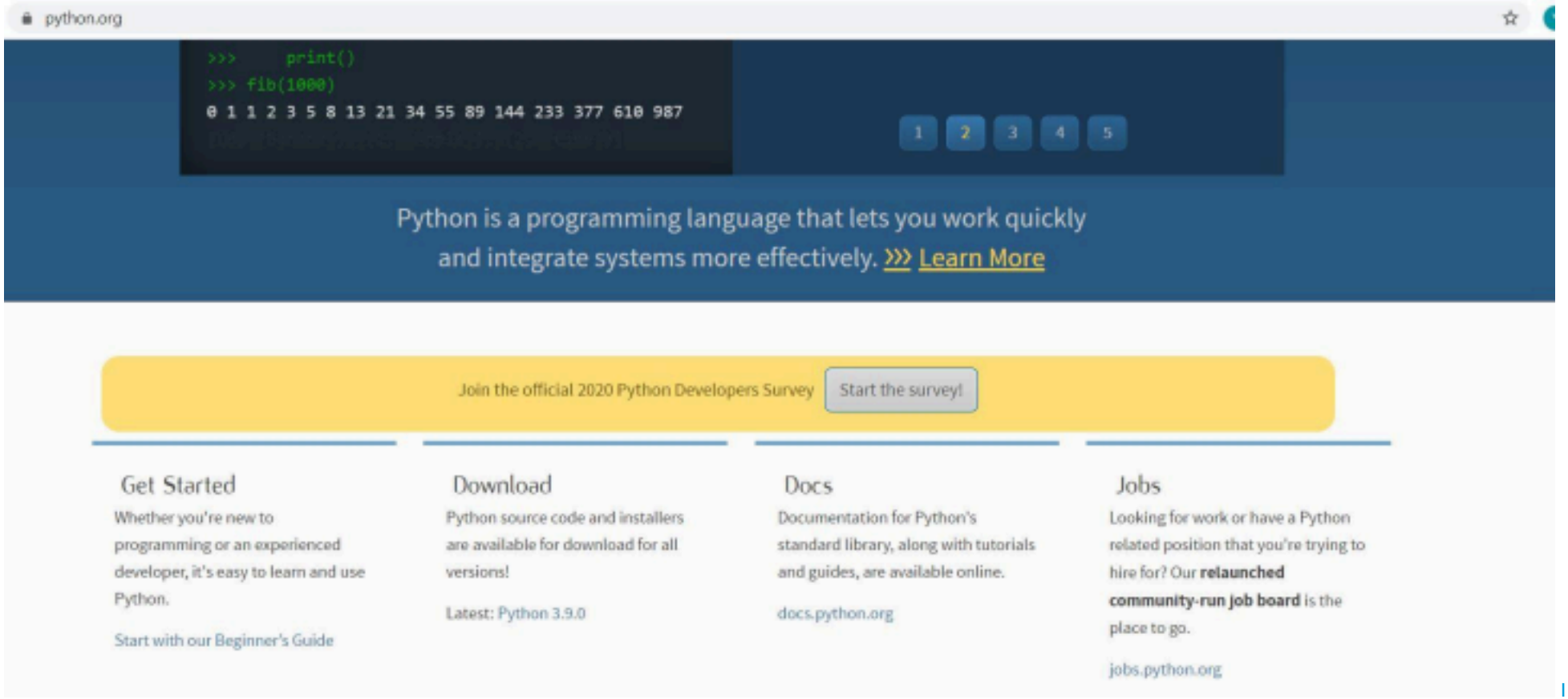
- Step1: login python website.



- Step2: scroll down in page.

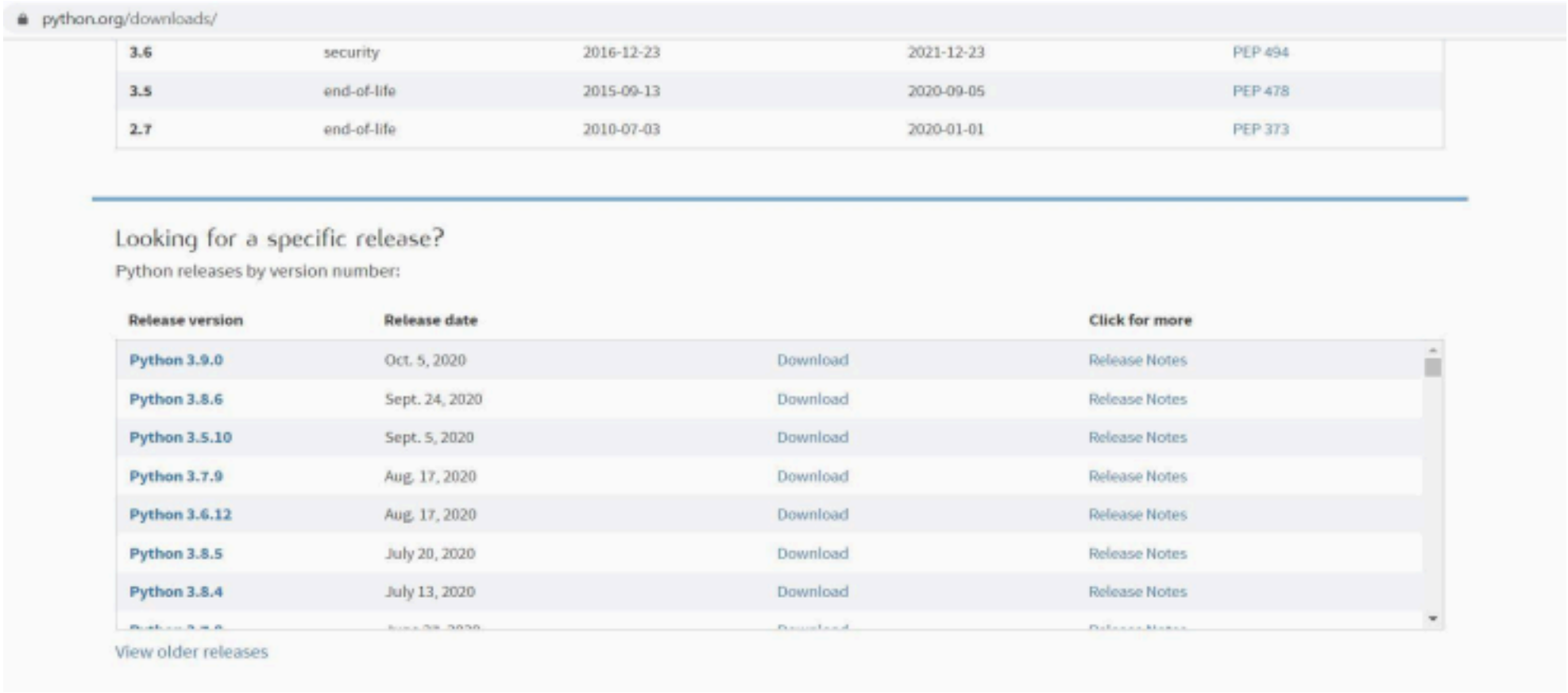


- Step3: click on all downloads.

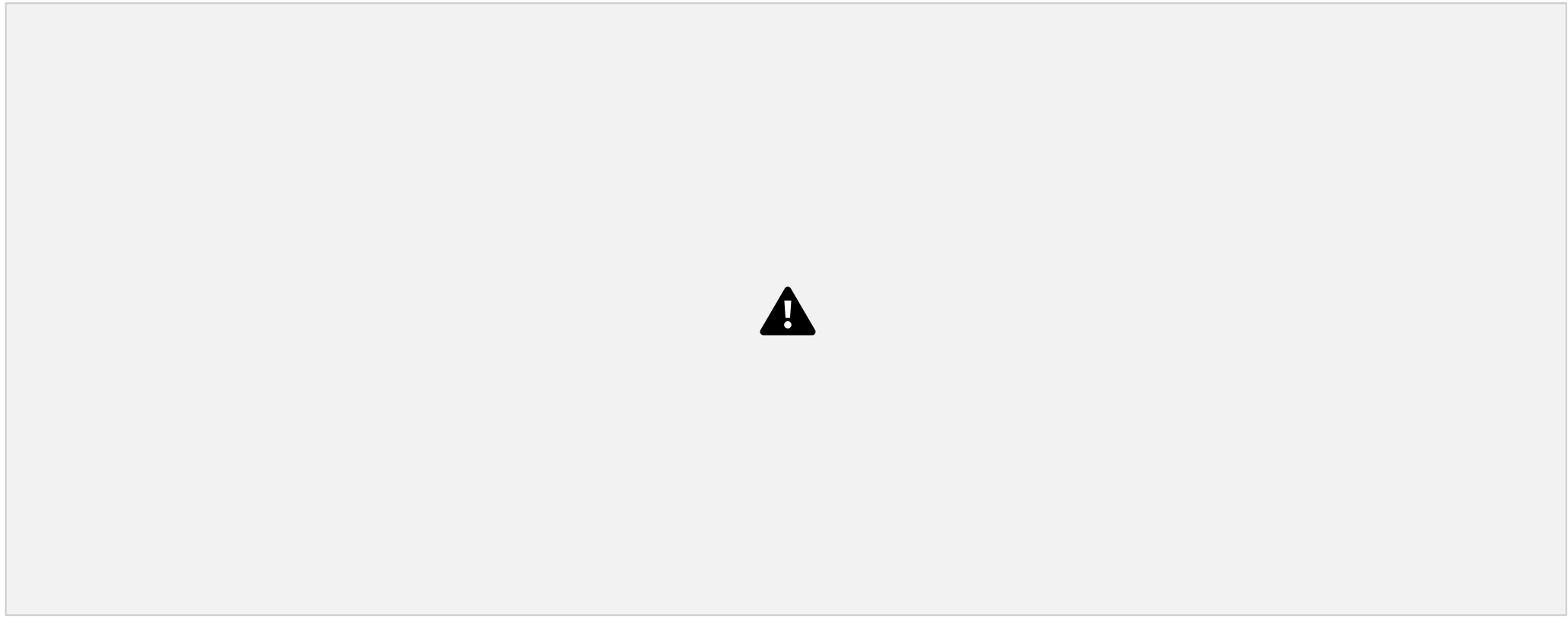


- Step4: choose all releases.

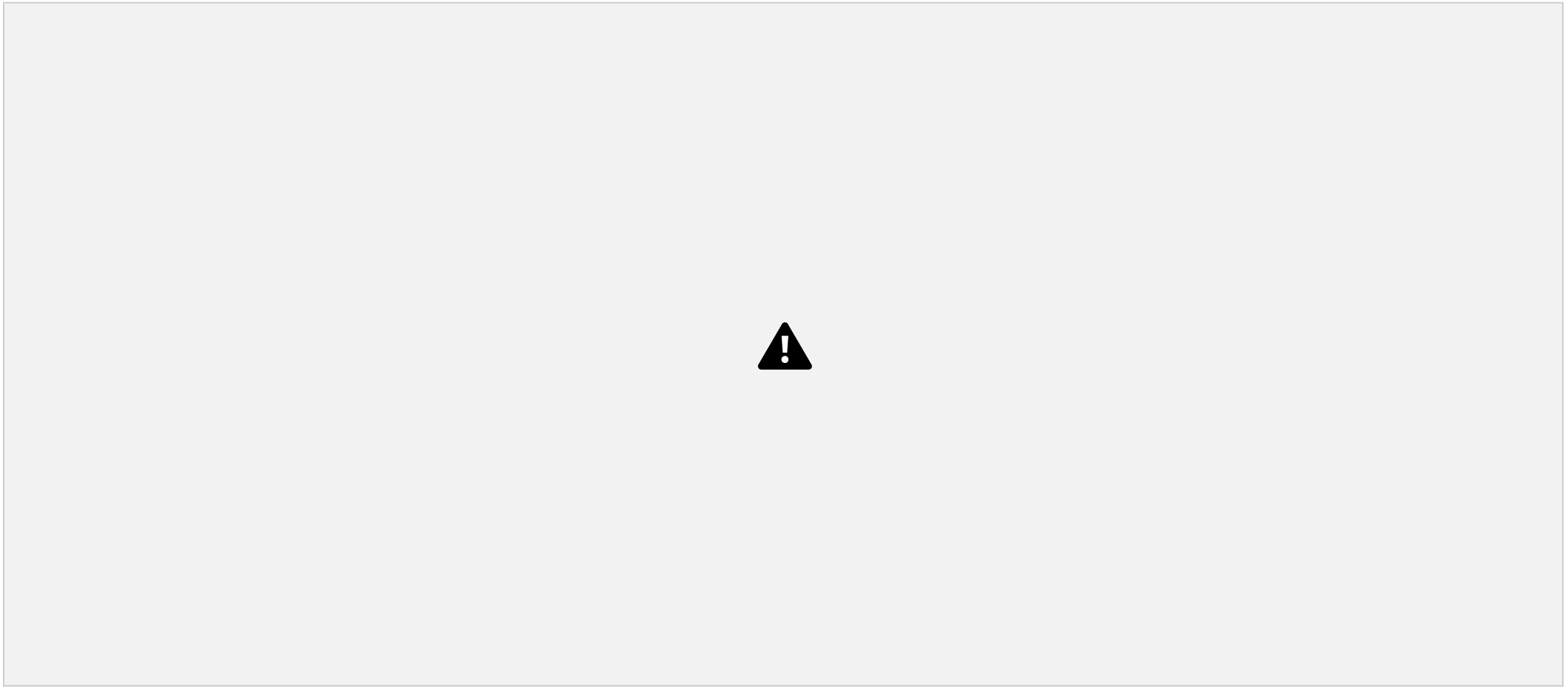
- Step5: .choose python version (3.7.6)



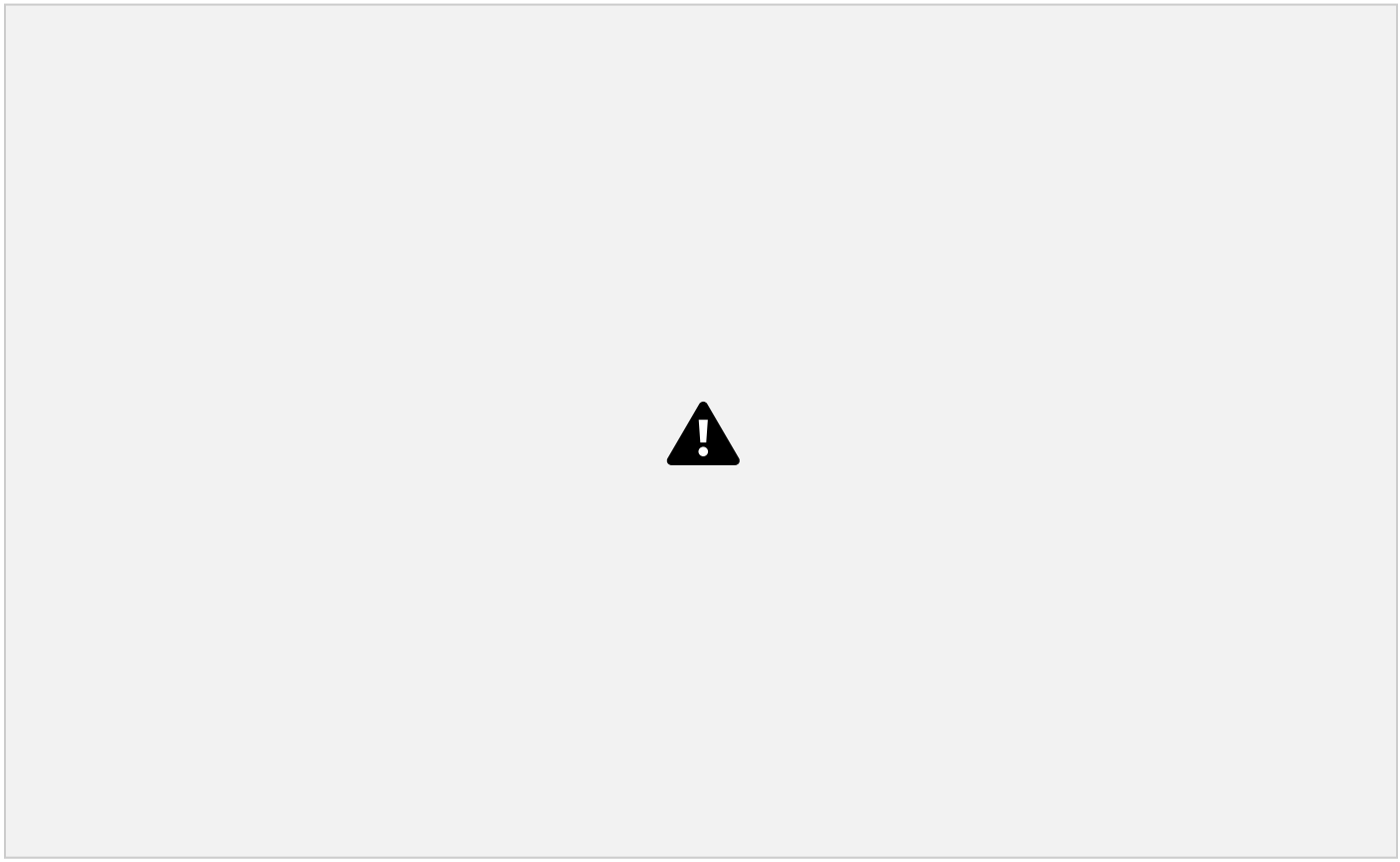
- Step6: choose your suitable installer for your computer.



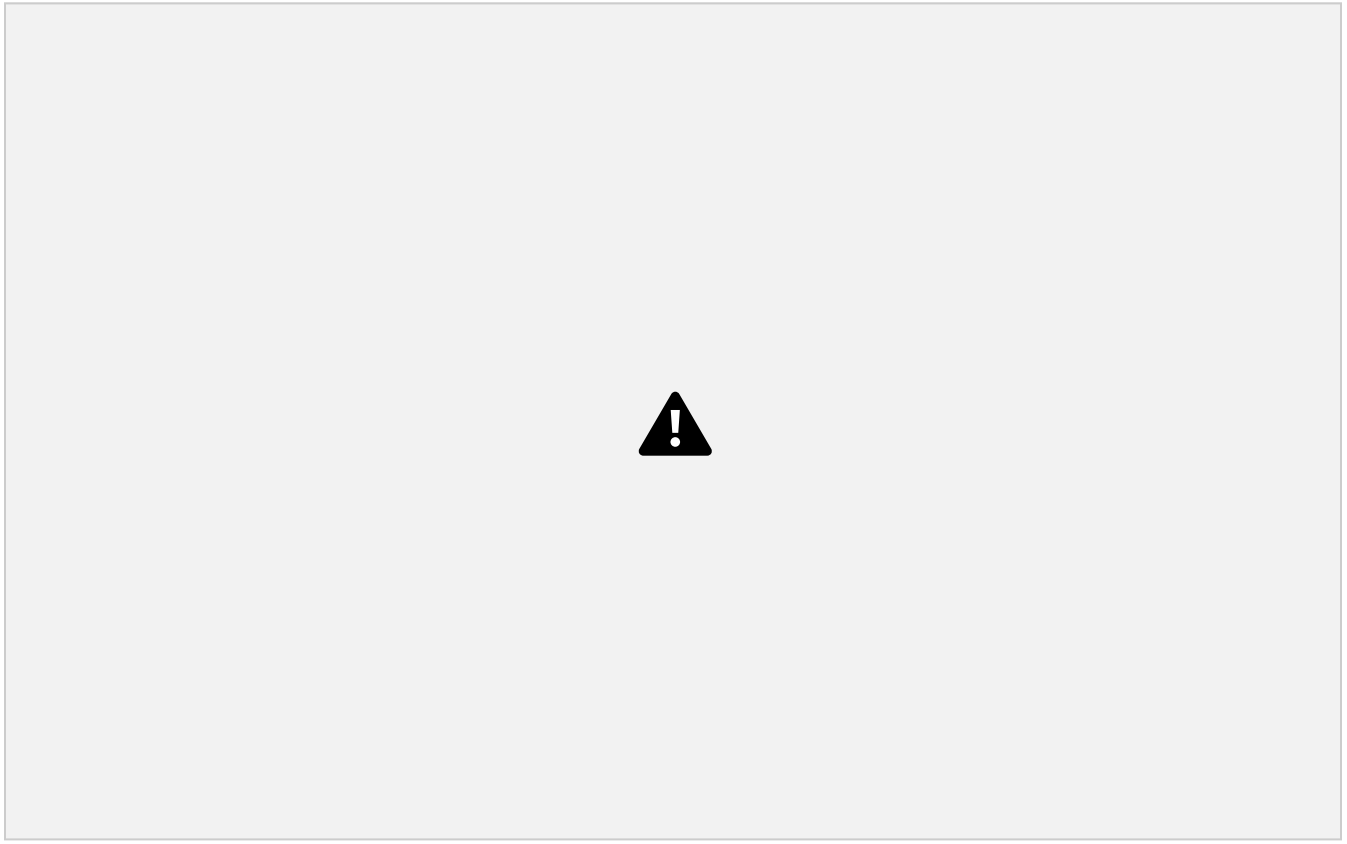
- Step7: start install.



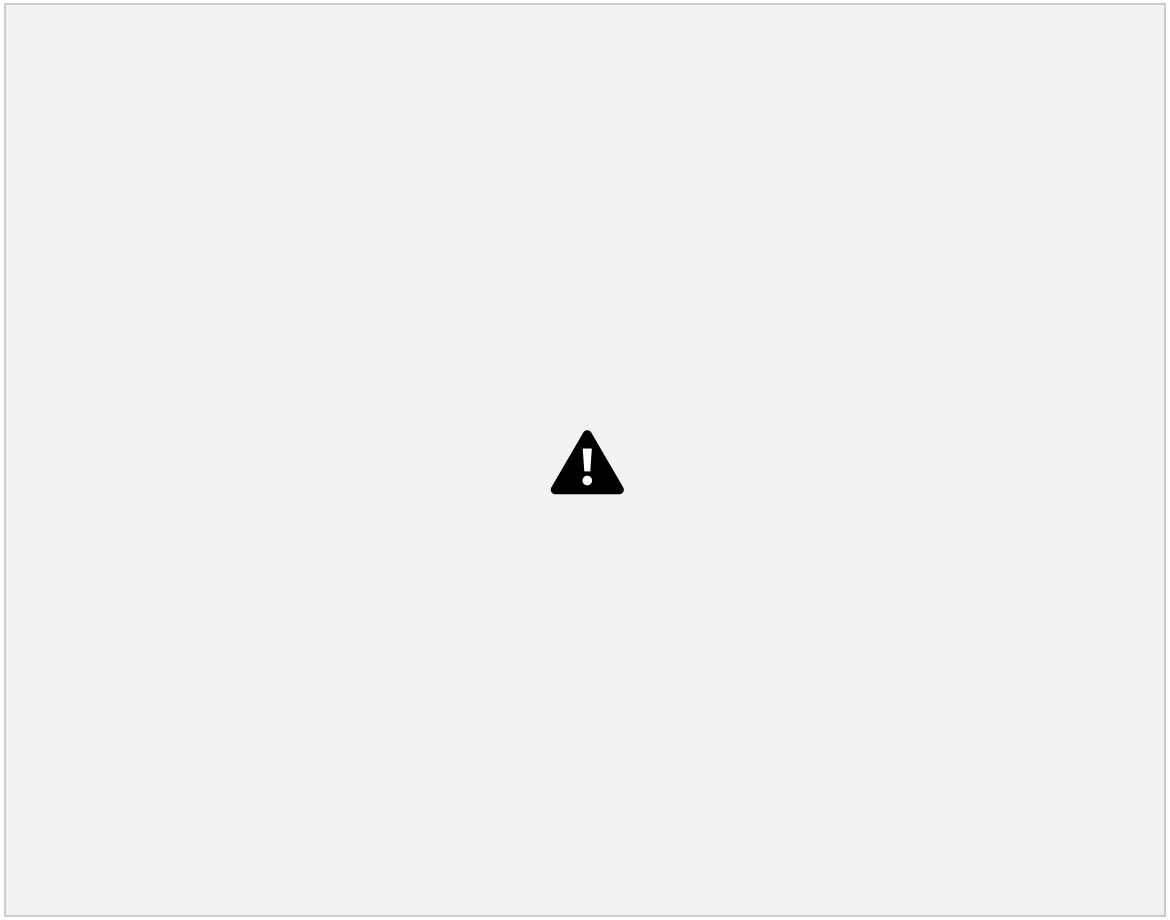
Step8: .setup progress



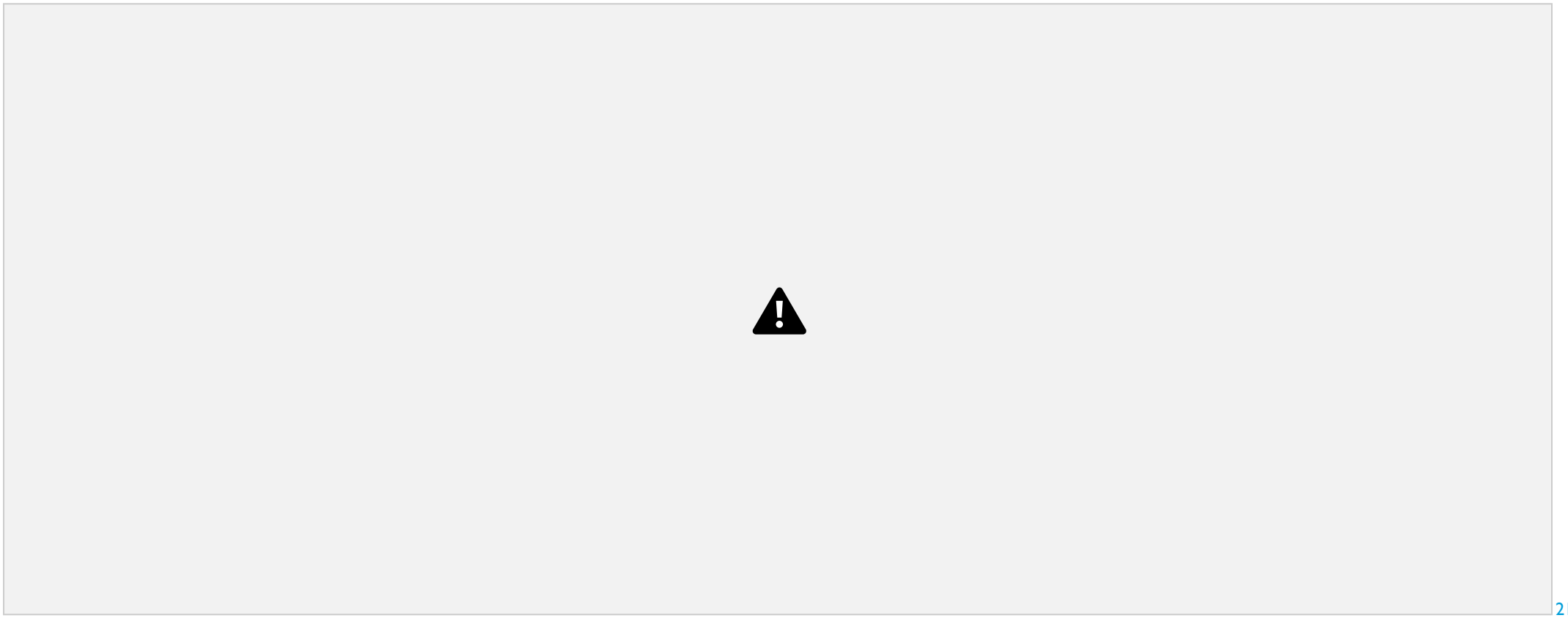
Step10: finish installation.



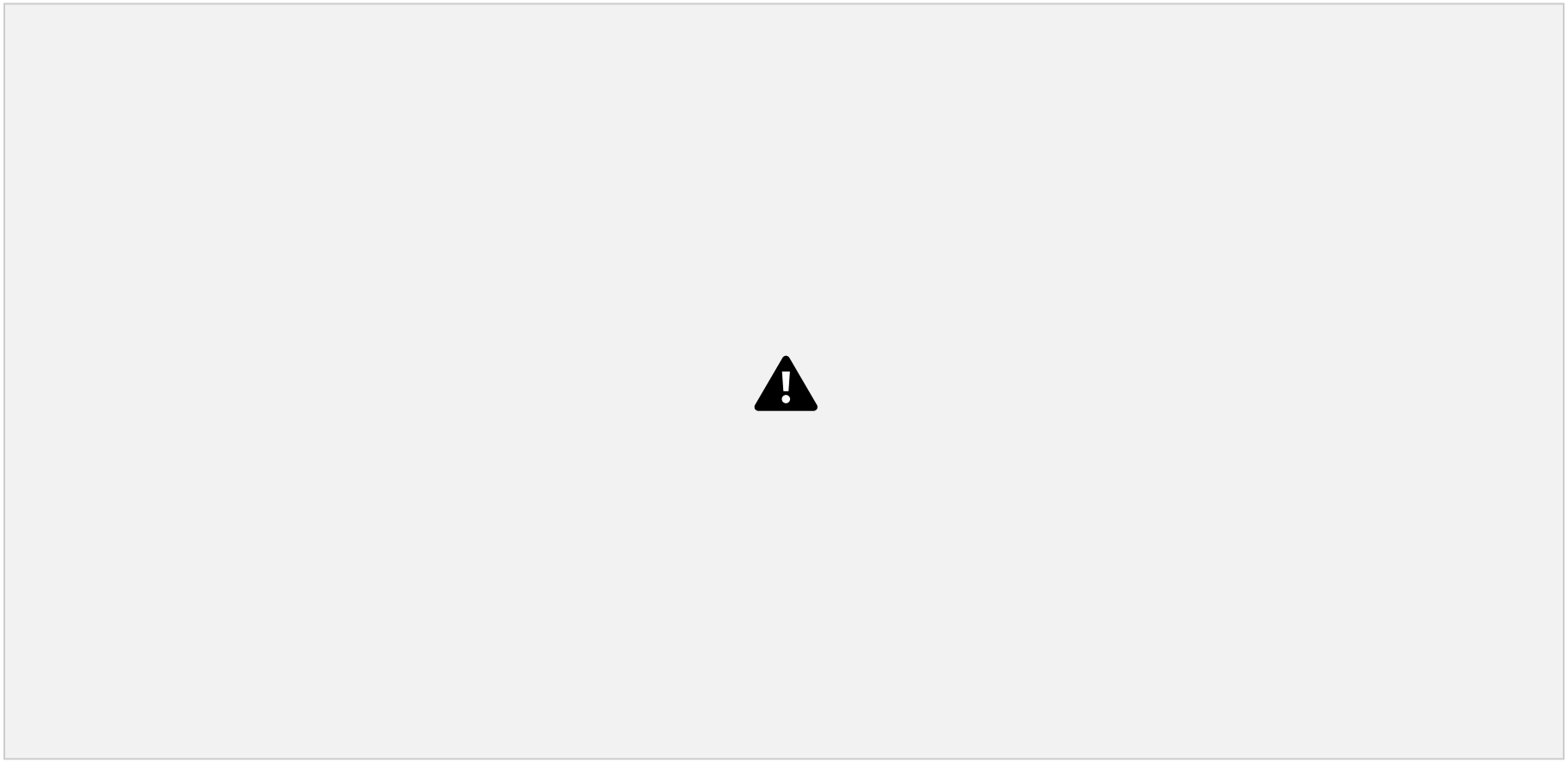
Step11: try the IDLE python 3.7.6



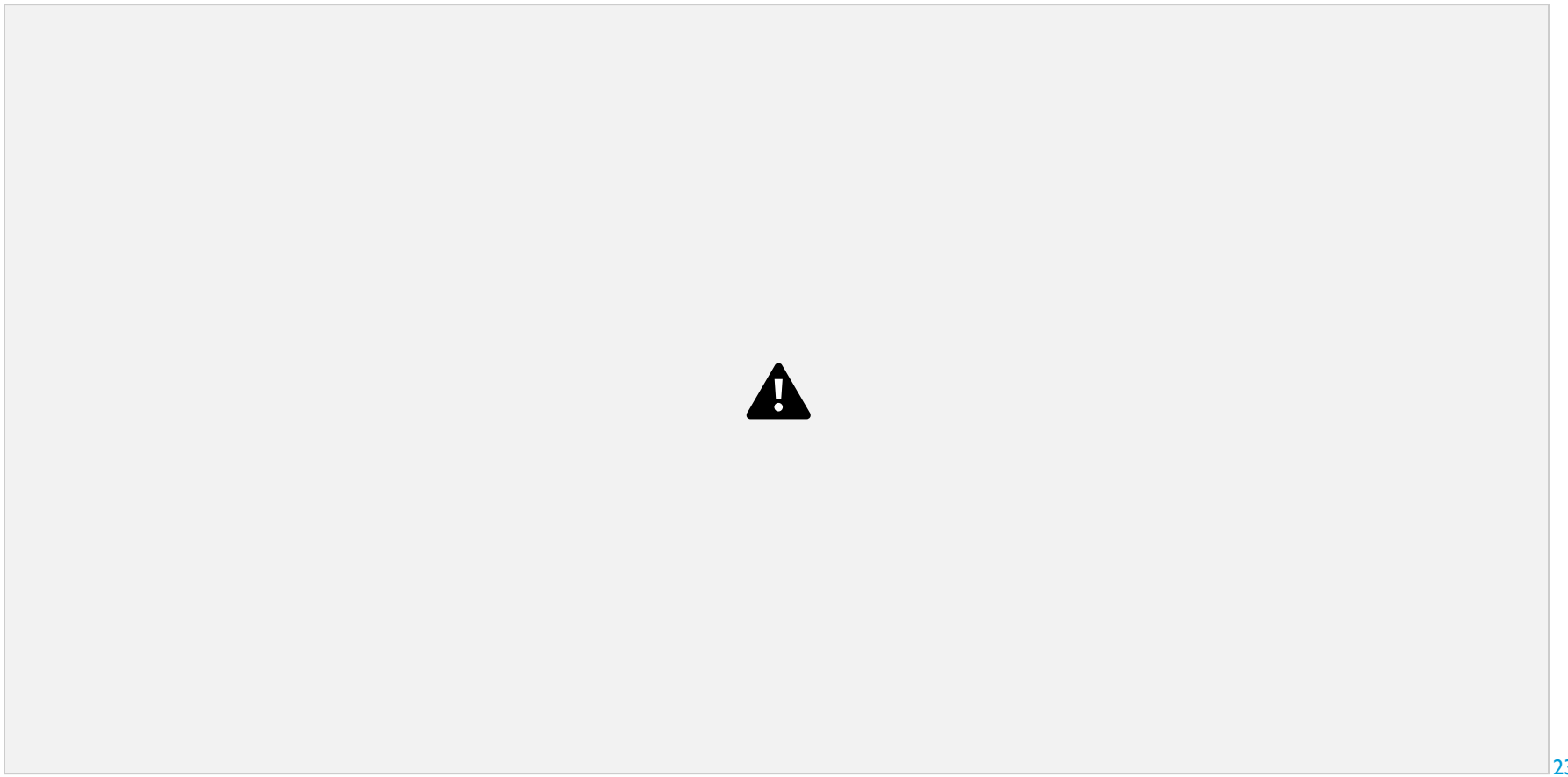
- Step1: login in pycharm website.



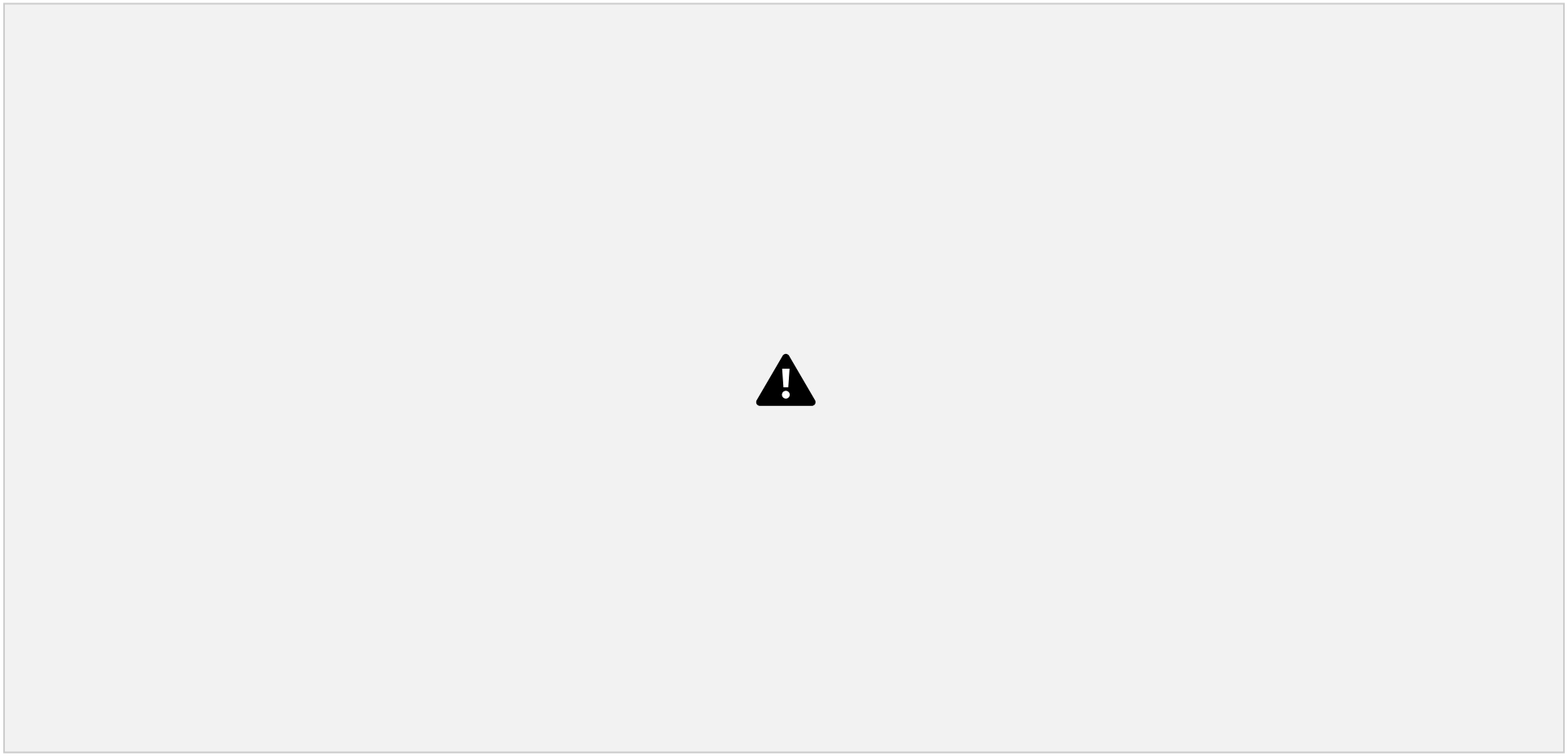
- Step2: click on download.



- Step3: click on other versions link.



- Step4: choose pycharm version 2019.3.3.



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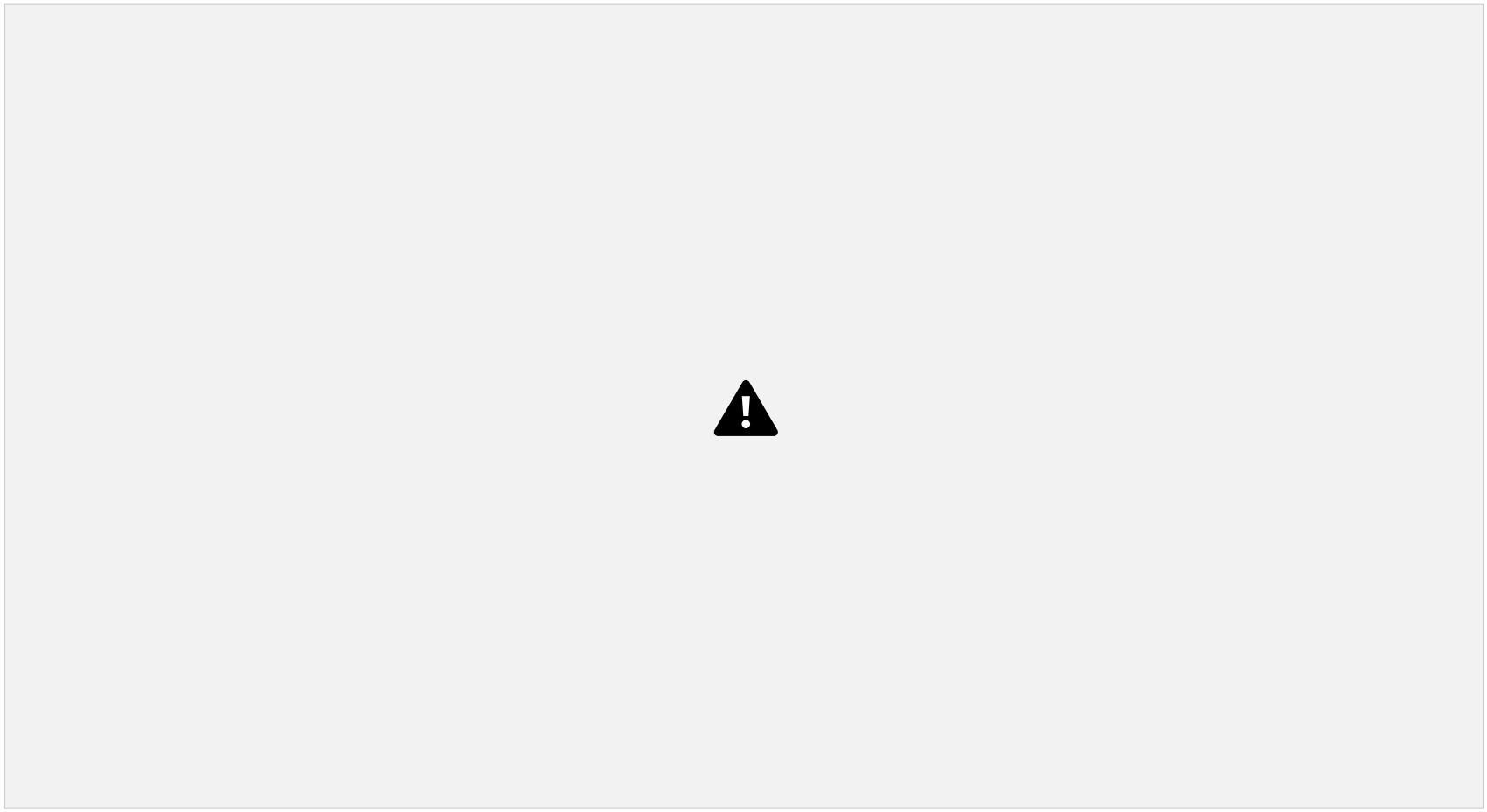
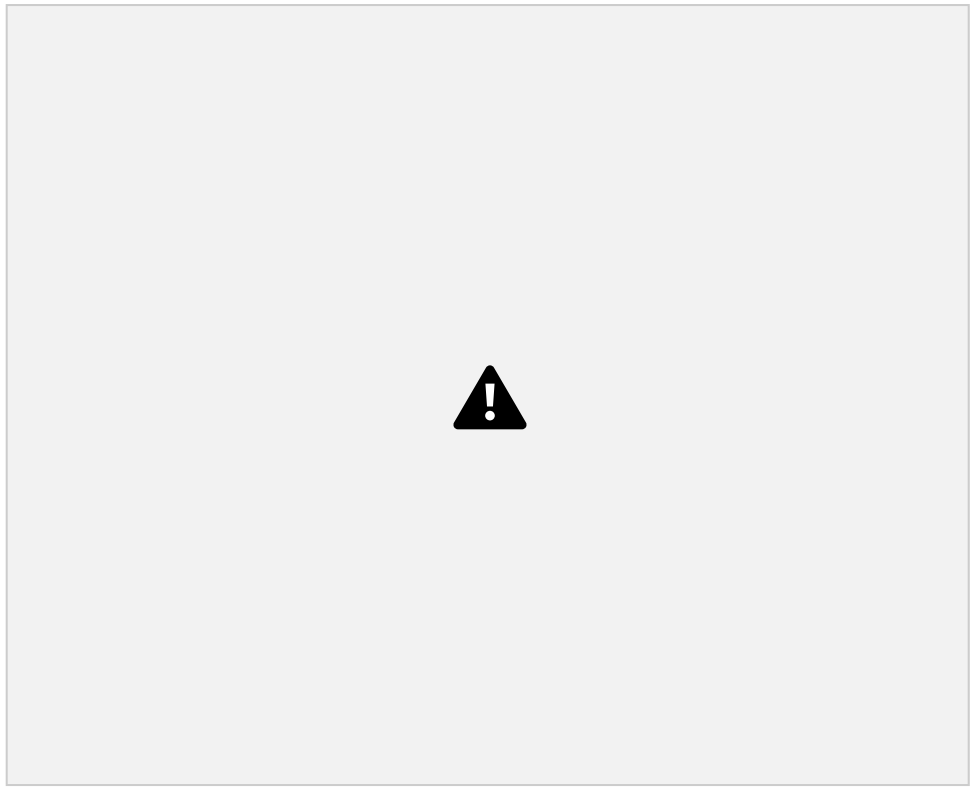
- Step5: start installation.

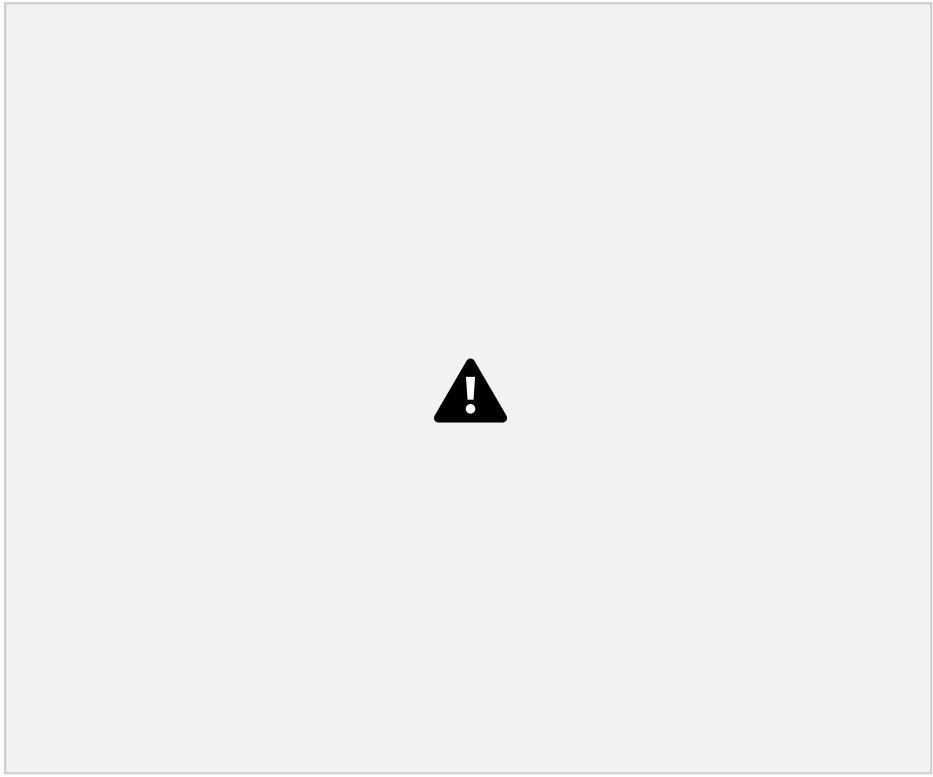


- Step6: complete the installation.

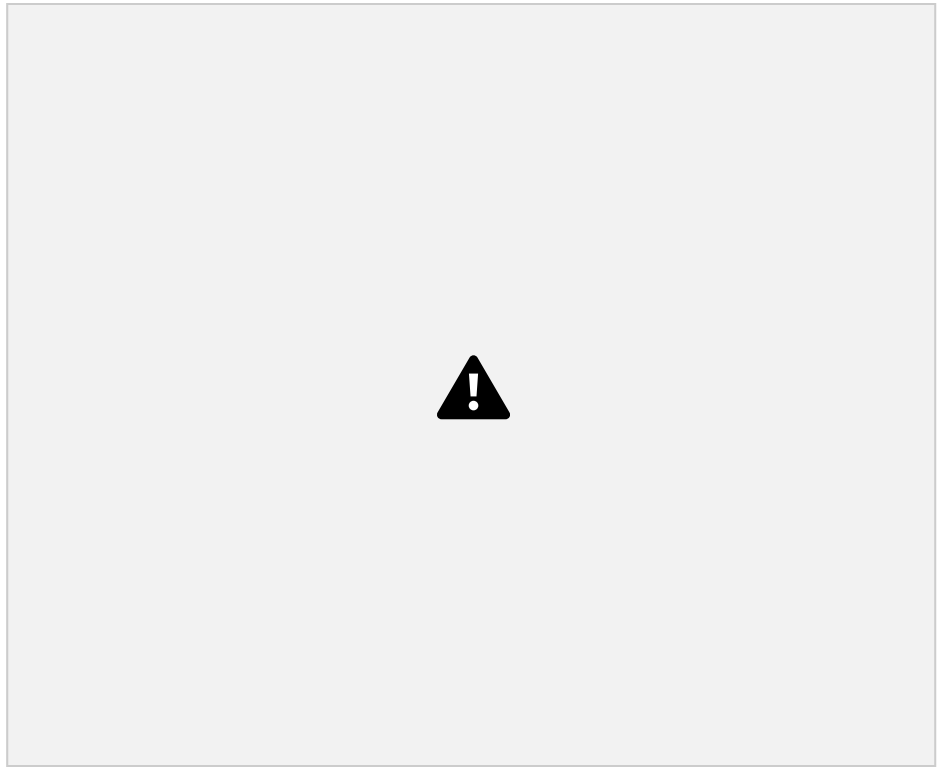


- Step7: complete the installation.

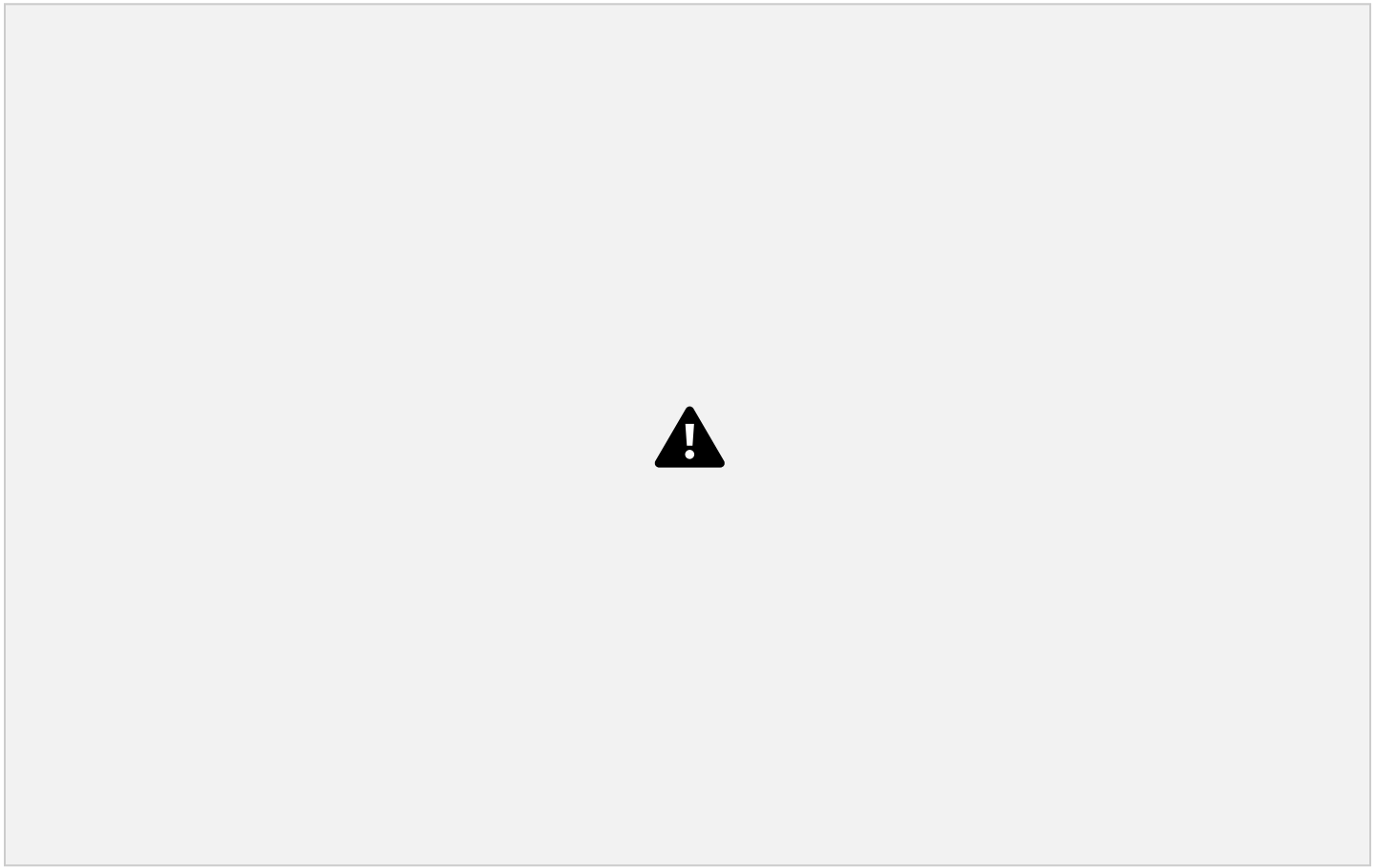
- Step8: complete the installation.



- Step9: complete the installation.



- Step10: finish the installation.

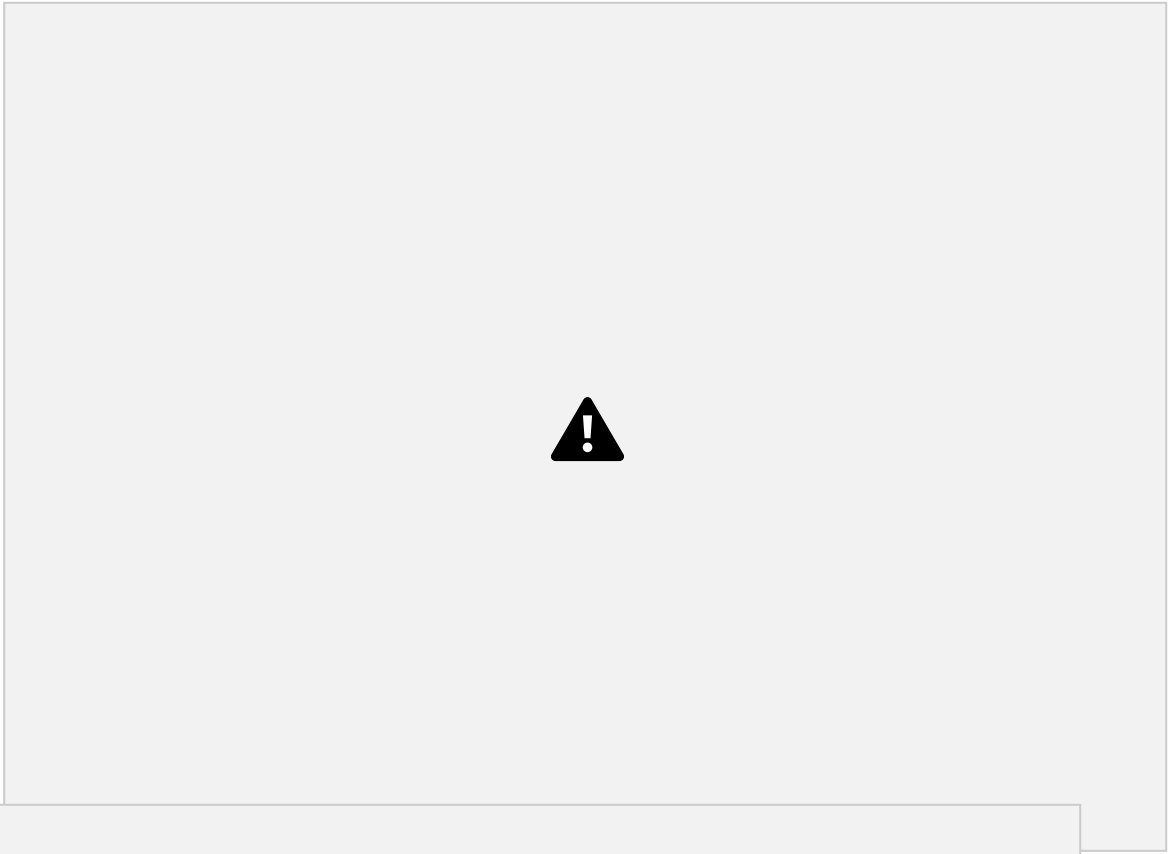


- Numpy is a very popular library for easily creating single, multidimensional array and matrices. It has a large collection of the mathematical function for performing an operation on these arrays.

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

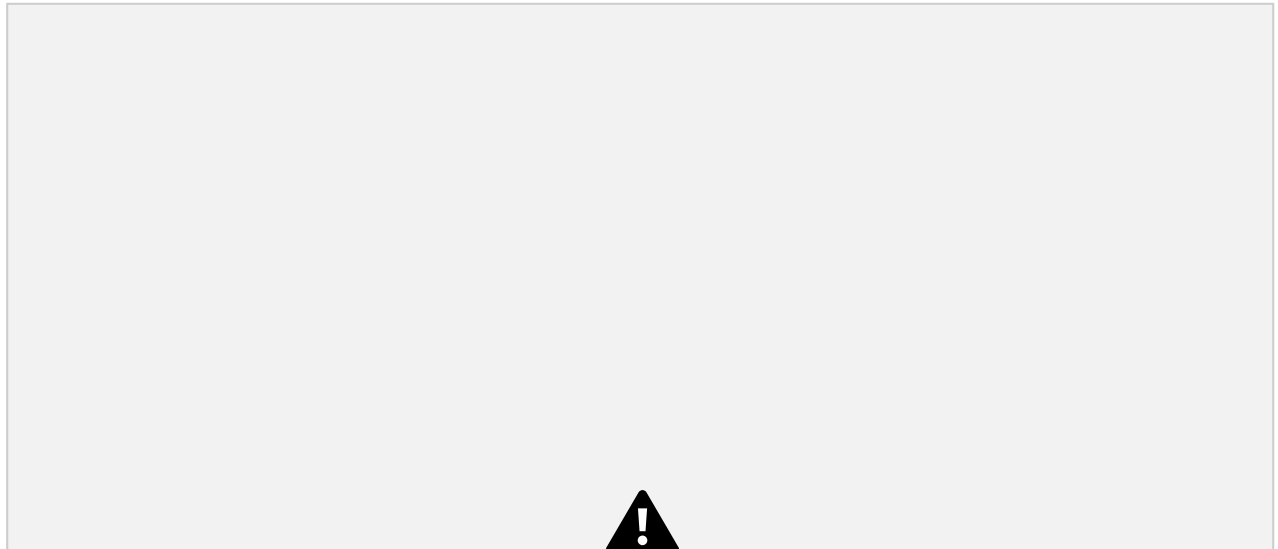
  Step1: Go to the File and click on Settings.

  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**.

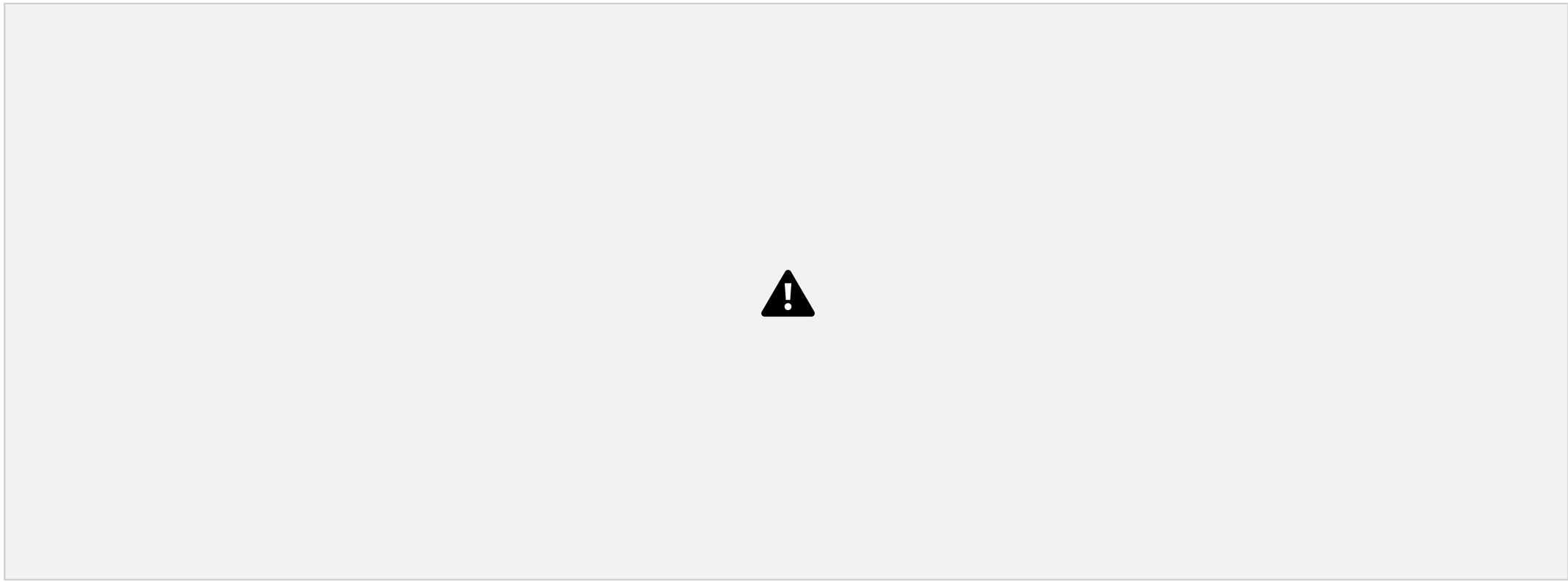


  Step 3: Click on the Project Interpreter.
  You will see all the packages installed.

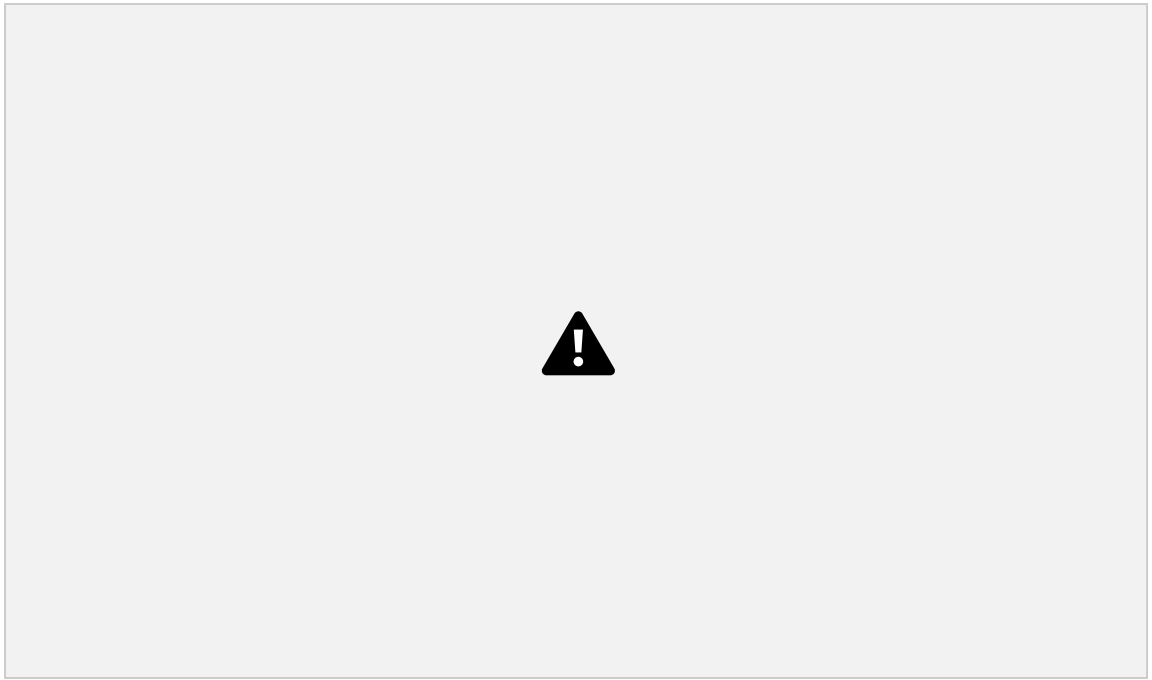
- Step 4:You will see the + button. Click on it and search for the numpy in the search field. You will see the numpy package as the left side and its description, version on the right side.

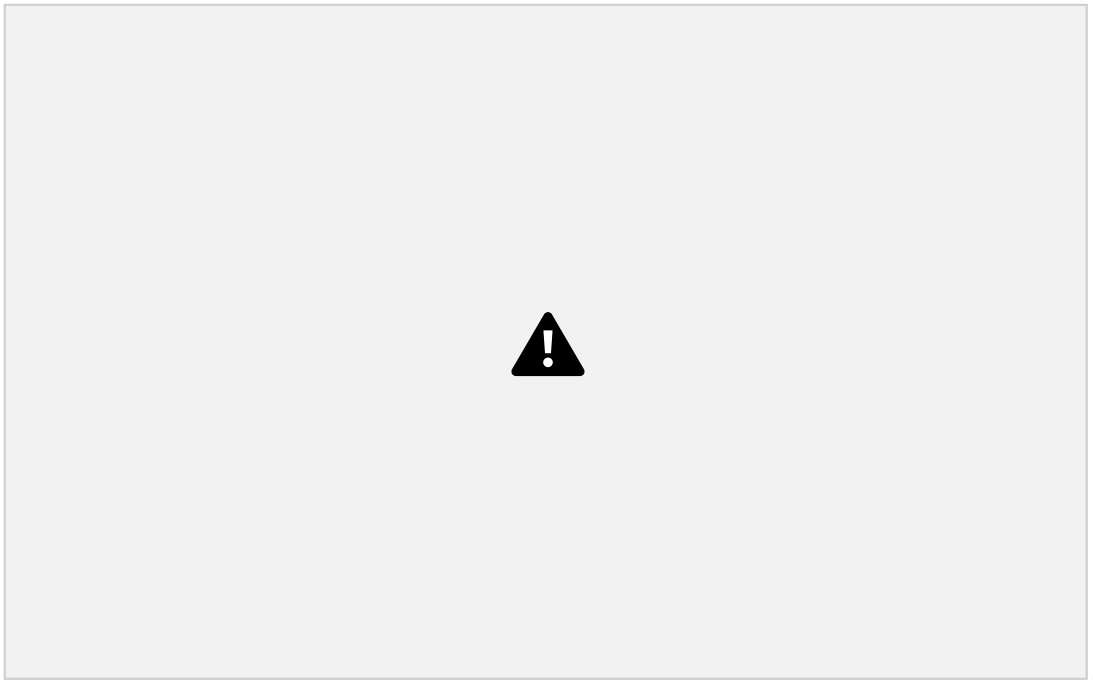


- Step 5: Selecting numpy click on the Install Package on the left bottom. It will install the packages. If you are unable to install and got an error. Then go to terminal first upgrade pip using the command.



Example (1) Example (2)





- **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

- 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:

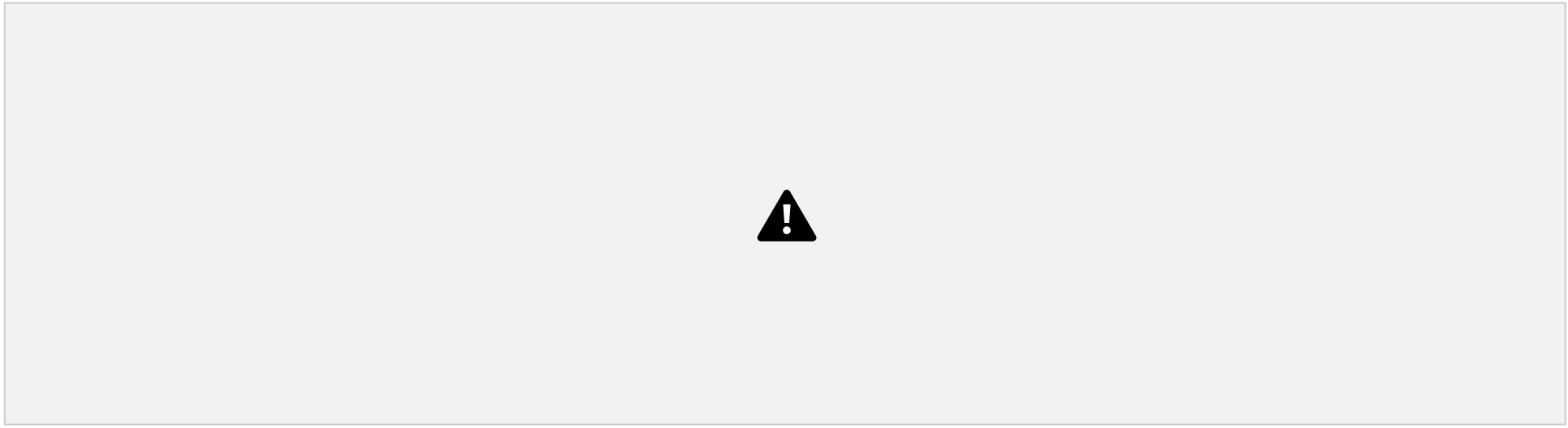
```
>>>import cv2
 >>>print(cv2.__version__)
```

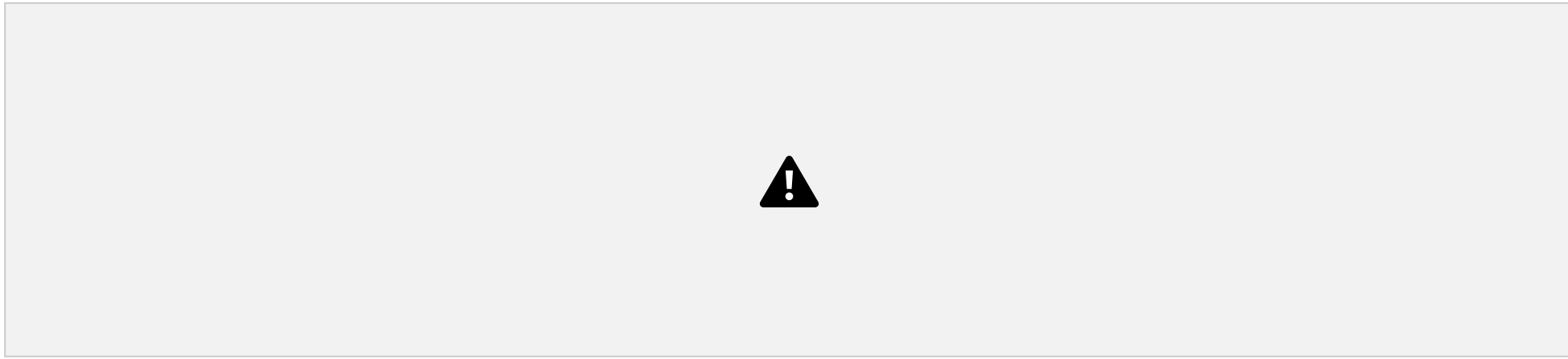

- The imread() function loads image from the specified file and returns it. The syntax is:

  cv2.imread(filename, mode of image read)

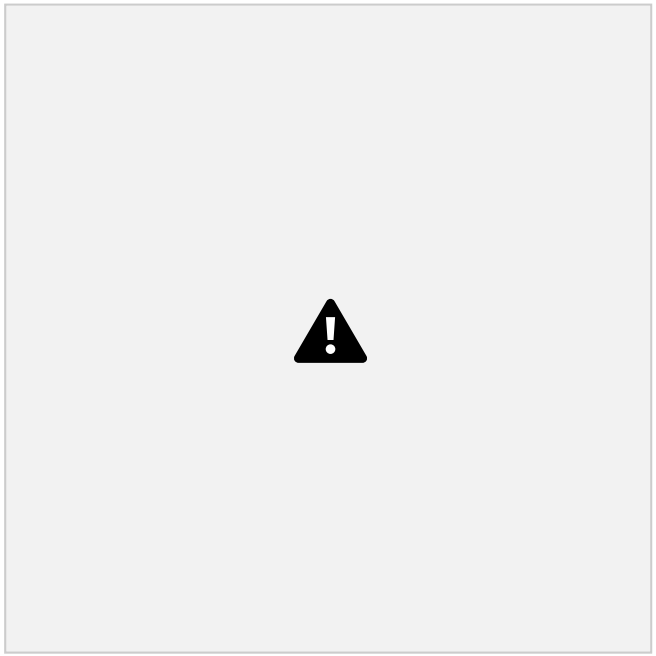
  filename: Name of the file to be loaded

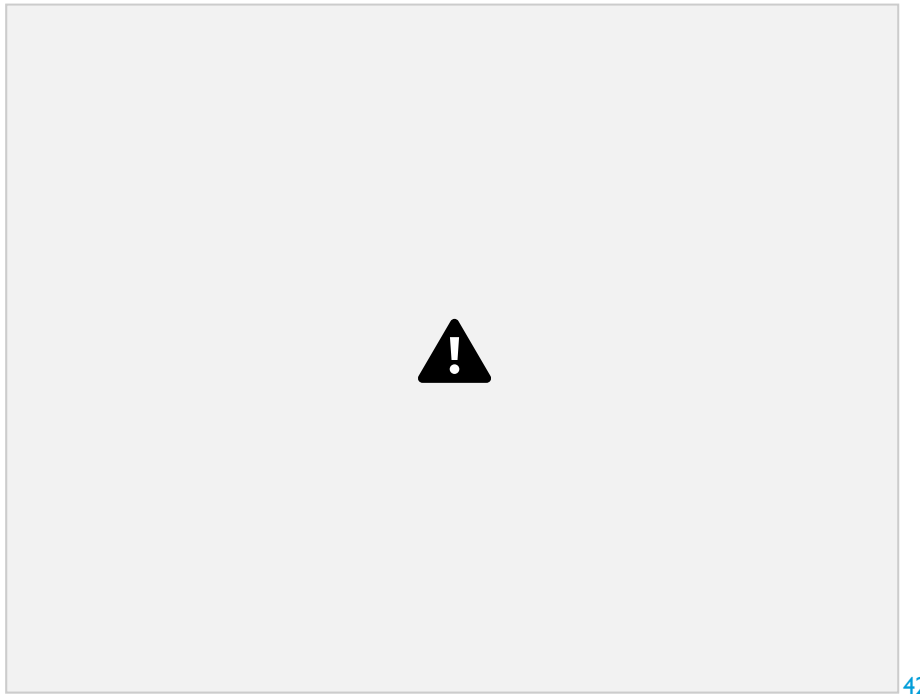
  Mode of image read:



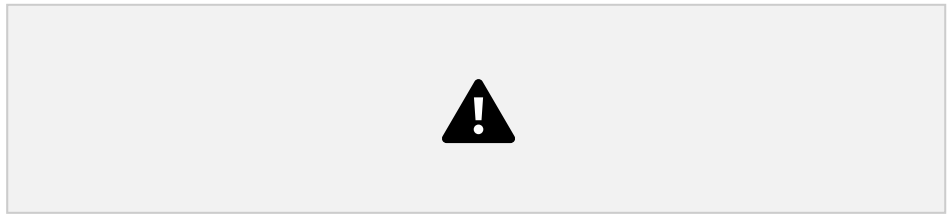


- Code: Output:





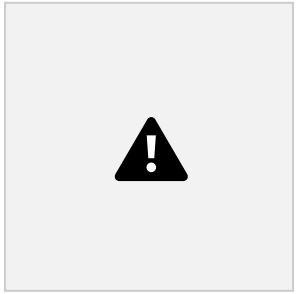
Example(1): Code Example(2): Code

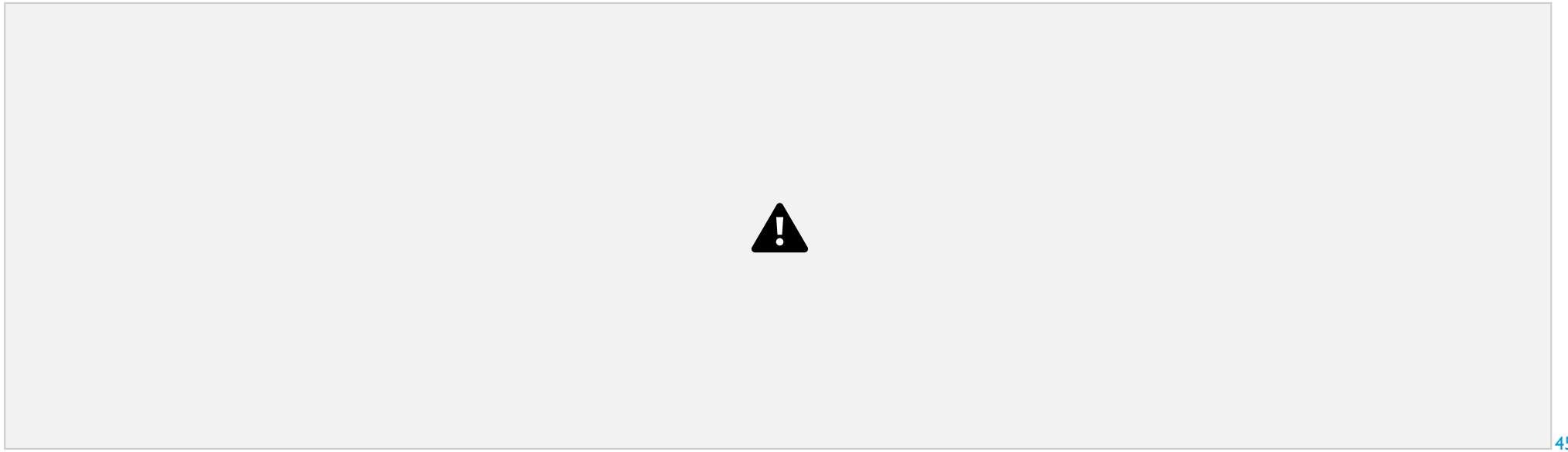


Output: Output:

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

- Output:



Output:

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