Aim: Install OpenCV for python on windows & manipulate the images.

Theory:

1) OpenCV Overview:
OpenCV stands for Open Source Computer Vision Library. It is a free and open-source software library used for real-time image processing, video analysis, and computer vision tasks.

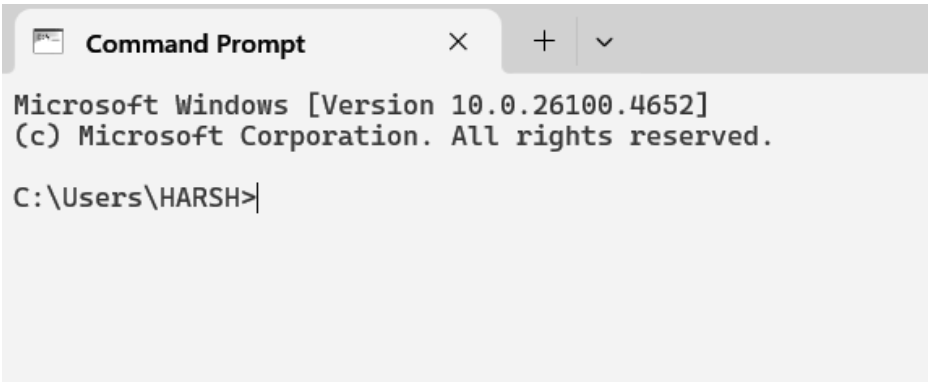
- Originally developed by Intel in 1999.
- Now maintained by the open-source community, including support from organizations like Willow Garage and Itseez.
- OpenCV is written in C/C++, but bindings are available for Python, Java, MATLAB, and JavaScript.
- The library provides over 2500 optimized algorithms, which can be used for a wide range of vision applications.

It simplifies complex visual tasks by providing a rich set of pre-built functions, allowing developers and researchers to solve problems with minimal code and high efficiency.

Key Features:

1. Image Processing: Reading, writing, resizing, filtering, and transforming images.
2. Video Analysis: Capture, process, and analyze video streams in real-time.
3. Object Detection: Detects faces, eyes, bodies, and other objects.
4. Machine Learning: Includes tools like k-NN, SVM, decision trees, and neural networks.
5. Cross-platform: Works on Windows, Linux, macOS, Android, iOS.

2) Procedure: Installing OpenCV:
Step 1: Open Command Prompt.



Step 2: Install OpenCV using the pip command: pip install opencv-python

```
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

C:\Users\HARSH\OneDrive\Desktop\python>pip install opencv-python
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Loc
ackages)
Requirement already satisfied: opencv-python in c:\users\harsh\appdata\local\prog
 (4.12.0.88)
Requirement already satisfied: numpy<2.3.0,>=2 in c:\users\harsh\appdata\local\pr
es (from opencv-python) (2.2.2)
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Loc
ackages)
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Loc
ackages)
```

Step 3: To use advanced features like GUI and image formats, install the additional package: pip install opencv-python-headless

```
C:\Users\HARSH\OneDrive\Desktop\python>pip install opencv-python-headless
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Local\Pro
ackages)
Collecting opencv-python-headless
  Downloading opencv_python_headless-4.12.0.88-cp37-abi3-win_amd64.whl.metadata (20 kB)
Requirement already satisfied: numpy<2.3.0,>=2 in c:\users\harsh\appdata\local\programs
es (from opencv-python-headless) (2.2.2)
Downloading opencv_python_headless-4.12.0.88-cp37-abi3-win_amd64.whl (38.9 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 38.9/38.9 MB 4.0 MB/s eta 0:00:00
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Local\Pro
ackages)
Installing collected packages: opencv-python-headless
WARNING: Ignoring invalid distribution ~angchain-core (C:\Users\HARSH\AppData\Local\Pro
ackages)
Successfully installed opencv-python-headless-4.12.0.88
```

Step 4: Verify the installation by launching Python in the terminal: Python.
Then type:
import cv2
print(cv2.__version__)
If no error appears and the version is printed, installation is successful.

```
>>> import cv2
>>> print(cv2.__version__)
4.12.0
>>>
```

Sample Code: Display image using OpenCV

```
import numpy as np
import cv2
from google.colab.patches import cv2_imshow

image = cv2.imread('/content/images.jpeg')
cv2_imshow(image)
```

Conclusion:

OpenCV was successfully installed on the Windows system.