Computer Vision Course — A.A. 2021/2022

Lab 1:

OpenCV Intro

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Recommendations

- Feel free to interrupt and ask questions 🙋‍♂️🙋‍♀️
- If you have any doubt, you can ask me after lectures or drop me an e-mail: nicola.garau@unitn.it 📧

Feedback

- First time the Lab is run by me 🧪
- Any feedback is welcome, **especially** negative ones 📉
- Anonymous feedback form at the end of this week 🎭

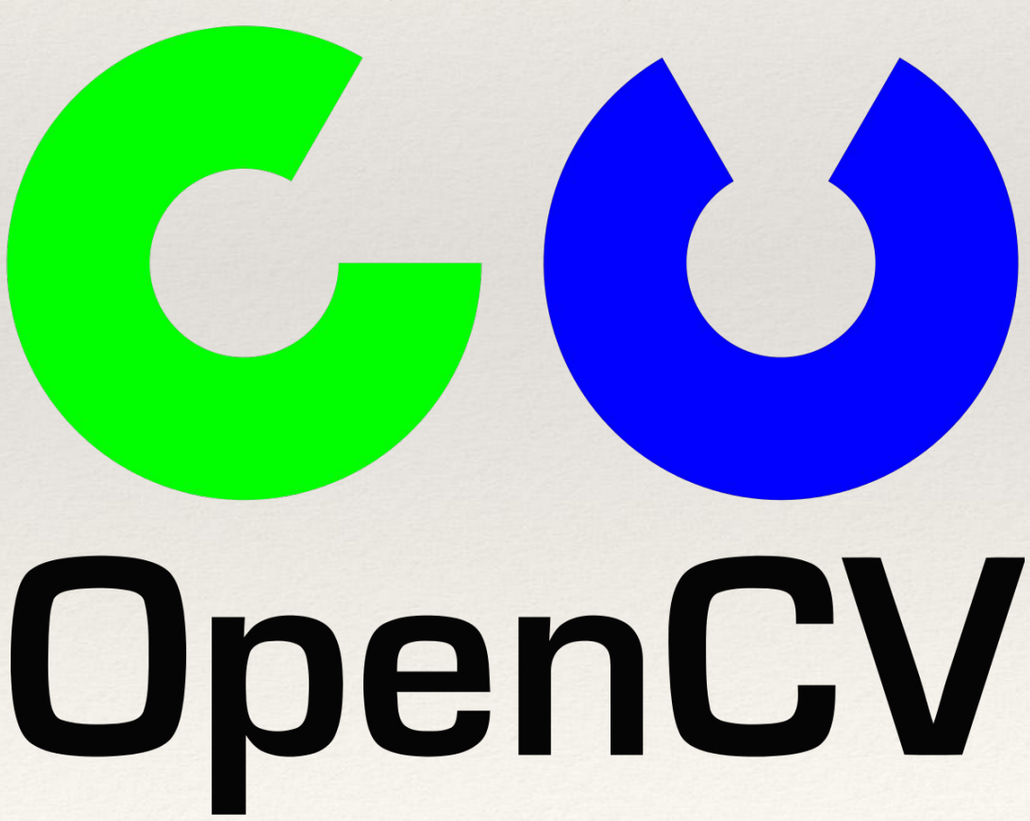
Any questions so far?

What's up today

- What is OpenCV? 🤔
- The Virtual Machine 💾
- How to initialise a project in OpenCV 📄
- How to open and display **images** 🖼️
- How to open and display **videos** 📽️

What is OpenCV?

- Computer Vision library
- Open source ♻️
- Website: opencv.org



What is OpenCV?

OpenCV is an Open Source Computer Vision Library: it's a collection of C/C++, **Python** and Java implementations of some of the popular algorithms of image processing and computer vision, which cover:

- 2D/3D feature toolkit
- Works for images and videos
- Face/gesture recognition
- Segmentation and recognition
- Tracking
- Image/video load, save, display
- Many more…

Why OpenCV?

- Fully supported and widely used
- Open Source
- Huge number of algorithms ready to use
- Recognised as the reference library by the research community
- Has good interface also for newbies 👨‍💻

The working environment

⚠️**Using the virtual machine is not recommended, but useful if you don't want to set up the environment on your machine**

Prerequisites:

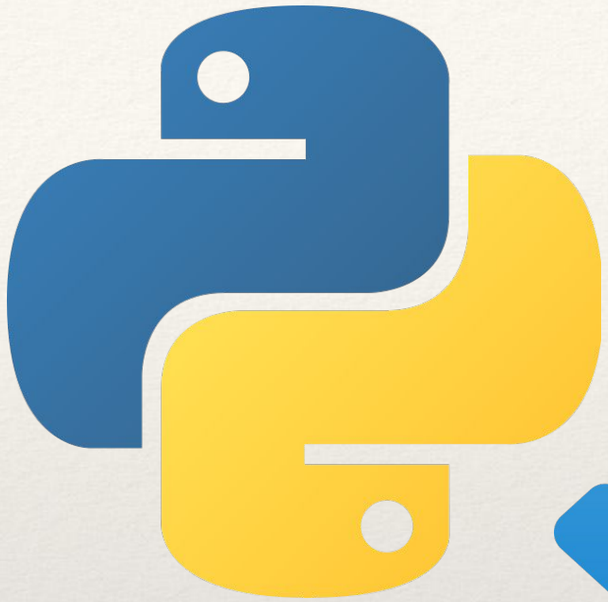
- Virtual Box: www.virtualbox.org
- Virtual Box Guest Additions
- Recommended: Virtual Box Extension Pack

Characteristics:

- OS: Ubuntu 18.04 LTS
- User: mmlab
- Password: mmlab

OpenCV version: 4.1.2-pre

What if I hate VMs?



You are not alone! 🥳

Prerequisites:

- Visual Studio Code
- Python (at least version 3 should be enough)
- All the dependencies installed (see GitHub page)

How to initialise a project: Python

- Start Visual Studio Code
- Create a new folder (optional)
- Create a new Python script (e.g. main.py)
- Open and edit script
- Open a terminal in VS Code
- Run the script (e.g. *python main.py*)

How to open and display images (Python)

```
import cv2

image = cv2.imread("../Google.jpg")
cv2.imshow('Window title', image)
cv2.waitKey(0)
```

How to open and display videos (Python)

```
import numpy as np
import cv2 as cv

cap = cv.VideoCapture(0)

while(True):
  # Capture frame-by-frame
  ret, frame = cap.read()

   # Display the resulting frame
  cv.imshow('frame',frame)
  cv.waitKey(1)


# # When everything done, release the capture
cap.release()
```

How to initialise a project: C++

- **Start Visual Studio Code**
- Create a new folder under C++ path
- Create a new file e.g. main.cpp
- Create a new file CMakeLists.txt

```
cmake_minimum_required(VERSION 2.8)
project( ProjectName )
find_package( OpenCV REQUIRED )
include_directories( ${OpenCV_INCLUDE_DIRS} )
include_directories( ${PROJECT_SOURCE_DIR} )
add_executable( ProjectName main.cpp )
target_link_libraries( ProjectName ${OpenCV_LIBS} )
```

- Now you have linked the OpenCV libraries with your project
- Open the project folder in Terminal
- In Terminal: '**cmake .**' to compile the project in the current folder
- In Terminal: '**make**' to build an executable of your project
- In Terminal: '**./ProjectName**' to run your executable

How to open and display images (C++)

```
#include <opencv2/opencv.hpp>
#include <opencv2/highgui.hpp>

using namespace cv;

int main( int argc, char** argv )
{
  Mat image;
  image = imread("Google.jpg", 1);

  namedWindow("Window",1);
  imshow("Window", image);
  waitKey(0);

  return 0;
}
```

How to open and display videos (C++)

```
#include <opencv2/opencv.hpp>
#include <opencv2/highgui.hpp>
using namespace cv;

int main( int argc, char** argv )
{
  Mat image;
  VideoCapture cap;
  cap.open("Video.mp4");
  if(!cap.isOpened())
        return 0;

  namedWindow("Window",1);

  for(;;){
        cap >>image;
        imshow("Window", image);

        if(waitKey(10) >= 0) break;
  }
  return 0;
}
```