

# COS 470/570: Computer Vision

Spring 2021

## Term Projects

**Project ID:** 001

**Project Title:** CV-GUI (an easy-to-use GUI for OpenCV library)

**Abstract:** OpenCV as a real-time and optimized open-source computer vision library has made a big advance in several computer vision application, including image segmentation, image recognition, and feature matching. However, the lack of handy and operational graphical user interface causes various difficulties to utilize it. This also makes different challenges to establish experiments using OpenCV functions.

**Aim:** To design and develop an easy-to-use graphical user interface top of the OpenCV library, thus a variety of users with different level of expertise can make an efficient use of OpenCV functions, such as image filtering, image operations, histogram equalization, shape analysis and more. Some of the software functionalities could include: Image derivatives, Thresholding, Binary operations, Color space, Interpolation, Image deformation, Image blurring, Contrast enhancement, Noise removal, Fourier transform, Binary contours, and Interest points.

**Technology and Tools:** OpenCV, Python or Java.

**Example:** <https://damiles.github.io/OpenCVGUI/>

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**Project ID:** 002

**Project Title:** Eye Motion as Mouse Input

**Abstract:** One of the real-world applications of computer vision is to help people with different sort of disabilities. For people with severe physical disabilities or paralysis, eye movement may be the most controllable way to navigate on a computer. This project replaces the traditional mouse movement by tracking eye movements. For example, looking to the left (without moving the head) may move the pointer to the left on the screen, while a blink could be equal a mouse click.

**Aim:** To design and develop computer vision methods to replace the traditional mouse inputs by tracking eye movements, creating a virtual mouse application controlled by the movement of the eyes. Steps could be included: calibration, face detection, eye detection, iris detection, and the moving cursor and clicking.

**Example:** <http://www.inf.u-szeged.hu/projectdirs/ssip2011/teamB/>

**Technology and Tools:** OpenCV, Python or Java.

**Project ID:** 003

**Project Title:** Traffic-Sign Detection and Interpretation

**Abstract:** Automatic detection and recognition of traffic signs have been around for advanced driver-assistance devices and autonomous systems. In this project, you are going to develop a machine learning/deep learning computer vision method(s) to automatically detect traffic signs in video sequences/images. 10 traffic signs would be enough for the COS 470/570 term project.

**Aim:** To design and develop machine learning/deep learning computer vision methods to automatically detect and interpret a list of 10 traffic signs. Selection of 10 traffic signs is your choice.

**Example:** [https://openaccess.thecvf.com/content\\_cvpr\\_2016/papers/Zhu\\_Traffic-Sign\\_Detection\\_and\\_CVPR\\_2016\\_paper.pdf](https://openaccess.thecvf.com/content_cvpr_2016/papers/Zhu_Traffic-Sign_Detection_and_CVPR_2016_paper.pdf)

**Technology and Tools:** OpenCV, Python or Java, Keras, PyTorch.

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**Project ID:** 004

**Project Title:** Shadow Removal from a Single-Color Image

**Abstract:** This project helps to remove shadow from a single-color image, turning the image into a shadow-free image.

**Aim:** To design and develop a software or mobile app that gets a single-color image (e.g., green, blue, etc.) and turn it to a shadow-free image.

**Example:** <http://www.inf.u-szeged.hu/ssip/2009/teams/team6/index.html>

**Technology and Tools:** OpenCV, Python or Java.

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**Project ID:** 005

**Project Title:** Brand Classification of Soft Drink Products

**Abstract:** The objective of this project is to identify which soft drink is presented in the image. This automatic detection and identification does have applications for visually-impaired people and also self-monitoring the nutritional information.

**Aim:** To design and develop machine learning/deep learning computer vision methods to automatically identify the brand/type of soft drinks (in can or bottle). The list of proposed soft drinks are: Coca-Cola (Regular, Zero, Diet), Pepsi (Regular, Zero, Diet), Mountain Dew, Fanta.

**Example:** <https://www.sciencedirect.com/science/article/pii/S1319157820304535>

**Technology and Tools:** OpenCV, Python or Java, Keras, PyTorch.

**Project ID:** 006

**Project Title:** A Mobile App for Portland Landmark Detection

**Abstract:** This project helps to automatically recognize Portland landmarks (e.g., John Ford Statue, Portland City Hall, Arts District, Portland Observatory, Old Port, etc.), with or without using machine learning/deep learning methods.

**Aim:** To design and develop a mobile application to automatically identify a list of Portland landmarks. 10 landmarks would be enough for the term project.

**Example:** <http://www.inf.u-szeged.hu/ssip/2008/projects/group1/Website/index.html>

**Technology and Tools:** OpenCV, Python or Java, Keras, PyTorch.

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**Project ID:** 007

**Project Title:** Gesture Recognition

**Abstract:** Imagine we have a patient in the emergency room (ER) where she/he can not talk fluently now, and there is a pressing need to communicate with her/him using a list of gestures, like Okay, Like, Dislike, etc. This project helps to autonomous gesture recognition using machine learning/deep learning computer vision methods.

**Aim:** To design and develop a software application to automatically identify a list of gestures, including Okay, Like (Thumbs up), Dislike (Thumbs down), Stop.

**Example:** <https://towardsdatascience.com/training-a-neural-network-to-detect-gestures-with-opencv-in-python-e09b0a12bdf1>

**Technology and Tools:** OpenCV, Python or Java, Keras, PyTorch