



Computer Vision Roadmap

WEEK 1:

Intro to Python and its libraries

Basics of Python

[Intro to Python 1](#)

[Intro to Python 2](#)

numpy , pandas , matplotlib

[python numpy tutorial](#)

Explore this Kaggle notebook to learn about the libraries.

<https://www.kaggle.com/code/chats351/introduction-to-numpy-pandas-and-matplotlib>

Images and image processing

Color spaces, pixels, application of image processing

Understanding color spaces

<https://www.geeksforgeeks.org/hsv-color-model-in-computer-graphics/>

Image processing (overview)

<https://www.youtube.com/watch?v=kSgxn6zGE0c>

Some basic OpenCV commands can be explored under the basic section

https://docs.opencv.org/4.x/d7/da8/tutorial_table_of_content_imgproc.html

Fundamental openCV functions:

[Exercises-1](#)

Tinkering with OpenCV

[Tinker here](#)

Histograms

Check out these geek-for-geeks articles for basic insight on histograms

<https://www.geeksforgeeks.org/histogram-equalization-in-digital-image-processing/>

<https://www.geeksforgeeks.org/histogram-of-an-image/?ref=lbp>

Medium article on the same with OpenCV implementation

<https://medium.com/@rndayala/image-histograms-in-opencv-40ee5969a3b7>

WEEK 2:

Convolution

Image kernels and maths behind the processes

What is convolution? (intuitive)

<https://youtu.be/KuXjwB4LzSA>

An article to help you understand convolution and the concept of padding

<https://www.allaboutcircuits.com/technical-articles/two-dimensional-convolution-in-image-processing/>

Convolution explained visually:

<https://setosa.io/ev/image-kernels/>

<https://programmatically.com/understanding-convolutional-filters-and-convolutional-kernels/>

Filters and Denoising

Image filtering:

[Image filtering](#)

[Medium article on image filters](#)

Denoising:

[Denoising methods](#)

[Medium article on commonly used image filters in OpenCV](#)

(till 'template matching' should suffice for filters and blurs)

 [Overview | Image Processing I](#)

Edge detection

Sobel filters, Scharr filters, Laplacian, Canny edge detection

Comparing different edge detection methods:


<https://medium.com/@nikatsanka/comparing-edge-detection-methods-638a2919476e>

Refer to these PDFs for more info on edge operators and canny detectors.

[Edge: Operators](#)

[Edge: Canny](#)

Reference to top up the PDFs (the playlist, till canny detector should suffice for edge detection)

 [Overview | Edge Detection](#)

WEEK 3:

Morphological operations

Erosion and dilation

[OpenCV: Eroding and Dilating](#)

Refer to this PDF as well

[Morphological Processing](#)

OpenCV documentations

[Arithmetic operations 1](#)


[Arithmetic operations 2](#)

Hough transforms

An article on the same

[Complete guide on hough transforms](#)

Refer to videos from 7 to 11

 [Overview | Edge Detection](#)

PDF for reference

[Hough Transforms](#)

RANSAC

[Intro to RANSAC](#)

[CS131 L07 RANSAC](#)

[Overview of RANSAC algo](#)

Mediapipe Model by Google (not required to do it under week 1, feel free to do it after completing other weeks' resources)

Also, check out this mediapipe model, which comes in handy in many projects:

[mediapipe for dummies](#)

Use this video as your reference

https://youtu.be/01sAkU_NvOY?feature=shared

Further applications of mediapipe and some mini projects

<https://learnopencv.com/introduction-to-mediapipe/>

WEEK 4:

Neural Networks

First 4 videos of this 3b1b playlist

https://youtube.com/playlist?list=PLZHQObOWTQDNU6R1_67000Dx_ZCJB-3pi&si=1YXoqA4v-zSkNzW5

All videos of weeks 1 and 2 of

<https://www.coursera.org/learn/advanced-learning-algorithms> on Coursera.

For practice, refer to this colab notebook.

You can look over these links for more insight about backpropagation

<https://towardsdatascience.com/backpropagation-made-easy-e90a4d5ede55>

https://cs231n.stanford.edu/slides/2018/cs231n_2018_ds02.pdf

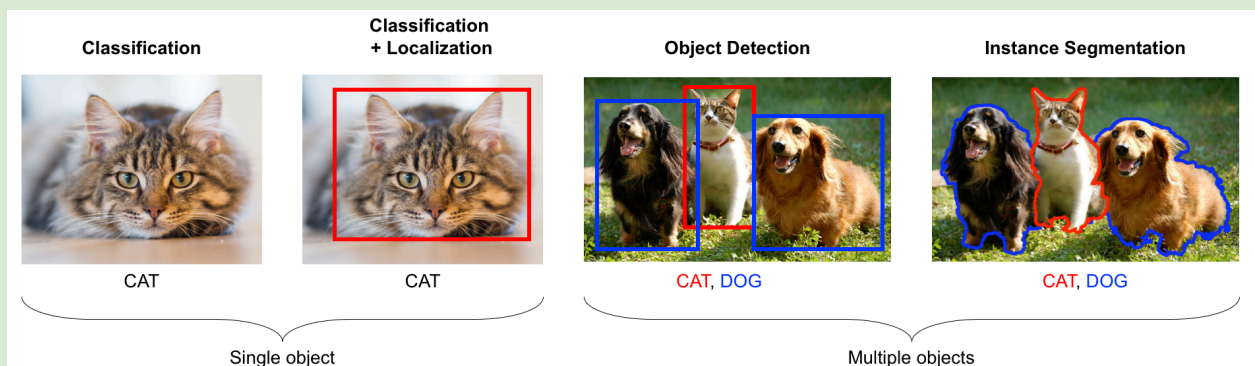
Deep Learning

1) Video 19 to 29 of the Deep Learning playlist by Deep Lizard:

https://youtube.com/playlist?list=PLZbbT5o_s2xq7LwI2y8_QtvuXZedL6tQU&si=k4Aa73BgSfZkiILU

2) <https://www.youtube.com/watch?v=HGwBXDKFk9I>

WEEK 5:



[Different CNN architectures for image classification](#)

[Semantic Segmentation vs Object Detection: Understanding the Differences](#)

[What Is Image Segmentation?](#)

Video 23 to 36:

<https://youtube.com/playlist?list=PLkDaE6sCZn6GI29AoE3liwdVwSG-KnDzF&si=IPpkI38MX0uUNBJo>

YOLO

▶ What is YOLO algorithm? | Deep Learning Tutorial 31 (Tensorflow, Keras & Python)

Object Detection using YOLO

▶ Train YOLOv8 object detection on a custom dataset | Step by step guide | Computer visi...

Image Segmentation using YOLO

▶ Image segmentation with YOLOv8 custom dataset | Computer vision tutorial

Colab notebook for implementation of YOLO:- [YOLOv3 in OpenCV](#)

[Detecting Potholes using TinyYOLO4](#)

[For more projects on YOLO](#)

Detectron2

▶ 329 - What is Detectron2? An introduction.

▶ 330 - Fine tuning Detectron2 for instance segmentation using custom data

Tutorial for using Detectron2 framework: [Detectron2 Tutorial.ipynb](#)