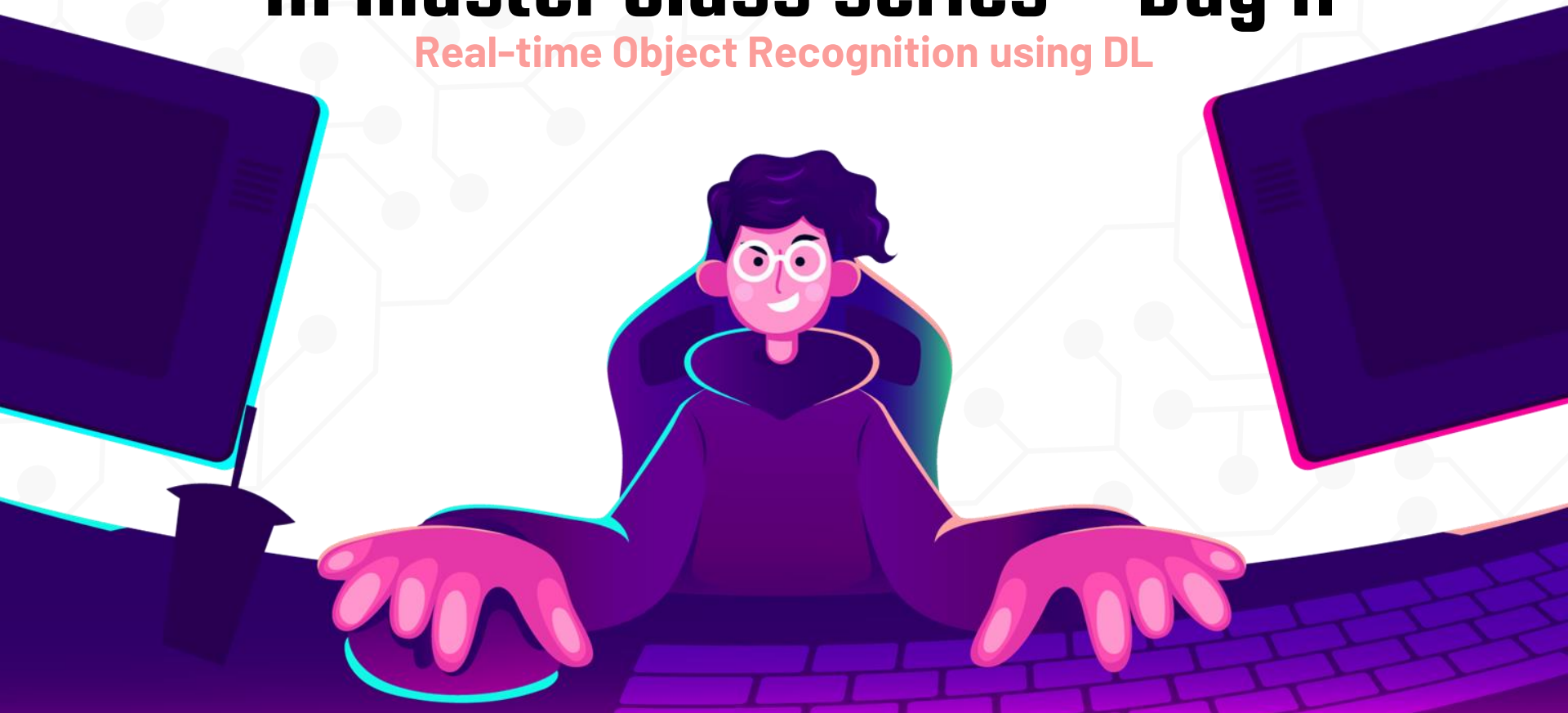




AI Master Class series – Day II

Real-time Object Recognition using DL



Day-II Agenda.

01.

Object Recognition

Object Recognition

02.

Implementing Object Recognition

Methodology

03.

Deep Neural Network

DNN & Object recognition
Model

04.

MobileNetSSD

Pre-trained Model

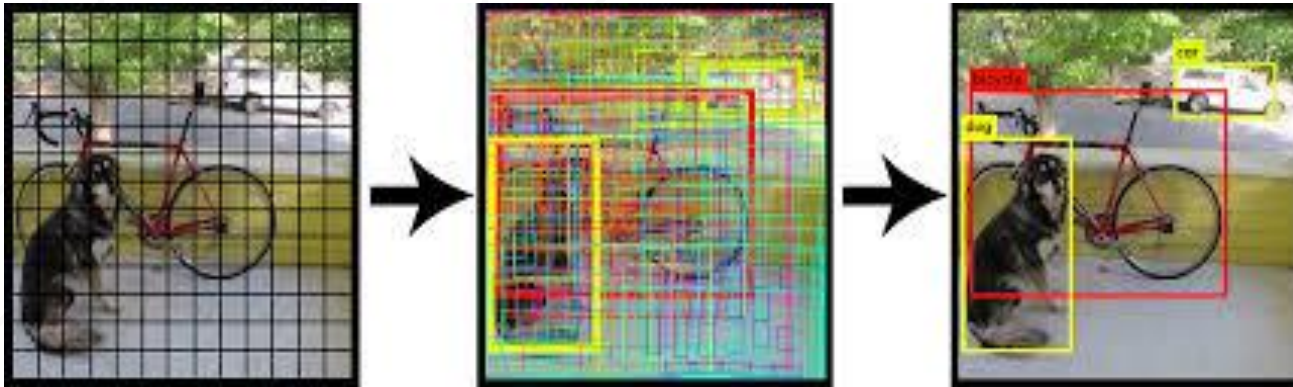
05.

Deploying Real-time Object recognition

Pre-Trained Model

Object Recognition.

Object recognition is a computer vision technique for identifying objects in images or videos. Object recognition is a key output of deep learning and machine learning algorithms. When humans look at a photograph or watch a video, we can readily spot people, objects, scenes, and visual details.



Implementing Object Recognition.

01

PRE-TRAINED MODEL

02

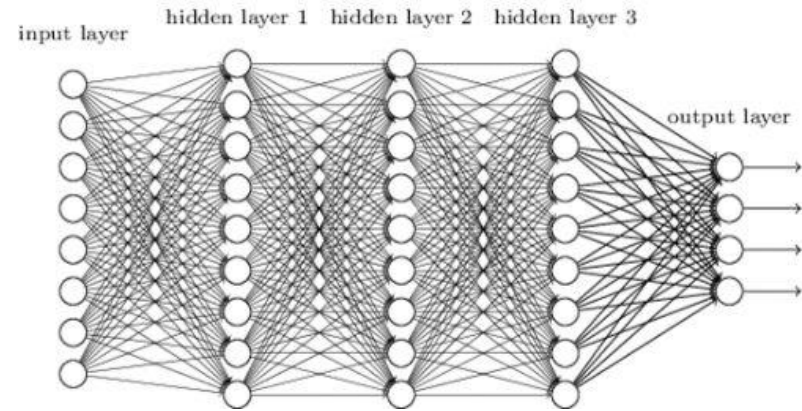
TRANSFER LEARNING

03

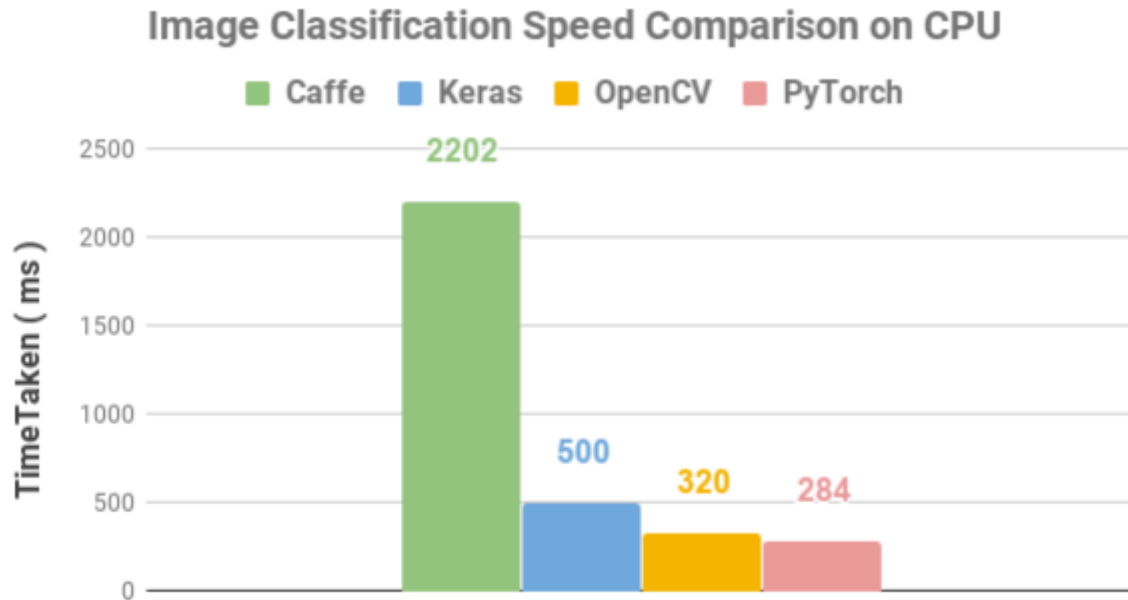
BUILDING FROM SCRATCH

Deep Neural Network – DNN.

- Solve Complex Task
- When it gets new information in the system, it learns how to act accordingly to a new situation.
- Learning becomes deeper when tasks you solve get harder.
- Helps to load pre-trained Model from DL frameworks such as
 - ✓ Tensorflow
 - ✓ Caffe
 - ✓ Darknet
 - ✓ Torch



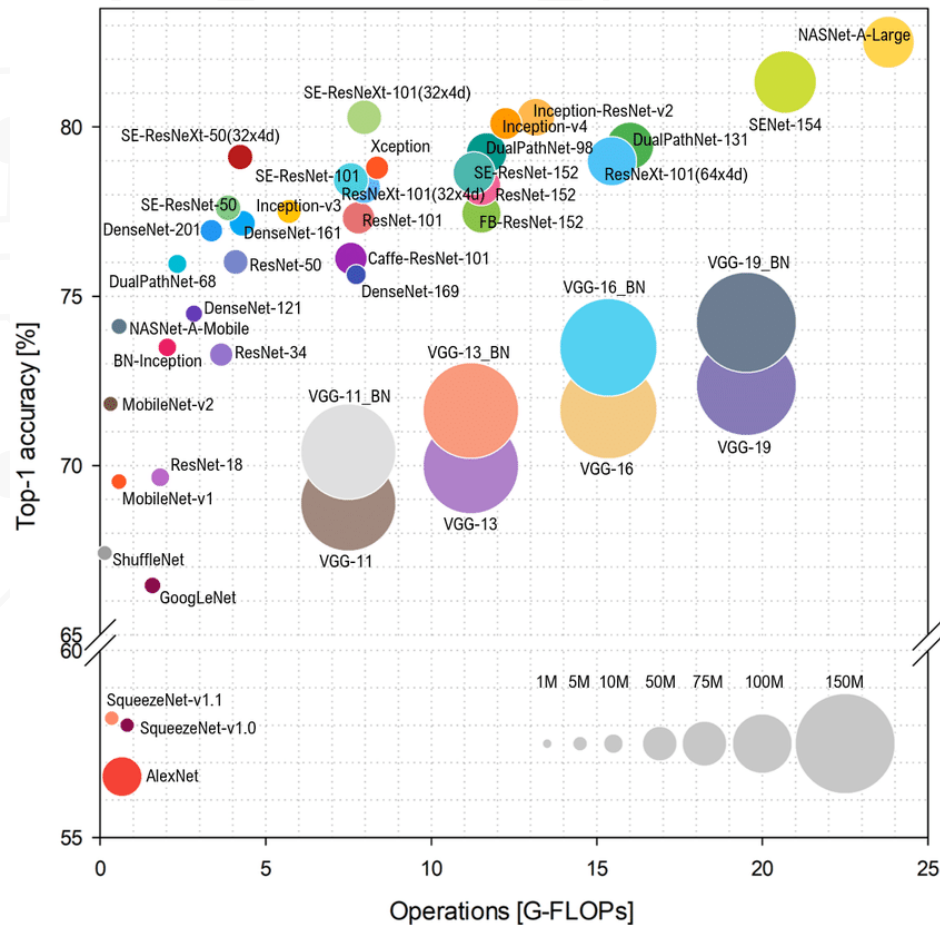
Speed Comparison on Image Classification.



OpenCV is faster by 7X (Caffe) and 1.5X (Keras)

Pre-trained Model for Object recognition.

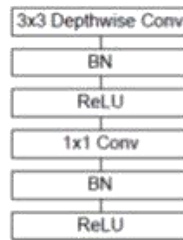
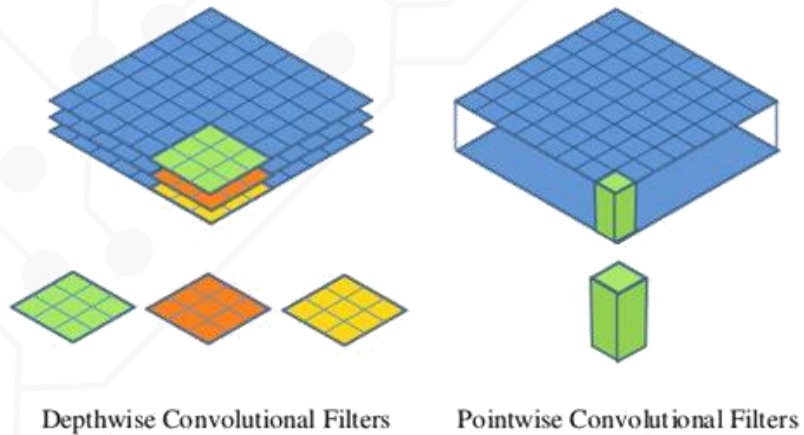
- MobileNet-SSD
- GoogleNet
- Squeezenet
- Faster R-CNN
- ResNet
- Inception
- YOLO
- VGGNet



MobileNet SSD (Single shot Multibox Detector).

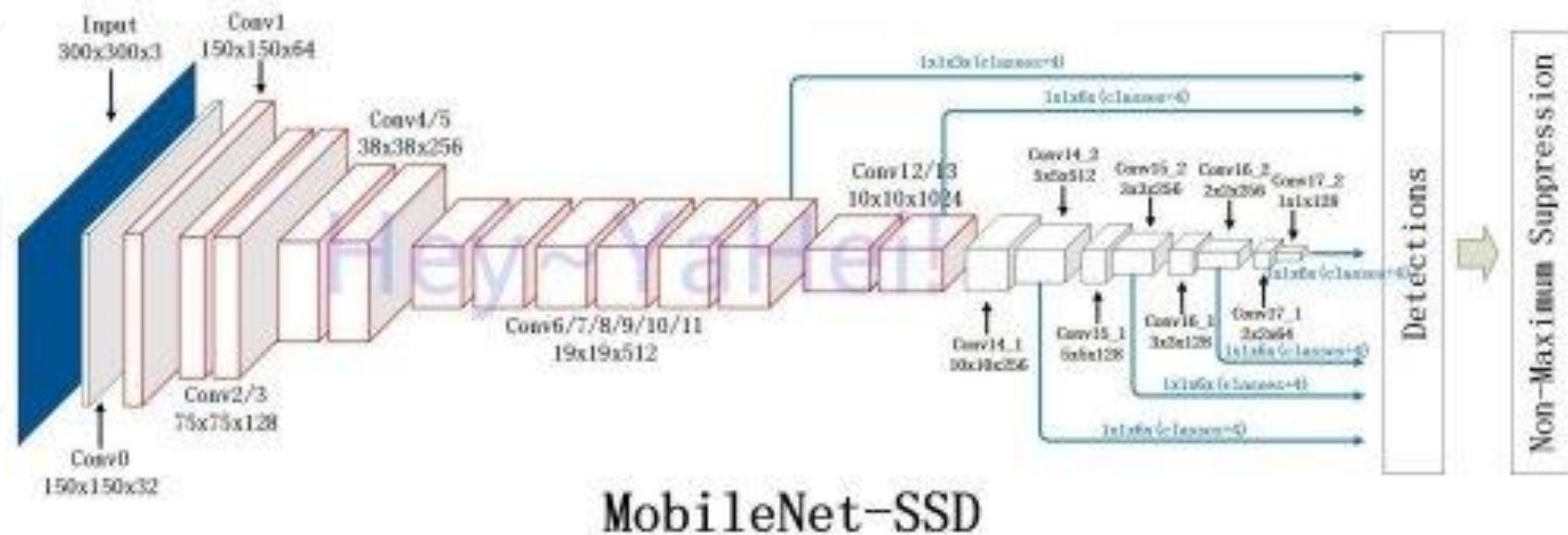
- The MobileNet model is based on depthwise separable convolutions which are a form of factorized convolutions. These factorize a standard convolution into a depthwise convolution and a 1×1 convolution called a pointwise convolution.
- For MobileNets, the depthwise convolution applies a single filter to each input channel. The pointwise convolution then applies a 1×1 convolution to combine the outputs of the depthwise convolution.
- A standard convolution both filters and combines inputs into a new set of outputs in one step. **The depthwise separable convolution splits this into two layers – a separate layer for filtering and a separate layer for combining.** This factorization has the effect of drastically reducing computation and model size.
- The SSD architecture is a single convolution network that learns to predict bounding box locations and classify these locations in one pass. Hence, SSD can be trained end-to-end.

MobileNet SSD.



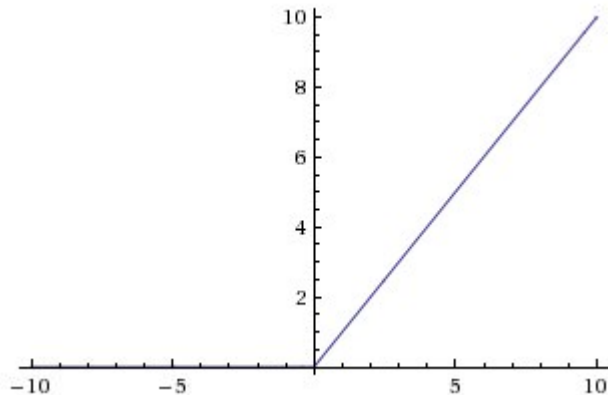
Depthwise Separable Convolution

MobileNet SSD Architecture.



ReLu.

- The Rectified Linear Unit is the most commonly used activation function in deep learning models.
- The function returns 0 if it receives any negative input, but for any positive value x it returns that value back. So it can be written as $f(x)=\max(0,x)$.
- the ReLu function is able to accelerate the training speed of deep neural networks compared to traditional activation functions since the derivative of ReLu is 1 for a positive input.



OpenCV Basic Syntax for DNN.

Loading Image from Disk to DNN

cv2.dnn.blobFromImage
cv2.dnn.blobFromImages

Import Model from various Framework

cv2.dnn.createCaffeImporter
cv2.dnn.createTensorFlowImporter
cv2.dnn.createTorchImporter

cv2.dnn.readNetFromCaffe
cv2.dnn.readNetFromTensorFlow
cv2.dnn.readNetFromTorch
cv2.dnn.readNetFromTorchBlob

.forward` method is used to forward-propagate our image and obtain the actual classification.

cv2.dnn.blobFromImage.

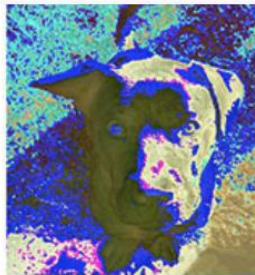
Mean Subtracted Normalized Image =

`cv2.dnn.blobFromImage(resizedImage, scalingFactor, Spatial Size, Mean Subtraction Values)`

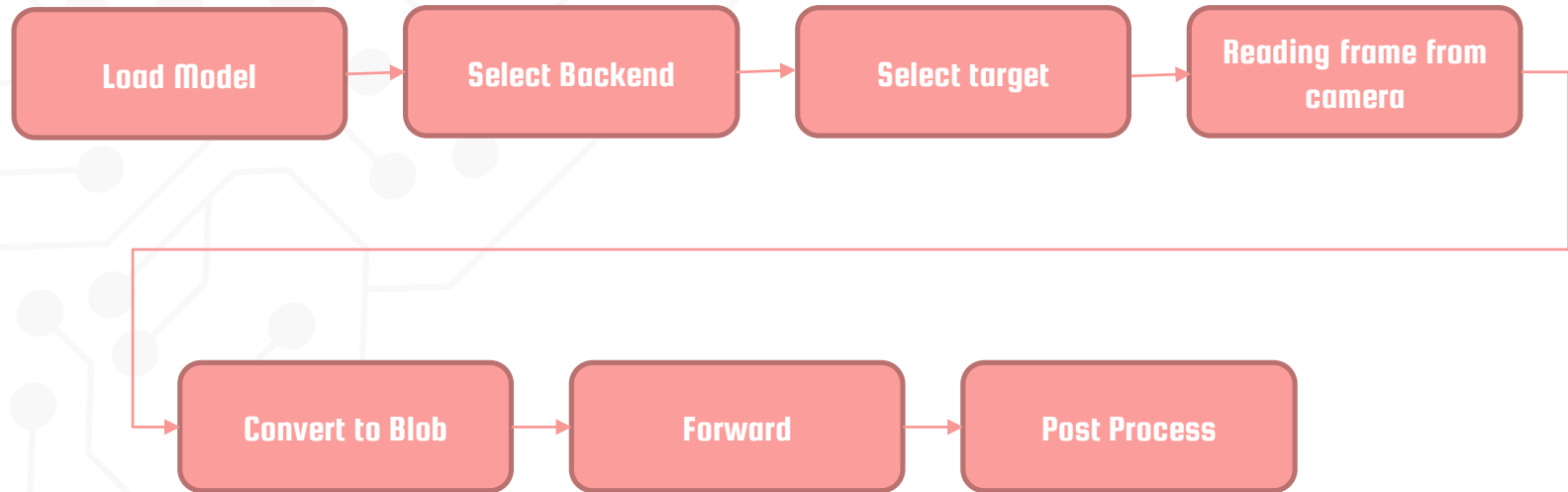
`blob = cv2.dnn.blobFromImage(imResizeBlob, 0.007843, (300, 300), 127.5)`



R=124.96
- G=115.97 =
B=106.13



Block Diagram – Workflow of DNN in OpenCV.



Practical session

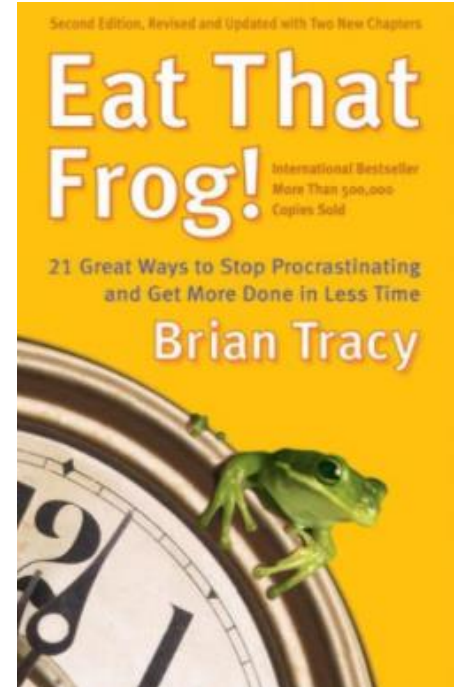
Object Recognition using Pre-trained Model with DNN in OpenCV



Today's Short Bytes – Book Suggestion

The key to reaching high levels of performance and productivity is to develop the lifelong habit of tackling your major task first thing each morning. You must develop the routine of “eating your frog” before you do anything else and without taking too much time to think about it.

- **Take Action Immediately (Failure to execute)**
- **Develop A Positive Addiction (Setting short and long-term SMART goals)**
- **Feeling as the satisfaction of accomplishing each task triggers the brain's reward and pleasure system**
- **No Shortcuts (Practice is the key)**
- **What is your “frog?” What is the one task that you despise doing each day? Once you have chosen your “frog” make it a habit to wake up every morning and do that task first.**





Thanks!

Connect with me on **LinkedIn:**
link in Description

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www.pantechsolutions.net

Course:
Learn.pantechsolutions.net

Tomorrow session

Image Classification using CNN

