Value Added Program - Python Vision Techniques

Submitted by - Andrew John - 18BEC1278

CERTIFICATE

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

CERTIFICATE OF COMPLETION

This is to certify that Mr./Ms. ANDREW JOHN (18BEC1278) of B.TECH ELECTRONICS AND COMMUNICATION ENGINEERING has successfully completed the Value Added Course **"Python for Vision Techniques"** organized by the **School of Electronics Engineering (SENSE),** Vellore Institute of Technology (VIT) – Chennai, from 25-February-2021 to 10-April-2021. His/her consolidated score is 90 out of 100.

Dr. Annis Fathima A
Faculty Coordinator

Dr. Sathya Narayanan S
Faculty Coordinator

Dr. Sivasubramanian A
Dean-SENSE

Dr. Kanchana Bhaaskaran
Pro Vice Chancellor

VIT – Recognised as Institution of Eminence (IoE) by Government of India
VIT - A place to learn; A chance to grow

Industry Complete Address & Contact Persons with Phone Numbers

VIT - Chennai -

Vellore Institute of Technology, Vandalur – Kelambakkam Road Chennai, Tamil Nadu – 600 127

Dr. Sathiya Narayanan Sekar - 9944226963

Dr. Annis Fathima - 9941499077

Andrew John - 18BEC1278 - 9003735112

Agenda

- ➢ Introduction to Python - Reading and understanding images
- ➢ Basic array operations on images using python
- ➢ Spatial domain operations and image enhancement using python
- ➢ Image segmentation and morphology using python
- ➢ Image classification using python
- ➢ CNN for vision applications
- ➢ State-of-the-art Computer Vision applications

About the Value Added Program

The motive is to enlighten them on start-of-the-art computer vision techniques and their implementation using Python. The course gave good insights into understanding images. Basic array operations on images using python were performed. Spatial domain operations and image enhancement using python gave good insights into various filters and operators used in image enhancement. Image segmentation and morphology using python helped in detecting edge and corner discrepancies in images and along with this image classification using python through k-Means was performed. CNN for vision applications and Deep Learning concepts in image processing was delivered through guest faculty. State-of-the-art Computer Vision applications were also delivered through the following guest faculty.

Objective of the Training

To gain extensive knowledge on the technologies of Computer Vision with the help of Python and OpenCV

To understand various operations on images and how they are applied day-to-day in industrial sectors

To learn about the influence of Neural Networks, Deep Learning and Machine Learning on OpenCV and Computer Vision

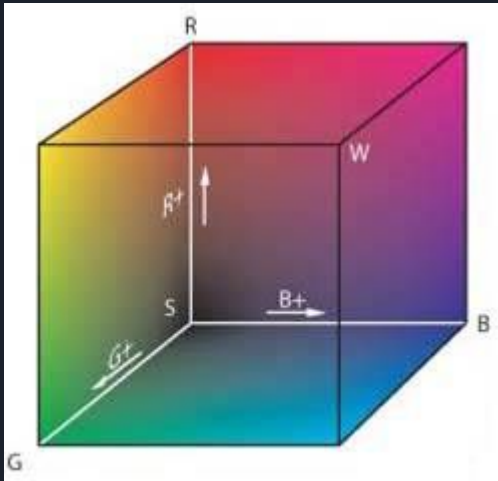To gain knowledge on the current applications of Computer Vision

Literature Survey or Overview of the Project

Introduction to Image Processing and Basic Array Operations

- Studying the Color-Plane information
- Studying the Histogram
- Converting a Grayscale Image to Binary Image

Literature Survey or Overview of the Project

Introduction to Image Processing and Basic Array Operations

RGB Color Space
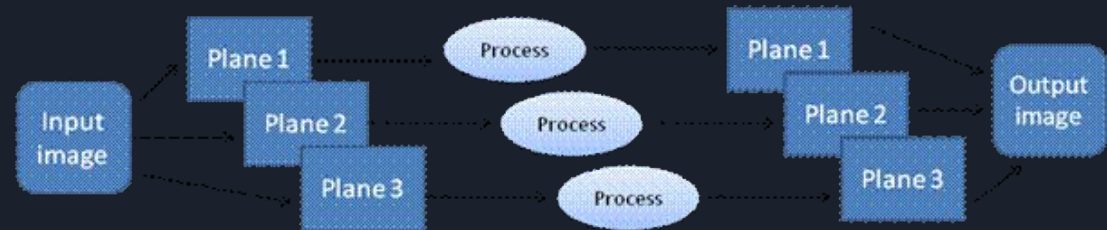
Scalar Processing

Literature Survey or Overview of the Project

Introduction to Image Processing and Basic Array Operations
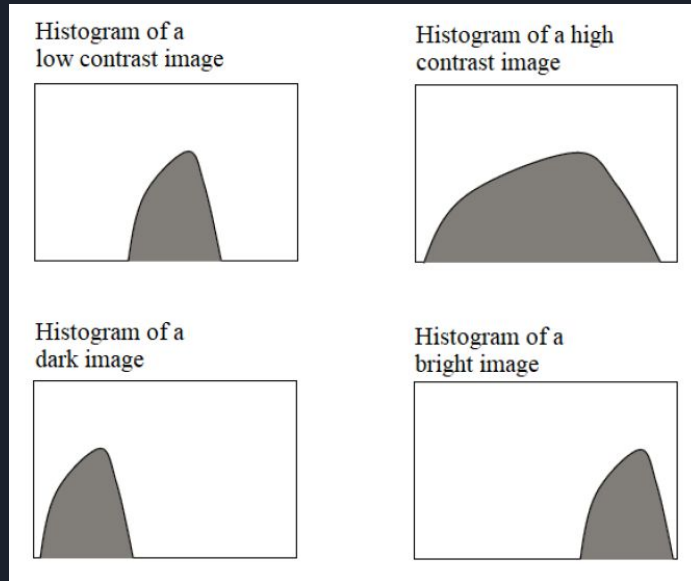
Brightness and Contrast Histogram of Images

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python

- Gaussian and Median Filter
- Maximum and Minimum Filter
- Sharpening Images - Laplacian Operator on Gaussian Operator
- Sobel and Prewitt Operators
- Brightness Function
- Gamma Transformation
- Contrast Stretching
- Log Transformation

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python
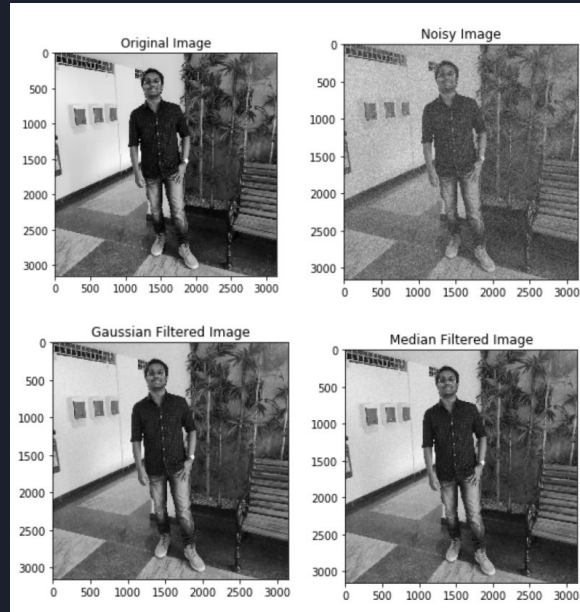
Gaussian and Median Filter

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python
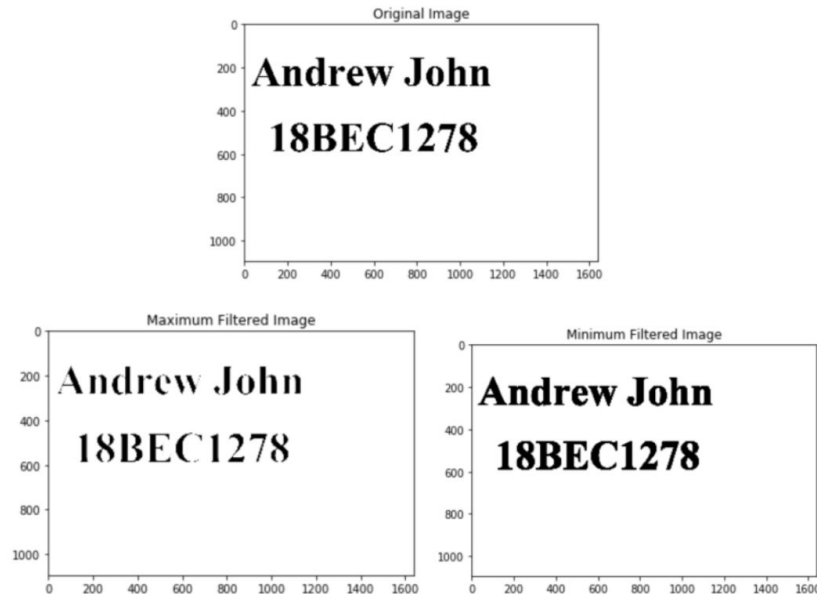
Maximum and Minimum Filter

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python
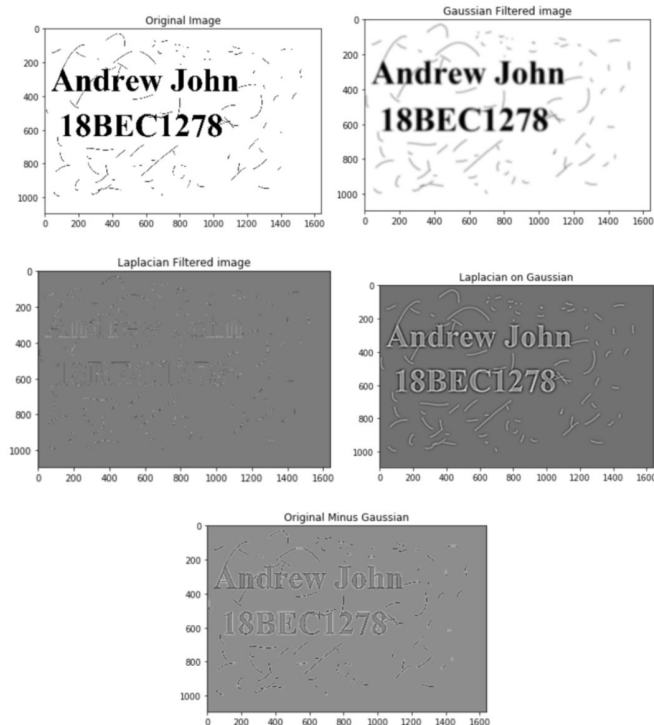
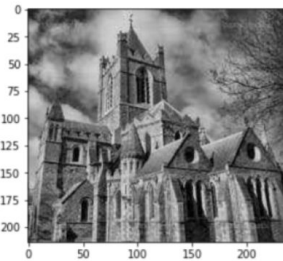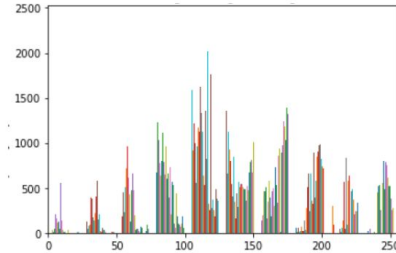Sharpening Image using Laplacian over Gaussian

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python
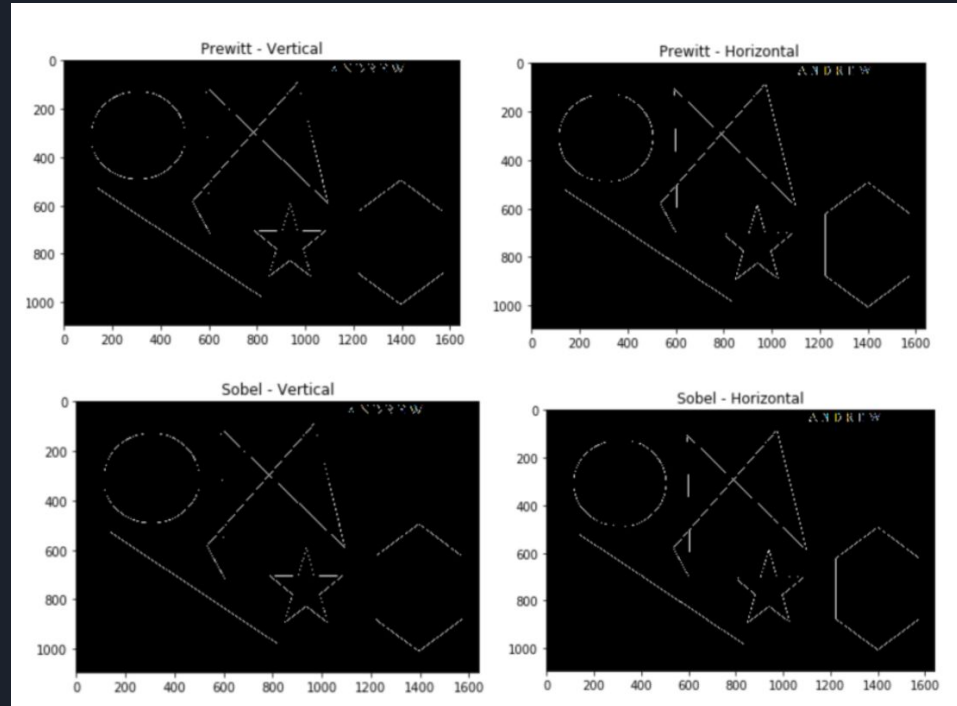
Sobel and Prewitt Operators
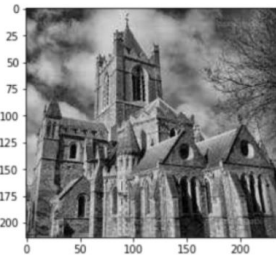
Literature Survey or Overview of the Project

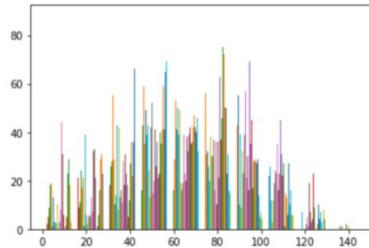Spatial Domain Operations and Image Enhancement using Python

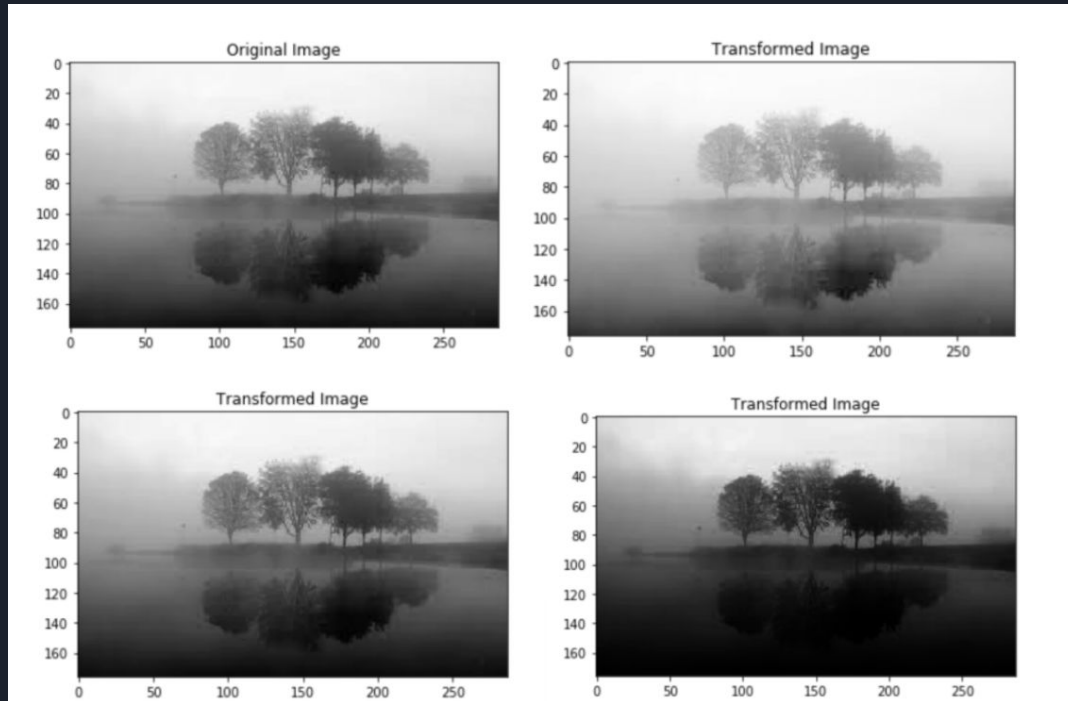(initial image - a)   (initial graph - a)

(brightness image - b)   (brightness graph - b)

Brightness Function

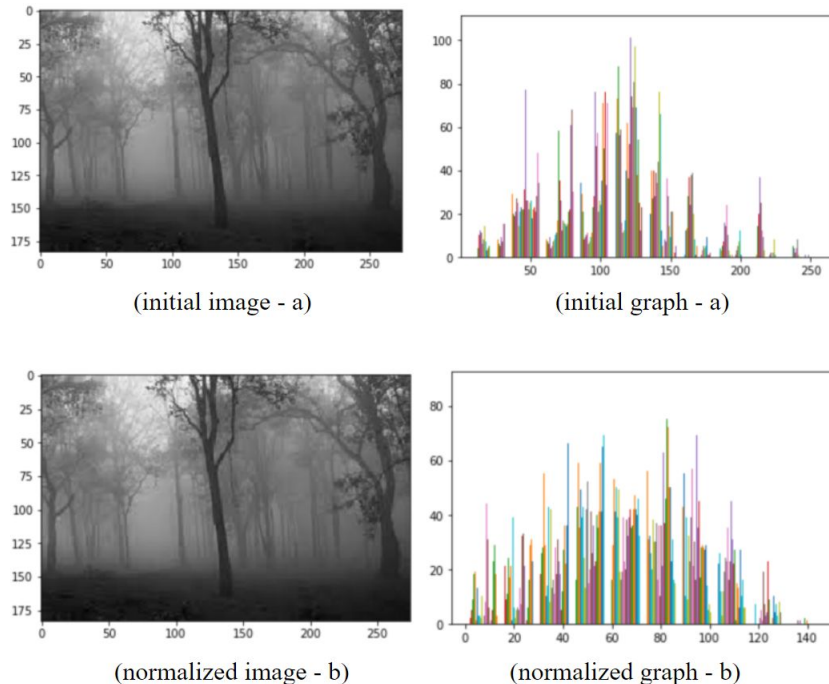# *Literature Survey or Overview of the Project*

Spatial Domain Operations and Image Enhancement using Python

Gamma Function

Literature Survey or Overview of the Project

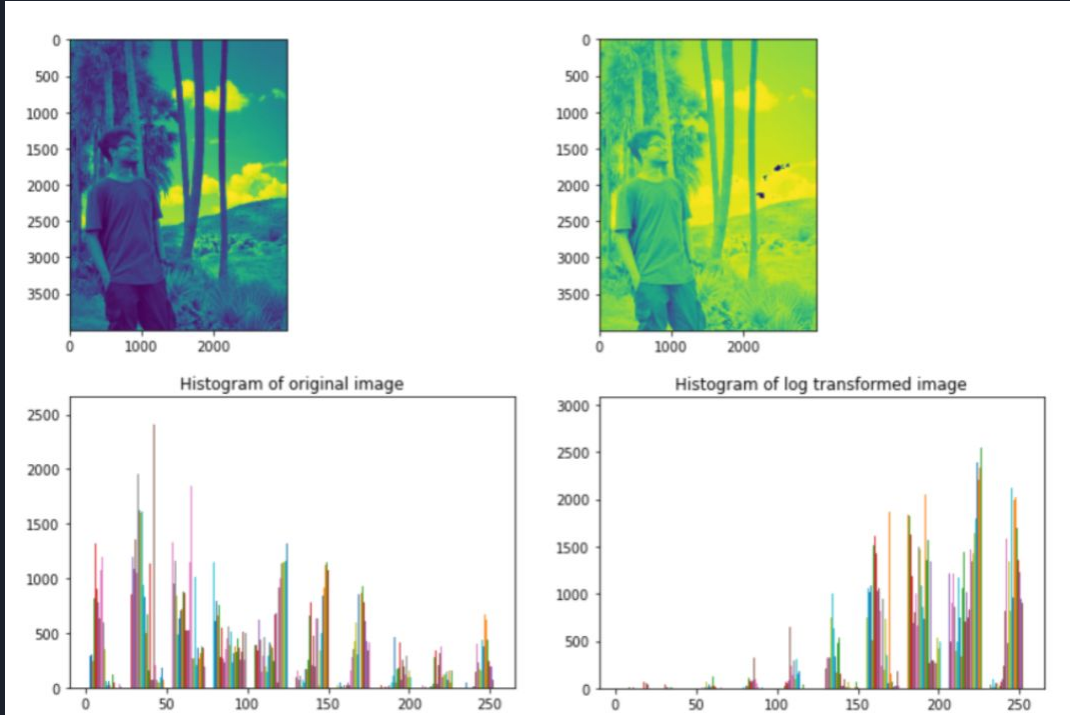Spatial Domain Operations and Image Enhancement using Python

(initial image - a)

(initial graph - a)

(normalized image - b)

(normalized graph - b)

Contrast Stretching

Literature Survey or Overview of the Project

Spatial Domain Operations and Image Enhancement using Python

Log Transformation
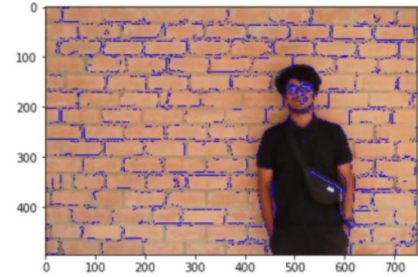
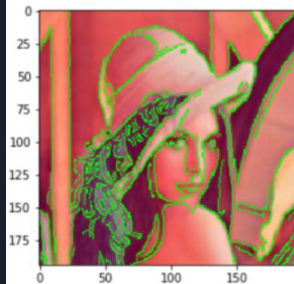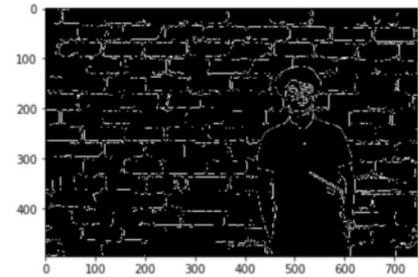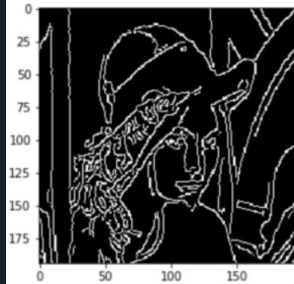# *Literature Survey or Overview of the Project*

Image Segmentation and Image Morphology using Python

- Canny Edge Detection on the Captured Images(s)
- Harris Corner Detection on the Captured Images(s)
- Hough Line Detection on Task - 1's Edge Detected Image(s)
- Hough Circle Detection on the Captured Images(s)
- k-Means Clustering
- Morphological Operations

Literature Survey or Overview of the Project

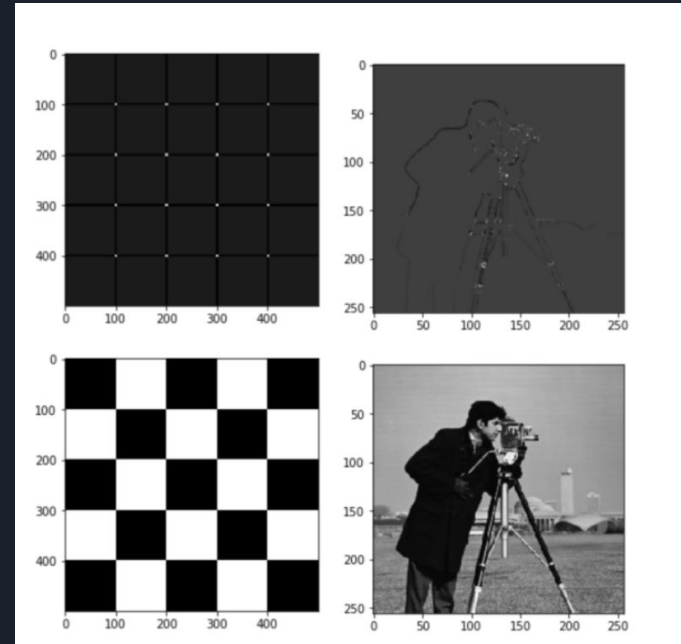Image Segmentation and Image Morphology using Python

Canny Edge Detection

Literature Survey or Overview of the Project

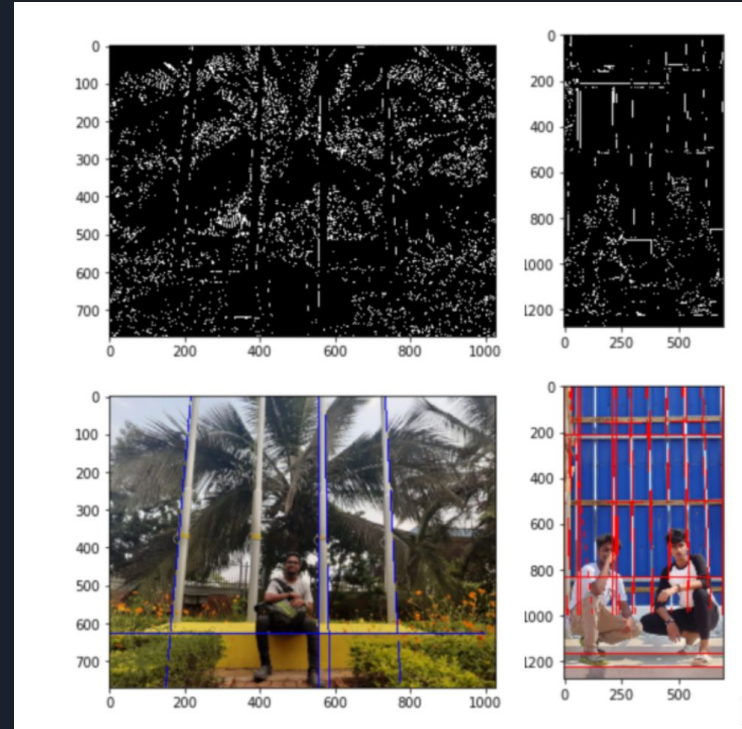Image Segmentation and Image Morphology using Python

Harris Corner Detection

Literature Survey or Overview of the Project

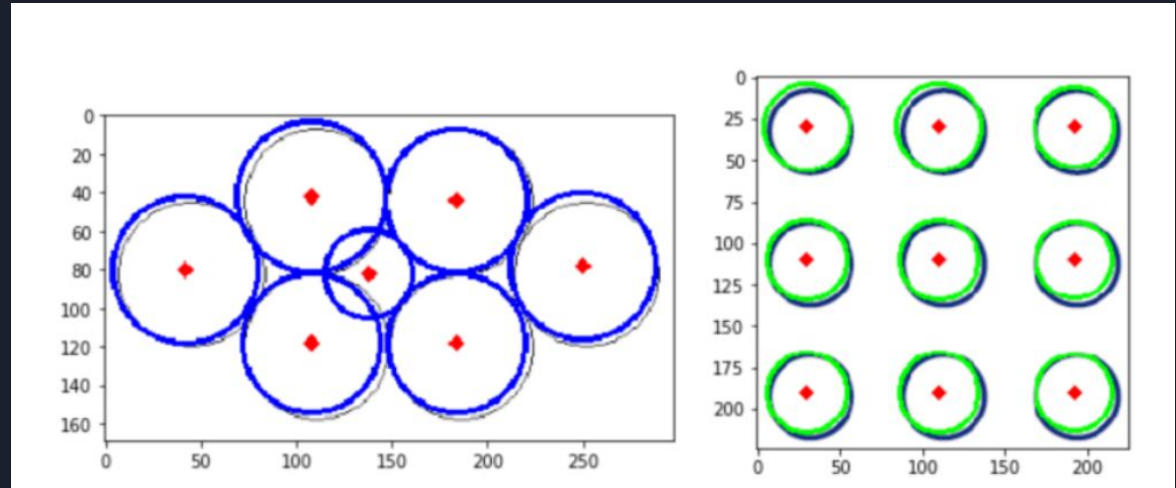Image Segmentation and Image Morphology using Python

Hough Line Transform

Literature Survey or Overview of the Project

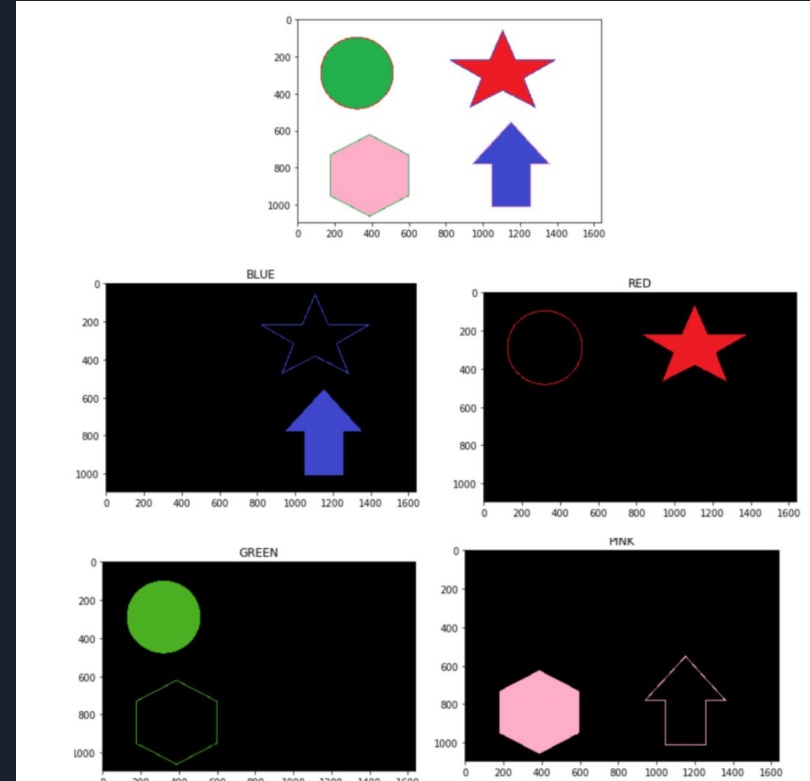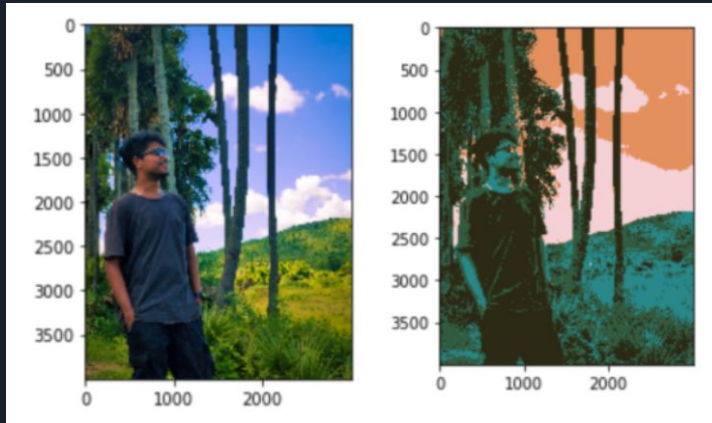Image Segmentation and Image Morphology using Python

Hough Circle Transform

Literature Survey or Overview of the Project

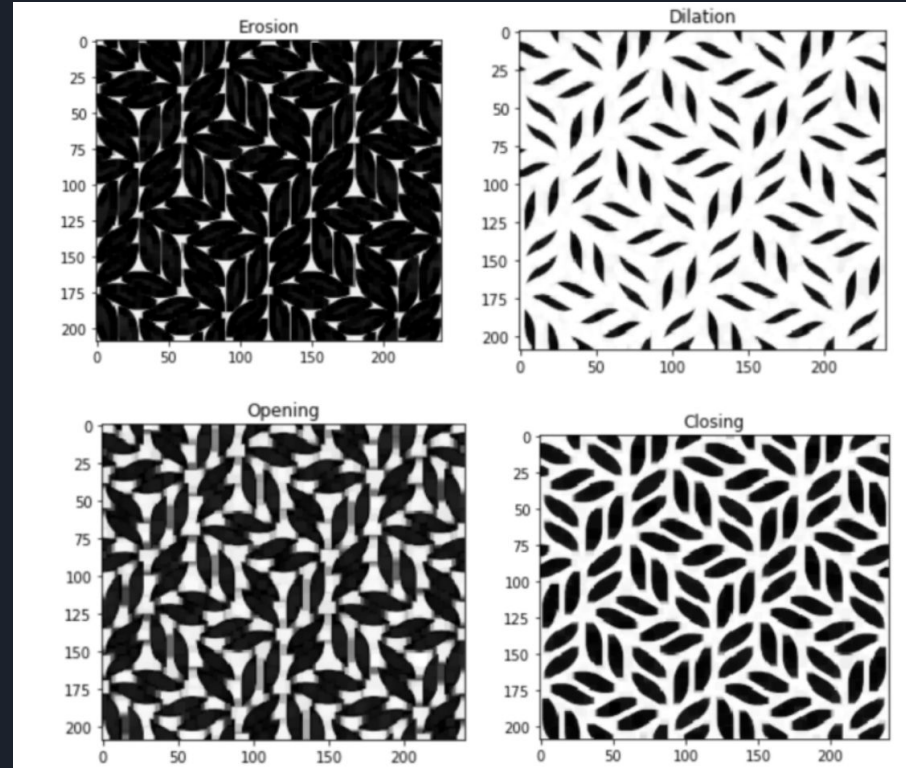Image Segmentation and Image Morphology using Python

k-Means, Image Segmentation
and Color Segmentation

Literature Survey or Overview of the Project

Image Segmentation and Image Morphology using Python

Morphological Operations
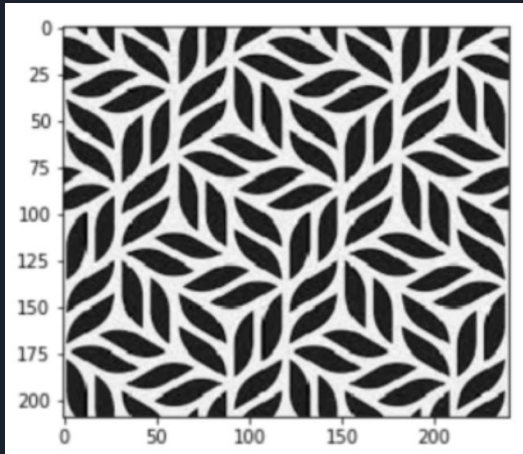
Deep Learning and CNN for Vision Applications
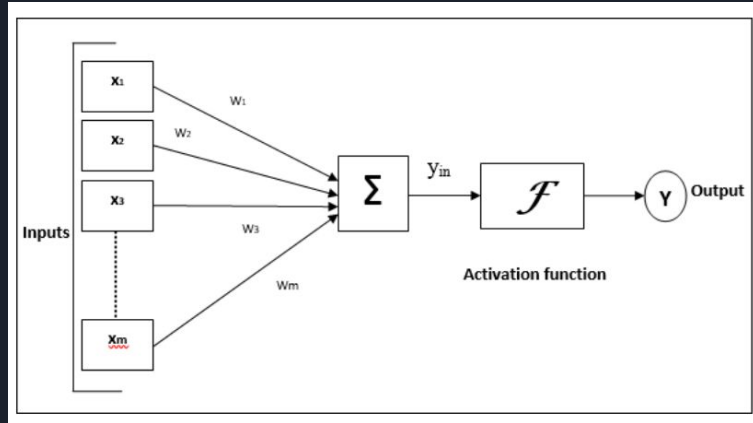
Model of Neural Network

Model of Convolutional Neural Network
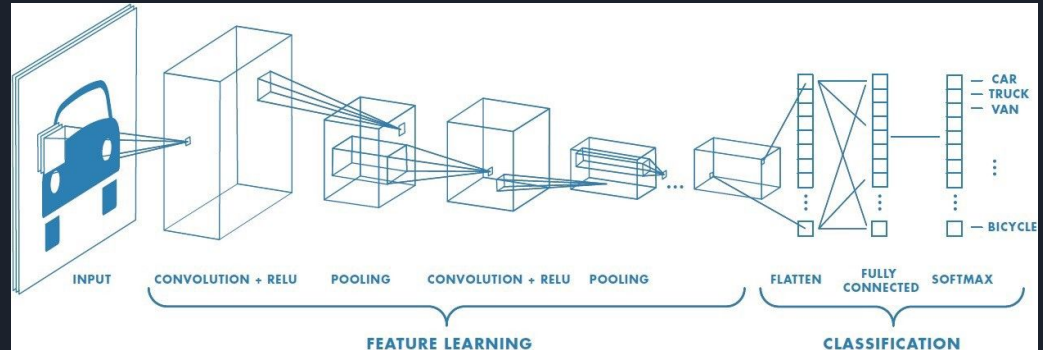
Deep Learning and CNN for Vision Applications

Transfer Learning

TRADITIONAL MACHINE LEARNING

DATASET 1 → MACHINE LEARNING MODEL 1

DATASET 2 → MACHINE LEARNING MODEL 2

TRANSFER LEARNING

DATASET 1 → MACHINE LEARNING MODEL 1

KNOWLEDGE

DATASET 2 → MACHINE LEARNING MODEL 2
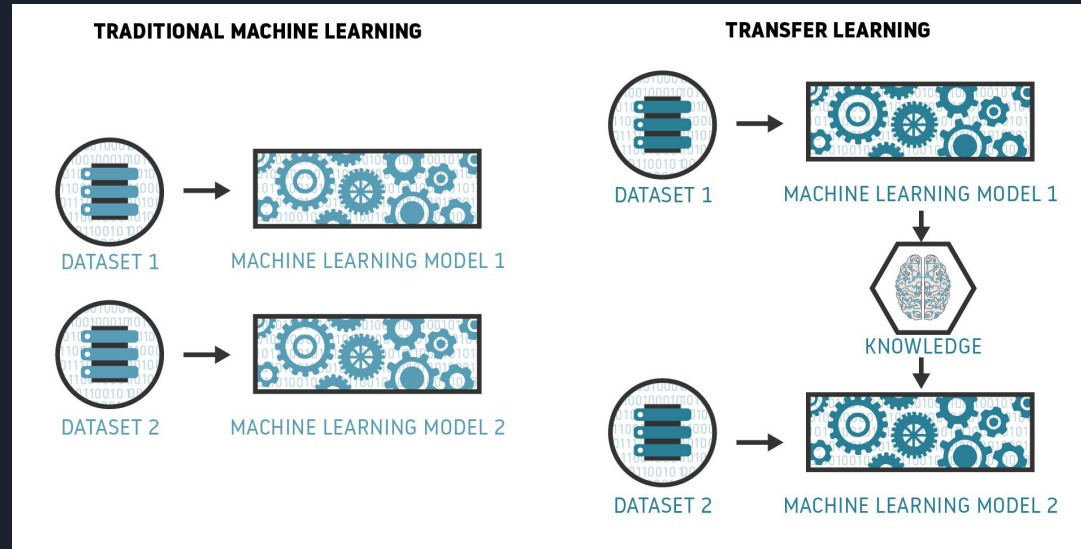
State-of-the-art Computer Vision Applications

Computer Vision in Manufacturing

Computer Vision in Healthcare

Computer Vision in Agriculture

Computer Vision in Transportation

Computer Vision in Retail

Computer Vision in Sports

Your learning from the training

Had acquired extensive knowledge on the technologies of Computer Vision with the help of Python and OpenCV

Understood various operations on images and how they are applied day-to-day in industrial sectors

Learned about the influence of Neural Networks, Deep Learning and Machine Learning on OpenCV and Computer Vision

Gained knowledge on the current applications of Computer Vision

Future Possibilities

According to Gartner, "The global computer vision market size was valued at USD 10.6 billion in 2019 and is expected to grow at a compound annual growth rate (CAGR) of 7.6% from 2020 to 2027."

Vision Intelligence will play a key role in the Post-COVID industrial world. With the spike in digital transformation adaptation in the last 9 months; the acute need of advanced automation in the manufacturing industry; a surge in demand for vision-guided quality inspection systems; increasing favorable government initiatives for worker safety, we expect an exponential growth in the market.

https://analyticsindiamag.com/9-computer-vision-trends-that-will-dominate-the-industry-in-2021/

Conclusions

At the end of the course we were able to : Identify appropriate computer vision techniques for various real-time projects, apply computer vision techniques for better image understanding, implement and debug python codes related to image enhancement, understand and implement object detection techniques in python, apply face detection algorithm in python and studied the importance of computer vision in real time world by understanding their applications in various fields.

References

https://chennai.vit.ac.in/

https://chennai.vit.ac.in/events/

https://www.wikipedia.org/

https://www.tutorialspoint.com/index.htm

https://towardsdatascience.com/

https://opencv.org/

https://www.python.org/

https://jupyter.org/

Thank You :)