Lab- 7

CSET340- Advanced Computer Vision and Video analytics

Task-1:- Blob detection and Image Quality Enhancement.

Blob detection:- Blob detection is a basic method in computer vision used to locate areas of interest in a picture. Apply the **three** different blob detection techniques (LoG, DoG, HoG) **separately** on the same image.

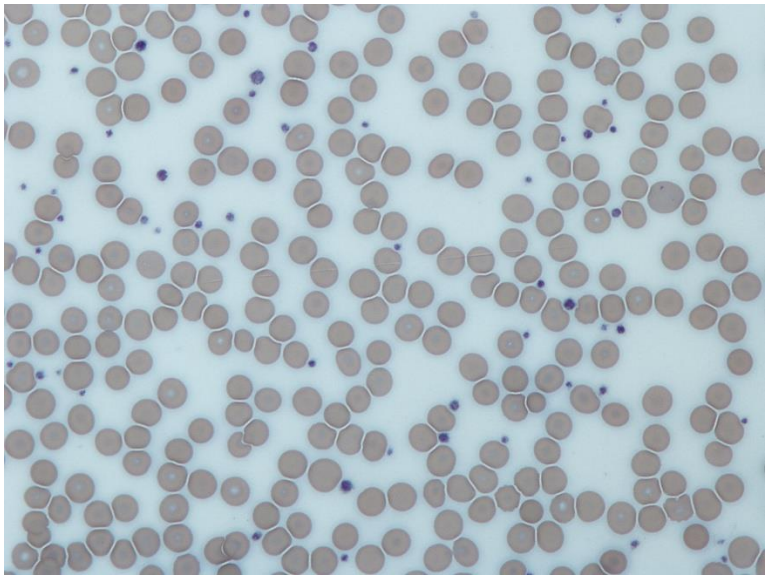
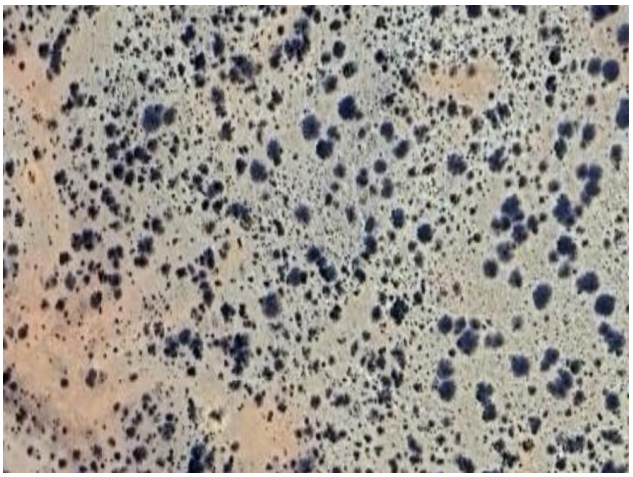


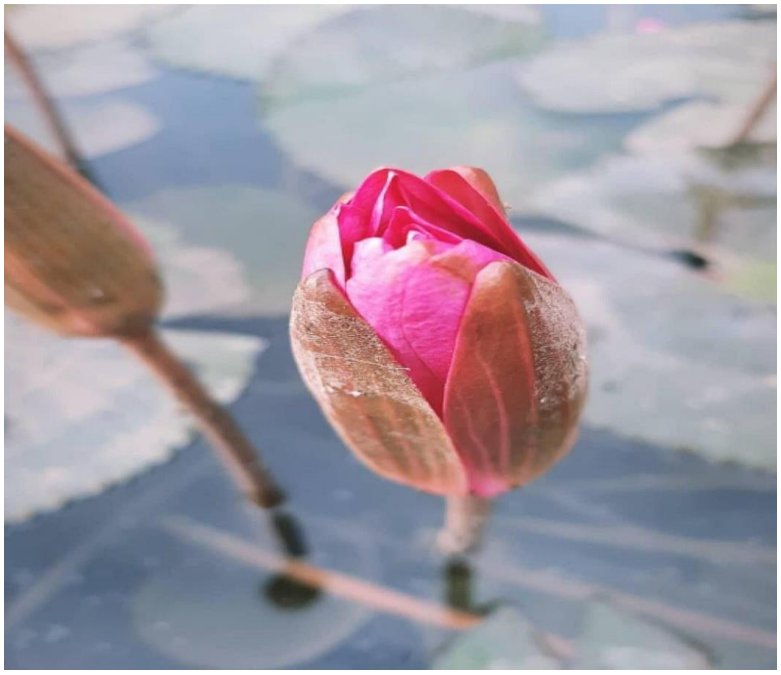
Image:- Image from a light microscope (500 ×) showing platelets (small **purple** dots) surrounded by red blood cells (large **gray** circular structures)

Image:- Candy image. How many candies are present ? (Optional task)



Images:- Satellite images

Image Quality Enhancement:-



- Perform this using the following techniques
    - Adjusting brightness and contrast
    - Sharpening images
    - Removing noise from images
    - Enhancing color in images
    - Image resizing and scaling
    - Inverse Transform
    - Equalizing histograms
    - Super-resolution
    - Color correction

Task-2:- Image Classification using AlexNet and VGG16 on Cifar-100

Objective:

- Compare the performance of AlexNet and VGG16 on an image classification task.
- Use **CIFAR-100**, a common dataset for image classification.
- Analyse model accuracy, loss, and inference time on a dataset.

Step 1: Installation of necessary libraries

Step 2: Load the dataset.

Step 3: Load the pretrained Model (AlexNet and VGG16)

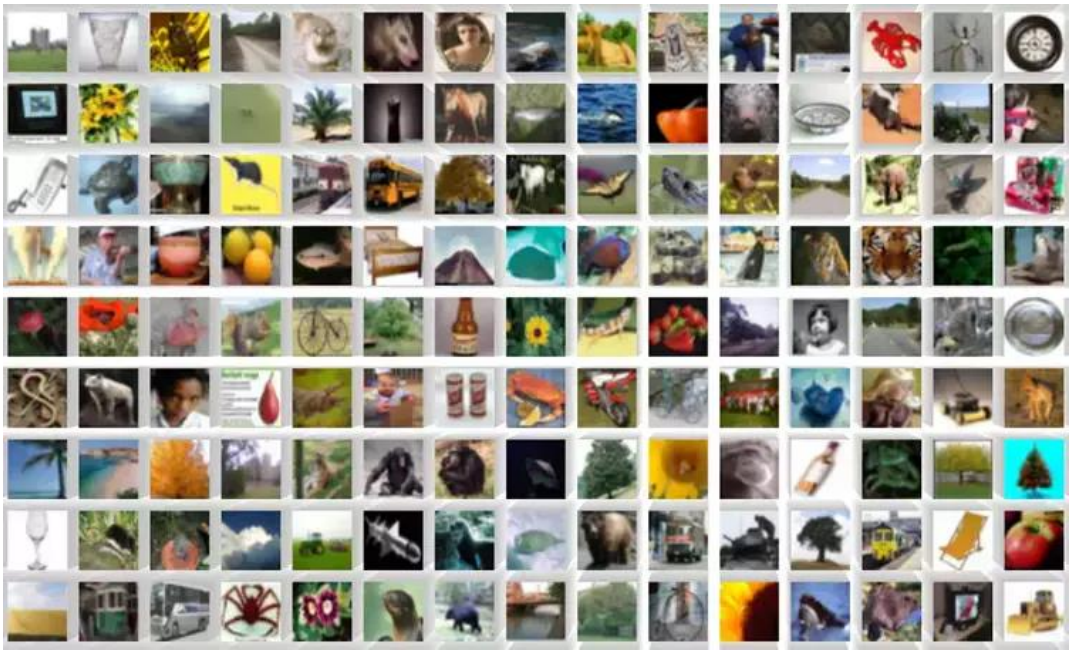
Step 4: Train the Models

Step 5: Evaluate the Performances

Step 6: Compare the results.

Datasets-

1. CIFAR-100 dataset:- The CIFAR100 (Canadian Institute For Advanced Research) dataset consists of 100 classes with 600 color images of 32×32 resolution for each class.
   This dataset is just like the CIFAR-10, except it has 100 classes containing 600 images each. There are 500 training images and 100 testing images per class. The 100 classes in the CIFAR-100 are grouped into 20 super classes. Each image comes with a "fine" label (the class to which it belongs) and a "coarse" label (the superclass to which it belongs).



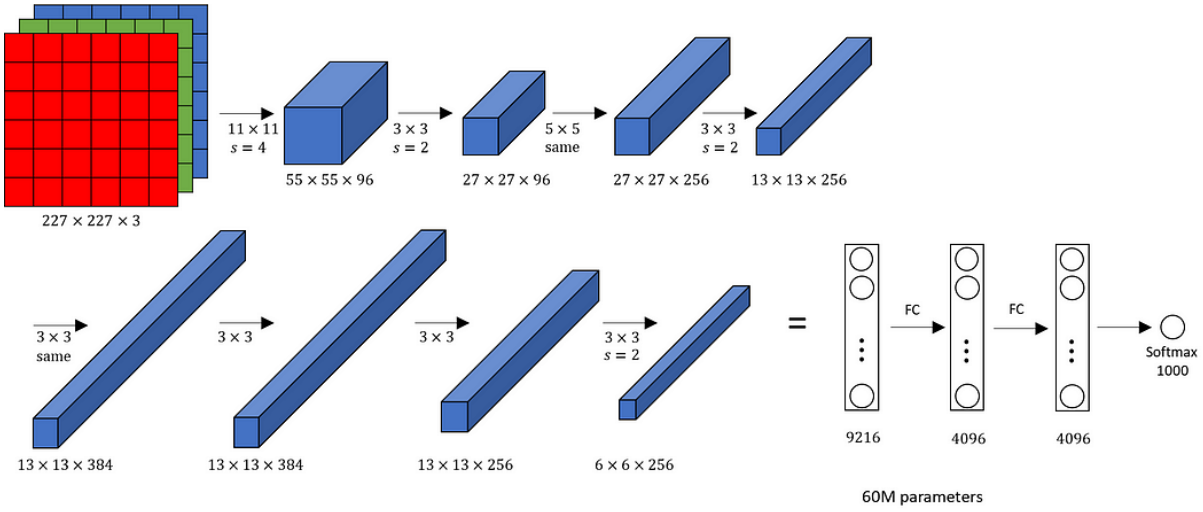
2. Load CIFAR 100 Dataset Training Subset in Python
   a. import deeplake
   b. ds = deeplake.load("hub://activeloop/cifar100-train")
3. Load CIFAR 100 Dataset Testing Subset in Python

a. import deeplake
b. ds = deeplake.load("hub://activeloop/cifar100-test")

4. CIFAR 100 Dataset Structure
    a. **CIFAR 100 Data Fields**
        i. images: tensor containing images of the dataset.
        ii. labels: tensor containing labels for their respective image.
        iii. coarse_labels: tensor containing superclass for their respective image.

Alexnet:-

- AlexNet consists of 5 convolution layers, 3 max-pooling layers, 2 Normalized layers, 2 fully connected layers and 1 SoftMax layer.
- Each convolution layer consists of a convolution filter and a non-linear activation function called “ReLU”.
- The pooling layers are used to perform **the max-pooling** function and the input size is fixed due to the presence of fully connected layers.
- The input size is mentioned at most of the places as 224x224x3 but due to some padding which happens it works out to be 227x227x3.
- AlexNet has over 60 million parameters.



VGG-16:-

- The 16 in VGG16 refers to 16 layers that have weights.
- In VGG16 there are 13 convolutional layers, 5 Max Pooling layers, and 3 Dense layers which sum up to 21 layers but it has only sixteen weight layers i.e., learnable parameters layer.
- VGG16 takes input tensor size as 224, 244 with 3 RGB channel
- Convolution layers of 3x3 filter with stride 1 and always used the same padding and maxpool layer of 2x2 filter of stride 2.
- Conv-1 Layer has 64 number of filters, Conv-2 has 128 filters, Conv-3 has 256 filters, Conv 4 and Conv 5 has 512 filters.