ENGR 391: Computer Vision
Homework Assignment # 7
Spring 2024

Problem 1

For a given image, I_x, I_y and I_t are given by

$$I_x = \begin{bmatrix} 10.75 & 17.50 \end{bmatrix} \tag{1}$$

$$I_y = \begin{bmatrix} 20.25 & 17.00 \end{bmatrix} \tag{2}$$

$$I_t = \begin{bmatrix} 11.25 & 06.00 \end{bmatrix} \tag{3}$$

Solve for optical flow using the following methods:

1. Graphically, you can use Matlab or Python or other tools.
2. Lucas and Kanade method.

Problem 2

In this problem we want to classify letters A and B (see figure 1) using two features: solidity and compactness. The data is summarized in the table below and shown in figure 2. We want to implement the iterative learning process for a single-neuron perceptron to solve a classification problem. Write code to implement the perceptron learning rule to solve this classification problem . Do not use built in neural networks functions. Plot the decision line with the data.

Figure 1. Letters A and B

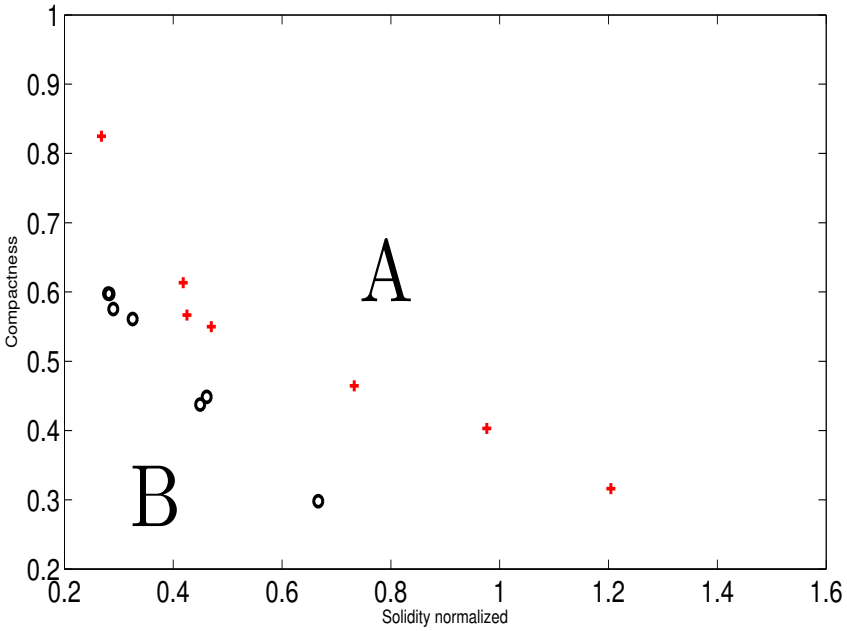

Figure 2. Plot of the features for letters A and B

B	B	A	A
Feature 1	Feature 2	Feature 1	Feature 2
0.2801	0.5977	0.4252	0.5667
0.3254	0.5610	0.4183	0.6134
0.2829	0.5972	0.2681	0.8249
0.2898	0.5754	0.4700	0.5498
0.6665	0.2978	1.2044	0.3161
0.4495	0.4375	0.9762	0.4029
0.4613	0.4485	0.7326	0.4645

(4)

Problem 3

Consider the classes shown in figures 3 and 4. In your opinion, what are the best shape descriptors that can be used to distinguish between bugs and butterflies. The shape descriptors must be scale invariant. We need to use at least two descriptors.

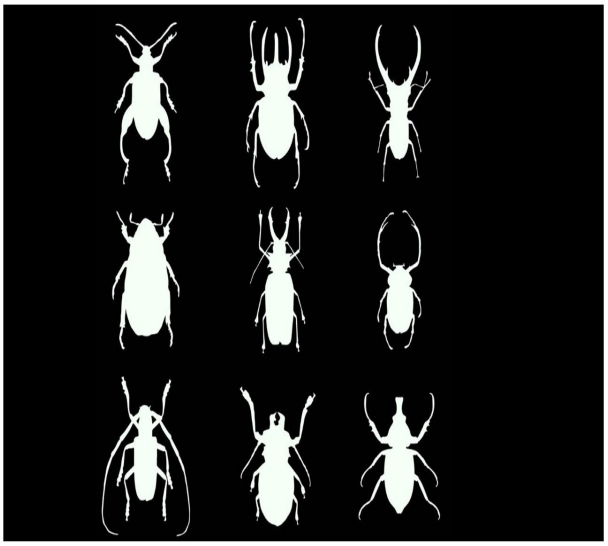

Figure 3. First class

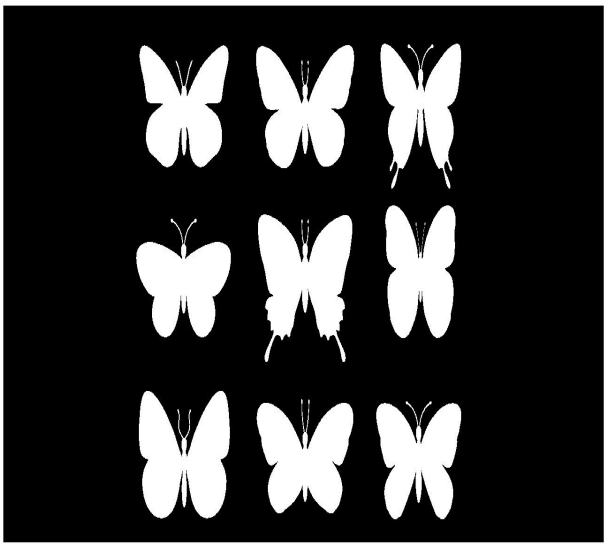

Figure 4. Second class