Bayesian Decision Theory

Saurabh H. Mirani

a) Based on the number of samples from the grass and cheetah training datasets, we can compute the prior probabilities as:

$$Py(Cheetah) = \frac{Samples\ in\ Foreground}{Samples\ in\ Foreground + Samples\ in\ Background}$$

$$= \frac{250}{250 + 1053}$$

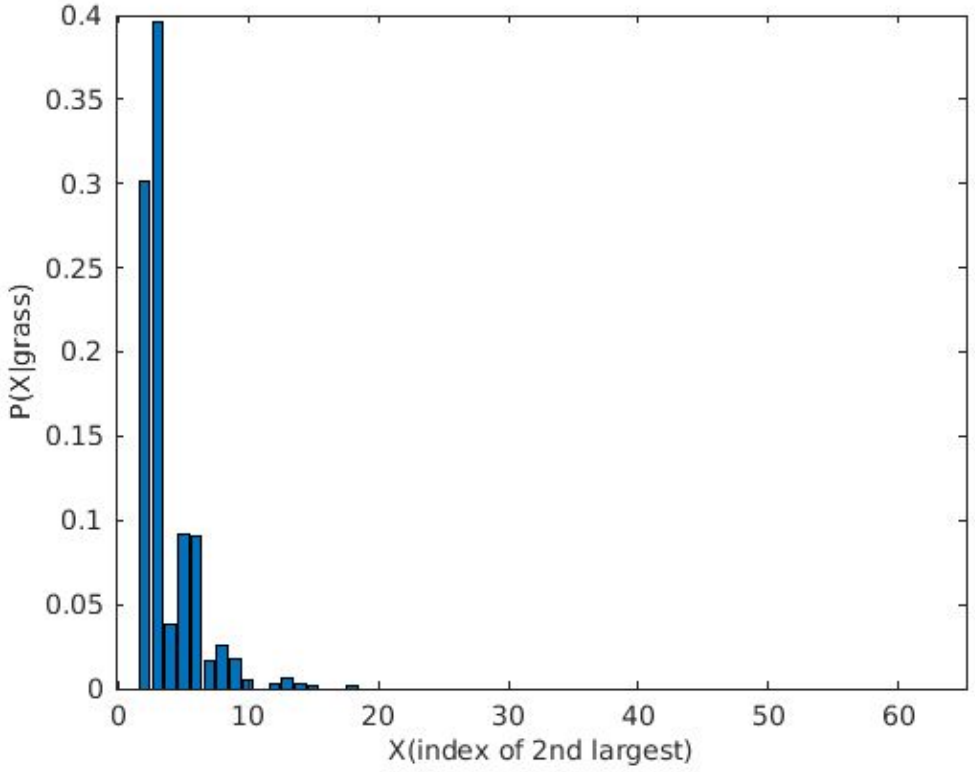
$$= 0.1919$$

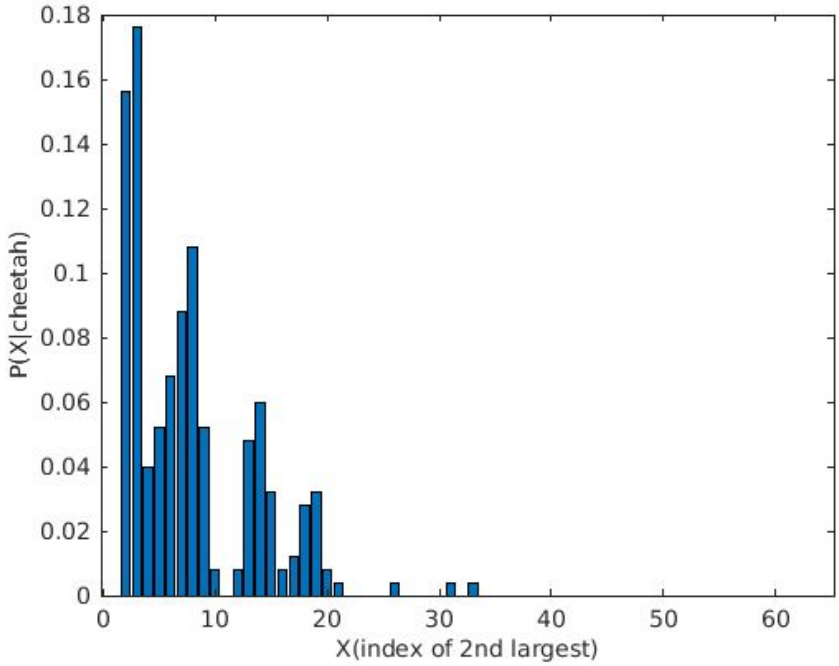
$$Py(Grass) = \frac{Samples\ in\ Background}{Samples\ in\ Foreground + Samples\ in\ Background}$$

$$= \frac{1053}{250 + 1053}$$

$$= 0.8081$$

b) The obtained histogram is

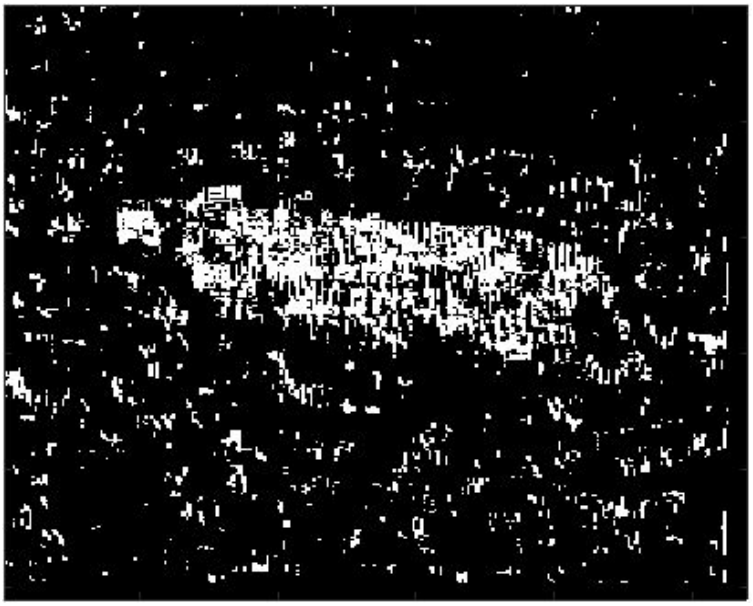




c) It is cheetah if:

$$P_{X|Y}(x \mid cheetah) * P_Y(cheetah) \geq P_{X|Y}(x \mid grass) * P_Y(grass)$$

Following this rule, the image obtained is:



d) The Probability of error is computed by:

$$POE = \frac{\#\ of\ misclassified\ pixels}{\#\ of\ total\ pixels} = 0.1784$$

Where # of misclassified pixels is calculated by comparing the image obtained in c) to the ground truth image provided as cheetah_mask.bmp