CS2180: Aritificial Intelligence Lab 5

Name & Roll. No:

February 8, 2019

Q1) Naive Bayes Classifier: A village contains adults or kid, and each person has two features namely (height,weight). The model information is given by $P(kid)$, $P(adult)$ and $p(x|kid)$ and $p(x|adult)$ where x=(x(1), x(2))=(height,weight). Class conditionals i.e., are given by

$$p(x|kid) = \frac{1}{\sqrt{2\pi}\sigma_1(1)} e^{(\frac{-1}{2}(\frac{x(1)-\mu_1(1)}{\sigma_1(1)})^2)} \frac{1}{\sqrt{2\pi}\sigma_1(2)} e^{(\frac{-1}{2}(\frac{x(2)-\mu_1(2)}{\sigma_1(2)})^2)} \tag{1}$$

$$p(x|adult) = \frac{1}{\sqrt{2\pi}\sigma_2(1)} e^{(\frac{-1}{2}(\frac{x(1)-\mu_2(1)}{\sigma_2(1)})^2)} \frac{1}{\sqrt{2\pi}\sigma_2(2)} e^{(\frac{-1}{2}(\frac{x(2)-\mu_2(2)}{\sigma_2(2)})^2)}, \tag{2}$$

where $\sigma_1(1) = \sigma_1(2) = \sigma_2(1) = \sigma_2(2) = 1.0$

a) Generate a population of size $n = 1000$. Show the two cluster of points. [25 Marks]

b) Now use the points generated in the previous question to estimate $\hat{P}$ and $\hat{p}$. [15 Marks]

c) Implement Baye's rule using $\hat{P}$ and $\hat{p}$ [10 Marks]

Q2) Perceptron: Consider the same village problem as in previous exercise. However, now, the class conditionals i.e., are given by uniform distributions: the height for kids is distributed uniformly between $[4.9, 5.3]$, the height of adult is distributed uniformly between $[5.4, 5.9]$, the weight of kids is distributed uniformly between $[30, 45]$ kilograms, and adults weight is distributed uniformly between $[50, 65]$ kilograms.

a) Generate a population of size $n = 1000$. Show the two cluster of points. [10 Marks]

b) Use perceptron algorithm, and compute the decision rule. Show the decision boundary at each time instant [10 Marks]

Q3) Support Vector Machine: For the set of points generated in the preceptron example, show the classifier learnt by SVM [20 Marks]