MANIPAL SCHOOL OF INFORMATION SCIENCES
MANIPAL
(A constituent unit of MAHE, Manipal)

AML5102 | Deep Learning | In-class Problem Set-1

Consider a dataset in which a sample has 5 features:

(1) *heart rate* (2) *blood pressure* (3) *temperature* (4) *age* (5) *weight*,

and a target variable *in hospital death* that has two levels *yes* and *no*. Suppose we build a logistic regression model using the dataset. Choose the correct answer for the following questions:

1. $x_2^{(1)}$ represents
   - A. 1st patients heart rate
   - B. 2nd patients heart rate
   - C. 2nd patients blood pressure
   - D. 1st patients blood pressure
2. The component w_3 of the weight vector is the weight applied to
   - A. Weight
   - B. Age
   - C. Blood pressure
   - D. Temperature
3. Which feature gets most weighted (ignoring sign) using the weight vector
   $$w = \begin{bmatrix} 10^{-1} & 10^{-2} & -10^{-2} & -10^{2} & 10 \end{bmatrix}?$$
   - A. Age
   - B. Weight
   - C. Temperature
   - D. Blood pressure
4. $y^{(1)}$ represents the 1st patient's
   - A. predicted output label
   - B. correct output label
   - C. predicted probability that it belongs to label 1
   - D. predicted probability that it belongs to label 0
5. Suppose the 1st patient survived. Then, $\hat{y}^{(1)}$ represents the 1st patient's
   - A. predicted output label
   - B. correct output label
   - C. predicted probability that they belong to label 1
   - D. predicted probability that they belong to label 0

6. Suppose the 1st patient did not survive. Then, $\hat{y}^{(1)}$ is equal to

   A. $1 - \sigma\left(w \cdot x^{(1)}\right)$

   B. $\sigma\left(w \cdot x^{(1)}\right)$

   C. $\sigma\left(w \cdot x^{(1)}\right) \times \left(1 - \sigma\left(w \cdot x^{(1)}\right)\right)$

   D. $\sigma\left(w \cdot x^{(1)}\right)^{\left(1-y^{(1)}\right)} \times \left(1 - \sigma\left(w \cdot x^{(1)}\right)\right)^{y^{(1)}}$

7. Suppose there are 4 patients in the dataset in which first two survived and the last two did not. Using a particular weight vector w, we get:

$$\begin{aligned} \sigma\left(w \cdot x^{(1)}\right) &= 0.1, \\ 1 - \sigma\left(w \cdot x^{(2)}\right) &= 0.2, \\ \sigma\left(w \cdot x^{(3)}\right) &= 0.9, \\ 1 - \sigma\left(w \cdot x^{(4)}\right) &= 0.15. \end{aligned}$$

   Without calculation, we can say that the loss is the highest for patient

   A. 1

   B. 2

   C. 3

   D. 4

8. The bias feature value for all samples is equal to

   A. -1

   B. 0

   C. 1

   D. any fixed positive number

9. If there are 100 patients' information in the dataset, then the size of the data matrix after the bias trick is

   A. 100×5

   B. 6×100

   C. 101×5

   D. 100×6

10. Suppose we have 100 patients of which 10 survived and the remaining did not. Which of the following is a suitable loss definition for the ith sample to address the output label imbalance?

   A. $L = \left[-y^{(i)} \log\left(\sigma\left(w \cdot x^{(i)}\right)\right)\right] + \left[-\left(1 - y^{(i)}\right) \log\left(1 - \sigma\left(w \cdot x^{(i)}\right)\right)\right]$

   B. $L = 0.9\left[-y^{(i)} \log\left(\sigma\left(w \cdot x^{(i)}\right)\right)\right] + 0.1\left[-\left(1 - y^{(i)}\right) \log\left(1 - \sigma\left(w \cdot x^{(i)}\right)\right)\right]$

   C. $L = 0.1\left[-y^{(i)} \log\left(\sigma\left(w \cdot x^{(i)}\right)\right)\right] + 0.9\left[-\left(1 - y^{(i)}\right) \log\left(1 - \sigma\left(w \cdot x^{(i)}\right)\right)\right]$

   D. $L = 0.5\left[-y^{(i)} \log\left(\sigma\left(w \cdot x^{(i)}\right)\right)\right] + 0.5\left[-\left(1 - y^{(i)}\right) \log\left(1 - \sigma\left(w \cdot x^{(i)}\right)\right)\right]$