Course: Machine Learning - Techniques

Week 4 Practice assignment solution

1. (1 point) **(Multiple Select)** Identify the correct statement?

   A. Classification of e-mails as spammed or not is an example of binary classification.

   B. Classification of different type of cars like sedan, SUV and ford is an example of multiclass classification.

   C. Classification of genre of a movie where a movie can have more than one genre is an example of multiclass classification.

   Answer: A, B

   Solution:
   A.)Email spam detection model contains two label of classes as spam or not spam and as we know classifying instances into one of two classes is called binary classification.

   B.) Since multiclass or multinomial classification is the problem of classifying instances into one of three or more classes .Here in option B we have 3 labels of classes (Sedan,SUV,Ford)

   C.) Since a movie can have more than one genre at a time so it is an example of multi-label classification.

2. (1 point) Consider the feature matrix $\mathbf{X}_{6\times 2}$ and corresponding label, weight vector $\mathbf{y}_{6\times 1}$ in the below table. Based on this calculate the total loss value.

```
features=np.array([[-0.90912317, -1.64763394],
        [-2.46713996, -0.40733471],
        [-1.32169038, -3.06806195],
        [ 3.05483814,  0.7044727 ],
        [ 2.88645294,  2.89814917],
        [ 2.73959279,  1.40490587]])

label=np.array([0, 0, 0, 1, 1, 1])

weight_vector=np.array([0.95183461, 0.11616577])
```

   A. 0

   B. 1

   C. 0.312

   D. 0.416

   E. 0.275

Answer: A

Solution: When the label is predicted, we see that all the labels are accurately predicted.Hence loss is zero.

```
e= features@weight_vector
y_pred=[]
for i in e:
  if i<0:
    y_pred.append(0)
  else:
    y_pred.append(1)
print(y_pred)
```

(Common data Q3, Q4, Q5,Q6) An Array of true and predicted label is given below.Based on that answer the following.

```
pred_labels = np.asarray([0,0,1,0,1,0,0])

true_labels = np.asarray([0,0,1,0,1,1,0])
```

3. (1 point) Calculate total number of true positive value.
   A. 2
   B. 0
   C. 4
   D. 1

Answer: A

Solution: We know, A true positive is an outcome where the model correctly predicts the positive class.
Here 2 outcomes are accurately predicted as positive class.

4. (1 point) Calculate total number of false negative value.
   A. 2
   B. 0
   C. 4
   D. 1

Answer: D

Solution: We know, A false negative is an outcome where the model incorrectly predicts the negative class.

5. (1 point) Calculate total number of false positive value.
   A. 2
   B. 0
   C. 4

D. 1

Answer: B

Solution:
A false positive is an outcome where the model incorrectly predicts the positive class

6. (1 point) Calculate total number of true negative value.

   A. 2

   B. 0

   C. 4

   D. 1

Answer: C

Solution:
A true negative is an outcome where the model correctly predicts the negative class.

7. (1 point) The decision boundary between two classes is represented with hyperplane $y = w_0 + w^T x$, Then

   A. On decision boundary, $y = 0$

   B. On decision boundary, $y \neq 0$

   C. On decision boundary, $y \geq 0$

   D. On decision boundary, $y \leq 0$

Answer: A

Solution: On decision boundary y value is taken as zero.

8. (1 point) Consider a multi-class classification problem with four classes: 'red,' 'blue,' and 'green,' 'yellow.' Then the number of one vs one binary classification problems are.

   A. 6

   B. 4

   C. 3

   D. 12

Answer: A

Solution: This problem can be divided into six binary classification type as follows:

Binary Classification Problem 1: red vs. blue
Binary Classification Problem 2: red vs. green
Binary Classification Problem 3: red vs. yellow
Binary Classification Problem 4: blue vs. green
Binary Classification Problem 5: blue vs. yellow
Binary Classification Problem 6: green vs. yellow

9. (1 point) What will be the output of following code snippet.

```
1
2 from sklearn.datasets import make_circles
3 x, y = make_circles()
4 #Refer polynomial_transform Function explained in the lecture.
5 x_poly = polynomial_transform(x, degree=3)
6 print (x_poly.shape[1])
```

A. 2
B. 1
C. 6
D. 10

Answer: D

Solution: Code output is 10

10. (1 point) To solve the optimization problems, we generally calculate the derivate $J(w)$ w.r.t to

A. weight vector
B. labels
C. features
D. class

Answer: A