Concept Quiz Over Week 4 Material

Due Oct 29 at 11:59pm **Points** 1 **Questions** 10
Available Oct 25 at 12am - Oct 29 at 11:59pm **Time Limit** None

Score for this survey: **1** out of 1
Submitted Oct 28 at 9:12pm
This attempt took 60 minutes.

Question 1

A hard-margin linear SVM only has a solution when the data is linearly separable.

- True
- False

ou Answered

True. The constrained optimization only considers solutions where all datapoints are correctly classified.

Question 2

Finding the optimal weight vector for a hard-margin SVM requires solving an unconstrained optimization problem.

- True
- False

ou Answered

False. The optimization includes constraints for the data to be correctly classified.

Question 3

The SVM dual formulation shows us that the optimal weight vector always depends on all data points.

- True
- False

ou Answered

False. While the weight vector is a weighted combination of all training points, points not within or on the margin have zero weight.

Question 4

Classifying new points for an SVM requires computing dot products between support vectors and the new point.

- True
- False

ou Answered

True. Substituting the definition of the optimal weight vector into $w^T x + b$ shows this fact.

Question 5

Both the SVM primal and dual formulations can be solved using _____.

- Gradient Descent
- ou Answered Quadratic Program Solvers
- Matrix Inverse

Quadratic Program Solvers

Question 6

Which of the following algorithms can handle multiclass classification?

- ou Answered k Nearest Neighbors
- Standard Logistic Regression
- ou Answered Multinomial Logistic Regression
- ou Answered Naive Bayes

k Nearest Neighbors and Naive Bayes can handle multiple classes in their standard definitions. However, for logistic regression we had to go through a new derivation in order to handle multiclass problems.

Question 7

Tree classifiers, one-vs-all classifiers, and all-vs-all classifiers are schemes to let binary classification models work for multiple classes.

ou Answered

- (●) True
- ( ) False

True! We can use any binary classifier in constructing one of these tree / one-vs-all / all-vs-all classifiers to make multiclass predictions.

Question 8

What would the softmax function output for the input vector [5, -2, 10]^T?

Your Answer:

[0.006698, 0.000006, 0.993296]

$$Softmax\left(\begin{bmatrix} z_1 \\ z_2 \\ \vdots \\ z_d \end{bmatrix}\right) = \begin{bmatrix} e^{z_1} \\ e^{z_2} \\ \vdots \\ e^{z_d} \end{bmatrix} \frac{1}{\sum_{i=1}^{d} e^{z_i}}$$

Implementing this in numpy with some pretty printing options:

```
import numpy as np
np.set_printoptions(formatter={'float': lambda x: "{0:0.3f}".format(x)})

a = np.array([5, -2, 10])
z = np.exp(a)
z = z/np.sum(z)
print(z)
```

```
[0.007 0.000 0.993]
```

Question 9

When deriving logistic regression originally, we set up our task of learning the optimal line w as maximizing the likelihood of our data under a conditional Bernoulli likelihood model. When deriving mulitclass logistic regression, we use the same formulation.

ou Answered

- (●) True
- ( ) False

False. A Bernoulli likelihood only considers the y label to be 0 or 1. We used a Categorical likelihood which allowed the y label to be from a discrete set corresponding to our classes.

Question 10

What is a confusion matrix and what can you learn about a classifier by looking at one?

Your Answer:

confusion matrix is a table used in machine learning and statistics to evaluate the performance of a classification model. It provides a comprehensive summary of the model's predictions and how they compare to the actual outcomes, a confusion matrix is particularly useful for understanding the quality of a classifier's predictions in a misclassification problem.

Confusion matrices keep track of a classifier's predictions relative to the true value of its inputs. For instance, the i, j'th entry in a confusion matrix counts the number of times an instance of class i is labeled class j by the classifier. Looking at a confusion matrix can show you which classes a classifier commonly mixes up.

Survey Score: **1** out of 1