CSPB 4622 - Truong - Machine Learning

Started on	Monday, 9 September 2024, 1:54 PM
State	Finished
Completed on	Monday, 9 September 2024, 2:00 PM
Time taken	6 mins 30 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Suppose that you are performing a binary classification to assign a class label $y \in \{0, 1\}$ to each data point and you model the probability that data point x belongs to Class 1 by $p(y = 1 \mid x) = \sigma(\hat{\beta_0} + \hat{\beta_1} x)$ where $\hat{\beta_0} = 1$ and $\hat{\beta_1} = 1$. **Note** The problem uses the σ symbol. The logistic function is a type of sigmoid function. We use the sigmoid function to map predicted values to probabilities because it maps any real value into another value between 0 and 1. The formula for the sigmoid function is: $\sigma(z) = \frac{1}{1+e^{-z}}$ How would your model classify a data point with $x = -1.5$. Select one:

- a. Class 0 ✔
- b. Class 1
- c. Inconclusive
- d. It would predict 0.5

Question **2**

Correct

Mark 1.00 out of 1.00

Suppose that you are performing a binary classification to assign a class label $y \in \{0, 1\}$ to each data point and you model the probability that data point x belongs to Class 1 by $p(y = 1 \mid x) = \sigma(\hat{\beta_0} + \hat{\beta_1} x)$ where $\hat{\beta_0} = 1$ and $\hat{\beta_1} = 1$. **Note** The problem uses the σ symbol. The logistic function is a type of sigmoid function. We use the sigmoid function to map predicted values to probabilities because it maps any real value into another value between 0 and 1. The formula for the sigmoid function is: $\sigma(z) = \frac{1}{1+e^{-z}}$ What happens if x increases by one unit?

- (●) a. The odds that y=1 increase by a factor of e ✔
- ( ) b. The odds that y=1 increases by 1 unit
- ( ) c. The probability that y=1 increases by 1 unit
- ( ) d. The probability that y=1 increases by a factor of e

Question **3**

Correct

Mark 1.00 out of 1.00

Suppose you train a logistic regression model using the bag-of-words approach to determine if an email is SPAM (y=1) or HAM (y=0) and obtain the following values for the weights: **bias "money" "mom" "work" "free"** 0.5 1.0 -2.0 -1.0 2.0 Note: In the table, the bias feature indicates the intercept in the logistic regression model. It does not represent the word "bias". Which word in the logistic regression model is the strongest predictor for HAM?

- ( ) a. Money
- (●) b. Mom ✔
- ( ) c. Work
- ( ) d. Free

Question **4**

Correct

Mark 1.00 out of 1.00

Suppose you train a logistic regression model using the bag-of-words approach to determine if an email is SPAM (y=1) or HAM (y=0) and obtain the following values for the weights: **bias "money" "mom" "work" "free"** 0.5 1.0 -2.0 -1.0 2.0 Note: In the table, the bias feature indicates the intercept in the logistic regression model. It does not represent the word "bias". How would the logistic regression model classify an empty email?

- (●) a. SPAM ✔
- ( ) b. HAM
- ( ) c. The model cannot handle empty emails
- ( ) d. The model would predict it equally likely to be SPAM or HAM

Question **5**

Correct

Mark 1.00 out of 1.00

Suppose you train a logistic regression model using the bag-of-words approach to determine if an email is SPAM (y=1) or HAM (y=0) and obtain the following values for the weights: **bias "money" "mom" "work" "free"** 0.5 1.0 -2.0 -1.0 2.0 Note: In the table, the bias feature indicates the intercept in the logistic regression model. It does not represent the word "bias". Which of the following emails is **most** likely to be SPAM?

- a. {free, mom}
- b. {mom, work, work}
- c. {free, work} ✔
- d. {mom, money}

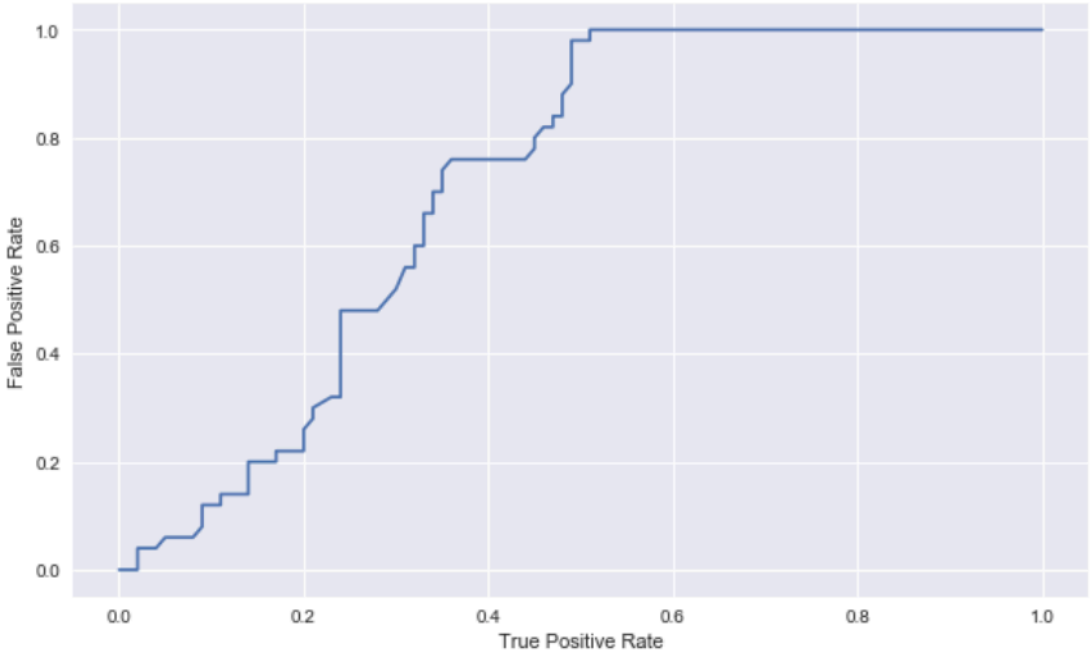
Question **6**

Correct

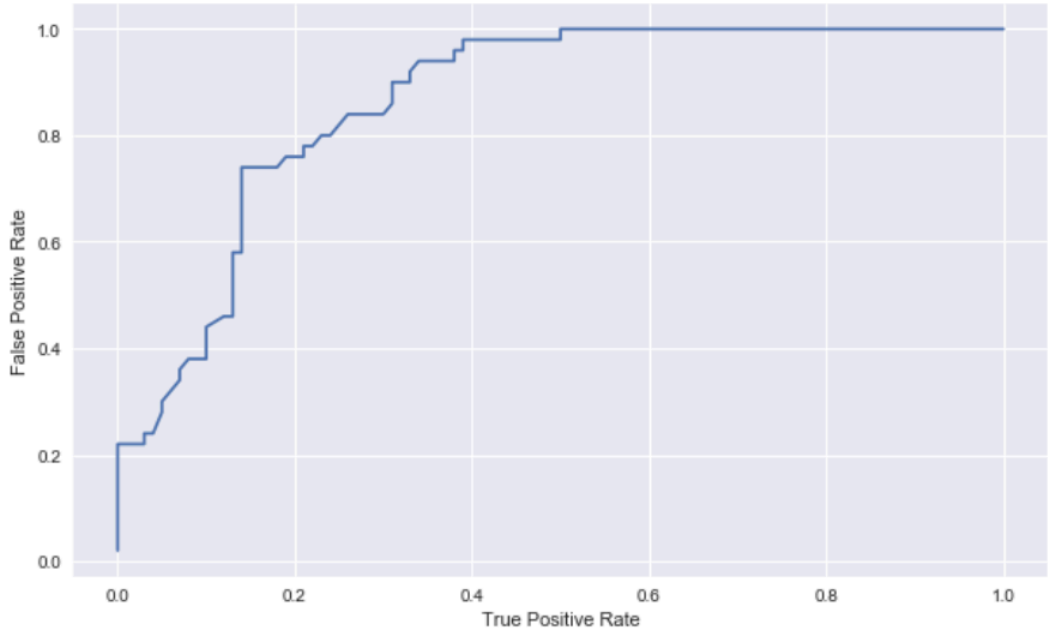
Mark 1.00 out of 1.00

The following three ROC curves can be ordered best, better, and worst by the expected accuracy of the expected models. **Note:** X-axis is FPR, and Y-axis is TPR in the graph. Out of the three curves, what is the ranking for **Curve A**

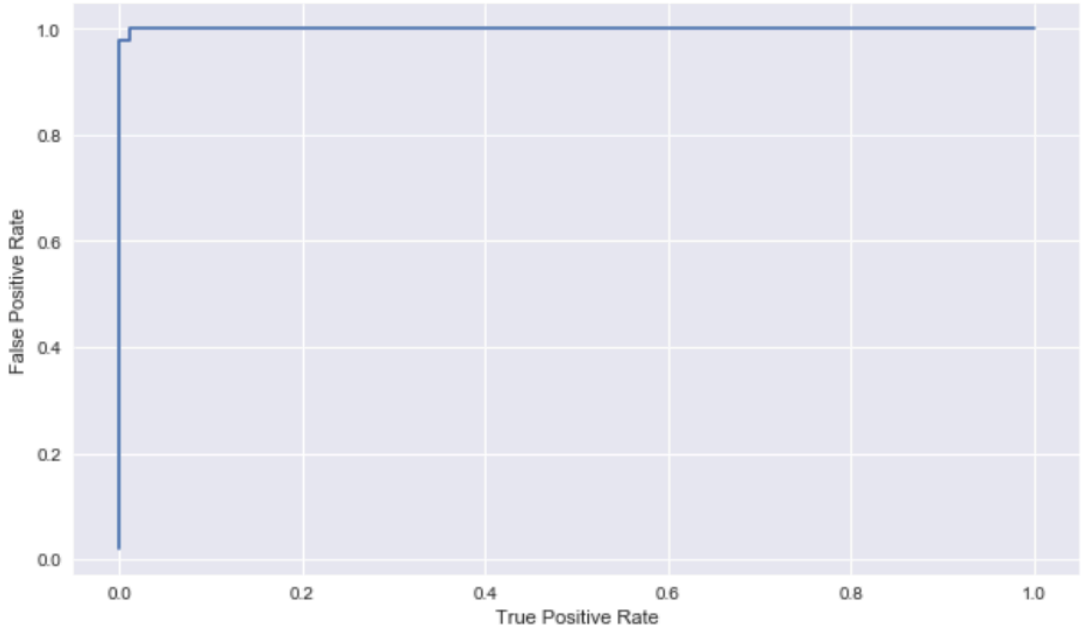
A.



B.



C.



- a. Best
- b. Better
- c. Worst ✔

Question **7**

Correct

Mark 1.00 out of 1.00

Given the following confusion matrix:

A	49	2	**0**
B	**1**	20	14
C	**0**	14	32
Yt/Yp	**A**	**B**	**C**

What is the classifier *accuracy* ? Enter your response as a fraction:

101/132

Your last answer was interpreted as follows: $\frac{101}{132}$

Accuracy is the percentage of correctly classified items.

This would be $\frac{49+20+32}{49+2+0+1+20+14+0+14+32} = \frac{101}{132}$

Question **8**

Correct

Mark 1.00 out of 1.00

Given the following confusion matrix:

A	**49**	0	**0**
B	**1**	21	**15**
C	**0**	15	**35**
Yt/Yp	**A**	**B**	**C**

What is the classifier *precision* for class **B**? Enter your response as a fraction? The answer should have the form of an irreducible fraction n/m, where n and m are integer numbers (irreducible means n and m do not have common divisor other than 1)

21/36

Your last answer was interpreted as follows: $\frac{21}{36}$

Precision is the percentage of a given class that are correctly predicted.

Class **B** contains 36 items of which 21 were predicted correctly.

Thus, the classifier precision for class **B** is $\frac{7}{12}$

Question **9**

Correct

Mark 1.00 out of 1.00

Given the following confusion matrix:

A	**49**	2	**0**
B	**1**	19	13
C	**0**	15	**35**
Yt/Yp	**A**	**B**	**C**

What is the classifier *recall* for class **B**? Enter your response as a fraction? The answer should have the form of an irreducible fraction n/m, where n and m are integer numbers (irreducible means n and m do not have common divisor other than 1).

19/33

Your last answer was interpreted as follows: $\frac{19}{33}$

Recall is the percentage of items classified as **B** that actually belong to class **B**.

1+19+13 = 33 items were classified as **B**, of which 19 are actually of class **B**.

Thus, the classifier recall for class **B** is $\frac{19}{33}$

Question **10**

Correct

Mark 1.00 out of 1.00

Assume you are modeling $Y \sim X$ where X and Y are discrete or categorical variables.

Is this a regression or classification problem?

Select one:

- a. Either technique could be used.
- b. Classification ✔
- c. Regression

Because the dependent variable, Y, is discrete or categorical, this is a classification problem.

We can use regression with either continuous or categorical independent variables (X).