Started on	Sunday, 4 February 2024, 10:18 AM
State	Finished
Completed on	Sunday, 4 February 2024, 11:04 AM
Time taken	46 mins
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Naïve Bayes is best suited for ML applications wherein

- the feature vectors $\bar{\mathbf{x}}$ are discrete, response is continuous
- the feature vectors $\bar{\mathbf{x}}$ are continuous, response is discrete
- the feature vectors $\bar{\mathbf{x}}$ are continuous, response is continuous
- the feature vectors $\bar{\mathbf{x}}$ are discrete, response is discrete ✔

Your answer is correct.

The correct answer is: the feature vectors $\bar{\mathbf{x}}$ are discrete, response is discrete

Question **2**

Correct

Mark 1.00 out of 1.00

In the example considered in lectures, the size of the feature vector equals

- Number of emails in the set
- 2
- Number of words in an e-mail
- Number of words in the dictionary ✔

Your answer is correct.

The correct answer is:
Number of words in the dictionary

Question **3**

Correct

Mark 1.00 out of 1.00

The naïve Bayes assumption states that

- (selected) the features are conditionally independent given the label ✔
- the features are independent
- the features are only uncorrelated given the label
- the features are independent of the past history of features given the immediate past feature

Your answer is correct.

The correct answer is:
the features are conditionally independent given the label

Question **4**

Correct

Mark 1.00 out of 1.00

The probability $p(x_j=1|y=1)$ can be evaluated using the formula

- $\frac{\sum_{j=1}^{N} 1(x_j(i)=1, y(i)=1)}{\sum_{i=1}^{M} 1(y(i)=1)}$
- $\frac{\sum_{j=1}^{N} 1(x_j(i)=1, y(i)=1)}{N}$
- (selected) $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=1)}{\sum_{i=1}^{M} 1(y(i)=1)}$ ✔
- $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=1)}{M}$

Your answer is correct.

The correct answer is: $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=1)}{\sum_{i=1}^{M} 1(y(i)=1)}$

Question **5**

Correct

Mark 1.00 out of 1.00

The probability $p(x_j = 1|y = 0)$ can be evaluated using the formula

- $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=0)}{\sum_{i=1}^{M} 1(y(i)=0)}$ ✔
- $\frac{\sum_{j=1}^{N} \mathbf{1}(x_j(i)=1, y(i)=0)}{N}$
- $1 - p(x_j = 1|y = 1)$
- $\frac{\sum_{i=1}^{M} \mathbf{1}(x_j(i)=1, y(i)=0)}{M}$

Your answer is correct.

The correct answer is: $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=0)}{\sum_{i=1}^{M} 1(y(i)=0)}$

Question **6**

Correct

Mark 1.00 out of 1.00

The probability $p(y = 1)$ can be evaluated as

- $\frac{\sum_{i=1}^{M} 1(y(i)=1)}{N}$
- $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=1)}{M}$
- $\frac{\sum_{i=1}^{M} 1(x_j(i)=1, y(i)=1)}{N}$
- $\frac{\sum_{i=1}^{M} 1(y(i)=1)}{M}$ ✔

Your answer is correct.

The correct answer is: $\frac{\sum_{i=1}^{M} 1(y(i)=1)}{M}$

Question **7**

Correct

Mark 1.00 out of 1.00

The probability (x_j = 1|y = 1) is given as

- ○ $1 - p(x_j = 1|y = 0)$
- ◉ $1 - p(x_j = 1|y = 1)$ ✔
- ○ $1 - p(x_j = 0|y = 0)$
- ○ $1 - p(y = 1|x_j = 0)$

Your answer is correct.

The correct answers are:
$1 - p(x_j = 1|y = 0)$,
$1 - p(x_j = 1|y = 1)$,
$1 - p(x_j = 0|y = 0)$,
$1 - p(y = 1|x_j = 0)$

Question **8**

Correct

Mark 1.00 out of 1.00

The posterior probability $p(y = 1|\bar{\mathbf{x}} = \bar{\mathbf{v}})$ is given as

- ◉ $\frac{p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=1)\times p(y=1)}{p(\bar{\mathbf{x}}=\bar{\mathbf{v}})}$ ✔
- ○ $\frac{p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=1)}{p(\bar{\mathbf{x}}=\bar{\mathbf{v}})}$
- ○ $\frac{p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=1)\times p(y=1)+p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=0)\times p(y=0)}{p(\bar{\mathbf{x}}=\bar{\mathbf{v}})}$
- ○ $\frac{p(\bar{\mathbf{x}}=\bar{\mathbf{v}})}{p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=1)\times p(y=1)}$

Your answer is correct.

The correct answer is:
$\frac{p(\bar{\mathbf{x}}=\bar{\mathbf{v}}|y=1)\times p(y=1)}{p(\bar{\mathbf{x}}=\bar{\mathbf{v}})}$

Question **9**

Correct

Mark 1.00 out of 1.00

Given a new observation $\bar{\mathbf{x}} = \bar{\mathbf{v}}$, it can be labeled as belonging to the class y = 1 if

- $\prod_{j=1}^{N} p(x_j = v_j | y = 1) > \prod_{j=1}^{N} p(x_j = v_j | y = 0)$
- $\prod_{j=1}^{N} p(x_j = v_j | y = 1) \times p(y = 1) > \prod_{j=1}^{N} p(x_j = v_j | y = 0) \times p(y = 0)$ ✔
- $\frac{\prod_{j=1}^{N} p(x_j = v_j | y=1)}{p(y=1)} > \frac{\prod_{j=1}^{N} p(x_j = v_j | y=0)}{p(y=0)}$
- $\frac{p(y=1)}{\prod_{j=1}^{N} p(x_j = v_j | y=1)} > \frac{p(y=0)}{\prod_{j=1}^{N} p(x_j = v_j | y=0)}$

Your answer is correct.

The correct answer is: $\prod_{j=1}^{N} p(x_j = v_j | y = 1) \times p(y = 1) > \prod_{j=1}^{N} p(x_j = v_j | y = 0) \times p(y = 0)$

Question **10**

Correct

Mark 1.00 out of 1.00

To avoid zero prior probabilities, one can use

- Conjugate priors
- Fourier approximation
- Laplace smoothing ✔
- Maximum likelihood

Your answer is correct.

The correct answer is: Laplace smoothing