Assignment 5

1

1.0/1.0 point (graded)

Naïve Bayes is best suited for ML applications wherein

- (selected) the feature vectors $\bar{x}$ are discrete, response is discrete
- the feature vectors $\bar{x}$ are discrete, response is continuous
- the feature vectors $\bar{x}$ are continuous, response is discrete
- the feature vectors $\bar{x}$ are continuous, response is continuous

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2

1.0/1.0 point (graded)

The Bayes principle is given as

- (selected) $p(B|A) = \frac{p(A|B)p(B)}{p(A)}$
- $p(B|A) = \frac{p(A|B)p(A)}{p(B)}$
- $p(B|A) = p(A|B)$
- $p(B|A) = p(A|B)p(A)$

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1.0/1.0 point (graded)

The Naïve Bayes assumption can be mathematically expressed as

- $p(\bar{x} = \bar{v}) = \prod_{j=1}^{N} p(x_j = v_j)$
- $p(y = u|\bar{x} = \bar{v}) = \prod_{j=1}^{N} p(y = u|x_j = v_j)$
- (selected) $p(\bar{x} = \bar{v}|y = u) = \prod_{j=1}^{N} p(x_j = v_j|y = u)$
- $p(y = u, \bar{x} = \bar{v}) = \prod_{j=1}^{N} p(y = u, x_j = v_j)$

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1.0/1.0 point (graded)

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

- ( ) $\frac{\sum_{j=1}^{N} 1\left(x_j(i)=1, y(i)=1\right)}{\sum_{i=1}^{M} 1(y(i)=1)}$
- (•) $\frac{\sum_{i=1}^{M} 1\left(x_j(i)=1, y(i)=1\right)}{\sum_{i=1}^{M} 1(y(i)=1)}$
- ( ) $\frac{\sum_{j=1}^{N} 1\left(x_j(i)=1, y(i)=1\right)}{N}$
- ( ) $\frac{\sum_{i=1}^{M} 1\left(x_j(i)=1, y(i)=1\right)}{M}$

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1.0/1.0 point (graded)

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

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

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1.0/1.0 point (graded)

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

- ( ) $\prod^{N} p\left(x_j = v_j|y = 1\right) > \prod^{N} p\left(x_j = v_j|y = 0\right)$

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

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

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

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7

1.0/1.0 point (graded)

The Naïve Bayes module can be imported in PYTHON as

- from sklearn.naive_bayes import NB
- from sklearn.naive_bayes import GaussianNB
- from sklearn import GaussianNB
- from sklearn import NB

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1.0/1.0 point (graded)

Consider the data given below. What is the prior probability of an accident occurring?

SNo.	Weather condition	Road condition	Traffic condition	Engine problem	Accident
1	Rain	bad	high	no	yes
2	snow	average	normal	yes	yes
3	clear	bad	light	no	no
4	clear	good	light	yes	yes
5	snow	good	normal	no	no
6	rain	average	light	no	no
7	rain	good	normal	no	no
8	snow	bad	high	no	yes
9	clear	good	high	yes	no
10	clear	bad	high	yes	yes

- $\frac{1}{4}$
- $\frac{2}{3}$

- [x] $\frac{1}{2}$
- [ ] $\frac{1}{3}$

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1.0/1.0 point (graded)

What is the probability of good road condition given no accident for the data below

SNo.	Weather condition	Road condition	Traffic condition	Engine problem	Accident
1	Rain	bad	high	no	yes
2	snow	average	normal	yes	yes
3	clear	bad	light	no	no
4	clear	good	light	yes	yes
5	snow	good	normal	no	no
6	rain	average	light	no	no
7	rain	good	normal	no	no
8	snow	bad	high	no	yes
9	clear	good	high	yes	no
10	clear	bad	high	yes	yes

- [ ] $\frac{1}{5}$
- [ ] $\frac{2}{5}$
- [x] $\frac{3}{5}$
- [ ] $\frac{4}{5}$

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10

1.0/1.0 point (graded)

Consider the data given below. What is the machine learning problem it can be used to solve?

SNo.	Weather condition	Road condition	Traffic condition	Engine problem	Accident
1	Rain	bad	high	no	yes
2	snow	average	normal	yes	yes
3	clear	bad	light	no	no
4	clear	good	light	yes	yes
5	snow	good	normal	no	no
6	rain	average	light	no	no
7	rain	good	normal	no	no
8	snow	bad	high	no	yes
9	clear	good	high	yes	no
10	clear	bad	high	yes	yes

- [x] Probability of determining accidents based on ambient conditions
- [ ] Probability of determining ambient conditions given accidents
- [ ] Probability of determining accidents irrespective of ambient conditions
- [ ] Probability of determining ambient conditions irrespective of accidents

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