ML Assignment

SHUBHI SINGHAL 2018195

Ques 3 Gaussian Naive Bayes

1) Implementation is in the python file
2) Evaluation Metrics

Accuracy
0.9814814814814815

Confusion Matrix

[[23 0 0]
[1 18 0]
[0 0 12]]

F1-score
0.9753639417693168

Classwise F1 score value
Class 0 0.9787234042553191
Class 1 0.9473684210526315
Class 2 1.0

The model gives good enough accuracy.

3) For inbuilt model, the values of each evaluation metric come out to be same

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Matches with the implementation

ML Assignment

4.) Mean squared error = $\varepsilon^T \varepsilon \frac{1}{n}$

$= \frac{1}{n} (Y - X\beta)^T (Y - X\beta)$

$= (Y^T - \beta^T X^T)(Y - X\beta) \frac{1}{n}$

$= \frac{1}{n} (Y^T Y - \beta^T X^T Y + \beta^T X^T X\beta - Y^T X\beta)$

$= \frac{1}{n} (Y^T Y - 2\beta^T X^T Y + \beta^T X^T X\beta)$

$= \frac{1}{n} (0 - 2X^T Y + 2X^T X\beta)$

$\Rightarrow \beta^* = (X^T X)^{-1} (X^T Y)$

$= (X^T X)^{-1} (X^T Y)$

$X \rightarrow n \times k$

$Y \rightarrow n \times 1$

$X^T X \Rightarrow (k \times n)(n \times k)$

$\Downarrow$

$k \times k$

$(X^T X)^{-1}$

$X^T Y$

$\downarrow \quad \searrow n \times 1$

$k \times n$

$(k \times k)(k \times n)(n \times 1)$

$\Downarrow \qquad \Downarrow$

$k \times 1$ dimensions match

Conditions :

(1) $\hookrightarrow X^T X$ has to be invertible for solution of β^*.

5-) $Y = 50 + 20X_1 + 0.07X_2 + 35X_3 + 0.01X_4 - 10X_5$

1-)

Female − male = $35 - 10[1][GPA]$

GPA ↑ ⇒ < 0

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Male > female for high GPA value

(c)

2-) $Y = 50 + 20 \times 3.5 + 0.07 \times 115 + 35 \times 1 + 0.01 \times 115 \times 3.5 - 10 \times 1 \times 3.5$

$= 163.05 - 35 + 0.4025$

$= 128.05 + 4.025 = 132.075$ thousand dollars salary

8.05

115 × 35 = 575 + 345 = 4025

3.) False since the interaction term (GPA multiplied by IQ) can be large, and the smaller coefficient when multiplied with this product value will result in a good amount of contribution.