A screenshot of a social media post

Description automatically generated

(i)

False.

Two principal components Z1 and Z2 of the Principal Component Analysis have the zero-correlation condition. In other words, the second principal component direction must be perpendicular, or perpendicular orthogonal, to the first principal component direction.

Partial Least Squares, use the annotated label to maximize inter-class variance. Principal components are pairwise orthogonal. Principal components are focus on maximize correlation.

A screenshot of a cell phone

Description automatically generated

A screenshot of a cell phone

Description automatically generated

(i)

(ii)

A screenshot of a cell phone screen with text

Description automatically generated

A screenshot of a cell phone

Description automatically generated

(a)

is the coefficient of ‘hours studied’. Exp(0.05) = 1.051271, meaning odds of earning an A are multiplied by 1.051271, with each 1 hour increase in ‘hours studied’

is the coefficient of ‘undergrad GPA’. Exp(1) = 2.718282, meaning odds of earning an A are multiplied by 2.718282, with each 1-unit increase in GPA.

(b)

(c)

He needs 50 hours study to reach the 50% chance of getting an A.

A screenshot of a cell phone

Description automatically generated

(a)

If the Bayes decision boundary is linear, we may expect that LDA performs better on the training set and test set. Because the QDA will suffer from high variance without a corresponding decrease in bias.

(b)

If the Bays decision boundary is non-linear, we may expect the QDA will outperform the LDA on both training set and test set. Because QDA is more flexible and does not share a common covariance matrix we may expect a decrease in bias.

(c)

As sample size n increase, we may expect that QDA may outperform the LDA. Because as n gets large, reducing variance of classifier is not a major concern, or if the assumption of a common covariance matrix for the K classifiers clearly untenable. Besides, QDA is more flexible than LDA. Then, QDA may perform better than LDA.

(d)

False.

When the number of observations is small but with more predictors, QDA may lead to overfitting due to the flexibility of QDA. Therefore, when considering reducing the variance, it is better to use LDA.