

MA515 - Foundations of Data Science

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1. Which does not give a linear decision boundary ?
A. Linear regression B. Logistic Regression C. Linear Discriminant Analysis (LDA)
D. Quadratic Discriminant Analysis (QDA) E. None

2. **[ISLR, q.6., p. 170]** Suppose we collect data for a group of students in a statistics class with variables X_1 = hours studied, X_2 = undergrad GPA, and Y = receive an A. We fit a logistic regression and produce estimated coefficient, $\hat{\beta}_0 = -6$, $\hat{\beta}_1 = 0.05$, $\hat{\beta}_2 = 1$.
 - a. Estimate the probability that a student who studies for 40 h and has an undergrad GPA of 3.5 gets an A in the class.
 - b. How many hours would the student in part (a) need to study to have a 50% chance of getting an A in the class?

3. **[ISLR, q.7., p. 170]** Suppose that we wish to predict whether a given stock will issue a dividend this year (“Yes” or “No”) based on X , last year’s percent profit. We examine a large number of companies and discover that the mean value of X for companies that issued a dividend was $\bar{X} = 10$, while the mean for those that didn’t was $\bar{X} = 0$. In addition, the variance of X for these two sets of companies was $\hat{\sigma}^2 = 36$. Finally, 80% of companies issued dividends. Assuming that X follows a normal distribution, predict the probability that a company will issue a dividend this year given that its percentage profit was $X = 4$ last year.

4. Twelve first-time heart attack victims were given a test that measures internal anger. The following data relates their scores and whether they had a second heart attack within 5 years.

Anger Score	Second Heart Attack
80	yes
77	yes
70	no
68	yes
64	no
60	yes
50	yes
46	no
40	yes
35	no
30	no
25	yes

- Using simple linear regression, predict if a person with anger score 55 will have a second heart attack or not. Calculate the prediction accuracy of the model.
- Using LDA predict if a person with anger score 55 will have a second heart attack or not. Calculate the prediction accuracy of the model.
- Using QDA predict if a person with anger score 55 will have a second heart attack or not. Calculate the prediction accuracy of the model.