亞洲大學 博士班資格考 試題

文件編號：AC-0054
機密等級：2 限閱

考試日期：112 年 09 月 06 日

考試科目	機器學習	系所別	人工智慧博士學位學程	命題教師	

1. Describe the principles of the logistic regression algorithm in machine learning. Explain the mathematical reasoning behind the algorithm and clearly define the meaning of every mathematical symbol in the equations. [8 points]

2. The successive (y) and failure (1-y) probabilities of the death and survival events respectively for 7 drug dosages are given in the following table. [9 points]

dosages	success (y)	failure (1-y)
1	0.119	8.81e-01
2	0.500	5.00e-01
3	0.881	1.19e-01
4	0.982	1.80e-02
5	0.998	2.47e-03
6	1.000	3.35e-04
7	1.000	4.54e-05

where 2.47e-03 = 0.00247.
Perform a logistic regression analysis and determine the beta_0 and beta_1 coefficients, where log (y / (1-y)) = beta_0 + beta_1 *x.

- The intercept value, beta_0 = _____
- The beta_1 = _____
- Following the above question, If the beta_1 value increases by one unit, the odds ratio will increase by a factor _____

3. Describe the principles of the support vector machine algorithm (SVM) in machine learning. In particular, explain the dual formulation of the SVM optimization problem. Explain the mathematical reasoning behind the algorithm and clearly define the meaning of every mathematical symbol in the equations. [8 points]

4. Given the equation of a two-dimensional hyperplane equation is $ax + by + cz + d = 0$, the normal vector to the plane is (1, 1, 2) and the plane passing through the point (1, 0, 0), Determines the coefficients a, b, c and d. [8 points]

5. The standardization of data has a certain impact on the predictive performance of machine learning methods.
   - Please explain the possible impact and why? [10 points]
   - Give an example of a machine learning method that is easily affected by data standardization. [5 points]

6. Feature dimensionality reduction also has a strong impact on the performance of machine learning methods.
   - Please explain the possible impact and why? [10 point]
   - Please explain the impact of principal component analysis on unsupervised learning methods. [8 points]

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7. Explain how to use machine learning to deal with the spam e-mail detection problem. [10 points]

8. Explain the differences between using traditional machine learning methods (such as SVM) and deep learning methods to deal with the spam e-mail detection problem. [10 points]

9. Machine learning is one of the major methods of artificial intelligence. There are three types of machine learning algorithms, including supervised learning, unsupervised learning and reinforcement learning. Please illustrate and explain one of unsupervised learning methods. [14 points]