

Machine Learning Homework 1

Question

1. Explain what is supervised and unsupervised learning, and list two representative algorithms respectively.

2. For K -fold cross-validation, if K = the number of samples, it is called leave-one-out method. Suppose you have the following data: both input and output have only one variable. Use a linear regression model ($y = wx + b$) to fit the data. So what is the mean squared error (MSE) obtained using Leave-One Out cross-validation?

X(independent variable)	Y(dependent variable)
0	2
2	2
3	1

3. Let us take an example of actual demand and forecasted demand for a brand of ice creams in a shop in a year. In the table, M = Month, AD = Actual Demand, FD = Forecasted Demand.

M	1	2	3	4	5	6	7	8	9	10	11	12
AD	42	45	49	55	57	60	62	58	54	50	44	40
FD	44	46	48	50	55	60	64	60	53	48	42	38

Please calculate the MAE(mean absolute error) and MSE(mean square error).

4. Consider a triple classification problem that requires the recognition of three classes, A, B and C.

		Predicted		
		A	B	C
Actual	A	40	20	10
	B	35	85	40
	C	0	10	20

Given the confusion matrix, please complete the following calculations.

- (1) Calculate the precision and recall for each class respectively.
- (2) Use both Macro-average and Weighted-average to calculate the precision and recall of the whole classifier. If you are not sure about these concepts, use a search engine. Retain 4 decimal places (only for (2)).

Submission

1. **Format:** Please submit a pdf/doc/docx file and name it in this format:
HW1+Student_ID+Name. Example: HW1+1234567+张三.pdf
2. **Deadline:** 2024/4/18 (Thursday) 23:59. You have 2 weeks.
3. Please submit your homework to **Canvas**.
4. **Late policy:** 7 free late days
 - a) Use up to 4 late days per assignment.
 - b) Afterwards, 25% off per day late.