

Haonan Hu

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2863545

In-Class Problem

- Imagine we have a collection of 15 photos.
 - Each photo shows one animal: either a cat, a dog, or a fox.
 - You have designed a classifier that predicts which animal is shown in each photo.
 - The test results of a k-fold cross-validation experiment you ran are:
 - Fold 1: {(Cat,Dog),(Dog,Dog),(Fox,Fox),(Cat,Cat),(Fox,Dog)}
 - Fold 2: {(Cat,Dog),(Dog,Dog),(Cat,Fox),(Cat,Cat),(Fox,Dog)}
 - Fold 3: {(Cat,Dog),(Dog,Dog),(Fox,Fox),(Cat,Cat),(Dog,Cat)}
1. What is the k value in "k -fold cross-validation"?
 2. Create a confusion matrix for the test results.
 3. Show the formulas and calculate the value of the following metrics:
 - a. Accuracy
 - b. P_{Cat}
 - c. P_{Dog}
 - d. P_{Fox}
 - e. R_{Cat}
 - f. R_{Dog}
 - g. R_{Fox}
 - h. $F1_{\text{Cat}}$
 - i. $F1_{\text{Dog}}$
 - j. $F1_{\text{Fox}}$

- You may work together.
- You may ask me or the SI for help.
- Turn in your problem when you are done:
- PDF submitted to BlackBoard before 11:59 PM
- You may leave when you are done.

1. What is the k value in "k -fold cross-validation"?

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2. Create a confusion matrix for the test results.

	Actual Cat	Actual Dog	Actual Fox
Predict Cat	3	3	1
Predict Dog	1	3	0
Predict Fox	0	2	2

3. Show the formulas and calculate the value of the following metrics:

- a. Accuracy = sum of diagonal / total samples = $(3 + 3 + 2) / 15 = 8 / 15 \approx 0.533$
- b. Pcat = correct cat / total cat prediction = $3 / (3 + 3 + 1) = 3 / 7 \approx 0.429$
- c. Pdog = correct dog / total dog prediction = $3 / (1 + 3 + 0) = 3 / 4 = 0.75$
- d. Pfox = correct fox / total fox prediction = $2 / (0 + 2 + 2) = 2 / 4 = 0.5$
- e. Rcat = correct cat / total actual cats = $3 / (3 + 1) = 3 / 4 = 0.75$
- f. Rdog = correct dog / total actual dogs = $3 / (3 + 3 + 2) = 3 / 8 = 0.375$
- g. Rfox = correct fox / total actual foxes = $2 / (1 + 2) = 2 / 3 \approx 0.67$
- h. F1cat = $2(Pcat * Rcat) / (Pcat + Rcat) = 2 * 0.429 * 0.75 / (0.429 + 0.75) \approx 0.546$
- i. F1dog = $2(Pdog * Rdog) / (Pdog + Rdog) = 2 * 0.75 * 0.375 / (0.375 + 0.75) = 0.5$
- j. F1dfox = $2(Pfox * Rfox) / (Pfox + Rfox) = 2 * 0.5 * 0.67 / (0.5 + 0.67) = 0.573$