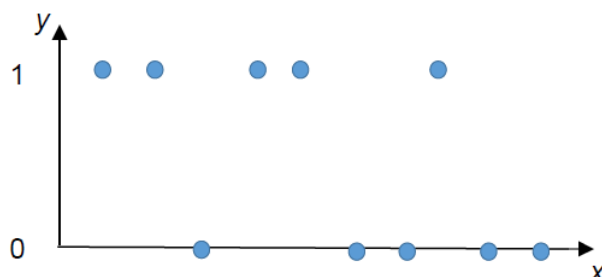


ECE 364: Assignment #6

1. (10 pts) Suppose you are using a Majority Classifier on the following training set containing 10 examples where each example has one real-valued descriptive feature, x , and a binary target feature, y , with value 0 or 1. The Majority Classifier predicts the target feature value that is in the majority in the training set, regardless of the descriptive feature value. In case of ties, it predicts class 1.
 - (a) (5 pts) What is the leave-1-out cross-validation accuracy?
 - (b) (5 pts) What is the two-fold cross-validation accuracy? Assume that the leftmost five instances (i.e., the five instances with smallest x values) are in one fold and the rightmost five instances are in the second fold.



2. (10 pts) The following three confusion matrices have been obtained after three-fold cross-validation.
 - (a) (2 pts) How would you obtain the final machine learning model?
 - (b) (2 pts) What is the classification accuracy of the machine learning model?
 - (c) (3 pts) What are the precision and recall of the model?
 - (d) (3 pts) What is the F_1 measure of the model?

Prediction → Target ↓	positive	negative
positive	53	11
negative	4	32
Prediction → Target ↓	positive	negative
positive	58	5
negative	2	35
Prediction → Target ↓	positive	negative
positive	49	5
negative	6	40

3. (10 pts) Prove that F1 score is given by $\frac{2TP}{2TP+FN+FP}$.
4. (10 pts) Five different models are fit using the same training data set, and tested on the same (separate) test set (which has the same size as the training set). The root mean squared errors

(RMSEs) for each model, on the training and test sets, are reported below. Comment briefly on the results for each model. You might mention whether the model's predictions are good or bad, whether it is likely to generalize to unseen data, or whether it is over-fit. You are also welcome to say that you don't believe the results, or think the reported numbers are fishy. Explain each comment you make.

Table 1: Training and test RMSEs for various models

Model	Training RMSE	Test RMSE
A	1.355	1.423
B	9.760	9.165
C	5.033	0.889
D	0.211	5.072
E	0.633	0.633