Homework 3
CS699 A1, Spring 2025

Due date: 2/18

Problem 1 (10 points). Suppose that you built a numeric prediction model and tested it on a test dataset, and you obtained the following result.

actual	predicted
14.32	30.06
1.19	13.70
30.82	50.21
32.77	52.59
27.89	46.64
7.65	21.82
1.40	10.30
3.60	7.10
46.52	69.26
16.24	32.42

Calculate RMSE, MAE, MAPE, ME, and MPE. You may use any tool for this problem.

Problem 2 (10 points). Suppose you built two classifier models $M1$ and $M2$ from the same training dataset and tested them on the same test dataset using 10-fold cross-validation. The error rates obtained over 10 iterations (in each iteration the same training and test partitions were used for both $M1$ and $M2$) are given in the table below. Determine whether there is a significant difference between the two models using the t-test that we discussed in the class. Use a significance level of 1%. If there is a significant difference, which one is better?

Iteration	M1	M2
1	0.08	0.06
2	0.04	0.09
3	0.07	0.04
4	0.11	0.09
5	0.05	0.08
6	0.13	0.14
7	0.03	0.08
8	0.13	0.05
9	0.09	0.02
10	0.17	0.05

Note: When you calculate *var(M1 – M2)*, make sure that you calculate a sample variance (not a population variance).

You must do all calculations yourself and must show all calculation steps. You may use a spreadsheet software only for calculations.

Problem 3 (10 points). Consider the following confusion matrix.

	predicted class		
actual class		C1 (positive)	C2 (negative)
	C1 (positive)	132	28
	C2 (negative)	42	218

Compute *sensitivity*, *specificity*, *precision*, *accuracy*, *F-meassure*, MCC, and Kappa static. You must do all calculations yourself and must show all your calculation steps.

Problem 4 (10 points). The following table shows a test result of a classifier on a dataset.

Tuple_id	Actual Class	Probability
1	P	0.72
2	N	0.32
3	N	0.57
4	P	0.62
5	P	0.46
6	P	0.93
7	N	0.12
8	P	0.43
9	N	0.66
10	P	0.77

(1). For each row, compute *TP*, *FP*, *TPR*, and *FPR*.
(2). Plot the ROC curve for the dataset. You must draw the curve yourself (i.e., don't use R or any other software to generate the curve).

Submission:

Include all files in a single archive file and name it *LastName_FirstName_HW3.EXT*. Here, "*EXT*" is an appropriate file extension (e.g., *zip* or *rar*).