

Assignment 3: Classification Accuracy Assessment

40 Points

Deliverables: Answers to background questions; edited Excel spreadsheet; Python code in an .ipynb file.

Data:

binaryPrediction.csv: Table of class labels and predictions for a binary classification problem. These data are synthetic and do not represent a real classification problem.

Variable	Description
sampleID	Unique ID for each sample
refLabel	Reference class label
refCode	Reference numeric code
predLogit	Predicted class logit

multiclassPrediction.csv: Table of class labels and predictions for a 4-class problem. These data are synthetic and do not represent a real classification problem.

Variable	Description
sampleID	Unique ID for each sample
refLabel	Reference class label
refCode	Reference numeric code
logitA	Predicted logit for Class A
logitB	Predicted logit for Class B
logitC	Predicted logit for Class C
logitD	Predicted logit for Class D
predCode	Predicted numeric class code
predLabel	Predicted class label

Background Questions

B1: State the equations for recall and precision relative to true positive (TP), false negative (FN), and false positive (FP) counts. Explain how these measures relate to commission and omission errors. (4 Points)

B2: State the equation for specificity and negative predictive value relative to true negative (TN), false negative (FN), and false positive (FP) counts. Explain how these measurements relate to commission and omission errors. (4 Points)

B3: Explain the difference between macro- and micro- averaging for aggregating class-level metrics to a single metric. (4 Points)

Tasks (Excel):

Perform the following calculations in Excel.

T1: For the binary classification results, count the number of true positive (TP), true negative (TN), false positive (FP), and false negative (FN) samples when samples with a predicted positive case probability larger than 0.5 are mapped to the positive case. (4 Points)

T2: Use the counts created in T1 to calculate overall accuracy, precision, recall, F1-score, specificity, and negative predictive value. (4 Points)

Tasks (PyTorch):

Perform the following calculations using Python/PyTorch.

T3: Use TorchMetrics to calculate the following metrics for the binary classification: precision, recall, F1-score, overall accuracy, area under the precision-recall curve, area under the receiver operating characteristic curve. (8 Points)

T5: Use TorchMetrics to calculate the following aggregated metrics for the multiclass classification: macro-averaged recall, precision, and F1-score; micro-averaged recall, precision, and F1-score; and overall accuracy. (6 Points)

T6: Use TorchMetrics to calculate the following class-level metrics for each class: precision, recall, and F1-score. (6 Points)