Open SupportCode\Framework-6-ComparingModels.py

Look at MachineLearningCourse.MLUtilities.Evaluations.ErrorBounds and implement error bounds
per Mitchell equation 5.1, supporting all the confidence levels provided in table 5.1.

0.5 points - Hand in your code for MachineLearningCourse.MLUtilities.Evaluations.ErrorBounds.GetAccuracyBounds

Ans: See Attached file

Evaluate the validation set accuracy of a logistic regression model with the following hyperparameters:
stepSize = 1.0
convergence = 0.001
numMutualInformationWords = 25
numFrequentWords = 0

0.5 points - What is the 90% confidence interval for validation set accuracy for this model.

Ans: 90% Confidence interval validation set accuracy = 0.8486 - 0.8955

Fit the MostCommonClassModel from MachineLearningCourse.MLUtilities.Learners.MostCommonClassModel and evaluate this model on the validation set.

0.5 points - At the 80% confidence level (using a two sided bound) is the logistic regression model better than the most common class model? In 2-3 sentences explain how you came to the answer.

Model	Confidence Interval	Confidence interval lower bound	Confidence interval upper bound
Most Common Model	80%	0.8209	0.8610
Logistic regression	80%	0.8537	0.8903

Ans: Using two sided bounds, the logistic regression model is not better that the most common model because the accuracy interval overlap. The upper bound of the accuracy interval for Most common model is > the lower bound of the accuracy interval for Logistic regression.

0.5 points - At the 75% confidence level (using a one sided bound) is the logistic regression model better than the most common class model? In 2-3 sentences explain how yo ucame to the answer.

Model	2 side bound	1 side bound	Confidence interval	Confidence interval lower bound	Confidence interval upper bound
Most Common Model	50%	25%	75%	-	0.8514
Logistic regression	50%	25%	75%	0.8625	-

Ans: At 75% confidence level, logistic regression is better than most common model because the confidence intervals of the two models do not overlap. 75% confidence level one side bound is equivalent to the sum of 2- side 50% confidence level + 25% confidence of a better accuracy. We can say with 75% confidence that the accuracy of most common model is less than 85.14%, while the accuracy of the logistic regression is better than 86.25%. Therefore with 75% confidence, the logistic regression is a better model than most common model.

Now use 5-fold cross validation on the training set to evaluate:
* logistic regression (using the same hyperparameters),
* and the most common model.

You can find a helper function for selecting training and testing data per fold in:

MachineLearningCourse.MLUtilities.Data.CrossValidation

1.0 points - Hand in the code you used to do cross validation and to evaluate the accuracy and bounds.

Ans: See attached file

1.0 points - Among the following possibilities for one-sided bounds: 75%, 90%, 95%, 97.5%, 99.5%
Which is the highest level of confidence where we can say the logistic regression model is better than simply predicting the most common class? In 3-5 sentences explain how you came to that conclusion.

With 99.5% confidence, we can say that the logistic regression model is better than the most common model because the confidence intervals do not overlap after running cross-validation with 5-folds. The one side bounds in the table below are clearly better for logistic regression when compared to most common class.

2 side bound	1 side bound	1 side Confidence interval	Most Common Model Confidence interval upper bound	Logistic Regression Confidence interval lower bound	Overlap ?
50%	25%	75%	0.8693	0.8975	No
80%	10%	90%	0.8723	0.8949	No
90%	5%	95%	0.8740	0.8933	No
95%	2.5%	97.5%	0.8756	0.8920	No
99%	0.5%	99.5%	0.8786	0.8893	No