Performance Evaluation for Classificarion

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Confusion Matrix

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

- True Positive: Number of samples correctly predicted as positive class.
- True Negative: Number of samples correctly predicted as negative class.
- False Positive: Number of samples predicted as positive class but actually belonging to negative class.
- False Negative: Number of samples predicted as negative class but actually belonging to positive class.

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Confusion Matrix

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

Total samples in class1

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Confusion Matrix

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

Total samples in class2

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Confusion Matrix

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

Total samples predicted as class1

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Confusion Matrix

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

Total samples predicted as class2

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Accuracy

- $\text{Accuracy}(\%) = \frac{\text{Number of samples correctly classified (TP+TN)}}{\text{Total number of samples used for testing}} * 100$

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

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Precision

- $\text{Precision} = \frac{\text{True Positive}}{\text{True Positive+False Positive}}$

- Precision: It is the fraction of correctly classified samples among the total samples predicted as a class

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

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Recall

- $\text{Recall} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negetive}}$

- Recall: Fraction of total samples that have been correctly classified over the total number of samples in that class

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

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F-measure (F-score)

- $\text{F score} = \frac{2 * (\text{Precision} * \text{Recall Rate})}{\text{Precision} + \text{Recall Rate}}$

- F-score: Harmonic average of the Precision and Recall

		Actual Class	
		Class1 (Positive)	Class2 (Negative)
Predicted Class	Class1 (Positive)	True Positive	False Positive
	Class2 (Negative)	False Negative	True Negative

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Confusion Matrix - Multiclass

		Actual Class		
		Class1	Class2	Class3
Predicted Class	Class1	C11	C21	C31
	Class2	C12	C22	C32
	Class2	C13	C23	C33

- True Positive: Number of samples correctly predicted as positive class (C11).
- True Negative: Number of samples correctly predicted as negative class (C22+C33).
- False Positive: Number of samples predicted as positive class but actually belonging to negative class (C21+C31)
- False Negative: Number of samples predicted as negative class but actually belonging to positive class (C12+C13)

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Confusion Matrix - Multiclass

		Actual Class			
		Class1	Class2	Class3	
Predicted Class	Class1	C11	C21	C31	Total samples predicted as class1
	Class2	C12	C22	C32	Total samples predicted as class2
	Class2	C13	C23	C33	Total samples predicted as class3
Total		Total samples in class1	Total samples in class2	Total samples in class3	

Total samples used for testing

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Accuracy of Multiclass Classification

- $\text{Accuracy}(\%) = \frac{\text{Number of samples correctly classified (TP+TN)}}{\text{Total number of samples used for testing}} * 100$

		Actual Class		
		Class1	Class2	Class3
Predicted Class	Class1	C11	C21	C31
	Class2	C12	C22	C32
	Class2	C13	C23	C33

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Precision for a Class

- $\text{Precision for Class i} = \frac{\text{Number of Samples Correctly Classified as Class i}}{\text{True Positive+False Positive for class i}}$

		Actual Class		
		Class1	Class2	Class3
Predicted Class	Class1	C11	C21	C31
	Class2	C12	C22	C32
	Class2	C13	C23	C33

- Precision of classifier = Mean Precision: Average of precision for each class

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Recall for a Class

- Recall for Class i $= \frac{\text{True Positive for Class i}}{\text{True Positive+False Negetive for Class i}}$

		Actual Class		
		Class1	Class2	Class3
Predicted Class	Class1	C11	C21	C31
	Class2	C12	C22	C32
	Class2	C13	C23	C33

- Recall of classifier = Mean Recall: Average of recall for each class

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F-score for a Class

- F score for Class i $= \frac{2*(\text{Precision for Class i} * \text{Recall for Class i})}{\text{Precision+Recall for Class i}}$

		Actual Class		
		Class1	Class2	Class3
Predicted Class	Class1	C11	C21	C31
	Class2	C12	C22	C32
	Class2	C13	C23	C33

- F-score of classifier = Mean F-score: Average of F-score for each class

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Thank You

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