What is Balanced Accuracy? (Definition & Example)

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Balanced accuracy is a metric used to evaluate the performance of a classification model by considering the accuracy of both positive and negative predictions. It takes into account the ratio of correctly predicted positive and negative samples, providing a more balanced and accurate measure of a model's effectiveness. This metric is particularly useful when there is an imbalance in the dataset, meaning one class is significantly more prevalent than the other. For example, in a medical diagnosis scenario, the number of healthy patients may be much higher than the number of sick patients. In this case, balanced accuracy would provide a more reliable measure of the model's performance compared to overall accuracy.

What is Balanced Accuracy? (Definition & Example)

Balanced accuracy is a metric we can use to assess the performance of a .

It is calculated as:

Balanced accuracy = (Sensitivity + Specificity) / 2

where:

Sensitivity: The "true positive rate" - the percentage of positive cases the model is able to detect.Specificity: The "true negative rate" - the percentage of negative cases the model is able to detect.

This metric is particularly useful when the two classes are imbalanced - that is, one class appears much more than the other.

The following example shows how to calculate balanced accuracy in practice and demonstrates why it's such a useful metric.

Example: Calculating Balanced Accuracy

Suppose a sports analyst uses a to predict whether or not 400 different college basketball players get drafted into the NBA.

The following confusion matrix summarizes the predictions made by the model:

		Predicted	
		Drafted = Yes	**Drafted = No**
Actual	**Drafted = Yes**	**15** (True Positive)	**5** (False Negative)
	Drafted = No	**5** (False positive)	**375** (True Negative)

To calculate the balanced accuracy of the model, we'll first calculate the sensitivity and specificity:

Sensitivity: The "true positive rate" = 15 / (15 + 5) = 0.75Specificity: The "true negative rate" = 375 / (375 + 5) = 0.9868

We can then calculate the balanced accuracy as:

Balanced accuracy = (Sensitivity + Specificity) / 2Balanced accuracy = (0.75 + 9868) / 2Balanced accuracy = 0.8684

The balanced accuracy for the model turns out to be 0.8684.

Note that the closer the balanced accuracy is to 1, the better the model is able to correctly classify observations.

In this scenario, since the classes are so imbalanced (20 players got drafted and 380 players did not) the balanced accuracy gives us a more realistic picture of how well the model performs compared to an overall accuracy metric.

For example, we would calculate the accuracy of the model as:

Accuracy = (TP + TN) / (TP + TN + FP + FN)Accuracy = (15 + 375) / (15 + 375 + 5 + 5)Accuracy = 0.975

The accuracy of the model is 0.975, which sounds extremely high.

However, consider a model that just predicts every player to not get drafted. It would have an accuracy of 380 / 400 = 0.95. This is only slightly lower than the accuracy of our model.

The balanced accuracy score of 0.8684 gives us a better idea of how well the model is able to predict both classes.

That is, it gives us a better idea of how well the model is able to predict players who won't get drafted *and* those who will get drafted.

The following tutorials explain how to create a confusion matrix in different statistical software: