Sklearn classification report explained worksheet answers key free

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The classification report is about key metrics in a classification problem. You'll have precision, recall, f1-score and support for each class you're trying to find. The recall means "how many of this class you find over the whole number of element of this class" The precision will be "how many are correctly classified among that class" The f1-score is the harmonic mean between precision & recall The support is the number of occurence of the given class in your dataset (so you have 37.5K of class 0 and 37.5K of class 1, which is a really well balanced dataset. The thing is, precision and recall is highly used for imbalanced dataset because in an highly imbalanced dataset, a 99% accuracy can be meaningless. I would say that you don't really need to look at these metrics for this problem , unless a given class should absolutely be correctly determined. To answer your other question, you cannot compare the precision and the recall over two classes. This only means you're classifier is better to find class 0 over class 1. Precision and recall of sklearn.metrics.precision_score or recall_score should not be different. But as long as the code is not provided, this is impossible to determine the root cause of this. sklearn.metrics.classification_report(y_true, y_pred, *, labels=None, target_names=None, sample_weight=None, digits=2, output_dict=False, zero_division='warn')[source]¶ Build a text report showing the main classification metrics. Read more in the User Guide. Parameters y_true1d array-like, or label indicator array / sparse matrixGround truth (correct) target values. y_pred1d array-like, or label indicator array / sparse matrixEstimated targets as returned by a classifier. labelsarray-like of shape (n_labels,), default=NoneOptional list of label indices to include in the report. target_nameslist of str of shape (n_labels,), default=NoneOptional display names matching the labels (same order). sample_weightarray-like of shape (n_samples,), default=NoneSample weights. digitsint, default=2Number of digits for formatting output floating point values. When output_dict is True, this will be ignored and the returned values will not be rounded. output_dictbool, default=FalseIf True, return output as dict. zero_division"warn", 0 or 1, default="warn"Sets the value to return when there is a zero division. If set to "warn", this acts as 0, but warnings are also raised. Returns reportstr or dictText summary of the precision, recall, F1 score for each class. Dictionary returned if output_dict is True. Dictionary has the following structure: {'label 1': {'precision':0.5, 'recall':1.0, 'f1-score':0.67, 'support':1}, 'label 2': { ... }, ... } The reported averages include macro average (averaging the unweighted mean per label), weighted average (averaging the support-weighted mean per label), and sample average (only for multilabel classification). Micro average (averaging the total true positives, false negatives and false positives) is only shown for multi-label or multi-class with a subset of classes, because it corresponds to accuracy otherwise and would be the same for all metrics. See also precision_recall_fscore_support for more details on averages. Note that in binary classification, recall of the positive class is also known as "sensitivity"; recall of the negative class is "specificity". Examples >>> from sklearn.metrics import classification_report >>> y_true = [0, 1, 2, 2, 2] >>> y_pred = [0, 0, 2, 2, 1] >>> target_names = ['class 0', 'class 1', 'class 2'] >>> print(classification_report(y_true, y_pred, target_names=target_names)) precision recall f1-score support class 0 0.50 1.00 0.67 1 class 1 0.00 0.00 0.00 1 class 2 1.00 0.67 0.80 3 accuracy 0.60 5 macro avg 0.50 0.56 0.49 5 weighted avg 0.70 0.60 0.61 5 >>> y_pred = [1, 1, 0] >>> y_true = [1, 1, 1] >>> print(classification_report(y_true, y_pred, labels=[1, 2, 3])) precision recall f1-score support 1 1.00 0.67 0.80 3 2 0.00 0.00 0.00 0 3 0.00 0.00 0.00 0 micro avg 1.00 0.67 0.80 3 macro avg 0.33 0.22 0.27 3 weighted avg 1.00 0.67 0.80 3 Recognizing hand-written digits¶ Faces recognition example using eigenfaces and SVMs¶ Pipeline ANOVA SVM¶ Parameter estimation using grid search with cross-validation¶ Restricted Boltzmann Machine features for digit classification¶ Column Transformer with Heterogeneous Data Sources¶ Label Propagation digits active learning¶ Label Propagation digits: Demonstrating performance¶ Classification of text documents using sparse features¶ © 2007 - 2022, scikit-learn developers (BSD License). Show this page source When using classification models in machine learning, there are three common metrics that we use to assess the quality of the model: 1. Precision: Percentage of correct positive predictions relative to total positive predictions. 2. Recall: Percentage of correct positive predictions relative to total actual positives. 3. F1 Score: A weighted harmonic mean of precision and recall. The closer to 1, the better the model. F1 Score: 2 * (Precision * Recall) / (Precision + Recall) Using these three metrics, we can understand how well a given classification model is able to predict the outcomes for some response variable. Fortunately, when fitting a classification model in Python we can use the classification_report() function from the sklearn library to generate all three of these metrics. The following example shows how to use this function in practice. Example: How to Use the Classification Report in sklearn For this example, we'll fit a logistic regression model that uses points and assists to predict whether or not 1,000 different college basketball players get drafted into the NBA. First, we'll import the necessary packages to perform logistic regression in Python: import pandas as pd import numpy as np from sklearn.model_selection import train_test_split from sklearn.linear_model import LogisticRegression from sklearn.metrics import classification_report Next, we'll create the data frame that contains the information on 1,000 basketball players: #make this example reproducible np.random.seed(1) #create DataFrame df = pd.DataFrame({'points': np.random.randint(30, size=1000), 'assists': np.random.randint(12, size=1000), 'drafted': np.random.randint(2, size=1000)}) #view DataFrame df.head() points assists drafted 0 5 1 1 1 11 8 0 2 12 4 1 3 8 7 0 4 9 0 0 Note: A value of 0 indicates that a player did not get drafted while a value of 1 indicates that a player did get drafted. Next, we'll split our data into a training set and testing set and fit the logistic regression model: #define the predictor variables and the response variable X = df[['points', 'assists']] y = df['drafted'] #split the dataset into training (70%) and testing (30%) sets X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.3,random_state=0) #instantiate the model logistic_regression = LogisticRegression() #fit the model using the training data logistic_regression.fit(X_train,y_train) #use model to make predictions on test data y_pred = logistic_regression.predict(X_test) Lastly, we'll use the classification_report() function to print the classification metrics for our model: #print classification report for model print(classification_report(y_test, y_pred)) precision recall f1-score support 0 0.51 0.58 0.54 160 1 0.43 0.36 0.40 140 accuracy 0.48 300 macro avg 0.47 0.47 0.47 300 weighted avg 0.47 0.48 0.47 300 Here's how to interpret the output: Precision: Out of all the players that the model predicted would get drafted, only 43% actually did. Recall: Out of all the players that actually did get drafted, the model only predicted this outcome correctly for 36% of those players. F1 Score: This value is calculated as: F1 Score: 2 * (Precision * Recall) / (Precision + Recall) F1 Score: 2 * (.43 * .36) / (.43 + .36) F1 Score: 0.40. Since this value isn't very close to 1, it tells us that the model does a poor job of predicting whether or not players will get drafted. Support: These values simply tell us how many players belonged to each class in the test dataset. We can see that among the players in the test dataset, 160 did not get drafted and 140 did get drafted. Note: You can find the complete documentation for the classification_report() function here. Additional Resources The following tutorials provide additional information on how to use classification models in Python: How to Perform Logistic Regression in Python How to Create a Confusion Matrix in Python How to Calculate Balanced Accuracy in Python A Classification report is used to measure the quality of predictions from a classification algorithm. How many predictions are True and how many are False. More specifically, True Positives, False Positives, True negatives and False Negatives are used to predict the metrics of a classification report as shown below. The report is copied from our previous post related to K-Means on Iris Dataset. The code to generate a report similar to the one above is: from sklearn.metrics import classification_report target_names = ['Iris-setosa', 'Iris-versicolor', 'Iris-virginica'] print(classification_report(irisdata['Class'],kmeans.labels_,target_names=target_names)) The report shows the main classification metrics precision, recall and f1-score on a per-class basis. The metrics are calculated by using true and false positives, true and false negatives. Positive and negative in this case are generic names for the predicted classes. There are four ways to check if the predictions are right or wrong: TN / True Negative: when a case was negative and predicted negative TP / True Positive: when a case was positive and predicted positive FN / False Negative: when a case was positive but predicted negative FP / False Positive: when a case was negative but predicted positive Precision – What percent of your predictions were correct? Precision is the ability of a classifier not to label an instance positive that is actually negative. For each class it is defined as the ratio of true positives to the sum of true and false positives. TP – True Positives FP – False Positives Precision – Accuracy of positive predictions. Precision = TP/(TP + FP) from sklearn.metrics import precision_score print("Precision score: {}".format(precision_score(y_true,y_pred))) Recall is the ability of a classifier to find all positive instances. For each class it is defined as the ratio of true positives to the sum of true positives and false negatives. FN – False Negatives Recall: Fraction of positives that were correctly identified.Recall = TP/(TP+FN) from sklearn.metrics import recall_score print("Recall score: {}".format(recall_score(y_true,y_pred))) F1 score – What percent of positive predictions were correct? The F1 score is a weighted harmonic mean of precision and recall such that the best score is 1.0 and the worst is 0.0. Generally speaking, F1 scores are lower than accuracy measures as they embed precision and recall into their computation. As a rule of thumb, the weighted average of F1 should be used to compare classifier models, not global accuracy. F1 Score = 2*(Recall * Precision) / (Recall + Precision) from sklearn.metrics import f1_score print("F1 Score: {}".format(f1_score(y_true,y_pred)))

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