Vamos experimentar agora o algoritmo Decision Tree?

```
!pip -q install yellowbrick
```

```
[notice] A new release of pip available: 22.3 -> 23.0.1
[notice] To update, run: python.exe -m pip install --upgrade pip
```

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
from sklearn.tree import DecisionTreeClassifier
```

```
import pickle
with open('restaurante.pkl', 'rb') as f:
  X_treino, X_teste, y_treino, y_teste = pickle.load(f)
```

Importando a biblioteca de ajuste de hiperparâmetros

```
from sklearn.model_selection import GridSearchCV
```

```
params = {
    'criterion':  ['gini', 'entropy'],
    'max_depth':  [None, 2, 4, 6, 8, 10],
    'max_features': [None, 'sqrt', 'log2', 0.2, 0.4, 0.6, 0.8],
}
```

```
modelo = GridSearchCV(
    estimator=DecisionTreeClassifier(),
    param_grid=params,
    cv=5,
    n_jobs=5,
    verbose=1,
)
```

```
modelo.fit(X_treino, y_treino)
print(modelo.best_params_)
print(modelo.best_score_)
```

```
Fitting 5 folds for each of 84 candidates, totalling 420 fits
```

```
c:\Python311\Lib\site-packages\sklearn\model_selection\_split.py:700:
UserWarning: The least populated class in y has only 4 members, which
is less than n_splits=5.
  warnings.warn(
```

```
{'criterion': 'gini', 'max_depth': 2, 'max_features': 0.4}
0.9
```

Agora precisamos rodar a árvore com os hiperparâmetros obtidos

```
modelo= DecisionTreeClassifier(max_depth=4, criterion='entropy',
max_features=0.6)
modelo.fit(X_treino, y_treino)
```

```
DecisionTreeClassifier(criterion='entropy', max_depth=4,
max_features=0.6)
```

Vamos testar o modelo?

```
previsoes = modelo.predict(X_teste)
```

```
previsoes
```

```
array(['Sim', 'Nao', 'Nao'], dtype=object)
```

Será se o modelo acertou?

```
y_teste
```

```
array(['Nao', 'Sim', 'Nao'], dtype=object)
```

```
from sklearn.metrics import accuracy_score, confusion_matrix,
classification_report
accuracy_score(y_teste,previsoes)
```

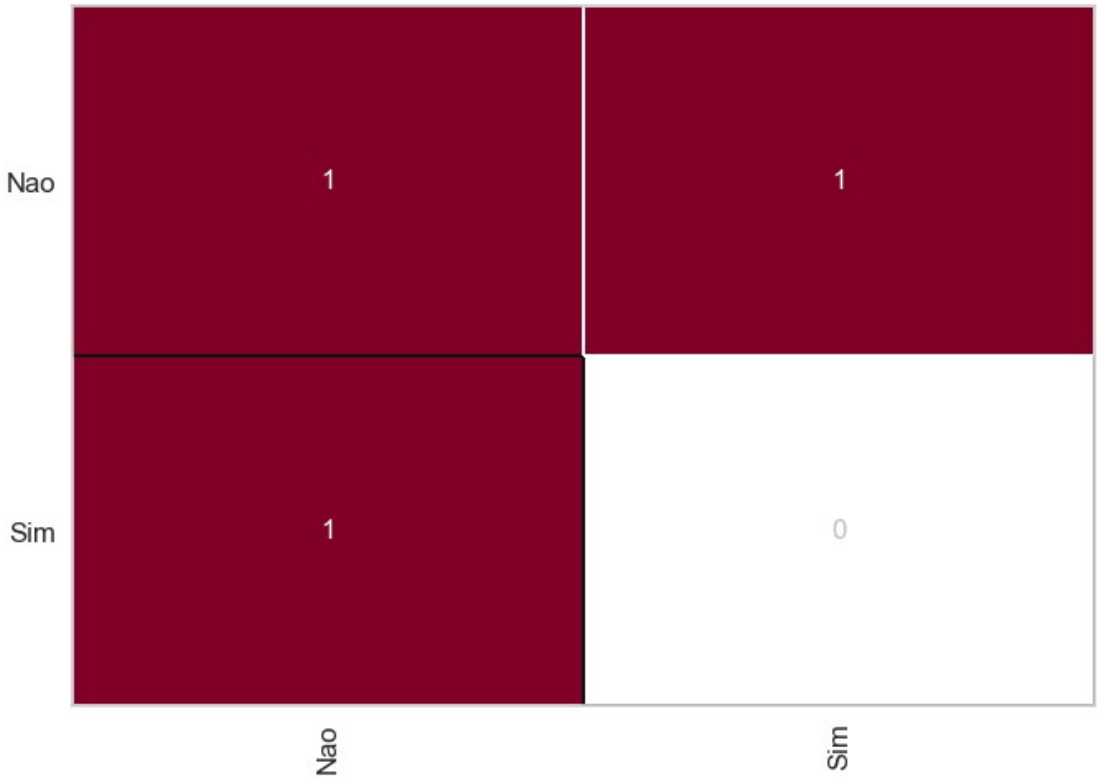
```
0.3333333333333333
```

```
from yellowbrick.classifier import ConfusionMatrix
confusion_matrix(y_teste, previsoes)
```

```
array([[1, 1],
       [1, 0]], dtype=int64)
```

```
cm = ConfusionMatrix(modelo)
cm.fit(X_treino, y_treino)
cm.score(X_teste, y_teste)
```

```
0.3333333333333333
```



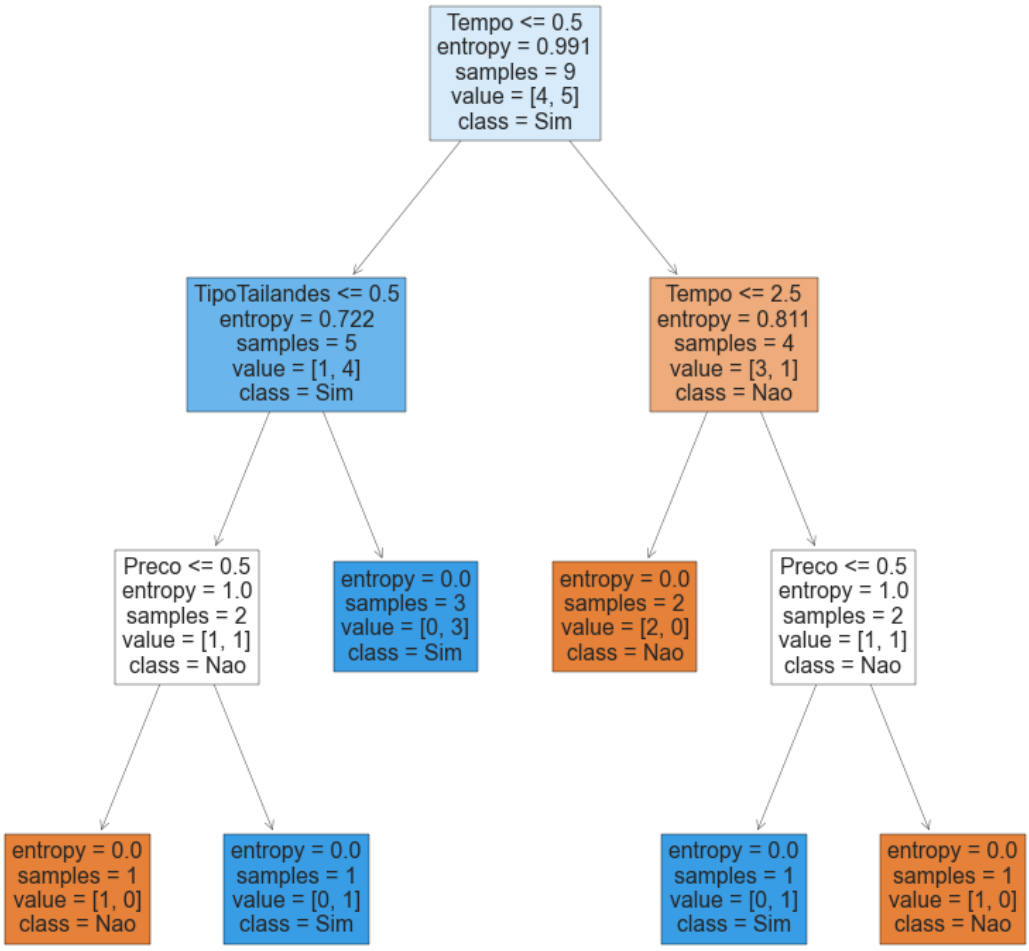

```
print(classification_report(y_teste, previsoes))
```

```
              precision    recall  f1-score   support

         Nao       0.50      0.50      0.50         2
         Sim       0.00      0.00      0.00         1

    accuracy                           0.33         3
   macro avg       0.25      0.25      0.25         3
weighted avg       0.33      0.33      0.33         3
```

```
from sklearn import tree
previsores = ['Alternativo', 'Bar', 'Sex/Sab', 'Fome', 'Cliente',
'Preco', 'Chuva', 'Res',
              'TipoFrances', 'TipoTailandes', 'TipoHamburger',
'TipoItaliano',
              'Tempo']
figura, eixos = plt.subplots(nrows=1, ncols=1, figsize=(10,10))
tree.plot_tree(modelo, feature_names=previsores, class_names =
modelo.classes_, filled=True);
```


Tempo <= 0.5
entropy = 0.991
samples = 9
value = [4, 5]
class = Sim
TipoTailandes <= 0.5
entropy = 0.722
samples = 5
value = [1, 4]
class = Sim
Tempo <= 2.5
entropy = 0.811
samples = 4
value = [3, 1]
class = Nao
Preco <= 0.5
entropy = 1.0
samples = 2
value = [1, 1]
class = Nao
entropy = 0.0
samples = 3
value = [0, 3]
class = Sim
entropy = 0.0
samples = 2
value = [2, 0]
class = Nao
Preco <= 0.5
entropy = 1.0
samples = 2
value = [1, 1]
class = Nao
entropy = 0.0
samples = 1
value = [1, 0]
class = Nao
entropy = 0.0
samples = 1
value = [0, 1]
class = Sim
entropy = 0.0
samples = 1
value = [0, 1]
class = Sim
entropy = 0.0
samples = 1
value = [1, 0]
class = Nao