Notebook

December 8, 2024

1 Import libraries

```
import os
import sys
import cv2
import math
import json
import joblib
import nbformat
import numpy as np
import pandas as pd
import seaborn as sns
from tqdm import tqdm
from sklearn.svm import SVC
from datetime import datetime
import matplotlib.pyplot as plt
from nbconvert.exporters import PDFExporter
from skimage.feature import hog as skimage_hog
from sklearn.preprocessing import LabelEncoder
from IPython.display import display, Javascript
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split, GridSearchCV
from sklearn.metrics import classification_report, confusion_matrix
from scipy.spatial.distance import cityblock, cosine, correlation, sqeuclidean
```

2 Load data

```
project_dir = os.getcwd()
project_dir = os.path.dirname(project_dir)
```

```
width = 64
height = 64
```

```
data_dir = project_dir + "\\data"

train_path = os.path.join(data_dir, "train")
```

```
test_path = os.path.join(data_dir, "test")

train_images = []
test_images = []

train_labels = []
test_labels = []

for path in (train_path, test_path):
    if (path.split('\\')[-1] == "train"):
        for dir in os.listdir(path):
            label_path = os.path.join(path, dir)
            label = dir.split('\\')[-1]
            for image in os.listdir(label_path):
                image_path = os.path.join(label_path, image)
                image = cv2.imread(image_path)
                image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
                image = cv2.resize(image, (width, height))
                train_images.append(image)
                train_labels.append(label)
    else:
        for dir in os.listdir(path):
            label_path = os.path.join(path, dir)
            label = dir.split('\\')[-1]
            for image in os.listdir(label_path):
                image_path = os.path.join(label_path, image)
                image = cv2.imread(image_path)
                image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
                image = cv2.resize(image, (width, height))
                test_images.append(image)
                test_labels.append(label)
```

```
label_encoder = LabelEncoder()
train_labels_encoded = label_encoder.fit_transform(train_labels)
test_labels_encoded = label_encoder.transform(test_labels)
```

```
joblib.dump(train_images, project_dir + '\joblib\\train_images.joblib')
joblib.dump(test_images, project_dir + '\joblib\\test_images.joblib')
joblib.dump(train_labels_encoded, project_dir + '\joblib\\train_labels_encoded.
 ↪joblib')
joblib.dump(test_labels_encoded, project_dir + '\joblib\\test_labels_encoded.
 ↪joblib')
joblib.dump(label_encoder, project_dir + '\joblib\\label_encoder.joblib')
```

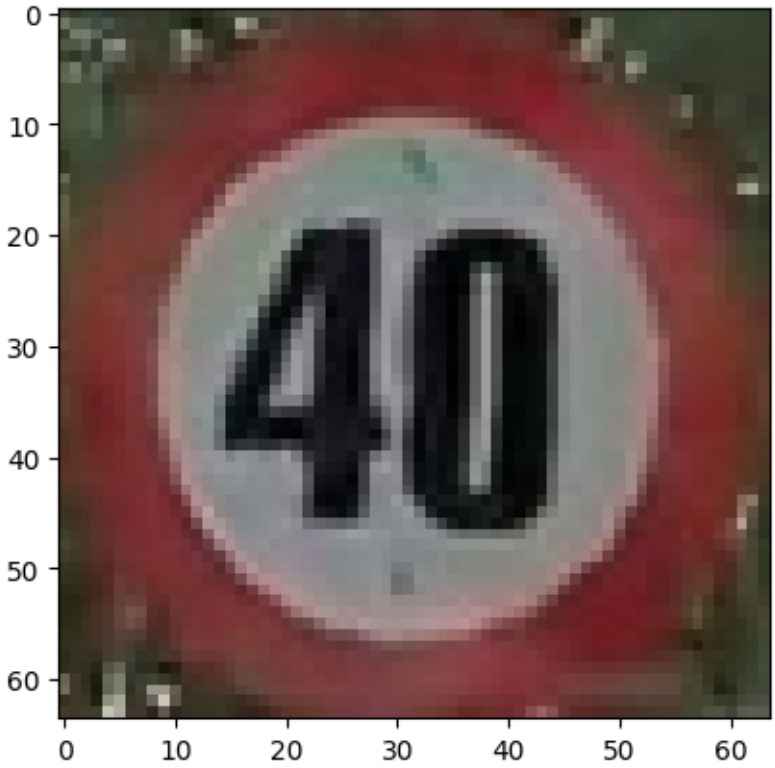
```
<>:1: SyntaxWarning: invalid escape sequence '\j'
<>:2: SyntaxWarning: invalid escape sequence '\j'
<>:3: SyntaxWarning: invalid escape sequence '\j'
```

```
<>:4: SyntaxWarning: invalid escape sequence '\j'
<>:5: SyntaxWarning: invalid escape sequence '\j'
<>:1: SyntaxWarning: invalid escape sequence '\j'
<>:2: SyntaxWarning: invalid escape sequence '\j'
<>:3: SyntaxWarning: invalid escape sequence '\j'
<>:4: SyntaxWarning: invalid escape sequence '\j'
<>:5: SyntaxWarning: invalid escape sequence '\j'
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\2963388047.py:1:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(train_images, project_dir + '\joblib\\train_images.joblib')
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\2963388047.py:2:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(test_images, project_dir + '\joblib\\test_images.joblib')
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\2963388047.py:3:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(train_labels_encoded, project_dir +
'\joblib\\train_labels_encoded.joblib')
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\2963388047.py:4:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(test_labels_encoded, project_dir +
'\joblib\\test_labels_encoded.joblib')
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\2963388047.py:5:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(label_encoder, project_dir + '\joblib\\label_encoder.joblib')
```

```
['e:\\Documents\\CS231\\project\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\label_encoder.joblib']
```

```
plt.imshow(test_images[0])
```

```
<matplotlib.image.AxesImage at 0x248df81ffb0>
```




```
plt.imshow(train_images[1])
```

```
<matplotlib.image.AxesImage at 0x248e42314f0>
```

3 Extract features

```
def blur_image(image):
    blurred_image = cv2.medianBlur(image, 5)
    return blurred_image
```

```
def color_histogram(image):
    # image = cv2.cvtColor(image, cv2.COLOR_RGB2LUV)
    row, column, channel = image.shape[:3]
    size = row * column
    feature = []
    for k in range(channel):
        histogram = np.squeeze(cv2.calcHist([image], [k], None, [64], [0, 256]))
        histogram = histogram / size
        feature.extend(histogram)
    # print('color histogram')
    # print(feature)
    return feature
```

```
def hog(image):
    # image = cv2.cvtColor(image, cv2.COLOR_RGB2LUV)
```

```
    hog_features = skimage_hog(image, orientations=9, pixels_per_cell=(8, 8),␣
 ↪cells_per_block=(4, 4), visualize=False, block_norm='L2-Hys',␣
 ↪transform_sqrt=True, channel_axis=2)
    # print('hog')
    # print(hog_features)
    return hog_features
```

```
# def extract_features(images):
#     blurred_images = [blur_image(image) for image in tqdm(images, desc="Blur␣
 ↪Images")]
#     color_features = [color_histogram(image) for image in␣
 ↪tqdm(blurred_images, desc="Extracting Color Features")]
#     hog_features = [hog(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting HOG Features")]
#     combined_features = [np.concatenate((color_feature, hog_feature))
#                          for color_feature, hog_feature in␣
 ↪tqdm(zip(color_features, hog_features), desc="Combining Features")]

#     return combined_features
```

```
def extract_features(images):
    blurred_images = [blur_image(image) for image in tqdm(images, desc="Blur␣
 ↪Images")]

    # Color Histogram Features
    color_features = [color_histogram(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting Color Features")]
    print("Shape of one color_histogram feature:", np.array(color_features[0]).
 ↪shape)
    print("Min of color_histogram feature:", np.min(color_features))
    print("Max of color_histogram feature:", np.max(color_features))

    # HOG Features
    hog_features = [hog(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting HOG Features")]
    print("Shape of one hog feature:", np.array(hog_features[0]).shape)
    print("Min of HOG feature:", np.min(hog_features))
    print("Max of HOG feature:", np.max(hog_features))

    # Combined Features
    combined_features = [np.concatenate((color_feature, hog_feature))
                         for color_feature, hog_feature in␣
 ↪tqdm(zip(color_features, hog_features), desc="Combining Features")]
    print("Shape of one combined feature:", np.array(combined_features[0]).
 ↪shape)
    print("Min of combined feature:", np.min(combined_features))
```

```
    print("Max of combined feature:", np.max(combined_features))

    return combined_features
```

```
train_features = extract_features(train_images)
joblib.dump(train_features, project_dir + '\joblib\\train_features.joblib')
```

```
<>:2: SyntaxWarning: invalid escape sequence '\j'
<>:2: SyntaxWarning: invalid escape sequence '\j'
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\3158454822.py:2:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(train_features, project_dir + '\joblib\\train_features.joblib')
Blur Images: 100%|      | 1415/1415 [00:00<00:00, 4216.99it/s]
Extracting Color Features: 100%|      | 1415/1415 [00:00<00:00,
27419.58it/s]

Shape of one color_histogram feature: (192,)
Min of color_histogram feature: 0.0
Max of color_histogram feature: 0.9987793

Extracting HOG Features: 100%|      | 1415/1415 [00:01<00:00, 859.00it/s]

Shape of one hog feature: (3600,)
Min of HOG feature: 0.0
Max of HOG feature: 0.9999960413728958

Combining Features: 1415it [00:00, 47108.68it/s]

Shape of one combined feature: (3792,)
Min of combined feature: 0.0
Max of combined feature: 0.9999960413728958

['e:\\Documents\\CS231\\project\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\train_features.joblib']
```

```
test_features = extract_features(test_images)
joblib.dump(test_features, project_dir + '\joblib\\test_features.joblib')
```

```
<>:2: SyntaxWarning: invalid escape sequence '\j'
<>:2: SyntaxWarning: invalid escape sequence '\j'
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\1121528714.py:2:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(test_features, project_dir + '\joblib\\test_features.joblib')
Blur Images: 100%|      | 150/150 [00:00<00:00, 3601.62it/s]
Extracting Color Features: 100%|      | 150/150 [00:00<00:00, 27152.29it/s]

Shape of one color_histogram feature: (192,)
Min of color_histogram feature: 0.0
Max of color_histogram feature: 0.70043945

Extracting HOG Features: 100%|      | 150/150 [00:00<00:00, 849.20it/s]
```

```
Shape of one hog feature: (3600,)
Min of HOG feature: 0.0
Max of HOG feature: 0.44957489127586786

Combining Features: 150it [00:00, 45216.73it/s]

Shape of one combined feature: (3792,)
Min of combined feature: 0.0
Max of combined feature: 0.700439453125
```

```
['e:\\Documents\\CS231\\project\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\test_features.joblib']
```

4 Distance metrics KNN

```
def chi_square_distance(x, y):
    return cv2.compareHist(np.array(x, dtype=np.float32), np.array(y, dtype=np.
 ↪float32), cv2.HISTCMP_CHISQR)

def bhattacharyya_distance(x, y):
    return cv2.compareHist(np.array(x, dtype=np.float32), np.array(y, dtype=np.
 ↪float32), cv2.HISTCMP_BHATTACHARYYA)

def intersection_distance(x, y):
    return 1 - cv2.compareHist(np.array(x, dtype=np.float32), np.array(y,␣
 ↪dtype=np.float32), cv2.HISTCMP_INTERSECT)
```

5 Load Best Model

```
# knn_model = joblib.load(project_dir + '\\joblib\\best_knn_model.joblib')
# svm_model = joblib.load(project_dir + '\\joblib\\best_svm_model.joblib')

# y_pred_knn = knn_model.predict(test_features)
# y_pred_svm = svm_model.predict(test_features)
```

6 Gridsearch KNN

```
knn_model = KNeighborsClassifier()
knn_model.fit(train_features, train_labels_encoded)
y_pred_knn = knn_model.predict(test_features)
```

```
param_grid = {
    'n_neighbors': [3, 4, 5, 6, 7, 10],
    'weights': ['uniform', 'distance'],
```

```
    'leaf_size': [3, 5, 10, 20, 30],
    'metric': [
        cityblock,
        cosine,
        # correlation,
        sqeuclidean,
        chi_square_distance,
        bhattacharyya_distance,
        intersection_distance
    ]
}

knn_model = KNeighborsClassifier()
grid_search_knn = GridSearchCV(
    knn_model,
    param_grid,
    cv=3,
    scoring='f1_macro',
    verbose=3
)

grid_search_knn.fit(train_features, train_labels_encoded)
```

```
Fitting 3 folds for each of 360 candidates, totalling 1080 fits
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.4s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.809 total time=   3.4s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.851 total time=   3.3s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.862 total time=   3.1s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.809 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.856 total time=   3.4s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.830 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.784 total time=   3.4s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.831 total time=   3.2s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.867 total time=   3.2s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.818 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.862 total time=   3.3s
```

```
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.834 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.773 total time=   3.4s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.842 total time=   3.3s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.2s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.807 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.2s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.816 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.782 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.824 total time=   3.5s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.853 total time=   3.2s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.805 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.859 total time=   3.3s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.813 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.774 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.827 total time=   3.4s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.838 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.798 total time=   3.3s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.842 total time=   3.4s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.800 total time=   3.3s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.752 total time=   3.3s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.794 total time=   3.4s
[CV 1/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.842 total time=   3.4s
[CV 2/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.784 total time=   3.2s
[CV 3/3] END leaf_size=3, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.831 total time=   3.3s
```

```
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.9s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.830 total time=   4.0s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.865 total time=   4.0s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.835 total time=   3.9s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.816 total time=   4.0s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.783 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.801 total time=   4.2s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.873 total time=   4.0s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.817 total time=   3.8s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.848 total time=   4.0s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.835 total time=   3.9s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.789 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.807 total time=   5.1s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.848 total time=   4.3s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   4.4s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.839 total time=   4.1s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.804 total time=   4.0s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.783 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.796 total time=   4.0s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.854 total time=   4.1s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.806 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.839 total time=   4.1s
```

```
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.811 total time=   4.2s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.791 total time=   3.9s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   4.0s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.836 total time=   3.9s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.817 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   4.1s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   4.0s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.768 total time=   4.0s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   3.9s
[CV 1/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.815 total time=   3.9s
[CV 2/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.798 total time=   3.9s
[CV 3/3] END leaf_size=3, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.805 total time=   4.1s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.855 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.802 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.827 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.870 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.815 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.833 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.813 total time=   2.9s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.785 total time=   2.8s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.794 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.874 total time=   2.6s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.813 total time=   2.8s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.846 total time=   2.7s
```

```
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.830 total time=   2.8s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.792 total time=   2.8s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.801 total time=   2.8s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.842 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.830 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.797 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.777 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.800 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.853 total time=   2.9s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.801 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.841 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.805 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.802 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.840 total time=   2.8s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.808 total time=   2.8s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.821 total time=   2.7s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.769 total time=   2.8s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   2.9s
[CV 1/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.817 total time=   2.7s
[CV 2/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.795 total time=   2.7s
[CV 3/3] END leaf_size=3, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   2.7s
```

```
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.725 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.721 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.710 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.747 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.758 total time=
4.6s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.739 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.733 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.705 total time=
4.6s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.713 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.750 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.734 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.716 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.9s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.759 total time=
4.6s
```

```
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.741 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.738 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.699 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.694 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.705 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.6s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.723 total time=
4.6s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.737 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.715 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.694 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.701 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.766 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.716 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.741 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.661 total time=
4.6s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.677 total time=
4.7s
```

```
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.678 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.741 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.707 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.726 total time=
4.6s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.855 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.787 total time=
4.9s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.778 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.871 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.802 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.796 total time=
5.4s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.824 total time=
5.1s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.764 total time=
4.9s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.765 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.862 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.796 total time=
5.0s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.806 total time=
4.8s
```

```
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.826 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.749 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.772 total time=
4.9s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.846 total time=
4.7s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.770 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.792 total time=
4.7s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.809 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.755 total time=
4.9s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.760 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.842 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.767 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.9s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.803 total time=
4.9s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.750 total time=
4.9s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.765 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.820 total time=
4.8s
```

```
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.752 total time=
4.9s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.771 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.760 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.8s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.9s
[CV 1/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.795 total time=
4.8s
[CV 2/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.756 total time=
4.7s
[CV 3/3] END leaf_size=3, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.767 total time=
4.8s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.793 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.754 total time=
3.3s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.760 total time=
3.2s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.762 total time=
3.1s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.714 total time=
3.1s
```

```
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.734 total time=
3.3s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.753 total time=
3.1s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.715 total time=
3.2s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.735 total time=
3.2s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.3s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.734 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.696 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.731 total time=
3.1s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.3s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
```

```
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.729 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.707 total time=
3.2s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.732 total time=
3.2s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.4s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.2s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.742 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.692 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.721 total time=
3.2s
[CV 1/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.2s
[CV 2/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=3, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.3s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.809 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.851 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.862 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.809 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.856 total time=   3.3s
```

```
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.830 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.784 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.831 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.867 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.818 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.862 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.834 total time=   3.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.773 total time=   3.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.842 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.807 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.816 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.782 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.824 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.853 total time=   3.1s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.805 total time=   3.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.859 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.813 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.774 total time=   3.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.827 total time=   3.1s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.838 total time=   3.3s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.798 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.842 total time=   3.1s
```

```
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.800 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.752 total time=   3.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.794 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.842 total time=   3.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.784 total time=   3.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.831 total time=   3.2s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.830 total time=   3.8s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.865 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.835 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.816 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.783 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.873 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.848 total time=   3.8s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.835 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.789 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.807 total time=   3.8s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.848 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.839 total time=   3.8s
```

```
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.804 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.783 total time=   3.8s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.796 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.854 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.806 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.839 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.811 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.791 total time=   3.8s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.836 total time=   3.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.768 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   3.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.815 total time=   3.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.798 total time=   3.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.805 total time=   3.8s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.855 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.802 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.827 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.870 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.815 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.833 total time=   2.6s
```

```
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.813 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.785 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.794 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.874 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.813 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.846 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.830 total time=   2.7s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.792 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.801 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.842 total time=   2.7s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.830 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.797 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.777 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.800 total time=   2.7s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.853 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.801 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.841 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.805 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   2.7s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.802 total time=   2.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.840 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.808 total time=   2.7s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.821 total time=   2.6s
```

```
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   2.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.769 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   2.7s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.817 total time=   2.7s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.795 total time=   2.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   2.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.725 total time=
4.6s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.721 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.710 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.747 total time=
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[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.758 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.733 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.705 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.713 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.750 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.734 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.739 total time=
4.6s
```

```
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.716 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.759 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.741 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.738 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.699 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.705 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.723 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.737 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.715 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.701 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.766 total time=
4.5s
```

```
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.716 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.741 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.661 total time=
4.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.677 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.678 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.741 total time=
4.6s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.707 total time=
4.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.726 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.855 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.787 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.871 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.802 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.796 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.824 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.764 total time=
4.7s
```

```
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.862 total time=
4.6s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.796 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.806 total time=
4.6s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.826 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.749 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.772 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.846 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.770 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.792 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.809 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.755 total time=
4.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.760 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.842 total time=
4.6s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.767 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.7s
```

```
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.803 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.750 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.820 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.752 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.771 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.760 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.795 total time=
4.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.756 total time=
4.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.767 total time=
4.7s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.793 total time=
3.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.754 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.760 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
```

```
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.762 total time=
3.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.714 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.734 total time=
3.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.753 total time=
3.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.715 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.735 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.734 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.696 total time=
3.1s
```

```
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.731 total time=
3.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.729 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.707 total time=
3.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.732 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.742 total time=
3.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.692 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.721 total time=
3.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
```

```
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.809 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.851 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.862 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.809 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.856 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.830 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.784 total time=   3.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.831 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.867 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.818 total time=   3.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.862 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.834 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.773 total time=   3.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.842 total time=   3.2s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.807 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.816 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.782 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.824 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.853 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.805 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.859 total time=   3.1s
```

```
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.813 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.774 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.827 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.838 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.798 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.842 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.800 total time=   3.1s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.752 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.794 total time=   3.2s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.842 total time=   3.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.784 total time=   3.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.831 total time=   3.1s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.830 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.865 total time=   3.8s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.835 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.816 total time=   3.8s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.783 total time=   3.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.873 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.848 total time=   3.9s
```

```
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.835 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.789 total time=   3.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.807 total time=   3.8s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.848 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   3.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.839 total time=   3.8s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.804 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.783 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.796 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.854 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.806 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.839 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.811 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.791 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.836 total time=   3.8s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   3.8s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   3.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.768 total time=   3.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   3.8s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.815 total time=   3.8s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.798 total time=   3.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.805 total time=   3.9s
```

```
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.855 total time=   2.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.802 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.827 total time=   2.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.870 total time=   2.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.815 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.833 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.813 total time=   2.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.785 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.794 total time=   2.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.874 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.813 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.846 total time=   2.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.830 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.792 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.801 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.842 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.830 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.797 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.777 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.800 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.853 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.801 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.841 total time=   2.6s
```

```
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.805 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.802 total time=   2.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.840 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.808 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.821 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   2.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.769 total time=   2.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   2.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.817 total time=   2.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.795 total time=   2.6s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   2.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.725 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.721 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.710 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.747 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.758 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.733 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.705 total time=
4.6s
```

```
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.713 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.750 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.734 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.716 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.759 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.741 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.738 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.699 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.705 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.723 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.737 total time=
4.6s
```

```
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.715 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.701 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.766 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.716 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.741 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.661 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.677 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.678 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.741 total time=
4.6s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.707 total time=
4.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.726 total time=
4.6s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.855 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.787 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.871 total time=
4.7s
```

```
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.802 total time=
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[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.796 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.824 total time=
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[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.862 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.796 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.806 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.826 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.749 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.772 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.846 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.770 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.792 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.809 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.755 total time=
4.7s
```

```
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.760 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.842 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.767 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.803 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.750 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.820 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.752 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.771 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.760 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.795 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.756 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.767 total time=
4.7s
```

```
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.793 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.754 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.760 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.762 total time=
3.0s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.714 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.734 total time=
3.0s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.753 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.715 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.735 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.1s
```

```
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.734 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.696 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.731 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.729 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.707 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.732 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.742 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.692 total time=
3.1s
```

```
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.721 total time=
3.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.809 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.851 total time=   3.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.862 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.809 total time=   3.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.856 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.830 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.784 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.831 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.867 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.818 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.862 total time=   3.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.834 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.773 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.842 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.807 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.1s
```

```
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.816 total time=   3.2s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.782 total time=   3.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.824 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.853 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.805 total time=   3.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.859 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.813 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.774 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.827 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.838 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.798 total time=   3.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.842 total time=   3.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.800 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.752 total time=   3.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.794 total time=   3.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.842 total time=   3.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.784 total time=   3.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.831 total time=   3.1s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.9s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.830 total time=   3.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.865 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.817 total time=   3.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.835 total time=   3.9s
```

```
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.816 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.783 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.873 total time=   3.9s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.817 total time=   3.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.848 total time=   3.8s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.835 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.789 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.807 total time=   3.8s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.848 total time=   3.9s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.839 total time=   3.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.804 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.783 total time=   3.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.796 total time=   3.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.854 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.806 total time=   3.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.839 total time=   3.8s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.811 total time=   3.9s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.791 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.836 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.817 total time=   3.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   3.8s
```

```
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.768 total time=   3.9s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   3.8s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.815 total time=   3.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.798 total time=   4.5s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.805 total time=   4.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.855 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.802 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.827 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.870 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.815 total time=   2.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.833 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.813 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.785 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.794 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.874 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.813 total time=   2.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.846 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.830 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.792 total time=   2.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.801 total time=   2.7s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.842 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.830 total time=   2.6s
```

```
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.797 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.777 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.800 total time=   2.7s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.853 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.801 total time=   2.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.841 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.805 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.802 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.840 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.808 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.821 total time=   2.6s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   2.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.769 total time=   2.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   2.7s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.817 total time=   2.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.795 total time=   2.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   2.7s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.725 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.721 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.710 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.747 total time=
4.6s
```

```
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.758 total time=
4.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.733 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.705 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.713 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.750 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.734 total time=
4.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.739 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.716 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.759 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.741 total time=
4.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.738 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.699 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.694 total time=
4.6s
```

```
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.705 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.723 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.737 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.715 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.701 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.766 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.716 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.741 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.661 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.677 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.678 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.741 total time=
4.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.707 total time=
4.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.726 total time=
4.6s
```

```
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.855 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.787 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.778 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.871 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.802 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.796 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.824 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.764 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.862 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.796 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.806 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.826 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.749 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.772 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.846 total time=
4.7s
```

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[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.770 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.792 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.809 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.755 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.760 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.842 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.767 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.803 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.750 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.820 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.752 total time=
4.6s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.771 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.760 total time=
4.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
```

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[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.795 total time=
4.6s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.756 total time=
4.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.767 total time=
4.7s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.793 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.754 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.760 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.714 total time=
3.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.734 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
```

```
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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3.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.715 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.735 total time=
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[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
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[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.734 total time=
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[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.696 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.731 total time=
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[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.729 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.707 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.732 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
```

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[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
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[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.742 total time=
3.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.692 total time=
3.2s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.721 total time=
3.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.809 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=uniform;, score=0.851 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.862 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.809 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=3, weights=distance;, score=0.856 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.830 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.784 total time=   3.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=uniform;, score=0.831 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.867 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.818 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=4, weights=distance;, score=0.862 total time=   3.1s
```

```
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.834 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.773 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=uniform;, score=0.842 total time=   3.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.1s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.807 total time=   3.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=5, weights=distance;, score=0.854 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.816 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.782 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=uniform;, score=0.824 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.853 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.805 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=6, weights=distance;, score=0.859 total time=   3.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.813 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.774 total time=   3.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=uniform;, score=0.827 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.838 total time=   3.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.798 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=7, weights=distance;, score=0.842 total time=   3.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.800 total time=   3.1s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.752 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=uniform;, score=0.794 total time=   3.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.842 total time=   3.1s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.784 total time=   3.1s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x00000248DD9F4040>,
n_neighbors=10, weights=distance;, score=0.831 total time=   3.2s
```

```
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.849 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=uniform;, score=0.830 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.865 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.817 total time=   3.8s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=3, weights=distance;, score=0.835 total time=   3.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.816 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.783 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=uniform;, score=0.801 total time=   3.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.873 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=4, weights=distance;, score=0.848 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.835 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.789 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=uniform;, score=0.807 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.848 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   3.8s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=5, weights=distance;, score=0.839 total time=   3.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.804 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.783 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=uniform;, score=0.796 total time=   3.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.854 total time=   3.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.806 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=6, weights=distance;, score=0.839 total time=   3.8s
```

```
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.811 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.791 total time=   3.8s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.836 total time=   3.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.817 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   3.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.768 total time=   3.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   3.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.815 total time=   3.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.798 total time=   3.8s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x00000248DD9CFCE0>,
n_neighbors=10, weights=distance;, score=0.805 total time=   3.9s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.855 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.802 total time=   2.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=uniform;, score=0.827 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.870 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.815 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=3, weights=distance;, score=0.833 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.813 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.785 total time=   2.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=uniform;, score=0.794 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.874 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.813 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=4, weights=distance;, score=0.846 total time=   2.6s
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```
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.830 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.792 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=uniform;, score=0.801 total time=   2.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.842 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.810 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=5, weights=distance;, score=0.830 total time=   2.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.797 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.777 total time=   2.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=uniform;, score=0.800 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.853 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.801 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=6, weights=distance;, score=0.841 total time=   2.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.805 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   2.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=uniform;, score=0.802 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.840 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.808 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=7, weights=distance;, score=0.821 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.764 total time=   2.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.769 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=uniform;, score=0.771 total time=   2.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.817 total time=   2.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.795 total time=   2.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x00000248DD9CFBA0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   2.6s
```

```
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
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[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.721 total time=
4.6s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=uniform;, score=0.710 total time=
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[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=3, weights=distance;, score=0.747 total time=
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[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
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[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.733 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.705 total time=
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[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=uniform;, score=0.713 total time=
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[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=4, weights=distance;, score=0.750 total time=
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4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
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4.6s
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0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.716 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=uniform;, score=0.703 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.759 total time=
4.5s
```

```
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.741 total time=
4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=5, weights=distance;, score=0.738 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.699 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=uniform;, score=0.705 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.723 total time=
4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=6, weights=distance;, score=0.737 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.715 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.694 total time=
4.6s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=uniform;, score=0.701 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.766 total time=
4.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.716 total time=
4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=7, weights=distance;, score=0.741 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.661 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.677 total time=
4.6s
```

```
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=uniform;, score=0.678 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.741 total time=
4.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.707 total time=
4.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x00000248E42911C0>, n_neighbors=10, weights=distance;, score=0.726 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.855 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.787 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=uniform;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.871 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.802 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=3, weights=distance;, score=0.796 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.824 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.764 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.862 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.796 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=4, weights=distance;, score=0.806 total time=
4.6s
```

```
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.826 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.749 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=uniform;, score=0.772 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.846 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.770 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=5, weights=distance;, score=0.792 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.809 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.755 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=uniform;, score=0.760 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.842 total time=
4.6s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.767 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=6, weights=distance;, score=0.778 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.803 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.750 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=uniform;, score=0.765 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.820 total time=
4.6s
```

```
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.752 total time=
4.6s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=7, weights=distance;, score=0.771 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.760 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=uniform;, score=0.737 total time=
4.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.795 total time=
4.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.756 total time=
4.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x00000248E4291BC0>, n_neighbors=10, weights=distance;, score=0.767 total time=
4.6s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.793 total time=
3.0s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.754 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=uniform;, score=0.760 total time=
3.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.1s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=3, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.762 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.714 total time=
3.1s
```

```
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=uniform;, score=0.734 total time=
3.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=4, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.753 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.715 total time=
3.1s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=uniform;, score=0.735 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=5, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.734 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.696 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=uniform;, score=0.731 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.2s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=6, weights=distance;, score=0.076 total time=
3.1s
```

```
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.729 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.707 total time=
3.1s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=uniform;, score=0.732 total time=
3.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=7, weights=distance;, score=0.076 total time=
3.0s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.742 total time=
3.1s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.692 total time=
3.1s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=uniform;, score=0.721 total time=
3.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.0s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x00000248E4291A80>, n_neighbors=10, weights=distance;, score=0.076 total time=
3.1s

GridSearchCV(cv=3, estimator=KNeighborsClassifier(),
             param_grid={'leaf_size': [3, 5, 10, 20, 30],
                         'metric': [<function cityblock at 0x00000248DD9F4040>,
                                    <function cosine at 0x00000248DD9CFCE0>,
                                    <function sqeuclidean at
0x00000248DD9CFBA0>,
                                    <function chi_square_distance at
0x00000248E42911C0>,
                                    <function bhattacharyya_distance at
0x00000248E4291BC0>,
```

```
                                    <function intersection_distance at
0x00000248E4291A80>],
                          'n_neighbors': [3, 4, 5, 6, 7, 10],
                          'weights': ['uniform', 'distance']},
             scoring='f1_macro', verbose=3)
```

```
best_knn = grid_search_knn.best_estimator_
print(f"Best Params: {grid_search_knn.best_params_}")


y_pred_knn = best_knn.predict(test_features)

joblib.dump(best_knn, project_dir + '\joblib\\best_knn_model.joblib')
```

```
Best Params: {'leaf_size': 3, 'metric': <function cityblock at
0x00000248DD9F4040>, 'n_neighbors': 4, 'weights': 'distance'}
```

```
<>:7: SyntaxWarning: invalid escape sequence '\j'
<>:7: SyntaxWarning: invalid escape sequence '\j'
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\3493465004.py:7:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(best_knn, project_dir + '\joblib\\best_knn_model.joblib')
```

```
['e:\\Documents\\CS231\\project\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\best_knn_model.joblib']
```

7 Gridsearch SVM

```
svm_model = SVC()
svm_model.fit(train_features, train_labels_encoded)
y_pred_svm = svm_model.predict(test_features)
```

```
param_grid = {
    'C': [0.1, 0.2, 0.3, 0.4],
    'kernel': ['rbf', 'linear', 'poly', 'sigmoid'],
    'gamma': ['scale', 'auto', 0.1, 0.01, 0.001],
    'degree': [2, 3, 4],
}

svm_model = SVC()

grid_search_svm = GridSearchCV(
    estimator=svm_model,
    param_grid=param_grid,
    cv=3,
    scoring='f1_macro',
    verbose=3,
```

```
)

grid_search_svm.fit(train_features, train_labels_encoded)
```

```
Fitting 3 folds for each of 240 candidates, totalling 720 fits
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.487 total time=
1.8s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.502 total time=
1.8s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.497 total time=
1.8s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.684 total time=
1.1s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.677 total time=
1.1s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.637 total time=
1.1s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.527 total
time=   1.2s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.538 total
time=   1.3s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.531 total
time=   1.2s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.806 total
time=   0.6s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.463 total time=
1.8s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.472 total time=
1.9s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.437 total time=
1.8s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.847 total time=
0.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.832 total time=
0.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.806 total time=
0.7s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.842 total time=
0.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.821 total time=
0.9s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.787 total time=
1.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.497 total
time=   1.3s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.518 total
time=   1.3s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.505 total
time=   1.3s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.447 total time=
1.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.469 total time=
1.9s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.454 total time=
1.8s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.447 total
```

```
time=   1.6s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.464 total
time=   1.6s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.454 total
time=   1.6s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.487 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.502 total time=
1.8s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.497 total time=
1.7s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.742 total time=
1.2s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.736 total time=
1.1s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.671 total time=
1.1s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.527 total
```

```
time=   1.2s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.538 total
time=   1.2s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.531 total
time=   1.2s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.806 total
time=   0.6s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.463 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.472 total time=
1.9s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.437 total time=
1.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.847 total time=
0.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.832 total time=
0.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.806 total time=
0.7s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.883 total time=
1.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.869 total time=
1.2s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.862 total time=
1.1s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.497 total
```

```
time=   1.2s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.518 total
time=   1.3s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.505 total
time=   1.3s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.447 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.469 total time=
1.9s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.454 total time=
1.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.447 total
time=   1.5s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.464 total
time=   1.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.454 total
time=   1.5s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.1s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.487 total time=
1.7s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.502 total time=
1.8s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.497 total time=
1.7s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.769 total time=
1.2s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.783 total time=
1.2s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.699 total time=
1.2s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.527 total
time=   1.2s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.538 total
time=   1.2s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.531 total
time=   1.2s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.463 total time=
1.9s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.472 total time=
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.437 total time=
1.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.847 total time=
0.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.832 total time=
0.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.806 total time=
0.7s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.880 total time=
1.3s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.881 total time=
1.3s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.855 total time=
1.3s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.497 total
time=   1.3s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.518 total
time=   1.3s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.505 total
time=   1.3s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.447 total time=
1.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.469 total time=
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.454 total time=
1.9s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.447 total
```

```
time=   1.5s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.464 total
time=   1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.454 total
time=   1.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.847 total
time=   0.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.832 total
time=   0.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.806 total
time=   0.7s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.614 total time=
1.6s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.594 total time=
1.6s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.585 total time=
1.6s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.839 total
time=   0.7s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.828 total
time=   0.7s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.793 total time=
1.0s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.800 total time=
1.0s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.724 total time=
1.0s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.567 total
```

```
time=   1.1s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.568 total
time=   1.1s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.589 total
time=   1.0s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.839 total
time=   0.7s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.828 total
time=   0.7s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.564 total time=
1.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.565 total time=
1.8s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.524 total time=
1.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.839 total time=
0.6s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.828 total time=
0.6s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.803 total time=
0.6s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.866 total time=
0.9s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.855 total time=
0.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.834 total time=
0.9s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.529 total
```

```
time=   1.1s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.541 total
time=   1.1s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.527 total
time=   1.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.7s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.828 total
time=   0.7s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.224 total time=
1.6s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.229 total time=
1.7s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.200 total time=
1.6s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.449 total
time=   1.4s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.484 total
time=   1.5s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.479 total
time=   1.5s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.8s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.4s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.4s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.5s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.614 total time=
1.4s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.594 total time=
1.4s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.585 total time=
1.5s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.834 total time=
1.0s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.822 total time=
1.0s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.784 total time=
0.9s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.567 total
time=   0.9s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.568 total
time=   1.0s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.589 total
time=   1.0s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
1.8s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
1.8s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
1.9s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.803 total
time=   0.5s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.4s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.5s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.4s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.4s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.564 total time=
1.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.565 total time=
1.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.524 total time=
1.6s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.839 total time=
0.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.828 total time=
0.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.803 total time=
0.6s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.881 total time=
1.0s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.872 total time=
1.0s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.862 total time=
1.0s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.529 total
time=   1.0s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.541 total
time=   1.0s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.527 total
time=   1.0s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.4s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.4s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.4s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.4s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.449 total
```

```
time=   1.2s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.484 total
time=   1.2s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.479 total
time=   1.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.8s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.4s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.4s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.4s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.4s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.4s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.614 total time=
1.5s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.594 total time=
1.5s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.585 total time=
1.4s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.857 total time=
1.1s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.850 total time=
1.2s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.814 total time=
1.1s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.567 total
```

```
time=   0.9s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.568 total
time=   1.0s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.589 total
time=   0.9s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
1.9s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.564 total time=
1.7s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.565 total time=
1.7s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.524 total time=
1.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.839 total time=
0.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.828 total time=
0.7s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.803 total time=
0.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.880 total time=
1.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.881 total time=
1.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.855 total time=
1.3s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.529 total
```

```
time=   1.1s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.541 total
time=   1.1s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.527 total
time=   1.1s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.6s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.537 total time=
1.6s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.803 total
time=   0.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.449 total
time=   1.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.484 total
time=   1.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.479 total
time=   1.3s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
1.9s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.839 total
time=   0.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.828 total
time=   0.6s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.803 total
time=   0.6s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.5s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.741 total time=
1.4s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.717 total time=
1.5s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.661 total time=
1.4s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.835 total time=
0.8s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.816 total time=
0.9s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.777 total time=
0.8s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.664 total
time=   0.9s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.674 total
time=   0.9s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.635 total
time=   0.9s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
1.9s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.5s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.646 total time=
1.6s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.635 total time=
1.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.603 total time=
1.5s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.834 total time=
0.6s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.825 total time=
0.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.802 total time=
0.6s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.871 total time=
0.8s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.864 total time=
0.8s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.862 total time=
0.8s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.571 total
time=   0.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.617 total
time=   1.0s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.576 total
time=   1.0s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.576 total time=
1.4s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.561 total time=
1.5s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.542 total time=
1.5s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.428 total time=
1.5s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.426 total time=
1.5s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.423 total time=
1.5s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.521 total
```

```
time=   1.2s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.527 total
time=   1.2s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.528 total
time=   1.2s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.352 total time=
1.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.334 total time=
2.0s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.318 total time=
2.0s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.7s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.741 total time=
1.4s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.717 total time=
1.5s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.661 total time=
1.5s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.863 total time=
1.0s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.852 total time=
1.2s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.817 total time=
1.0s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.664 total
```

```
time=   1.0s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.674 total
time=   1.0s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.635 total
time=   1.0s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.646 total time=
1.7s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.635 total time=
1.7s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.603 total time=
1.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.834 total time=
0.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.825 total time=
0.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.802 total time=
0.7s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.881 total time=
1.1s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.872 total time=
1.1s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.862 total time=
1.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.571 total
```

```
time=   1.0s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.617 total
time=   1.0s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.576 total
time=   1.0s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.576 total time=
1.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.561 total time=
1.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.542 total time=
1.5s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.521 total
time=   1.3s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.527 total
time=   1.2s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.528 total
time=   1.2s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.352 total time=
2.1s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.334 total time=
2.0s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.318 total time=
2.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.741 total time=
1.5s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.717 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.661 total time=
1.5s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.881 total time=
1.3s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.871 total time=
1.3s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.838 total time=
1.3s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.664 total
time=   0.9s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.674 total
time=   1.0s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.635 total
time=   1.0s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.646 total time=
1.7s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.635 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.603 total time=
1.7s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.834 total time=
0.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.825 total time=
0.7s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.802 total time=
0.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.880 total time=
1.3s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.881 total time=
1.3s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.855 total time=
1.3s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.571 total
time=   1.0s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.617 total
time=   1.0s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.576 total
time=   1.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.576 total time=
1.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.561 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.542 total time=
1.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.521 total
```

```
time=   1.3s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.527 total
time=   1.3s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.528 total
time=   1.3s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.352 total time=
2.1s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.334 total time=
2.1s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.318 total time=
2.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.834 total
time=   0.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.802 total
time=   0.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.776 total time=
1.5s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.793 total time=
1.5s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.715 total time=
1.4s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.845 total time=
0.9s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.823 total time=
0.9s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.805 total time=
0.9s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.700 total
```

```
time=   0.9s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.712 total
time=   0.9s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.666 total
time=   0.9s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.730 total time=
1.7s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.735 total time=
1.7s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.674 total time=
1.7s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.829 total time=
0.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.825 total time=
0.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.804 total time=
0.6s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.878 total time=
1.0s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.856 total time=
0.9s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.864 total time=
0.9s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.629 total
```

```
time=   0.9s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.650 total
time=   1.0s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.600 total
time=   1.0s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.589 total time=
1.5s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.583 total time=
1.5s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.570 total time=
1.4s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.454 total time=
1.5s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.467 total time=
1.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.446 total time=
1.5s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.560 total
time=   1.1s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.548 total
time=   1.2s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.541 total
time=   1.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.435 total time=
2.0s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.443 total time=
2.0s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.441 total time=
2.0s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.776 total time=
1.4s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.793 total time=
1.4s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.715 total time=
1.4s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.804 total
time=   0.7s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.881 total time=
1.1s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.861 total time=
1.1s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.839 total time=
1.1s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.700 total
time=   0.9s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.712 total
time=   0.9s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.666 total
time=   0.9s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.730 total time=
1.7s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.735 total time=
1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.674 total time=
1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.829 total time=
0.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.825 total time=
0.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.804 total time=
0.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.881 total time=
1.1s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.872 total time=
1.1s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.862 total time=
1.1s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.629 total
time=   0.9s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.650 total
time=   1.0s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.600 total
time=   1.0s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.589 total time=
1.5s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.583 total time=
1.5s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.570 total time=
1.5s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.560 total
```

```
time=   1.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.548 total
time=   1.2s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.541 total
time=   1.2s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.435 total time=
2.1s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.443 total time=
2.1s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.441 total time=
2.0s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.776 total time=
1.5s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.793 total time=
1.5s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.715 total time=
1.4s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.825 total
time=   0.7s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.883 total time=
1.3s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.876 total time=
1.3s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.856 total time=
1.3s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.700 total
```

```
time=   0.9s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.712 total
time=   0.9s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.666 total
time=   0.9s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.1s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
1.5s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.730 total time=
1.7s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.735 total time=
1.7s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.674 total time=
1.7s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.829 total time=
0.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.825 total time=
0.6s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.804 total time=
0.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.880 total time=
1.3s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.881 total time=
1.3s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.855 total time=
1.3s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.629 total
```

```
time=   1.0s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.650 total
time=   1.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.600 total
time=   1.0s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.589 total time=
1.5s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.583 total time=
1.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.570 total time=
1.5s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.560 total
time=   1.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.548 total
time=   1.2s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.541 total
time=   1.2s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.435 total time=
2.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.443 total time=
2.1s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.441 total time=
2.0s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.829 total
time=   0.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.825 total
time=   0.6s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.804 total
time=   0.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
1.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
```

```
time=   1.6s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.6s
```

```
GridSearchCV(cv=3, estimator=SVC(),
             param_grid={'C': [0.1, 0.2, 0.3, 0.4], 'degree': [2, 3, 4],
                         'gamma': ['scale', 'auto', 0.1, 0.01, 0.001],
                         'kernel': ['rbf', 'linear', 'poly', 'sigmoid']},
             scoring='f1_macro', verbose=3)
```

```
best_svm = grid_search_svm.best_estimator_
# Get the best parameters and score
print("Best parameters:", grid_search_svm.best_params_)

y_pred_svm = best_svm.predict(test_features)

joblib.dump(best_svm, project_dir + '\joblib\\best_svm_model.joblib')
```

```
Best parameters: {'C': 0.1, 'degree': 4, 'gamma': 0.1, 'kernel': 'poly'}
```

```
<>:7: SyntaxWarning: invalid escape sequence '\j'
<>:7: SyntaxWarning: invalid escape sequence '\j'
C:\Users\Legion 5 Pro\AppData\Local\Temp\ipykernel_23280\952400143.py:7:
SyntaxWarning: invalid escape sequence '\j'
  joblib.dump(best_svm, project_dir + '\joblib\\best_svm_model.joblib')
```

```
['e:\\Documents\\CS231\\project\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\best_svm_model.joblib']
```

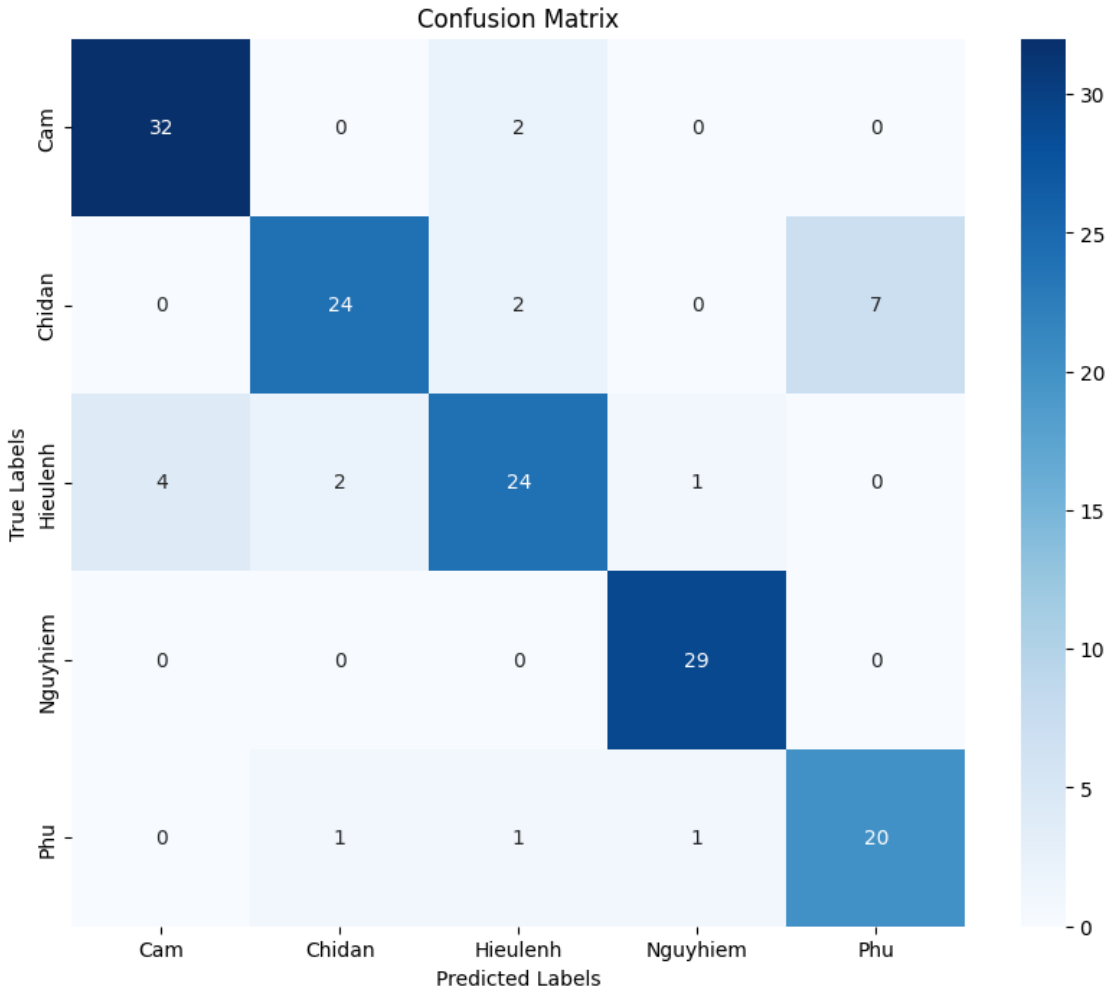
8 Predict on test images for KNN

```
report_knn = classification_report(test_labels_encoded, y_pred_knn,␣
 ↪target_names=label_encoder.classes_)
print(report_knn)
```

```
              precision    recall  f1-score   support

         Cam       0.89      0.94      0.91        34
      Chidan       0.89      0.73      0.80        33
    Hieulenh       0.83      0.77      0.80        31
    Nguyhiem       0.94      1.00      0.97        29
         Phu       0.74      0.87      0.80        23

    accuracy                           0.86       150
   macro avg       0.86      0.86      0.86       150
```

```
weighted avg       0.86      0.86      0.86       150
```

```
heatmap_label_knn = confusion_matrix(test_labels_encoded, y_pred_knn)

plt.figure(figsize=(10, 8))
sns.heatmap(heatmap_label_knn, annot=True, fmt='d', cmap='Blues',␣
 ↪xticklabels=label_encoder.classes_, yticklabels=label_encoder.classes_)
plt.title('Confusion Matrix')
plt.xlabel('Predicted Labels')
plt.ylabel('True Labels')
plt.show()
```




```
n_columns = 10
n_rows = math.ceil(len(test_images) / n_columns)
```

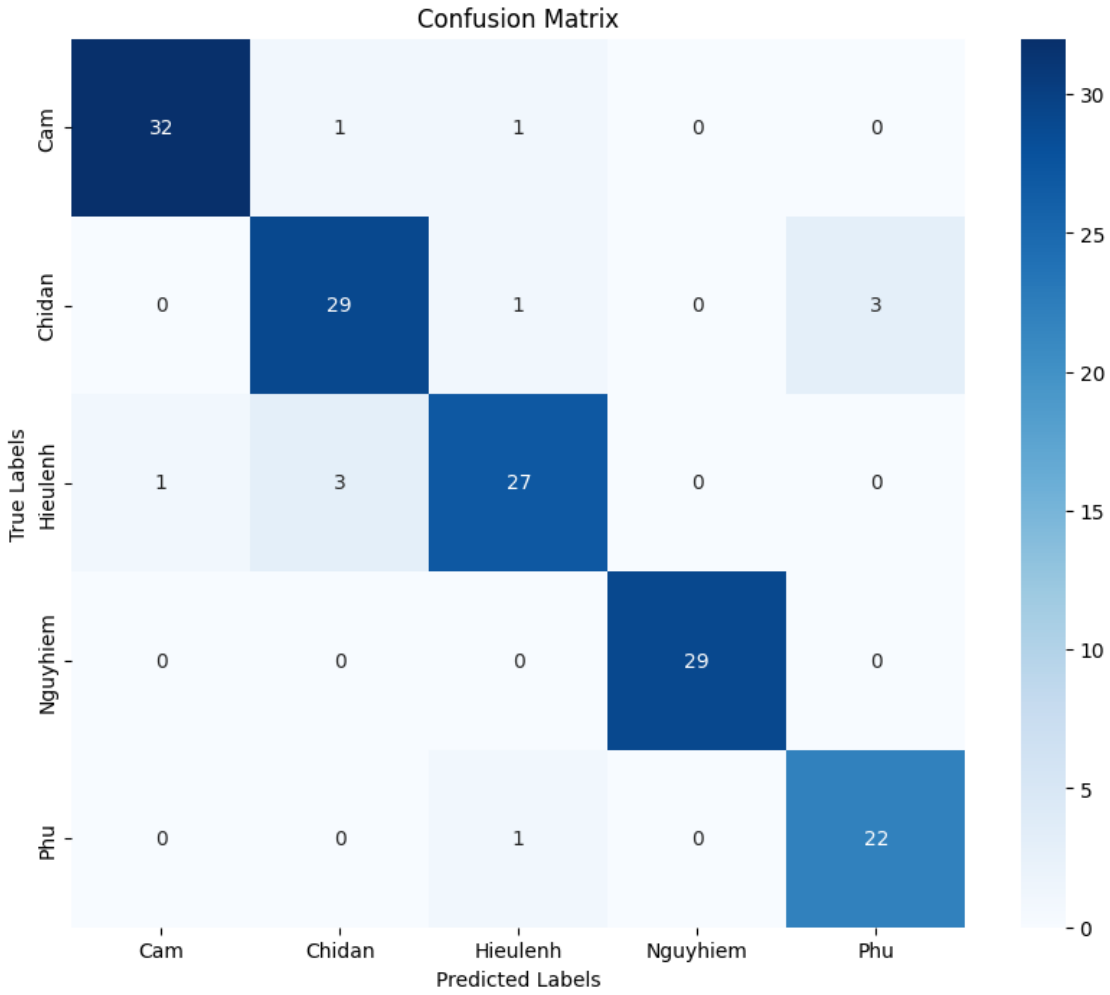
```
fig, axes = plt.subplots(n_rows, n_columns, figsize=(30, n_rows * 3))

for idx, (image, true_label, pred_label) in enumerate(zip(test_images,␣
 ↪test_labels_encoded, y_pred_knn)):
    row = idx // n_columns
    col = idx % n_columns

    axes[row, col].imshow(image)
    axes[row, col].set_title(f'True: {label_encoder.classes_[true_label]}\nPred:
 ↪ {label_encoder.classes_[pred_label]}')
    axes[row, col].axis('off')

for ax in axes.flat:
    if not ax.has_data():
        ax.axis('off')

plt.tight_layout()
plt.show()
```

9 Predict on test images for SVM

```
report_svm = classification_report(test_labels_encoded, y_pred_svm,␣
  ↪target_names=label_encoder.classes_)
print(report_svm)
```

```
              precision    recall  f1-score   support

         Cam       0.97      0.94      0.96        34
      Chidan       0.88      0.88      0.88        33
    Hieulenh       0.90      0.87      0.89        31
    Nguyhiem       1.00      1.00      1.00        29
         Phu       0.88      0.96      0.92        23

    accuracy                           0.93       150
   macro avg       0.93      0.93      0.93       150
weighted avg       0.93      0.93      0.93       150
```

```
heatmap_label_svm = confusion_matrix(test_labels_encoded, y_pred_svm)

plt.figure(figsize=(10, 8))
sns.heatmap(heatmap_label_svm, annot=True, fmt='d', cmap='Blues',␣
  ↪xticklabels=label_encoder.classes_, yticklabels=label_encoder.classes_)
plt.title('Confusion Matrix')
plt.xlabel('Predicted Labels')
plt.ylabel('True Labels')
plt.show()
```




```
n_columns = 10
n_rows = math.ceil(len(test_images) / n_columns)

fig, axes = plt.subplots(n_rows, n_columns, figsize=(30, n_rows * 3))

for idx, (image, true_label, pred_label) in enumerate(zip(test_images,␣
 ↪test_labels_encoded, y_pred_svm)):
    row = idx // n_columns
    col = idx % n_columns

    axes[row, col].imshow(image)
    axes[row, col].set_title(f'True: {label_encoder.classes_[true_label]}\nPred:
 ↪ {label_encoder.classes_[pred_label]}')
    axes[row, col].axis('off')
```

```
for ax in axes.flat:
    if not ax.has_data():
        ax.axis('off')

plt.tight_layout()
plt.show()
```

10 Save grid search results

```
def export_notebook_to_pdf(notebook_path, project_dir):
    results_dir = os.path.join(project_dir)
    os.makedirs(results_dir, exist_ok=True)

    # Đọc notebook
    with open(notebook_path, 'r', encoding='utf-8') as f:
        nb = nbformat.read(f, as_version=4)

    # Cấu hình PDF exporter
    pdf_exporter = PDFExporter()
    pdf_exporter.exclude_input_prompt = True
    pdf_exporter.exclude_output_prompt = True

    # Thêm template và style cơ bản
    pdf_exporter.template_name = 'classic'

    # Chuyển đổi sang PDF
    pdf_data, resources = pdf_exporter.from_notebook_node(nb)

    # Tạo tên file với timestamp
    current_time = datetime.now().strftime('%Y-%m-%d_%H_%M_%S')
    pdf_file = os.path.join(results_dir, f"notebook_export_{current_time}.pdf")

    # Lưu file PDF
    with open(pdf_file, 'wb') as f:
        f.write(pdf_data)

    print(f"Đã xuất file PDF thành công: {pdf_file}")
    return pdf_file
```

```
# project_dir = os.path.dirname(project_dir)
notebook_path = project_dir + "\\model\\main.ipynb"
proj_dir = project_dir + "\\grid_search_results"

export_notebook_to_pdf(notebook_path, proj_dir)
```

```
---------------------------------------------------------------------------
LatexFailed                               Traceback (most recent call last)
Cell In[32], line 5
      2 notebook_path = project_dir + "\\model\\main.ipynb"
      3 proj_dir = project_dir + "\\grid_search_results"
```

```
----> 5 export_notebook_to_pdf(notebook_path, proj_dir)

Cell In[31], line 18, in export_notebook_to_pdf(notebook_path, project_dir)
     15 pdf_exporter.template_name = 'classic'
     17 # Chuyển đổi sang PDF
---> 18 pdf_data, resources = pdf_exporter.from_notebook_node(nb)
     20 # Tạo tên file với timestamp
     21 current_time = datetime.now().strftime('%Y-%m-%d_%H_%M_%S')

File c:\Users\Legion 5␣
 ↪Pro\AppData\Local\Programs\Python\Python312\Lib\site-packages\nbconvert\exporters\pdf.
 ↪py:197, in PDFExporter.from_notebook_node(self, nb, resources, **kw)
    195 tex_file = self.writer.write(latex, resources,␣
 ↪notebook_name=notebook_name)
    196 self.log.info("Building PDF")
--> 197 self.run_latex(tex_file)
    198 if self.run_bib(tex_file):
    199     self.run_latex(tex_file)

File c:\Users\Legion 5␣
 ↪Pro\AppData\Local\Programs\Python\Python312\Lib\site-packages\nbconvert\exporters\pdf.
 ↪py:166, in PDFExporter.run_latex(self, filename, raise_on_failure)
    163 def log_error(command, out):
    164     self.log.critical("%s failed: %s\n%s", command[0], command, out)
--> 166 return self.run_command(
    167␣
 ↪    self.latex_command, filename, self.latex_count, log_error, raise_on_failure
    168 )

File c:\Users\Legion 5␣
 ↪Pro\AppData\Local\Programs\Python\Python312\Lib\site-packages\nbconvert\exporters\pdf.
 ↪py:156, in PDFExporter.run_command(self, command_list, filename, count,␣
 ↪log_function, raise_on_failure)
    154             if raise_on_failure:
    155                 msg = f'Failed to run "{command}" command:\n{out_str}'
--> 156                 raise raise_on_failure(msg)
    157             return False  # failure
    158 return True

LatexFailed: PDF creating failed, captured latex output:
Failed to run "xelatex notebook.tex -quiet" command:
```