Notebook

November 22, 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)
```

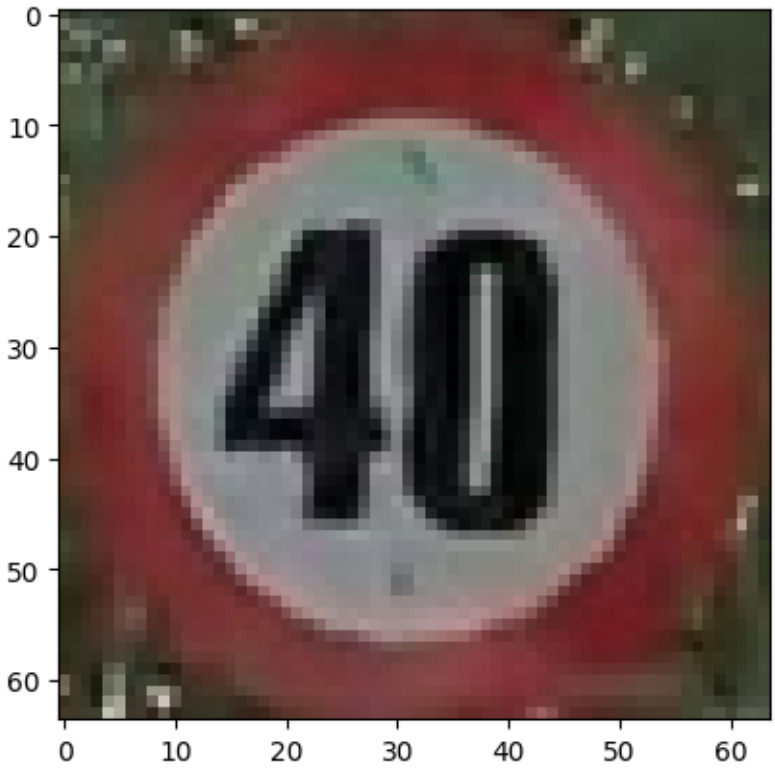
```
label_encoder = LabelEncoder()
train_labels_encoded = label_encoder.fit_transform(train_labels)
test_labels_encoded = label_encoder.transform(test_labels)
```

```
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')
```

```
['d:\\ASUS\\Deploy-Traffic-Sign-Classification-through-
Images\\joblib\\label_encoder.joblib']
```

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

```
<matplotlib.image.AxesImage at 0x1b7a6ddd650>
```




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

```
<matplotlib.image.AxesImage at 0x1b7a6e5d910>
```

3 Extract features

```
def sharpen_image(image, amount=2.0):
    # Create a Gaussian blur
    gaussian_blur = cv2.GaussianBlur(image, (0, 0), 2.0)

    # Calculate the unsharp mask
    unsharp_mask = cv2.addWeighted(image, 1.0 + amount, gaussian_blur, -amount,␣
 ↪0)

    # Ensure pixel values stay within valid range
    sharpened = np.clip(unsharp_mask, 0, 255).astype(np.uint8)

    return sharpened
```

```
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, [32], [0, 256]))
        histogram = histogram / size
        feature.extend(histogram)
    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=(2, 2), visualize=False, block_norm='L2-Hys',␣
 ↪transform_sqrt=True, channel_axis=2)
    return hog_features
```

```
def extract_features(images):
    blurred_images = [sharpen_image(image) for image in tqdm(images,␣
 ↪desc="Sharpening 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
```

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

```
<matplotlib.image.AxesImage at 0x1b7a6ee1f10>
```


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

```
Sharpening Images: 100%|      | 1415/1415 [00:00<00:00, 3960.11it/s]
Extracting Color Features: 100%|      | 1415/1415 [00:00<00:00,
12931.87it/s]
Extracting HOG Features: 100%|      | 1415/1415 [00:04<00:00, 304.49it/s]
Combining Features: 1415it [00:00, 40681.48it/s]
```

```
['d:\\ASUS\\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')
```

```
Sharpening Images: 100%|      | 150/150 [00:00<00:00, 3079.90it/s]
Extracting Color Features: 100%|      | 150/150 [00:00<00:00, 11065.21it/s]
Extracting HOG Features: 100%|      | 150/150 [00:00<00:00, 282.96it/s]
Combining Features: 150it [00:00, 9601.61it/s]
```

```
['d:\\ASUS\\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_model(project_dir + '\\joblib\\best_knn_model.joblib')
# svm_model = joblib.load_model(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': [5, 10, 20, 30, 40, 50],
    '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 432 candidates, totalling 1296 fits
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   5.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   5.7s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   5.3s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   5.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   5.6s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   5.3s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   5.3s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   5.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   5.9s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   5.8s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   5.6s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   5.4s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   5.6s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   5.8s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.7s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   5.5s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   6.0s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   6.4s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   5.4s
```

```
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   5.6s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   5.6s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   5.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   4.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   4.0s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   4.0s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   4.0s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   4.0s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   4.0s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   4.0s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   4.2s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   4.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   4.0s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   5.4s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   4.1s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   4.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   4.1s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  10.1s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  10.0s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  10.0s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  10.5s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  11.4s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  16.7s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  14.3s
```

```
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  14.1s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  14.6s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  14.3s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  13.5s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  17.7s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  18.0s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  19.4s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  22.1s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  24.7s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  21.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  20.6s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  20.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  21.2s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  20.8s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  22.7s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  23.5s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  21.4s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  22.7s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  21.1s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  21.4s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  22.4s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  22.6s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  22.5s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  23.4s
```

```
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  21.7s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  21.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  24.5s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  23.4s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  24.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   9.5s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   8.4s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   8.7s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   8.5s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   8.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   8.7s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   8.8s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   8.8s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   9.1s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   8.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   8.4s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   8.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   8.7s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   9.2s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   8.5s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   9.3s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   8.8s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   8.6s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   8.7s
```

```
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   8.7s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   8.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   8.3s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   8.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   8.3s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   7.8s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   8.0s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   8.5s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   8.0s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   8.4s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   8.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   8.9s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   8.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   8.0s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   8.8s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   9.4s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   8.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
10.9s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
10.7s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
10.8s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
10.6s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
```

```
10.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.707 total time=
10.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
10.9s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
12.4s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
10.9s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
10.1s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
9.8s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
12.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
11.0s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
11.4s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
10.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.715 total time=
11.3s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
9.9s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
10.4s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
10.3s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
10.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
```

```
10.4s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
10.2s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
9.9s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
10.0s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
10.0s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
10.0s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
11.0s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
10.2s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
10.3s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
10.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
10.5s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
10.8s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
11.5s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
10.6s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
10.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
10.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
```

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9.0s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
8.5s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.756 total time=
44.3s
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0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.808 total time=
10.0s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.764 total time=
8.0s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
8.2s
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8.9s
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8.4s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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8.5s
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8.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
10.5s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
8.6s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.745 total time=
9.0s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.734 total time=
8.6s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
9.1s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
```

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9.2s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
8.9s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
9.0s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.733 total time=
8.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
8.5s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.803 total time=
8.6s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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8.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.738 total time=
8.2s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.772 total time=
8.3s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.731 total time=
8.5s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
8.5s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.799 total time=
7.9s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.739 total time=
8.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.721 total time=
8.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.761 total time=
8.4s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
8.4s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.651 total time=
```

```
9.5s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.783 total time=
9.2s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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9.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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9.5s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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9.7s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.693 total time=
8.3s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
8.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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8.4s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
8.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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7.7s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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7.9s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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8.2s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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8.2s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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7.7s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
7.8s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.707 total time=
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```
8.1s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
8.4s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
8.8s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
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[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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7.7s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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8.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
8.3s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.706 total time=
8.7s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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8.4s
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8.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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8.2s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
```

```
8.3s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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8.3s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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8.6s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.596 total time=
8.3s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
7.7s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
7.9s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
8.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   8.4s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   8.4s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   8.7s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   8.8s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   8.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   8.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   8.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   8.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   8.7s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   8.0s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   8.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   8.7s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   8.5s
```

```
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   8.1s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   8.5s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   8.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   8.5s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   8.7s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   8.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   9.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   8.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   8.4s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   8.7s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   8.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   7.9s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   8.9s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   8.5s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   8.4s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   8.4s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   8.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   9.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   8.8s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   9.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   8.9s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   9.4s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   8.9s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  23.7s
```

```
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  22.2s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  23.6s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  22.4s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  22.5s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  23.1s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  22.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  22.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  22.1s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  22.3s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  23.5s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  23.6s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  23.5s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  23.5s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  21.8s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  22.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  23.3s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  22.4s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  22.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  29.2s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  24.4s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  22.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  22.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  22.7s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  23.3s
```

```
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  21.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  21.5s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  21.6s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  23.8s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  21.7s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  21.7s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  20.9s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  23.0s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  23.5s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  22.7s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  21.2s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   7.5s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   8.2s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   7.9s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   7.4s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   7.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   7.5s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   7.4s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   7.5s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   7.3s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   7.5s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   8.2s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   7.3s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   7.6s
```

```
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   7.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   8.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   7.9s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   7.5s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   7.5s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   8.2s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   8.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   8.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   7.4s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   7.4s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   7.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   7.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   7.7s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   8.1s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   8.2s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   7.8s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   7.9s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   7.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   7.9s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   7.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   7.6s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   7.5s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   8.3s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
```

```
9.5s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
9.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
9.0s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
9.0s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
9.1s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
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9.0s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
9.7s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
9.0s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
9.2s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
9.0s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
9.5s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
9.2s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
9.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
9.8s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
9.1s
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9.2s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
```

```
9.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
9.1s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
9.1s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
9.5s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
10.2s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
9.5s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
9.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
10.2s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
9.4s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
9.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
10.0s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
9.9s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
9.7s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
10.5s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
9.8s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
9.7s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
```

```
9.6s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
10.5s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
10.0s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
9.9s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
8.5s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
8.3s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.756 total time=
8.8s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.808 total time=
7.8s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.764 total time=
6.1s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
6.2s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.760 total time=
5.4s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.732 total time=
5.3s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.723 total time=
5.2s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.827 total time=
5.5s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.784 total time=
5.5s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
5.5s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
```

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5.6s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.745 total time=
5.4s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.734 total time=
5.5s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
5.4s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
5.6s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
5.6s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
5.5s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.733 total time=
5.4s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
5.5s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.803 total time=
5.5s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.754 total time=
5.4s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.738 total time=
5.5s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.772 total time=
5.4s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.731 total time=
5.5s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
5.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.799 total time=
5.2s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.739 total time=
```

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5.9s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.721 total time=
5.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.761 total time=
5.3s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
5.3s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.651 total time=
5.2s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.783 total time=
5.3s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.731 total time=
5.3s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.701 total time=
5.3s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.734 total time=
4.7s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.693 total time=
4.9s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
4.9s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
4.8s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.717 total time=
4.9s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.665 total time=
4.8s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.660 total time=
```

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4.7s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
4.8s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
4.9s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.707 total time=
4.8s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.680 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.637 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
4.9s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
4.7s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.706 total time=
5.2s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
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5.0s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
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4.8s
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4.6s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.706 total time=
```

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4.9s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.634 total time=
4.8s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.620 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
4.8s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
4.8s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.679 total time=
4.9s
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5.1s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
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5.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
4.8s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
4.7s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
4.8s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   5.4s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   4.9s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   5.2s
```

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[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   5.4s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   5.4s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   4.9s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   4.9s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   4.9s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   5.5s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   5.2s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   5.0s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   5.5s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   4.9s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   4.9s
```

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[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   5.2s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   5.4s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  13.2s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  13.1s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  13.2s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  12.8s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  13.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  12.7s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  13.1s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  13.1s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  13.1s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  13.5s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  13.2s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  13.3s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  13.4s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  13.1s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  13.3s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  13.4s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  13.1s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  13.6s
```

```
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  13.5s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  13.1s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  13.0s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  14.4s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  13.7s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  13.0s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  50.0s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  14.0s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  13.7s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  14.1s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  16.6s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  16.6s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  13.0s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  13.2s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  14.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   4.9s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   5.1s
```

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[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   5.9s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   5.7s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   5.2s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   5.2s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   5.0s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   5.4s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   5.4s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   5.0s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   5.1s
```

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[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   5.5s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   6.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   5.7s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   5.9s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   6.0s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
6.9s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
6.8s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
6.9s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
7.1s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.707 total time=
6.8s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
6.9s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
6.9s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
```

```
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
6.5s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.715 total time=
6.3s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
7.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
7.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
7.1s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
6.5s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
6.3s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
6.7s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
6.8s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
6.7s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
6.7s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
10.7s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
```

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8.2s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
6.9s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
6.8s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
6.7s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
7.8s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
7.0s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
7.0s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
5.9s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.756 total time=
6.8s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.808 total time=
5.9s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.764 total time=
6.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
6.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.760 total time=
6.1s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.732 total time=
8.0s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.723 total time=
```

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7.0s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.827 total time=
9.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.784 total time=
8.4s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
9.1s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
9.2s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.745 total time=
8.2s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.734 total time=
11.6s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
8.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
8.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
9.2s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
6.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.733 total time=
7.4s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.803 total time=
6.4s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.754 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.738 total time=
8.2s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.772 total time=
```

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7.0s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.731 total time=
7.1s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
7.5s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.799 total time=
7.4s
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6.8s
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8.3s
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10.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
11.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
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13.4s
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11.0s
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10.4s
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11.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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11.8s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.693 total time=
10.9s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
10.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
8.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
```

```
9.5s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
10.7s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.717 total time=
11.5s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.665 total time=
9.8s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
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10.3s
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12.7s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
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9.9s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
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9.8s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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12.9s
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10.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
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9.6s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
8.2s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
6.8s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.638 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.640 total time=
```

```
6.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
6.2s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
6.0s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
6.0s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.706 total time=
6.0s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.634 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.620 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.9s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.617 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.596 total time=
6.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   7.4s
```

```
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   6.8s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   6.6s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   6.7s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   7.0s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   7.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   8.4s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   8.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   7.6s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   6.5s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   7.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   7.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   7.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   6.9s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   7.3s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   7.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   7.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   7.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   7.1s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   7.2s
```

```
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   7.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   6.7s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   7.0s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   6.9s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   6.9s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   6.8s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   7.4s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   7.0s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   6.5s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  18.3s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  17.3s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  18.7s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  16.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  17.4s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  17.6s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  17.6s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  17.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  17.7s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  19.5s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  17.7s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  17.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  19.2s
```

```
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  16.9s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  17.2s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  18.6s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  17.0s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  17.3s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  18.6s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  18.2s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  17.4s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  17.5s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  18.6s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  19.0s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  17.9s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  18.6s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  17.5s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  16.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  17.7s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  18.7s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  17.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  17.7s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  17.7s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  18.7s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  18.1s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  18.1s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   6.7s
```

```
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   6.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   7.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   6.4s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   7.0s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   6.9s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   6.5s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   6.8s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   6.8s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   7.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   7.1s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   7.1s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   6.9s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   6.9s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   6.4s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   6.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   7.0s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   6.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   7.9s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   6.4s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   7.8s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   7.6s
```

```
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   7.0s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   6.8s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   6.8s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   6.9s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   6.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   7.6s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   6.5s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   6.9s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   6.5s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   6.7s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   8.0s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
8.7s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
8.1s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
8.5s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
8.4s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
8.1s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.707 total time=
8.4s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
8.3s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
8.3s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
```

```
10.0s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
8.0s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
9.1s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
12.1s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
10.2s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
10.2s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
7.8s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.715 total time=
7.7s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
7.7s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
8.2s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
7.9s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
8.6s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
12.9s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
14.8s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
10.9s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
8.2s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
```

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8.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
7.8s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
7.7s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
7.8s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
7.9s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
7.6s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
8.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
13.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
12.7s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
13.7s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
10.0s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
6.9s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
7.0s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.756 total time=
8.0s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.808 total time=
6.9s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.764 total time=
```

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7.1s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.760 total time=
7.1s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.732 total time=
6.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.723 total time=
6.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.827 total time=
6.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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6.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
7.2s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
6.7s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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6.7s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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6.7s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
6.9s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.733 total time=
6.5s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
```

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6.6s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.803 total time=
7.2s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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8.2s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.738 total time=
7.3s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.772 total time=
6.6s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.731 total time=
6.6s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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6.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.761 total time=
9.0s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
7.5s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.651 total time=
6.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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7.0s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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6.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
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[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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```

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6.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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6.3s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
6.2s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
6.8s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
6.6s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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6.4s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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6.3s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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6.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.4s
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[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.4s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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```

```
6.6s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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6.5s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.6s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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6.8s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.8s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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6.6s
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6.7s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
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[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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6.6s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.596 total time=
```

```
6.5s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
7.2s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.6s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.6s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   6.8s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   6.8s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   7.3s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   6.8s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   7.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   6.8s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   7.3s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   7.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   6.8s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   6.9s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   6.9s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   6.6s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   6.8s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   7.1s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   7.1s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   7.3s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   7.7s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   6.7s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   6.7s
```

```
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   7.1s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   6.8s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   6.7s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   6.7s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   6.8s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   6.9s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   7.2s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   7.0s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   6.7s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   6.8s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   6.8s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   7.0s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   6.9s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   6.9s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   6.5s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   6.9s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   7.5s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  18.0s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  18.5s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  18.6s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  19.1s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  18.6s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  18.4s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  19.0s
```

```
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  18.1s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  18.7s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  18.0s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  19.2s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  18.5s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  18.2s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  19.3s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  18.3s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  18.3s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  18.4s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  19.7s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  18.3s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  18.7s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  19.6s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  18.4s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  18.9s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  18.7s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  18.8s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  17.9s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  18.1s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  18.6s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  18.4s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  18.0s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  18.5s
```

```
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  19.4s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  18.2s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  18.1s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  19.2s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  17.8s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   7.0s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   6.9s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   6.9s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   7.0s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   6.8s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   7.1s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   7.9s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   6.9s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   7.0s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   7.5s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   7.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   6.9s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   6.7s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   6.8s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   7.2s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   8.6s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   5.9s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   5.8s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   5.9s
```

```
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   5.7s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   5.7s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   5.6s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   5.6s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   5.7s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   5.6s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   5.8s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   6.7s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   6.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   5.8s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   6.9s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   5.8s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   5.7s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   5.7s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   5.7s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   6.5s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   5.7s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
7.4s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
7.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
6.8s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
6.9s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
```

```
6.9s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.707 total time=
6.8s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
8.2s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
6.7s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
6.7s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
6.6s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
6.4s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
6.4s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
6.3s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.715 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
6.3s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
6.3s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
6.3s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
6.9s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
```

```
6.8s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
6.4s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
6.7s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
7.4s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
6.8s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
6.6s
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0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
6.8s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
6.5s
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0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
7.0s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
6.7s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
6.8s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
6.5s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
6.6s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
6.6s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
6.6s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
```

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6.1s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
6.1s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.756 total time=
5.9s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.808 total time=
6.2s
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0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.764 total time=
5.6s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
5.8s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.760 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.732 total time=
6.0s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
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5.9s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.827 total time=
6.7s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.784 total time=
5.8s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
6.7s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
6.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.745 total time=
8.8s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.734 total time=
6.0s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
5.7s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
```

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5.6s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
5.7s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
5.7s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.733 total time=
5.6s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
5.8s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.803 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.754 total time=
5.6s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=distance;, score=0.738 total time=
5.6s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.772 total time=
5.9s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.731 total time=
6.0s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
6.3s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.799 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.739 total time=
5.9s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.721 total time=
7.5s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.761 total time=
8.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
6.4s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.651 total time=
```

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6.7s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.783 total time=
6.1s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.731 total time=
6.7s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.701 total time=
6.4s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.734 total time=
5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.693 total time=
5.8s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
7.7s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
8.2s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
8.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
7.8s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.717 total time=
8.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.665 total time=
6.9s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.660 total time=
5.7s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.0s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.0s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.707 total time=
```

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5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.680 total time=
5.0s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.637 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.0s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.706 total time=
5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.638 total time=
5.1s
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5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
4.9s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.706 total time=
5.1s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
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5.3s
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0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.620 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.0s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
```

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4.9s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.679 total time=
4.9s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.617 total time=
5.1s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.596 total time=
5.2s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.4s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.4s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
4.8s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.834 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.808 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=uniform;, score=0.804 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.842 total time=   5.0s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.816 total time=   5.0s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=3, weights=distance;, score=0.802 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.797 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.793 total time=   5.1s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=uniform;, score=0.772 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.854 total time=   5.6s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.818 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=4, weights=distance;, score=0.806 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.809 total time=   5.3s
```

```
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.797 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.825 total time=   5.1s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.803 total time=   5.1s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=5, weights=distance;, score=0.775 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.808 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.798 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=uniform;, score=0.750 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.832 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.820 total time=   5.4s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=6, weights=distance;, score=0.786 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.803 total time=   5.1s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.801 total time=   5.1s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=uniform;, score=0.743 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.819 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.810 total time=   5.0s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=7, weights=distance;, score=0.767 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.785 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.776 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=uniform;, score=0.726 total time=   5.7s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.809 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.796 total time=   5.8s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001B7A332F1A0>,
n_neighbors=10, weights=distance;, score=0.749 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.838 total time=  13.3s
```

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[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.799 total time=  13.2s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=uniform;, score=0.772 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.855 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.810 total time=  14.2s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=3, weights=distance;, score=0.784 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.783 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.774 total time=  13.3s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=uniform;, score=0.759 total time=  13.3s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.833 total time=  13.6s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.815 total time=  13.1s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=4, weights=distance;, score=0.800 total time=  13.6s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.788 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.766 total time=  13.6s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=uniform;, score=0.744 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.828 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.788 total time=  13.2s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=5, weights=distance;, score=0.795 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.795 total time=  14.1s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.746 total time=  13.3s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=uniform;, score=0.734 total time=  13.1s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.816 total time=  13.2s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.784 total time=  13.1s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=6, weights=distance;, score=0.785 total time=  13.6s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.791 total time=  13.3s
```

```
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.761 total time=  13.8s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=uniform;, score=0.733 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.819 total time=  13.5s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.779 total time=  14.1s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=7, weights=distance;, score=0.756 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.765 total time=  13.3s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.743 total time=  13.3s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=uniform;, score=0.703 total time=  13.6s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.812 total time=  16.6s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.765 total time=  17.8s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001B7A332EE80>,
n_neighbors=10, weights=distance;, score=0.737 total time=  17.1s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.831 total time=   6.1s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.800 total time=   6.5s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=uniform;, score=0.765 total time=   6.4s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.852 total time=   8.5s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.810 total time=   8.2s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=3, weights=distance;, score=0.780 total time=   8.0s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.790 total time=   8.3s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.771 total time=   8.4s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=uniform;, score=0.757 total time=   8.3s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.839 total time=   8.3s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.812 total time=   9.1s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=4, weights=distance;, score=0.798 total time=   8.2s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.790 total time=   8.0s
```

```
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.771 total time=   8.1s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=uniform;, score=0.742 total time=   8.4s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.828 total time=   8.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.791 total time=   8.2s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=5, weights=distance;, score=0.793 total time=   8.1s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.790 total time=   8.9s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.743 total time=   8.2s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=uniform;, score=0.731 total time=   8.4s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.818 total time=   8.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.781 total time=   8.3s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=6, weights=distance;, score=0.780 total time=   8.1s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.796 total time=   8.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.758 total time=   8.8s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=uniform;, score=0.730 total time=   8.9s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.818 total time=   8.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.777 total time=   8.0s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=7, weights=distance;, score=0.752 total time=   8.3s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.763 total time=   8.1s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.750 total time=   8.1s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=uniform;, score=0.705 total time=   8.0s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.809 total time=   8.4s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.767 total time=   8.5s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001B7A332ED40>,
n_neighbors=10, weights=distance;, score=0.742 total time=   8.1s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.695 total time=
```

```
9.9s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.683 total time=
9.7s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=uniform;, score=0.686 total time=
10.3s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.725 total time=
9.8s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.699 total time=
10.2s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=3, weights=distance;, score=0.707 total time=
10.3s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.705 total time=
10.0s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.666 total time=
9.9s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=uniform;, score=0.692 total time=
9.9s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.721 total time=
10.3s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.699 total time=
10.0s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=4, weights=distance;, score=0.712 total time=
10.4s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.684 total time=
10.3s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.690 total time=
10.1s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=uniform;, score=0.685 total time=
10.2s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.715 total time=
10.1s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.691 total time=
```

```
10.1s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=5, weights=distance;, score=0.714 total time=
11.2s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.690 total time=
9.9s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.662 total time=
10.1s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=uniform;, score=0.714 total time=
9.9s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.733 total time=
9.9s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.700 total time=
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[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=6, weights=distance;, score=0.720 total time=
10.0s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.714 total time=
10.4s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.675 total time=
10.2s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=uniform;, score=0.695 total time=
10.4s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.730 total time=
10.1s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.694 total time=
10.1s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=7, weights=distance;, score=0.722 total time=
10.0s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.692 total time=
10.3s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.681 total time=
9.8s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=uniform;, score=0.707 total time=
```

```
10.1s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.718 total time=
9.9s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.715 total time=
10.3s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001B7FD322160>, n_neighbors=10, weights=distance;, score=0.736 total time=
9.9s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.793 total time=
8.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=uniform;, score=0.758 total time=
8.9s
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5.6s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=3, weights=distance;, score=0.767 total time=
5.6s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.760 total time=
5.7s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.732 total time=
5.5s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=uniform;, score=0.723 total time=
5.5s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.827 total time=
5.5s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.784 total time=
5.5s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=4, weights=distance;, score=0.774 total time=
6.0s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.793 total time=
```

```
5.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.745 total time=
6.0s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=uniform;, score=0.734 total time=
5.8s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.802 total time=
5.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.759 total time=
5.7s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=5, weights=distance;, score=0.736 total time=
5.8s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.749 total time=
6.4s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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6.7s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=6, weights=uniform;, score=0.692 total time=
6.7s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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7.0s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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6.0s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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6.2s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=uniform;, score=0.717 total time=
6.2s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.799 total time=
5.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.739 total time=
```

```
6.2s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=7, weights=distance;, score=0.721 total time=
5.6s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.761 total time=
7.0s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.706 total time=
7.7s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=uniform;, score=0.651 total time=
7.0s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.783 total time=
6.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.731 total time=
5.7s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001B7A6EB8E00>, n_neighbors=10, weights=distance;, score=0.701 total time=
5.9s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.734 total time=
5.4s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.693 total time=
5.4s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=uniform;, score=0.675 total time=
5.1s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.8s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
6.5s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=3, weights=distance;, score=0.076 total time=
6.9s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.717 total time=
5.5s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.665 total time=
5.7s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=uniform;, score=0.660 total time=
```

```
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.8s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=4, weights=distance;, score=0.076 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.707 total time=
6.4s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.680 total time=
5.9s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=uniform;, score=0.637 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.5s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.3s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.638 total time=
6.4s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=uniform;, score=0.640 total time=
5.7s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
7.0s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
8.0s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=6, weights=distance;, score=0.076 total time=
13.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.706 total time=
```

```
8.1s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.634 total time=
7.6s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=uniform;, score=0.620 total time=
13.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
6.1s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.7s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=7, weights=distance;, score=0.076 total time=
6.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.1s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.617 total time=
6.0s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=uniform;, score=0.596 total time=
5.9s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.1s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
8.4s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001B7A6EB8EA0>, n_neighbors=10, weights=distance;, score=0.076 total time=
11.0s

GridSearchCV(cv=3, estimator=KNeighborsClassifier(),
             param_grid={'leaf_size': [5, 10, 20, 30, 40, 50],
                         'metric': [<function cityblock at 0x000001B7A332F1A0>,
                                    <function cosine at 0x000001B7A332EE80>,
                                    <function sqeuclidean at
0x000001B7A332ED40>,
                                    <function chi_square_distance at
0x000001B7FD322160>,
                                    <function bhattacharyya_distance at
0x000001B7A6EB8E00>,
                                    <function intersection_distance at
0x000001B7A6EB8EA0>],
```

```
                        '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': 5, 'metric': <function cityblock at
0x000001B7A332F1A0>, 'n_neighbors': 4, 'weights': 'distance'}
```

```
['d:\\ASUS\\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=0.509 total time=
2.4s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.531 total time=
```

```
2.0s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.482 total time=
2.2s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.818 total
time=   1.2s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.815 total
time=   1.1s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.802 total
time=   1.3s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.733 total time=
2.0s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.743 total time=
1.4s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.677 total time=
1.3s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.437 total
time=   2.1s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.476 total
time=   1.9s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.425 total
time=   2.5s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.2s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.0s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.0s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.818 total
time=   1.2s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.815 total
time=   1.1s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.802 total
time=   1.0s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.2s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.3s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
1.8s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.1s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.1s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.9s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.405 total time=
2.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.438 total time=
```

```
3.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.371 total time=
2.5s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.818 total time=
1.6s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.815 total time=
1.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.802 total time=
1.1s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.843 total time=
1.2s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.841 total time=
1.2s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.819 total time=
1.1s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.094 total
time=   2.2s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   2.3s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   2.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.440 total time=
2.2s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.492 total time=
3.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.437 total time=
2.8s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.818 total
time=   1.0s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.815 total
time=   1.2s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.802 total
time=   1.1s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.416 total time=
1.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.437 total time=
1.8s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.399 total time=
1.9s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.428 total
time=   2.2s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.451 total
time=   2.2s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.413 total
time=   1.9s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
```

```
2.6s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.5s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.818 total
time=   0.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.815 total
time=   1.3s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.802 total
time=   1.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
1.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
3.7s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.1s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.509 total time=
2.9s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.531 total time=
3.1s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.482 total time=
2.5s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.818 total
time=   1.1s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.815 total
time=   1.2s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.802 total
time=   1.0s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.796 total time=
1.5s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.782 total time=
1.5s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.736 total time=
1.5s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.437 total
time=   2.0s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.476 total
time=   2.6s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.425 total
time=   1.9s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.6s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
```

```
2.7s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
2.6s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.818 total
time=   0.9s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.815 total
time=   0.9s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.802 total
time=   0.9s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.1s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.7s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
1.7s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.7s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.7s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   1.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.405 total time=
2.2s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.438 total time=
2.2s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.371 total time=
2.2s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.818 total time=
0.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.815 total time=
0.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.802 total time=
0.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.874 total time=
1.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.853 total time=
1.1s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.826 total time=
1.1s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.094 total
time=   1.9s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   1.9s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   2.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.440 total time=
2.2s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.492 total time=
```

```
2.0s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.437 total time=
1.9s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.818 total
time=   0.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.815 total
time=   0.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.802 total
time=   0.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
1.8s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.428 total
time=   1.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.451 total
time=   1.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.413 total
time=   1.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.2s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.3s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.076 total time=
2.2s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.818 total
time=   0.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.815 total
time=   0.9s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.802 total
time=   0.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
1.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
2.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   1.7s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.509 total time=
1.9s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.531 total time=
```

```
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.482 total time=
1.9s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.818 total
time=   0.7s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.815 total
time=   0.8s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.802 total
time=   0.8s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.862 total time=
1.2s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.820 total time=
1.1s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.787 total time=
1.2s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.437 total
time=   1.5s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.476 total
time=   1.6s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.425 total
time=   1.6s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.3s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
2.3s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
3.6s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.818 total
time=   1.3s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.815 total
time=   1.3s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.802 total
time=   1.7s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.3s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
2.6s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   4.0s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.8s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.5s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.405 total time=
4.1s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.438 total time=
```

```
4.1s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.371 total time=
4.2s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.818 total time=
1.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.815 total time=
1.4s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.802 total time=
1.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.876 total time=
2.1s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.857 total time=
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.817 total time=
1.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.094 total
time=   2.9s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   2.8s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.080 total
time=   2.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.440 total time=
2.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.492 total time=
2.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.437 total time=
2.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.818 total
time=   1.2s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.815 total
time=   1.2s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.802 total
time=   1.2s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
2.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
2.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
2.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.428 total
time=   2.5s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.451 total
time=   2.5s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.413 total
time=   2.5s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
3.2s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
```

```
3.2s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.076 total time=
3.1s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.818 total
time=   1.2s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.815 total
time=   1.2s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.802 total
time=   1.1s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.652 total time=
2.7s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.597 total time=
2.5s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.634 total time=
2.5s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.814 total
time=   1.3s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.799 total
time=   1.3s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.783 total time=
1.7s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.779 total time=
1.7s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.745 total time=
1.6s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.496 total
time=   2.2s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.512 total
time=   2.3s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.473 total
time=   2.1s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.2s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
```

```
3.2s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.1s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.814 total
time=   1.2s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.799 total
time=   1.2s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.6s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.6s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.447 total time=
3.0s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.471 total time=
3.0s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.399 total time=
2.9s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.827 total time=
1.2s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.814 total time=
1.3s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.799 total time=
1.3s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.859 total time=
1.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.847 total time=
1.7s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.822 total time=
2.3s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.148 total
time=   3.4s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.131 total
time=   4.0s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.116 total
time=   3.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.532 total time=
2.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.526 total time=
```

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2.8s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.504 total time=
2.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.814 total
time=   1.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.799 total
time=   1.5s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.432 total time=
2.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.473 total time=
2.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.413 total time=
2.4s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.472 total
time=   2.5s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.513 total
time=   2.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.459 total
time=   2.3s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.364 total time=
3.0s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.339 total time=
3.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.276 total time=
3.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.814 total
time=   1.3s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.799 total
time=   1.3s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.652 total time=
2.5s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.597 total time=
```

```
2.5s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.634 total time=
2.4s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.827 total
time=   1.4s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.814 total
time=   1.2s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.799 total
time=   1.2s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.860 total time=
1.7s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.811 total time=
1.8s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.793 total time=
1.8s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.496 total
time=   2.2s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.512 total
time=   2.2s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.473 total
time=   2.0s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
3.0s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
3.0s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
3.1s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.814 total
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.799 total
time=   1.2s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.6s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.447 total time=
2.9s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.471 total time=
```

```
3.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.399 total time=
3.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.827 total time=
1.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.814 total time=
1.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.799 total time=
1.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.874 total time=
1.7s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.853 total time=
1.7s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.826 total time=
1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.148 total
time=   2.8s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.131 total
time=   3.0s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.116 total
time=   2.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.532 total time=
2.4s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.526 total time=
2.4s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.504 total time=
2.4s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.814 total
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.799 total
time=   1.1s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.407 total time=
2.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.423 total time=
2.7s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.381 total time=
2.9s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.472 total
time=   2.3s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.513 total
time=   2.3s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.459 total
time=   2.1s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.364 total time=
3.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.339 total time=
```

```
3.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.276 total time=
3.3s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.814 total
time=   1.2s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.799 total
time=   1.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
2.6s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.652 total time=
3.6s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.597 total time=
3.2s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.634 total time=
2.9s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.827 total
time=   1.5s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.814 total
time=   1.5s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.799 total
time=   1.8s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.872 total time=
2.1s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.857 total time=
2.5s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.814 total time=
3.0s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.496 total
time=   2.7s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.512 total
time=   2.6s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.473 total
time=   2.4s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
3.6s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
```

```
3.6s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
3.4s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.814 total
time=   1.2s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.799 total
time=   1.2s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
2.6s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.5s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.447 total time=
3.0s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.471 total time=
3.0s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.399 total time=
3.0s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.827 total time=
1.2s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.814 total time=
1.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.799 total time=
1.3s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.876 total time=
1.9s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.857 total time=
2.0s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.817 total time=
2.1s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.148 total
time=   2.8s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.131 total
time=   2.8s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.116 total
time=   2.8s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.532 total time=
2.5s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.526 total time=
```

```
3.1s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.504 total time=
2.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.814 total
time=   1.5s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.799 total
time=   1.4s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
3.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
3.7s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.076 total time=
3.2s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.472 total
time=   2.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.513 total
time=   2.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.459 total
time=   2.3s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.364 total time=
3.4s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.339 total time=
3.2s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.276 total time=
3.2s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.814 total
time=   1.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.799 total
time=   1.3s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.9s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
3.0s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.9s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.722 total time=
2.5s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.730 total time=
```

```
2.5s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.670 total time=
2.3s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.828 total
time=   1.4s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.812 total
time=   1.4s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.795 total
time=   1.3s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.813 total time=
1.5s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.794 total time=
1.8s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.771 total time=
1.5s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.510 total
time=   2.2s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.523 total
time=   2.4s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.543 total
time=   2.1s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.3s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.076 total time=
3.1s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.133 total time=
3.3s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.828 total
time=   1.3s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.812 total
time=   1.4s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.795 total
time=   1.3s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.2s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.1s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.579 total time=
3.2s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.577 total time=
```

```
3.7s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.537 total time=
4.8s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.828 total time=
1.3s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.812 total time=
1.5s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.795 total time=
1.7s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.859 total time=
1.8s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.843 total time=
1.9s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.818 total time=
2.1s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.315 total
time=   3.1s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.264 total
time=   3.2s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.247 total
time=   3.2s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.608 total time=
2.8s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.558 total time=
2.5s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.615 total time=
2.5s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.828 total
time=   1.4s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.812 total
time=   1.4s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.494 total time=
2.5s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.517 total time=
2.6s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.457 total time=
2.3s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.524 total
time=   2.3s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.526 total
time=   2.4s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.481 total
time=   2.2s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.414 total time=
3.4s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.430 total time=
```

```
3.2s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.396 total time=
3.3s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.828 total
time=   1.3s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.812 total
time=   1.3s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.9s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.080 total
time=   3.0s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.722 total time=
2.5s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.730 total time=
2.5s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.670 total time=
2.4s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.828 total
time=   1.5s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.812 total
time=   1.5s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.854 total time=
2.0s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.842 total time=
2.0s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.813 total time=
1.9s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.510 total
time=   2.2s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.523 total
time=   2.2s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.543 total
time=   2.2s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
3.4s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.076 total time=
```

```
3.4s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.133 total time=
3.4s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.828 total
time=   1.4s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.812 total
time=   1.3s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.795 total
time=   1.3s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.579 total time=
3.2s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.577 total time=
3.1s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.537 total time=
3.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.828 total time=
1.3s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.812 total time=
1.4s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.795 total time=
1.4s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.874 total time=
2.0s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.853 total time=
2.0s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.826 total time=
1.9s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.315 total
time=   2.9s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.264 total
time=   2.9s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.247 total
time=   3.0s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.608 total time=
2.3s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.558 total time=
```

```
2.4s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.615 total time=
2.4s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.828 total
time=   1.7s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.812 total
time=   1.7s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.795 total
time=   1.7s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.419 total time=
3.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.452 total time=
3.7s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.399 total time=
3.5s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.524 total
time=   2.8s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.526 total
time=   3.8s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.481 total
time=   3.3s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.414 total time=
5.2s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.430 total time=
3.9s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.396 total time=
3.9s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.828 total
time=   1.5s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.812 total
time=   2.0s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.795 total
time=   1.8s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
3.7s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
4.4s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
4.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   4.2s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   5.3s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.080 total
time=   5.3s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.722 total time=
4.0s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.730 total time=
```

```
3.8s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.670 total time=
3.8s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.828 total
time=   2.2s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.812 total
time=   2.2s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.795 total
time=   2.2s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.876 total time=
4.6s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.857 total time=
4.9s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.817 total time=
3.8s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.510 total
time=   4.1s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.523 total
time=   3.9s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.543 total
time=   4.2s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
4.4s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.076 total time=
4.1s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.133 total time=
4.2s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.828 total
time=   1.6s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.812 total
time=   1.8s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.2s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.3s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.0s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.6s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.6s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.579 total time=
3.3s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.577 total time=
```

```
3.0s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.537 total time=
3.2s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.828 total time=
1.4s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.812 total time=
1.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.795 total time=
1.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.876 total time=
2.2s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.857 total time=
1.9s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.817 total time=
2.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.315 total
time=   2.9s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.264 total
time=   3.0s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.247 total
time=   3.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.608 total time=
2.4s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.558 total time=
2.5s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.615 total time=
2.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.828 total
time=   1.3s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.812 total
time=   1.3s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.184 total time=
3.2s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.189 total time=
2.9s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.190 total time=
3.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.524 total
time=   2.4s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.526 total
time=   2.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.481 total
time=   2.2s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.414 total time=
3.5s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.430 total time=
```

```
3.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.396 total time=
3.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.828 total
time=   1.4s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.812 total
time=   1.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.795 total
time=   1.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
3.0s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
3.0s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.076 total
time=   2.9s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.080 total
time=   3.1s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.755 total time=
2.5s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.759 total time=
2.4s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.694 total time=
2.4s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.791 total
time=   1.4s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.826 total time=
1.7s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.808 total time=
1.8s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.799 total time=
1.5s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.558 total
time=   2.0s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.580 total
time=   2.2s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.606 total
time=   2.0s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.368 total time=
3.4s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.370 total time=
```

```
3.4s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.325 total time=
3.4s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.808 total
time=   1.5s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.791 total
time=   1.5s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
3.0s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.1s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.651 total time=
3.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.621 total time=
3.2s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.635 total time=
3.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.830 total time=
1.5s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.808 total time=
1.5s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.791 total time=
1.4s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.859 total time=
1.7s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.843 total time=
1.7s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.818 total time=
1.7s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.381 total
time=   2.8s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.353 total
time=   2.9s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.316 total
time=   2.8s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.673 total time=
2.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.692 total time=
```

```
2.5s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.646 total time=
2.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.791 total
time=   1.3s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.533 total time=
2.4s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.529 total time=
2.4s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.495 total time=
2.3s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.542 total
time=   2.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.535 total
time=   2.1s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.571 total
time=   2.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.424 total time=
3.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.451 total time=
3.3s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.410 total time=
3.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.830 total
time=   1.5s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.808 total
time=   1.3s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.791 total
time=   1.5s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
3.1s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
3.1s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.076 total time=
3.1s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.367 total
time=   3.0s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.355 total
time=   3.0s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.301 total
time=   3.0s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.755 total time=
2.5s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.759 total time=
```

```
2.4s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.694 total time=
2.3s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.791 total
time=   1.4s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.864 total time=
1.8s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.855 total time=
2.0s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.830 total time=
1.8s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.558 total
time=   2.0s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.580 total
time=   2.2s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.606 total
time=   2.0s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.368 total time=
3.2s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.370 total time=
3.4s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.325 total time=
3.3s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.830 total
time=   1.3s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.808 total
time=   1.2s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.791 total
time=   1.3s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.7s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.8s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.076 total time=
2.9s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.7s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   2.8s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.651 total time=
2.9s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.621 total time=
```

```
3.0s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.635 total time=
2.9s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.830 total time=
1.3s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.808 total time=
1.3s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.791 total time=
1.4s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.874 total time=
1.9s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.853 total time=
1.9s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.826 total time=
1.9s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.381 total
time=   3.0s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.353 total
time=   3.0s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.316 total
time=   3.1s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.673 total time=
2.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.692 total time=
2.4s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.646 total time=
2.3s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.808 total
time=   1.5s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.791 total
time=   1.4s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.426 total time=
2.6s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.464 total time=
2.8s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.404 total time=
2.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.542 total
time=   2.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.535 total
time=   2.2s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.571 total
time=   2.0s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.424 total time=
3.1s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.451 total time=
```

```
3.2s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.410 total time=
3.3s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.830 total
time=   1.3s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.791 total
time=   1.3s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
2.8s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
3.2s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.076 total time=
3.0s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.367 total
time=   3.0s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.355 total
time=   3.0s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.301 total
time=   3.1s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.755 total time=
2.4s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.759 total time=
2.4s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.694 total time=
2.3s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.791 total
time=   1.5s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.876 total time=
2.1s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.857 total time=
2.2s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.817 total time=
2.1s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.558 total
time=   2.1s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.580 total
time=   2.3s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.606 total
time=   2.0s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.368 total time=
3.7s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.370 total time=
```

```
3.4s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.325 total time=
3.3s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.808 total
time=   1.4s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.791 total
time=   1.4s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.0s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.0s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.076 total time=
3.1s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.1s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.076 total
time=   3.0s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.651 total time=
3.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.621 total time=
3.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.635 total time=
2.8s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.830 total time=
1.2s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.808 total time=
1.4s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.791 total time=
1.3s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.876 total time=
2.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.857 total time=
2.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.817 total time=
2.1s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.381 total
time=   2.9s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.353 total
time=   2.9s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.316 total
time=   2.9s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.673 total time=
2.3s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.692 total time=
```

```
2.4s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.646 total time=
2.2s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.830 total
time=   1.4s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.808 total
time=   1.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.791 total
time=   1.3s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.372 total time=
3.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.409 total time=
3.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.338 total time=
3.0s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.542 total
time=   2.2s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.535 total
time=   2.3s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.571 total
time=   2.1s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.424 total time=
3.2s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.451 total time=
3.2s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.410 total time=
3.2s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.830 total
time=   1.3s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.808 total
time=   1.3s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.791 total
time=   1.4s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
2.9s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
3.1s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.076 total time=
3.0s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.367 total
time=   3.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.355 total
time=   2.9s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.301 total
time=   3.1s
```

```
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': 3, 'gamma': 0.1, 'kernel': 'poly'}
```

```
['d:\\ASUS\\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)
```

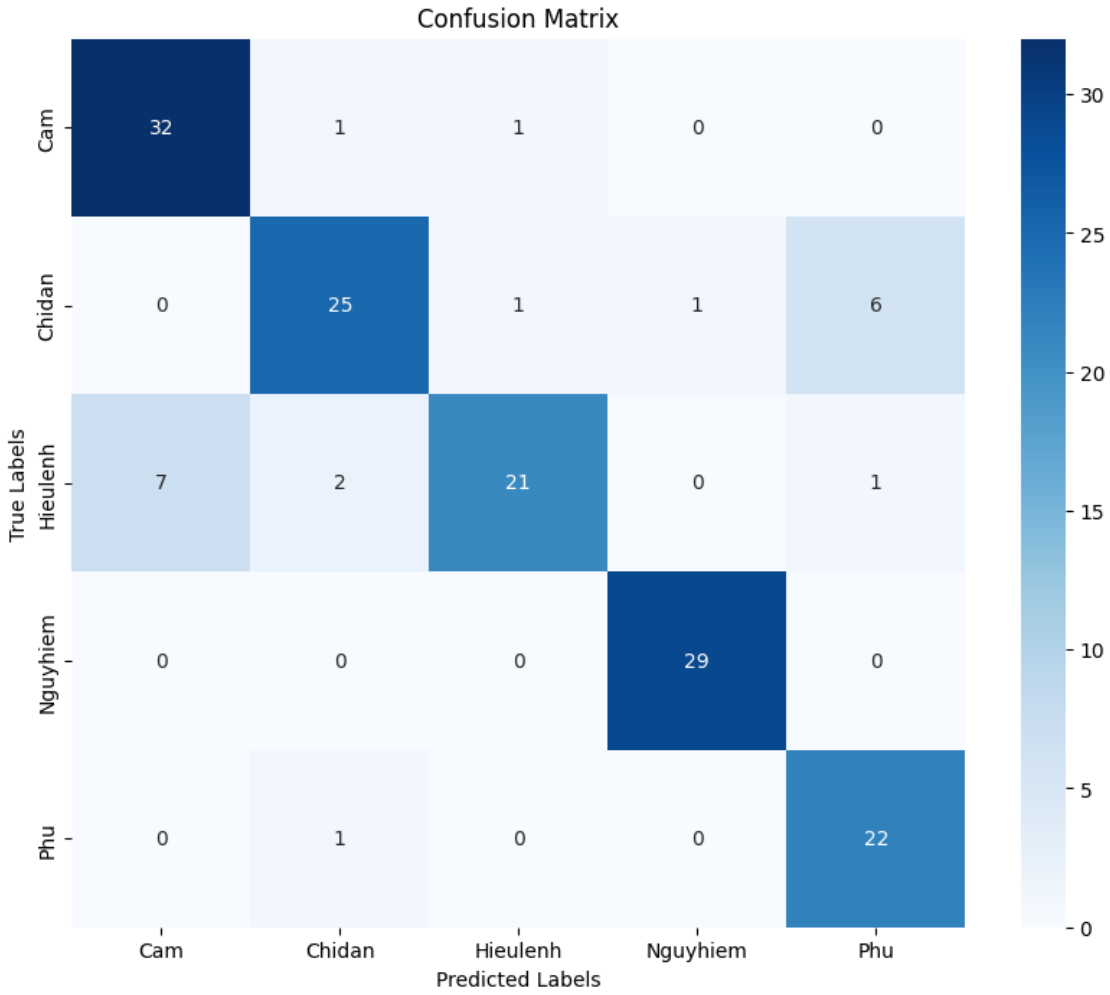
```
              precision    recall  f1-score   support

         Cam       0.82      0.94      0.88        34
      Chidan       0.86      0.76      0.81        33
    Hieulenh       0.91      0.68      0.78        31
    Nguyhiem       0.97      1.00      0.98        29
         Phu       0.76      0.96      0.85        23

    accuracy                           0.86       150
   macro avg       0.86      0.87      0.86       150
weighted avg       0.87      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)
```

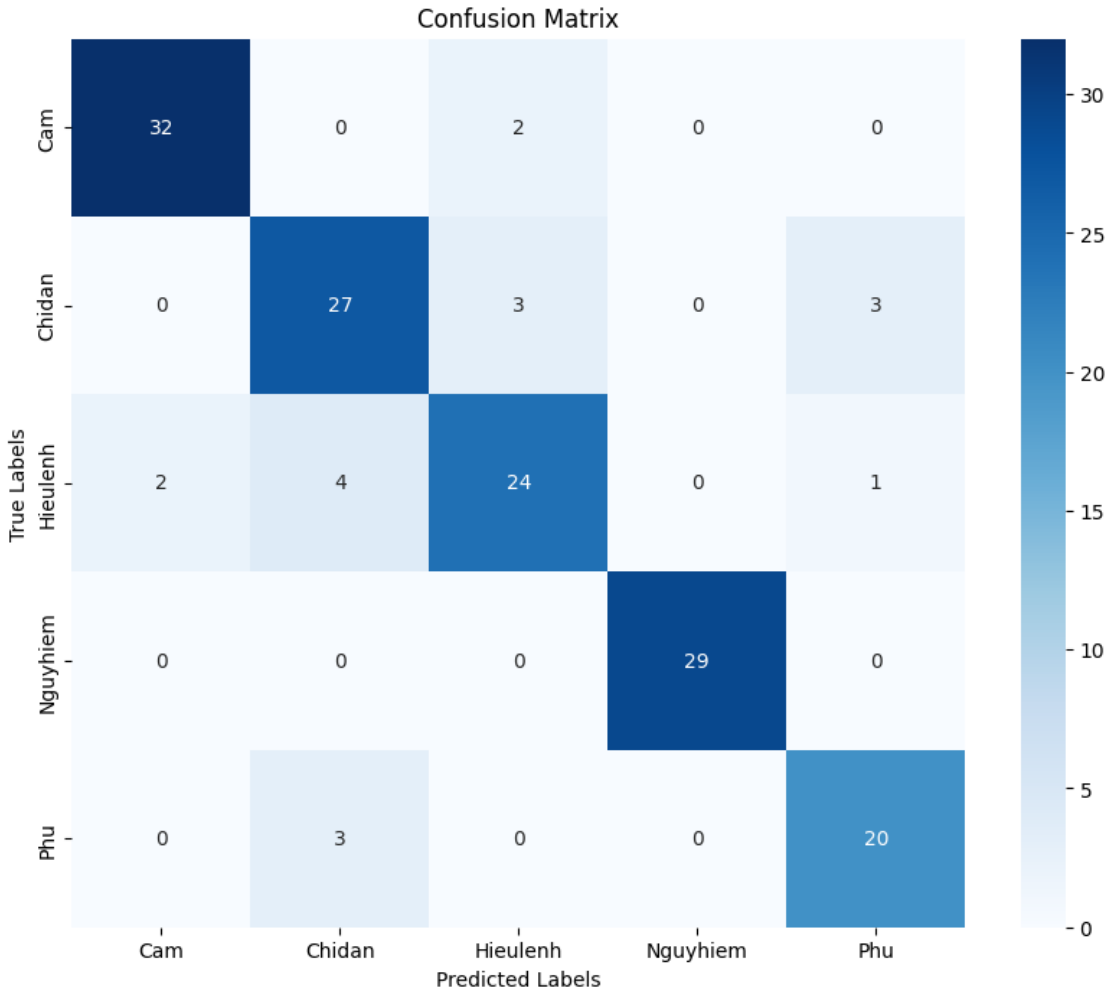
```
              precision    recall  f1-score   support

         Cam       0.94      0.94      0.94        34
      Chidan       0.79      0.82      0.81        33
    Hieulenh       0.83      0.77      0.80        31
    Nguyhiem       1.00      1.00      1.00        29
         Phu       0.83      0.87      0.85        23

    accuracy                           0.88       150
   macro avg       0.88      0.88      0.88       150
weighted avg       0.88      0.88      0.88       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)
```