Notebook

November 24, 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)
```

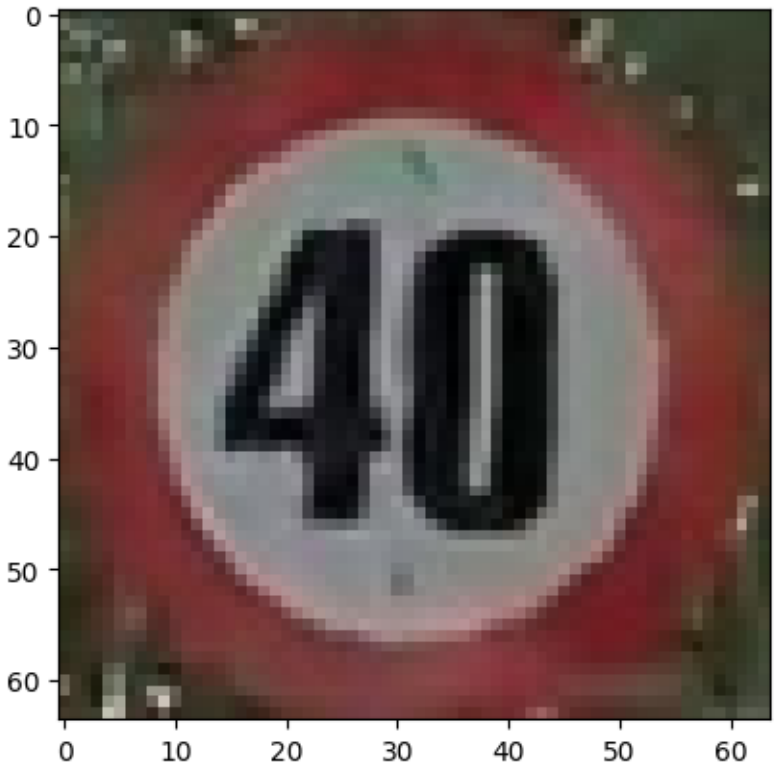
```
label_encoder = LabelEncoder()
train_labels_encoded = label_encoder.fit_transform(train_labels)
test_labels_encoded = label_encoder.transform(test_labels)
```

```
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 0x1d5cf53bd50>
```




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

```
<matplotlib.image.AxesImage at 0x1d5e14ccf90>
```

3 Extract features

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

```
def color_histogram(image):
    # image = cv2.cvtColor(image, cv2.COLOR_RGB2LUV)
    row, column, channel = image.shape[:3]
    size = row * column
    feature = []
    for k in range(channel):
        histogram = np.squeeze(cv2.calcHist([image], [k], None, [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
```

```
from skimage import measure
from scipy import ndimage

def compute_ccv(image, threshold=500):

    hsv_img = cv2.cvtColor(image, cv2.COLOR_RGB2HSV)

    h_bins = 8
    s_bins = 8
    v_bins = 1

    h = hsv_img[:,:,0]
    s = hsv_img[:,:,1]
    v = hsv_img[:,:,2]

    h_quantized = np.floor(h * h_bins / 180).astype(int)
    s_quantized = np.floor(s * s_bins / 256).astype(int)
    v_quantized = np.floor(v * v_bins / 256).astype(int)

    quantized = h_quantized * s_bins * v_bins + s_quantized * v_bins +␣
↪v_quantized

    ccv_features = []

    for color_bin in range(h_bins * s_bins * v_bins):
        color_mask = (quantized == color_bin)

        if not np.any(color_mask):
            ccv_features.extend([0, 0])
            continue

        labeled_array, num_features = measure.label(color_mask, return_num=True)

        component_sizes = np.bincount(labeled_array.ravel())[1:]

        coherent = np.sum(component_sizes >= threshold)
        incoherent = np.sum(component_sizes < threshold)

        ccv_features.extend([coherent, incoherent])

    return np.array(ccv_features)
```

```
def extract_features(images):
    blurred_images = [blur_image(image) for image in tqdm(images, desc="Blur␣
 ↪Images")]
    color_features = [color_histogram(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting Color Features")]
    hog_features = [hog(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting HOG Features")]
    ccv_features = [compute_ccv(image) for image in tqdm(blurred_images,␣
 ↪desc="Extracting CCV Features")]

    combined_features = [np.concatenate((color_feature, hog_feature,␣
 ↪ccv_feature))
                         for color_feature, hog_feature, ccv_feature
                         in tqdm(zip(color_features, hog_features, ccv_features),
                                 desc="Combining Features")]
    return combined_features
```

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

```
Blur Images: 100%|      | 1415/1415 [00:00<00:00, 1526.87it/s]
Extracting Color Features: 100%|      | 1415/1415 [00:00<00:00, 9474.12it/s]
Extracting HOG Features: 100%|      | 1415/1415 [00:08<00:00, 176.26it/s]
Extracting CCV Features: 100%|      | 1415/1415 [00:03<00:00, 417.15it/s]
Combining Features: 1415it [00:00, 17226.49it/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')
```

```
Blur Images: 100%|      | 150/150 [00:00<00:00, 1669.39it/s]
Extracting Color Features: 100%|      | 150/150 [00:00<00:00, 11848.54it/s]
Extracting HOG Features: 100%|      | 150/150 [00:00<00:00, 163.11it/s]
Extracting CCV Features: 100%|      | 150/150 [00:00<00:00, 475.28it/s]
Combining Features: 150it [00:00, 19938.06it/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(project_dir + '\\joblib\\best_knn_model.joblib')
# svm_model = joblib.load(project_dir + '\\joblib\\best_svm_model.joblib')

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

6 Gridsearch KNN

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

```
param_grid = {
    'n_neighbors': [3, 4, 5, 6, 7, 10],
    'weights': ['uniform', 'distance'],
    'leaf_size': [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 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.822 total time=   7.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   7.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   7.8s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.831 total time=   7.7s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   6.8s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   7.1s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   7.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   7.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   7.4s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   7.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.821 total time=   7.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.794 total time=   7.4s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   7.2s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   7.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.750 total time=   7.5s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.813 total time=   7.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   7.2s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   7.8s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.779 total time=   6.9s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.759 total time=   6.9s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   7.0s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.807 total time=   6.9s
```

```
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   7.0s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   7.3s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   8.5s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   7.5s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   7.5s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   7.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   7.5s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   7.5s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   7.6s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   7.3s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   8.0s
[CV 1/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   7.4s
[CV 2/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=  10.1s
[CV 3/3] END leaf_size=5, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   7.3s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  18.7s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  19.5s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  18.7s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  17.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  18.3s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  19.5s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  18.4s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  18.6s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  18.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  19.0s
```

```
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  19.4s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  18.2s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  18.7s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  18.6s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  18.2s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  18.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  18.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  18.3s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  17.8s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  18.2s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  18.1s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  17.9s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  17.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  19.9s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  18.6s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  17.9s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  19.0s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  18.1s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  19.0s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  18.5s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  19.5s
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  18.5s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  17.6s
[CV 1/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  19.5s
```

```
[CV 2/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  19.5s
[CV 3/3] END leaf_size=5, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  18.4s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   7.0s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   7.3s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   7.3s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   7.2s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   7.1s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   7.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   7.3s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   7.1s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   6.9s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   8.6s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.5s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   6.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.5s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.0s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.4s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   7.1s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.7s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   6.8s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   9.3s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   9.5s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   7.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   7.9s
```

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[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   8.4s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=  13.2s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   8.9s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   6.3s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.4s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.5s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.3s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   5.4s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   6.4s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.6s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   7.0s
[CV 1/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   8.3s
[CV 2/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   7.5s
[CV 3/3] END leaf_size=5, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   7.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
7.0s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.7s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
6.5s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.723 total time=
7.1s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
7.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
7.1s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
```

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7.3s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.7s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.675 total time=
7.0s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.711 total time=
6.7s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.6s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.9s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
6.6s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
7.3s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
7.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
7.4s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
8.2s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
7.0s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.8s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
6.9s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.660 total time=
6.7s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
7.3s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
```

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7.3s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.9s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
6.9s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
6.7s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.679 total time=
6.6s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.725 total time=
6.4s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.711 total time=
6.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.704 total time=
6.4s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.683 total time=
6.4s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.7s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.666 total time=
6.5s
[CV 1/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.4s
[CV 2/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
6.5s
[CV 3/3] END leaf_size=5, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.713 total time=
6.4s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
5.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.733 total time=
5.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.701 total time=
```

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5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.803 total time=
5.8s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.754 total time=
5.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.733 total time=
5.7s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.769 total time=
6.3s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.734 total time=
5.9s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.709 total time=
5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.806 total time=
5.9s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.759 total time=
5.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.730 total time=
5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.784 total time=
5.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.736 total time=
5.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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5.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.743 total time=
5.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.718 total time=
6.2s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
```

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5.8s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.698 total time=
5.7s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.710 total time=
6.1s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.791 total time=
5.8s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
5.7s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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5.8s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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6.6s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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7.2s
[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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6.3s
[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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[CV 1/3] END leaf_size=5, metric=<function bhattacharyya_distance at
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[CV 2/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.746 total time=
```

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6.2s
[CV 3/3] END leaf_size=5, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.720 total time=
6.0s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.3s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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5.3s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.604 total time=
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[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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5.7s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
6.1s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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6.9s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
6.9s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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6.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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6.3s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.695 total time=
6.3s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.625 total time=
7.0s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.609 total time=
```

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6.9s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
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6.0s
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6.1s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
6.7s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.690 total time=
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[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
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[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
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5.7s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.671 total time=
5.6s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.612 total time=
5.5s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.603 total time=
5.6s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.3s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.5s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.665 total time=
```

```
5.7s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.595 total time=
5.5s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.594 total time=
5.6s
[CV 1/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.4s
[CV 2/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.6s
[CV 3/3] END leaf_size=5, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.1s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.822 total time=   5.9s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   5.7s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   5.9s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.831 total time=   5.9s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   5.7s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   5.3s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   5.7s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   5.7s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   5.5s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.821 total time=   5.6s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.794 total time=   5.7s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.5s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.750 total time=   5.3s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.813 total time=   5.3s
```

```
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   5.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   5.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.779 total time=   5.6s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.759 total time=   5.7s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   5.6s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.807 total time=   5.4s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   5.9s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   5.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   5.4s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   5.4s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   5.3s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   5.2s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   5.2s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   5.2s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   5.3s
[CV 1/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=   5.6s
[CV 3/3] END leaf_size=10, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   5.5s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  13.1s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  13.0s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  13.1s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  13.0s
```

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[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  13.7s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  13.3s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  12.9s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  13.1s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  13.5s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  16.5s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  15.4s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  13.1s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  13.8s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  13.4s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  13.3s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  13.3s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  13.0s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  13.0s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  13.6s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  13.3s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  13.2s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  13.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  13.1s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  13.6s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  13.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  13.3s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  13.3s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  13.0s
```

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[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  13.7s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  13.3s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  13.2s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  13.5s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  13.3s
[CV 1/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  13.7s
[CV 2/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  13.4s
[CV 3/3] END leaf_size=10, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  13.7s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   5.1s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   5.7s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   5.1s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   5.4s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   5.1s
```

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[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   5.3s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   5.3s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   5.2s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   5.1s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.0s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   5.0s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.4s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   5.4s
[CV 1/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   5.0s
[CV 2/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   5.2s
[CV 3/3] END leaf_size=10, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   5.1s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.4s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.4s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
```

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6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.723 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
6.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
6.3s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
6.7s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.6s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.675 total time=
6.5s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.711 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
6.4s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
6.7s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
```

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6.4s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
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[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.660 total time=
6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
6.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.5s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
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[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
6.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
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6.8s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
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6.4s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.711 total time=
6.3s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.704 total time=
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6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.4s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
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6.4s
[CV 1/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.3s
[CV 2/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
```

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6.5s
[CV 3/3] END leaf_size=10, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.713 total time=
6.4s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
5.9s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.733 total time=
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5.8s
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[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.7s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.733 total time=
5.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
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5.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.9s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
```

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5.8s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.795 total time=
5.8s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
5.8s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.9s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
5.8s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.713 total time=
5.8s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.7s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.7s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.765 total time=
```

```
5.9s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.709 total time=
5.8s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.8s
[CV 1/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.9s
[CV 2/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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6.1s
[CV 3/3] END leaf_size=10, metric=<function bhattacharyya_distance at
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5.7s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.2s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.620 total time=
5.6s
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5.3s
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0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.1s
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5.0s
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0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
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5.2s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
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[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
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.0s
[CV 2/3] END leaf_size=10, metric=<function intersection_distance at
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```

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5.5s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
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5.2s
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5.2s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
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5.2s
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5.1s
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5.1s
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5.1s
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5.1s
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5.1s
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5.2s
[CV 3/3] END leaf_size=10, metric=<function intersection_distance at
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```

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5.2s
[CV 1/3] END leaf_size=10, metric=<function intersection_distance at
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5.6s
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n_neighbors=3, weights=uniform;, score=0.822 total time=   5.3s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   5.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   5.5s
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[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   5.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   5.3s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   5.4s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   5.5s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   5.4s
```

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[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
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n_neighbors=4, weights=distance;, score=0.794 total time=   5.8s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   5.5s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.2s
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n_neighbors=5, weights=uniform;, score=0.750 total time=   5.4s
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n_neighbors=5, weights=distance;, score=0.813 total time=   5.4s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   5.3s
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n_neighbors=6, weights=uniform;, score=0.779 total time=   5.3s
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n_neighbors=6, weights=uniform;, score=0.759 total time=   5.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   5.3s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
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[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   5.5s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   5.5s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   5.3s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   5.3s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   5.3s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   5.3s
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   5.2s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   5.3s
[CV 1/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   5.3s
```

```
[CV 2/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=   5.3s
[CV 3/3] END leaf_size=20, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   5.4s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  13.5s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  12.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  13.2s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  13.4s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  13.3s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  13.3s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  13.4s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  13.9s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  13.6s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  13.3s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  13.2s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  13.1s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  13.4s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  13.2s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  13.2s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  13.1s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  13.6s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  13.0s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  13.0s
```

```
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  13.1s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  12.9s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  13.6s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  13.3s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  13.0s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  13.0s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  13.0s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  13.7s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  13.5s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  13.2s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  13.0s
[CV 1/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  13.1s
[CV 2/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  13.8s
[CV 3/3] END leaf_size=20, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  13.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   5.2s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   5.0s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   5.4s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   5.2s
```

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[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.3s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   5.0s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   5.1s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   5.6s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   5.3s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   5.1s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.1s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   4.9s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   5.2s
[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.0s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   4.9s
```

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[CV 2/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   5.6s
[CV 3/3] END leaf_size=20, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   5.0s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.6s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.723 total time=
6.3s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.675 total time=
6.6s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.711 total time=
6.6s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
6.4s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
```

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6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.9s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
6.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.660 total time=
6.5s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
6.5s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.5s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
6.3s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
6.4s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.679 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.725 total time=
6.3s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.711 total time=
6.8s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.704 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.683 total time=
```

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6.4s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.5s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.666 total time=
6.3s
[CV 1/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.4s
[CV 2/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
6.3s
[CV 3/3] END leaf_size=20, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.713 total time=
6.4s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.733 total time=
5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.0s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.803 total time=
6.0s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.754 total time=
5.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.733 total time=
5.9s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.769 total time=
5.9s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.734 total time=
5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.709 total time=
5.8s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.806 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.759 total time=
```

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5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.730 total time=
5.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.784 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.736 total time=
5.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
6.1s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.795 total time=
5.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.743 total time=
5.9s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.718 total time=
5.9s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.698 total time=
5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.710 total time=
5.8s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.791 total time=
5.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.747 total time=
5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.727 total time=
5.7s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.709 total time=
6.2s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.713 total time=
```

```
5.8s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.778 total time=
5.8s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
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6.0s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.717 total time=
5.9s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.765 total time=
5.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.709 total time=
5.7s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.726 total time=
5.8s
[CV 1/3] END leaf_size=20, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.779 total time=
5.7s
[CV 2/3] END leaf_size=20, metric=<function bhattacharyya_distance at
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5.8s
[CV 3/3] END leaf_size=20, metric=<function bhattacharyya_distance at
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5.8s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.6s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.620 total time=
5.3s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.604 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.698 total time=
```

```
5.4s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.598 total time=
5.4s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.609 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
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5.3s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.625 total time=
5.3s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
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5.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.690 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.613 total time=
5.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.596 total time=
5.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
```

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5.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.671 total time=
5.2s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.612 total time=
5.7s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.603 total time=
5.2s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.4s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.665 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.595 total time=
5.1s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.594 total time=
5.1s
[CV 1/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.1s
[CV 2/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=20, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.822 total time=   5.6s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   5.9s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   5.5s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.831 total time=   5.3s
```

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[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   5.5s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   5.3s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.821 total time=   5.3s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.794 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.5s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.750 total time=   5.4s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.813 total time=   5.3s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   5.3s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.779 total time=   5.3s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.759 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   5.3s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.807 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   5.3s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   5.3s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   5.5s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   5.5s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   5.2s
```

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[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   5.4s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   5.3s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   5.3s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   5.9s
[CV 1/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   5.6s
[CV 2/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=   5.5s
[CV 3/3] END leaf_size=30, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   5.9s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  15.2s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  16.7s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  13.5s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  12.8s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  13.3s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  13.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  13.4s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  13.0s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  13.2s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  13.1s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  13.6s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  13.3s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  13.0s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  13.5s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  14.2s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  14.8s
```

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[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  14.6s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  13.4s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  13.0s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  13.7s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  13.5s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  13.2s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  13.1s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  13.2s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  13.7s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  13.4s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  13.3s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  13.2s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  13.3s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  13.8s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  13.2s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  13.2s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  13.2s
[CV 1/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  13.4s
[CV 2/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  13.6s
[CV 3/3] END leaf_size=30, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  13.3s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   5.1s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   5.1s
```

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[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   5.8s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   6.1s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   5.4s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.6s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   5.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.7s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.5s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   5.5s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   5.6s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   5.4s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   5.5s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   5.1s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   5.3s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   5.1s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.2s
```

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[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   5.2s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   5.1s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.1s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   5.7s
[CV 1/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   5.2s
[CV 2/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   5.2s
[CV 3/3] END leaf_size=30, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   5.4s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
6.4s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.723 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
6.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
6.3s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.8s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.675 total time=
6.5s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.711 total time=
6.8s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.721 total time=
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6.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.5s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
6.6s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
6.5s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
6.4s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
6.5s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
6.6s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.4s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
6.7s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.660 total time=
6.4s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
6.4s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
6.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.3s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
6.4s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
6.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.679 total time=
```

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6.7s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.725 total time=
6.8s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.711 total time=
6.4s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.704 total time=
7.1s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.683 total time=
7.1s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.8s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.666 total time=
6.9s
[CV 1/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.8s
[CV 2/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
6.8s
[CV 3/3] END leaf_size=30, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.713 total time=
7.0s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
7.0s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.733 total time=
6.2s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.2s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.803 total time=
6.0s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.754 total time=
5.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.733 total time=
5.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.769 total time=
```

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5.8s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.734 total time=
5.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.709 total time=
5.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.806 total time=
5.9s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.759 total time=
6.0s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.730 total time=
6.2s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.784 total time=
5.8s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.736 total time=
5.9s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
6.0s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.795 total time=
5.8s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.743 total time=
5.9s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.718 total time=
5.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
5.9s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.698 total time=
5.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.710 total time=
6.0s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.791 total time=
5.9s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.747 total time=
```

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6.4s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.727 total time=
5.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
6.1s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.709 total time=
6.0s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.713 total time=
5.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.778 total time=
5.8s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.724 total time=
5.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.717 total time=
5.8s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.765 total time=
6.0s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.709 total time=
6.0s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.726 total time=
5.9s
[CV 1/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.779 total time=
6.2s
[CV 2/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.746 total time=
5.8s
[CV 3/3] END leaf_size=30, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.720 total time=
5.9s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.2s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.620 total time=
5.2s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.604 total time=
```

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5.2s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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5.1s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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5.2s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.698 total time=
5.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.598 total time=
5.5s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.609 total time=
5.3s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.6s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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5.2s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
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0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.695 total time=
5.4s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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5.2s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
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5.2s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
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5.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
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5.4s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.4s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.690 total time=
```

```
5.6s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.613 total time=
5.5s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.596 total time=
5.7s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.9s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.6s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.6s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.671 total time=
5.6s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.612 total time=
5.4s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.603 total time=
5.6s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.5s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.3s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.665 total time=
5.3s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.595 total time=
5.2s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.594 total time=
5.4s
[CV 1/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.5s
[CV 2/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
```

```
5.3s
[CV 3/3] END leaf_size=30, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.822 total time=   5.6s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   5.3s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.831 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   5.2s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   5.4s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   5.9s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.821 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.794 total time=   5.5s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   5.5s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.5s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.750 total time=   5.4s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.813 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   5.4s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.779 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.759 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   6.2s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.807 total time=   6.3s
```

```
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   5.6s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   6.0s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   5.3s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   5.3s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   5.4s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   5.4s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   5.9s
[CV 1/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   5.5s
[CV 2/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   5.5s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  13.2s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  13.3s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  13.2s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  14.1s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  14.3s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  14.0s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  14.9s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  14.1s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  13.9s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  13.3s
```

```
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  13.2s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  13.4s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  13.7s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  13.4s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  13.1s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  13.1s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  13.6s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  13.5s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  13.4s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  13.3s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  13.3s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  13.4s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  14.5s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  13.2s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  13.1s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  13.4s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  13.4s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  13.9s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  14.2s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  13.9s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  13.6s
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  13.8s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  14.7s
[CV 1/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  13.7s
```

```
[CV 2/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  13.5s
[CV 3/3] END leaf_size=40, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  13.3s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   5.8s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   5.1s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   5.5s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   5.3s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   5.3s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   5.1s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   5.2s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.6s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.1s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   5.5s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   5.3s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   5.1s
```

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[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=   5.1s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   5.2s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.6s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.5s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.2s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   5.5s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   5.4s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.1s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   5.2s
[CV 1/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   5.1s
[CV 2/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   5.3s
[CV 3/3] END leaf_size=40, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   5.1s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.4s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
7.0s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.723 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
6.6s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
6.5s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
```

```
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.675 total time=
6.5s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.711 total time=
6.9s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.721 total time=
6.9s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.9s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
7.3s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
6.9s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
7.1s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
6.9s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
6.9s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
7.2s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
6.7s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.660 total time=
6.6s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
7.0s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
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6.6s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.4s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
6.4s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.679 total time=
6.5s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.725 total time=
6.4s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.711 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=distance;, score=0.704 total time=
6.5s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.683 total time=
6.5s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
7.0s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.666 total time=
6.4s
[CV 1/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.7s
[CV 2/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
6.5s
[CV 3/3] END leaf_size=40, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.713 total time=
6.6s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.733 total time=
5.9s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.701 total time=
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5.9s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.803 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.754 total time=
5.8s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=distance;, score=0.733 total time=
6.0s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.769 total time=
6.2s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.734 total time=
5.8s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=uniform;, score=0.709 total time=
6.0s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.806 total time=
5.9s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.759 total time=
6.0s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.730 total time=
5.8s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.784 total time=
5.9s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.736 total time=
6.0s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
5.9s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.795 total time=
6.0s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.743 total time=
6.0s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.718 total time=
6.1s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
```

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5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.698 total time=
5.9s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.710 total time=
5.9s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.791 total time=
5.9s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.747 total time=
5.8s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.727 total time=
6.0s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
5.8s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.709 total time=
5.9s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.713 total time=
5.7s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.778 total time=
6.1s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.724 total time=
6.2s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.717 total time=
6.1s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.765 total time=
6.4s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.709 total time=
6.3s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.726 total time=
6.4s
[CV 1/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.779 total time=
6.3s
[CV 2/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.746 total time=
```

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6.2s
[CV 3/3] END leaf_size=40, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.720 total time=
6.1s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.5s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.620 total time=
5.7s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.604 total time=
6.0s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.3s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.5s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.698 total time=
5.3s
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5.3s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.609 total time=
5.2s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.1s
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0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.695 total time=
5.3s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.625 total time=
5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.609 total time=
```

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5.4s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.3s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
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5.2s
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5.1s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
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5.4s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
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5.3s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
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5.2s
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5.3s
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5.3s
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[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.4s
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0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.665 total time=
```

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5.3s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
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5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
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5.2s
[CV 1/3] END leaf_size=40, metric=<function intersection_distance at
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5.3s
[CV 2/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=40, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.822 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.795 total time=   5.4s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=uniform;, score=0.754 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.831 total time=   6.0s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.806 total time=   5.4s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=3, weights=distance;, score=0.784 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.786 total time=   5.5s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.768 total time=   5.4s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=uniform;, score=0.769 total time=   5.4s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.830 total time=   5.4s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.821 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=4, weights=distance;, score=0.794 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.793 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.772 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=uniform;, score=0.750 total time=   5.4s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.813 total time=   6.1s
```

```
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.794 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=5, weights=distance;, score=0.786 total time=   5.5s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.779 total time=   5.4s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.759 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=uniform;, score=0.718 total time=   5.6s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.807 total time=   5.7s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.798 total time=   5.7s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=6, weights=distance;, score=0.774 total time=   5.5s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.779 total time=   5.6s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.753 total time=   5.8s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=uniform;, score=0.716 total time=   6.0s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.809 total time=   5.9s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.784 total time=   5.6s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=7, weights=distance;, score=0.757 total time=   6.0s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.777 total time=   5.6s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.747 total time=   5.7s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=uniform;, score=0.703 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.804 total time=   5.4s
[CV 2/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.786 total time=   5.4s
[CV 3/3] END leaf_size=50, metric=<function cityblock at 0x000001D5CBAC31A0>,
n_neighbors=10, weights=distance;, score=0.748 total time=   5.5s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.659 total time=  13.8s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.680 total time=  13.6s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=uniform;, score=0.628 total time=  13.3s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.682 total time=  13.1s
```

```
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.696 total time=  13.0s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=3, weights=distance;, score=0.671 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.632 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.678 total time=  13.3s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=uniform;, score=0.608 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.666 total time=  13.3s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.693 total time=  13.5s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=4, weights=distance;, score=0.647 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.621 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.674 total time=  13.1s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=uniform;, score=0.604 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.644 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.685 total time=  13.4s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=5, weights=distance;, score=0.629 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.605 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.646 total time=  13.5s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=uniform;, score=0.601 total time=  14.5s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.644 total time=  14.8s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.668 total time=  14.4s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=6, weights=distance;, score=0.638 total time=  14.3s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.614 total time=  13.4s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.649 total time=  14.0s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=uniform;, score=0.580 total time=  13.4s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.627 total time=  13.3s
```

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[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.662 total time=  13.4s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=7, weights=distance;, score=0.617 total time=  13.2s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.599 total time=  13.8s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.624 total time=  13.4s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=uniform;, score=0.590 total time=  13.3s
[CV 1/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.610 total time=  13.2s
[CV 2/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.649 total time=  13.4s
[CV 3/3] END leaf_size=50, metric=<function cosine at 0x000001D5CBAC2E80>,
n_neighbors=10, weights=distance;, score=0.604 total time=  13.7s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.581 total time=   5.5s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.589 total time=   5.1s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=uniform;, score=0.582 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.620 total time=   5.1s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.630 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=3, weights=distance;, score=0.598 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.565 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.595 total time=   5.3s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=uniform;, score=0.584 total time=   5.1s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.601 total time=   5.4s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.626 total time=   5.5s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=4, weights=distance;, score=0.616 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.551 total time=   5.3s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.585 total time=   5.5s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=uniform;, score=0.582 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.601 total time=   5.1s
```

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[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.611 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=5, weights=distance;, score=0.615 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.543 total time=   5.1s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.563 total time=   5.2s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=uniform;, score=0.558 total time=   5.3s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.586 total time=   5.2s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.618 total time=   5.8s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=6, weights=distance;, score=0.601 total time=   5.2s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.542 total time=   5.5s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.573 total time=   5.6s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=uniform;, score=0.545 total time=   5.4s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.581 total time=   5.6s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.607 total time=   5.5s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=7, weights=distance;, score=0.600 total time=   5.5s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.539 total time=   5.5s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.576 total time=   5.6s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=uniform;, score=0.546 total time=   5.5s
[CV 1/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.570 total time=   5.7s
[CV 2/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.601 total time=   5.8s
[CV 3/3] END leaf_size=50, metric=<function sqeuclidean at 0x000001D5CBAC2D40>,
n_neighbors=10, weights=distance;, score=0.587 total time=   5.4s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.701 total time=
6.6s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.703 total time=
6.5s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=uniform;, score=0.692 total time=
```

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6.6s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
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6.5s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.704 total time=
6.6s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=3, weights=distance;, score=0.706 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.691 total time=
6.5s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=uniform;, score=0.687 total time=
6.6s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
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6.9s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
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6.5s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
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6.5s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=4, weights=distance;, score=0.714 total time=
6.4s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.700 total time=
6.6s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.679 total time=
6.8s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=uniform;, score=0.682 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.712 total time=
6.5s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.717 total time=
6.6s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=5, weights=distance;, score=0.707 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.706 total time=
```

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7.0s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=uniform;, score=0.687 total time=
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6.7s
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0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.732 total time=
6.4s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.710 total time=
6.7s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=6, weights=distance;, score=0.707 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.712 total time=
6.5s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=7, weights=uniform;, score=0.688 total time=
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[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
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6.5s
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[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
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6.7s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
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6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.683 total time=
6.6s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.679 total time=
6.5s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=uniform;, score=0.666 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.723 total time=
6.4s
[CV 2/3] END leaf_size=50, metric=<function chi_square_distance at
0x000001D5CF4F2F20>, n_neighbors=10, weights=distance;, score=0.714 total time=
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6.6s
[CV 3/3] END leaf_size=50, metric=<function chi_square_distance at
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[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=3, weights=uniform;, score=0.790 total time=
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[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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[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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5.8s
[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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5.7s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
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[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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6.2s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.759 total time=
6.2s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=4, weights=distance;, score=0.730 total time=
6.1s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.784 total time=
6.5s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.736 total time=
6.3s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=uniform;, score=0.720 total time=
```

```
6.3s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.795 total time=
6.4s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.743 total time=
6.3s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=5, weights=distance;, score=0.718 total time=
6.2s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.759 total time=
5.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.698 total time=
5.9s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=uniform;, score=0.710 total time=
6.5s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.791 total time=
5.9s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.747 total time=
6.0s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=6, weights=distance;, score=0.727 total time=
6.2s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.763 total time=
5.8s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.709 total time=
6.0s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=uniform;, score=0.713 total time=
5.9s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.778 total time=
5.9s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.724 total time=
5.9s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=7, weights=distance;, score=0.717 total time=
6.0s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.765 total time=
```

```
5.9s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.709 total time=
5.9s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=uniform;, score=0.726 total time=
5.8s
[CV 1/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.779 total time=
6.0s
[CV 2/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.746 total time=
6.2s
[CV 3/3] END leaf_size=50, metric=<function bhattacharyya_distance at
0x000001D5CF4F37E0>, n_neighbors=10, weights=distance;, score=0.720 total time=
5.9s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.716 total time=
5.4s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.620 total time=
5.3s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=uniform;, score=0.604 total time=
5.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.3s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=3, weights=distance;, score=0.076 total time=
5.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.698 total time=
5.3s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.598 total time=
5.2s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=uniform;, score=0.609 total time=
5.1s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.6s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
```

```
5.4s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=4, weights=distance;, score=0.076 total time=
5.1s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.695 total time=
5.4s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.625 total time=
5.3s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=uniform;, score=0.609 total time=
5.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=5, weights=distance;, score=0.076 total time=
5.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.690 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.613 total time=
5.2s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=uniform;, score=0.596 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.3s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.7s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=6, weights=distance;, score=0.076 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.671 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.612 total time=
5.4s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=uniform;, score=0.603 total time=
```

```
5.4s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.2s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.2s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=7, weights=distance;, score=0.076 total time=
5.3s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.665 total time=
5.3s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.595 total time=
5.2s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=uniform;, score=0.594 total time=
5.2s
[CV 1/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.3s
[CV 2/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
6.0s
[CV 3/3] END leaf_size=50, metric=<function intersection_distance at
0x000001D5CF4F36A0>, n_neighbors=10, weights=distance;, score=0.076 total time=
5.5s

GridSearchCV(cv=3, estimator=KNeighborsClassifier(),
             param_grid={'leaf_size': [5, 10, 20, 30, 40, 50],
                         'metric': [<function cityblock at 0x000001D5CBAC31A0>,
                                    <function cosine at 0x000001D5CBAC2E80>,
                                    <function sqeuclidean at
0x000001D5CBAC2D40>,
                                    <function chi_square_distance at
0x000001D5CF4F2F20>,
                                    <function bhattacharyya_distance at
0x000001D5CF4F37E0>,
                                    <function intersection_distance at
0x000001D5CF4F36A0>],
                         '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
0x000001D5CBAC31A0>, '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=0.216 total time=
2.2s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.229 total time=
2.3s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=rbf;, score=0.246 total time=
2.3s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.843 total
time=   1.1s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.814 total
```

```
time=   1.1s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=linear;, score=0.805 total
time=   1.1s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.199 total time=
1.9s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.181 total time=
1.8s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=poly;, score=0.179 total time=
1.8s
[CV 1/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.112 total
time=   1.7s
[CV 2/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.095 total
time=   1.8s
[CV 3/3] END C=0.1, degree=2, gamma=scale, kernel=sigmoid;, score=0.137 total
time=   2.0s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.217 total time=
2.1s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.231 total time=
2.1s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=rbf;, score=0.248 total time=
2.0s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.814 total
time=   1.1s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=linear;, score=0.805 total
time=   1.1s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.199 total time=
1.8s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.180 total time=
1.8s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=poly;, score=0.166 total time=
1.9s
[CV 1/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.113 total
time=   1.9s
[CV 2/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.097 total
time=   1.9s
[CV 3/3] END C=0.1, degree=2, gamma=auto, kernel=sigmoid;, score=0.138 total
time=   2.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.076 total time=
2.5s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.113 total time=
2.3s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=rbf;, score=0.110 total time=
2.3s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.843 total time=
1.1s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.814 total time=
```

```
1.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=linear;, score=0.805 total time=
1.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.818 total time=
0.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.806 total time=
0.9s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=poly;, score=0.791 total time=
0.8s
[CV 1/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.087 total
time=   1.9s
[CV 2/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.8s
[CV 3/3] END C=0.1, degree=2, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.8s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.423 total time=
2.2s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.439 total time=
2.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=rbf;, score=0.379 total time=
2.1s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.814 total
time=   1.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=linear;, score=0.805 total
time=   1.1s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.771 total time=
1.1s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.733 total time=
1.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=poly;, score=0.721 total time=
1.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.197 total
time=   1.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.01, kernel=sigmoid;, score=0.169 total
time=   1.7s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.237 total time=
2.0s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.247 total time=
2.1s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=rbf;, score=0.251 total time=
2.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.843 total
time=   1.1s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.814 total
```

```
time=   1.0s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.252 total time=
1.7s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.228 total time=
1.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=poly;, score=0.243 total time=
1.9s
[CV 1/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.092 total
time=   1.8s
[CV 2/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.075 total
time=   1.7s
[CV 3/3] END C=0.1, degree=2, gamma=0.001, kernel=sigmoid;, score=0.117 total
time=   1.9s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.216 total time=
2.1s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.229 total time=
2.1s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=rbf;, score=0.246 total time=
2.1s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.814 total
time=   1.1s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=linear;, score=0.805 total
time=   1.1s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.214 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.221 total time=
1.7s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=poly;, score=0.207 total time=
2.0s
[CV 1/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.112 total
time=   1.9s
[CV 2/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.095 total
time=   1.9s
[CV 3/3] END C=0.1, degree=3, gamma=scale, kernel=sigmoid;, score=0.137 total
time=   1.9s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.217 total time=
2.3s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.231 total time=
2.1s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=rbf;, score=0.248 total time=
2.1s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.843 total
time=   1.1s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.814 total
```

```
time=   1.0s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=linear;, score=0.805 total
time=   1.1s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.212 total time=
1.8s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.219 total time=
1.8s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=poly;, score=0.205 total time=
1.9s
[CV 1/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.113 total
time=   1.9s
[CV 2/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.097 total
time=   1.9s
[CV 3/3] END C=0.1, degree=3, gamma=auto, kernel=sigmoid;, score=0.138 total
time=   1.9s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.076 total time=
2.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.113 total time=
2.2s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=rbf;, score=0.110 total time=
2.2s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.843 total time=
1.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.814 total time=
1.1s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=linear;, score=0.805 total time=
1.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.778 total time=
0.6s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.768 total time=
0.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=poly;, score=0.761 total time=
0.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.087 total
time=   1.8s
[CV 2/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.9s
[CV 3/3] END C=0.1, degree=3, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.9s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.423 total time=
2.0s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.439 total time=
2.0s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=rbf;, score=0.379 total time=
2.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.843 total
time=   1.1s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.814 total
```

```
time=   1.0s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.660 total time=
0.9s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.677 total time=
0.8s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=poly;, score=0.666 total time=
0.9s
[CV 1/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.197 total
time=   1.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.7s
[CV 3/3] END C=0.1, degree=3, gamma=0.01, kernel=sigmoid;, score=0.169 total
time=   1.8s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.237 total time=
2.3s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.247 total time=
2.1s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=rbf;, score=0.251 total time=
2.1s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.814 total
time=   1.0s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.345 total time=
1.7s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.331 total time=
1.6s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=poly;, score=0.311 total time=
1.6s
[CV 1/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.092 total
time=   1.9s
[CV 2/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.075 total
time=   1.8s
[CV 3/3] END C=0.1, degree=3, gamma=0.001, kernel=sigmoid;, score=0.117 total
time=   1.8s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.216 total time=
2.1s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.229 total time=
2.1s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=rbf;, score=0.246 total time=
2.2s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.814 total
```

```
time=   1.0s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.231 total time=
1.9s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.246 total time=
1.9s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=poly;, score=0.226 total time=
1.8s
[CV 1/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.112 total
time=   1.9s
[CV 2/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.095 total
time=   1.9s
[CV 3/3] END C=0.1, degree=4, gamma=scale, kernel=sigmoid;, score=0.137 total
time=   1.8s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.217 total time=
2.1s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.231 total time=
2.0s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=rbf;, score=0.248 total time=
2.2s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.814 total
time=   1.0s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.227 total time=
1.8s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.244 total time=
1.7s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=poly;, score=0.220 total time=
1.7s
[CV 1/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.113 total
time=   1.9s
[CV 2/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.097 total
time=   1.8s
[CV 3/3] END C=0.1, degree=4, gamma=auto, kernel=sigmoid;, score=0.138 total
time=   1.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.076 total time=
2.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.113 total time=
2.3s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=rbf;, score=0.110 total time=
2.3s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.843 total time=
1.0s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.814 total time=
```

```
1.0s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=linear;, score=0.805 total time=
1.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.758 total time=
0.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.744 total time=
0.5s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=poly;, score=0.717 total time=
0.6s
[CV 1/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.087 total
time=   1.9s
[CV 2/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.8s
[CV 3/3] END C=0.1, degree=4, gamma=0.1, kernel=sigmoid;, score=0.076 total
time=   1.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.423 total time=
2.1s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.439 total time=
2.1s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=rbf;, score=0.379 total time=
2.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.843 total
time=   1.0s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.814 total
time=   1.0s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.605 total time=
0.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.641 total time=
0.8s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=poly;, score=0.668 total time=
0.8s
[CV 1/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.197 total
time=   1.7s
[CV 2/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.01, kernel=sigmoid;, score=0.169 total
time=   1.7s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.237 total time=
2.2s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.247 total time=
2.0s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=rbf;, score=0.251 total time=
2.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.843 total
time=   1.1s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.814 total
```

```
time=   1.0s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=linear;, score=0.805 total
time=   1.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.424 total time=
1.6s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.370 total time=
1.6s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=poly;, score=0.360 total time=
2.0s
[CV 1/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.092 total
time=   1.8s
[CV 2/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.075 total
time=   1.9s
[CV 3/3] END C=0.1, degree=4, gamma=0.001, kernel=sigmoid;, score=0.117 total
time=   1.9s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.279 total time=
2.3s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.254 total time=
2.1s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=rbf;, score=0.299 total time=
2.3s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.831 total
time=   1.3s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.813 total
time=   1.3s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=linear;, score=0.819 total
time=   1.2s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.220 total time=
2.0s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.199 total time=
1.9s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=poly;, score=0.220 total time=
1.8s
[CV 1/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.104 total
time=   1.7s
[CV 2/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.122 total
time=   1.6s
[CV 3/3] END C=0.2, degree=2, gamma=scale, kernel=sigmoid;, score=0.149 total
time=   1.8s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.281 total time=
2.2s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.254 total time=
2.2s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=rbf;, score=0.300 total time=
2.2s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.831 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.813 total
```

```
time=   1.1s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.215 total time=
1.8s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.199 total time=
1.7s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=poly;, score=0.203 total time=
1.7s
[CV 1/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.105 total
time=   1.7s
[CV 2/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.120 total
time=   1.7s
[CV 3/3] END C=0.2, degree=2, gamma=auto, kernel=sigmoid;, score=0.146 total
time=   1.8s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.200 total time=
2.4s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.148 total time=
2.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=rbf;, score=0.121 total time=
2.2s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.831 total time=
1.1s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.813 total time=
1.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=linear;, score=0.819 total time=
1.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.820 total time=
0.9s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.803 total time=
0.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=poly;, score=0.793 total time=
0.9s
[CV 1/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.173 total
time=   1.9s
[CV 2/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.135 total
time=   1.9s
[CV 3/3] END C=0.2, degree=2, gamma=0.1, kernel=sigmoid;, score=0.111 total
time=   1.9s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.466 total time=
2.0s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.494 total time=
2.0s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=rbf;, score=0.435 total time=
2.0s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.831 total
time=   1.2s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.813 total
```

```
time=   1.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.789 total time=
1.1s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.787 total time=
1.0s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=poly;, score=0.747 total time=
1.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.216 total
time=   1.8s
[CV 2/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.193 total
time=   1.8s
[CV 3/3] END C=0.2, degree=2, gamma=0.01, kernel=sigmoid;, score=0.158 total
time=   1.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.393 total time=
2.3s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.400 total time=
2.1s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=rbf;, score=0.350 total time=
2.2s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.813 total
time=   1.2s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.360 total time=
1.9s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.343 total time=
1.8s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=poly;, score=0.345 total time=
1.7s
[CV 1/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.7s
[CV 2/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.078 total
time=   1.5s
[CV 3/3] END C=0.2, degree=2, gamma=0.001, kernel=sigmoid;, score=0.124 total
time=   1.6s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.279 total time=
2.2s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.254 total time=
2.0s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=rbf;, score=0.299 total time=
2.1s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.813 total
```

```
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.245 total time=
1.7s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.239 total time=
1.8s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=poly;, score=0.233 total time=
1.7s
[CV 1/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.104 total
time=   1.7s
[CV 2/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.122 total
time=   1.7s
[CV 3/3] END C=0.2, degree=3, gamma=scale, kernel=sigmoid;, score=0.149 total
time=   1.8s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.281 total time=
2.3s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.254 total time=
1.9s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=rbf;, score=0.300 total time=
2.1s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.813 total
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.245 total time=
1.7s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.233 total time=
1.8s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=poly;, score=0.232 total time=
1.8s
[CV 1/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.105 total
time=   1.7s
[CV 2/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.120 total
time=   1.8s
[CV 3/3] END C=0.2, degree=3, gamma=auto, kernel=sigmoid;, score=0.146 total
time=   1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.200 total time=
2.4s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.148 total time=
2.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=rbf;, score=0.121 total time=
2.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.831 total time=
1.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.813 total time=
```

```
1.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=linear;, score=0.819 total time=
1.1s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.778 total time=
0.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.768 total time=
0.7s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=poly;, score=0.761 total time=
0.7s
[CV 1/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.173 total
time=   1.9s
[CV 2/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.135 total
time=   1.9s
[CV 3/3] END C=0.2, degree=3, gamma=0.1, kernel=sigmoid;, score=0.111 total
time=   1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.466 total time=
2.0s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.494 total time=
2.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=rbf;, score=0.435 total time=
1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.813 total
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=linear;, score=0.819 total
time=   1.2s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.730 total time=
0.9s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.690 total time=
0.8s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=poly;, score=0.715 total time=
0.9s
[CV 1/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.216 total
time=   1.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.193 total
time=   1.7s
[CV 3/3] END C=0.2, degree=3, gamma=0.01, kernel=sigmoid;, score=0.158 total
time=   1.8s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.393 total time=
2.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.400 total time=
1.9s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=rbf;, score=0.350 total time=
2.0s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.813 total
```

```
time=   1.1s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.446 total time=
1.6s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.392 total time=
1.5s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=poly;, score=0.423 total time=
1.6s
[CV 1/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.5s
[CV 2/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.078 total
time=   1.5s
[CV 3/3] END C=0.2, degree=3, gamma=0.001, kernel=sigmoid;, score=0.124 total
time=   1.6s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.279 total time=
2.1s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.254 total time=
2.4s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=rbf;, score=0.299 total time=
2.1s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.831 total
time=   1.2s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.813 total
time=   1.2s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.252 total time=
1.7s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.279 total time=
1.7s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=poly;, score=0.234 total time=
1.8s
[CV 1/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.104 total
time=   1.7s
[CV 2/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.122 total
time=   1.7s
[CV 3/3] END C=0.2, degree=4, gamma=scale, kernel=sigmoid;, score=0.149 total
time=   1.9s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.281 total time=
2.1s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.254 total time=
2.0s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=rbf;, score=0.300 total time=
2.0s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.831 total
time=   1.2s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.813 total
```

```
time=   1.2s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.251 total time=
1.7s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.272 total time=
1.7s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=poly;, score=0.238 total time=
1.9s
[CV 1/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.105 total
time=   1.7s
[CV 2/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.120 total
time=   1.7s
[CV 3/3] END C=0.2, degree=4, gamma=auto, kernel=sigmoid;, score=0.146 total
time=   1.9s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.200 total time=
2.3s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.148 total time=
2.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=rbf;, score=0.121 total time=
2.2s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.831 total time=
1.1s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.813 total time=
1.1s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=linear;, score=0.819 total time=
1.1s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.758 total time=
0.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.744 total time=
0.5s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=poly;, score=0.717 total time=
0.5s
[CV 1/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.173 total
time=   1.8s
[CV 2/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.135 total
time=   1.9s
[CV 3/3] END C=0.2, degree=4, gamma=0.1, kernel=sigmoid;, score=0.111 total
time=   1.8s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.466 total time=
2.0s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.494 total time=
1.9s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=rbf;, score=0.435 total time=
2.0s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.831 total
time=   1.2s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.813 total
```

```
time=   1.3s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=linear;, score=0.819 total
time=   1.1s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.624 total time=
0.8s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.645 total time=
0.8s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=poly;, score=0.679 total time=
0.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.216 total
time=   1.7s
[CV 2/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.193 total
time=   1.6s
[CV 3/3] END C=0.2, degree=4, gamma=0.01, kernel=sigmoid;, score=0.158 total
time=   1.7s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.393 total time=
2.1s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.400 total time=
2.0s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=rbf;, score=0.350 total time=
2.2s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.831 total
time=   1.1s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.813 total
time=   1.1s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=linear;, score=0.819 total
time=   1.0s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.473 total time=
1.6s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.420 total time=
1.4s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=poly;, score=0.476 total time=
1.5s
[CV 1/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.5s
[CV 2/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.078 total
time=   1.5s
[CV 3/3] END C=0.2, degree=4, gamma=0.001, kernel=sigmoid;, score=0.124 total
time=   1.7s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.376 total time=
2.2s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.381 total time=
2.1s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=rbf;, score=0.338 total time=
1.9s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.816 total
```

```
time=   1.2s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.239 total time=
1.8s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.214 total time=
1.7s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=poly;, score=0.233 total time=
1.7s
[CV 1/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.144 total
time=   1.7s
[CV 2/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.115 total
time=   1.7s
[CV 3/3] END C=0.3, degree=2, gamma=scale, kernel=sigmoid;, score=0.202 total
time=   1.6s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.364 total time=
2.1s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.370 total time=
2.1s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=rbf;, score=0.332 total time=
2.0s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.816 total
time=   1.2s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.235 total time=
1.7s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.208 total time=
1.8s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=poly;, score=0.231 total time=
1.9s
[CV 1/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.153 total
time=   1.7s
[CV 2/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.115 total
time=   1.7s
[CV 3/3] END C=0.3, degree=2, gamma=auto, kernel=sigmoid;, score=0.203 total
time=   1.6s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.218 total time=
2.2s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.151 total time=
2.2s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=rbf;, score=0.181 total time=
2.2s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.827 total time=
1.1s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.816 total time=
```

```
1.8s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=linear;, score=0.806 total time=
1.1s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.820 total time=
0.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.803 total time=
0.8s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=poly;, score=0.793 total time=
0.9s
[CV 1/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.188 total
time=   1.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.146 total
time=   1.7s
[CV 3/3] END C=0.3, degree=2, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   2.2s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.510 total time=
1.9s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.523 total time=
2.0s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=rbf;, score=0.466 total time=
1.9s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.816 total
time=   1.1s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.813 total time=
1.1s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.800 total time=
0.9s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=poly;, score=0.747 total time=
0.9s
[CV 1/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.213 total
time=   1.7s
[CV 2/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.184 total
time=   1.7s
[CV 3/3] END C=0.3, degree=2, gamma=0.01, kernel=sigmoid;, score=0.167 total
time=   1.7s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.473 total time=
2.0s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.449 total time=
2.1s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=rbf;, score=0.403 total time=
1.9s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.816 total
```

```
time=   1.3s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.414 total time=
1.7s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.442 total time=
1.8s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=poly;, score=0.442 total time=
1.8s
[CV 1/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.093 total
time=   1.5s
[CV 2/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.074 total
time=   1.4s
[CV 3/3] END C=0.3, degree=2, gamma=0.001, kernel=sigmoid;, score=0.164 total
time=   1.5s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.376 total time=
2.1s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.381 total time=
2.2s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=rbf;, score=0.338 total time=
2.1s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.816 total
time=   1.3s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.255 total time=
1.8s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.270 total time=
1.7s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=poly;, score=0.242 total time=
1.8s
[CV 1/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.144 total
time=   1.6s
[CV 2/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.115 total
time=   1.7s
[CV 3/3] END C=0.3, degree=3, gamma=scale, kernel=sigmoid;, score=0.202 total
time=   1.8s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.364 total time=
2.1s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.370 total time=
2.0s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=rbf;, score=0.332 total time=
2.0s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.816 total
```

```
time=   1.2s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=linear;, score=0.806 total
time=   1.2s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.252 total time=
1.7s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.249 total time=
1.7s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=poly;, score=0.239 total time=
1.8s
[CV 1/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.153 total
time=   1.6s
[CV 2/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.115 total
time=   1.7s
[CV 3/3] END C=0.3, degree=3, gamma=auto, kernel=sigmoid;, score=0.203 total
time=   1.7s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.218 total time=
2.3s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.151 total time=
2.2s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=rbf;, score=0.181 total time=
2.2s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.827 total time=
1.1s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.816 total time=
1.2s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=linear;, score=0.806 total time=
1.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.778 total time=
0.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.768 total time=
0.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=poly;, score=0.761 total time=
0.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.188 total
time=   1.9s
[CV 2/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.146 total
time=   1.9s
[CV 3/3] END C=0.3, degree=3, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   1.9s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.510 total time=
2.0s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.523 total time=
2.1s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=rbf;, score=0.466 total time=
2.0s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.3s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.816 total
```

```
time=   1.1s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.740 total time=
0.8s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.731 total time=
0.8s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=poly;, score=0.724 total time=
0.9s
[CV 1/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.213 total
time=   1.7s
[CV 2/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.184 total
time=   1.7s
[CV 3/3] END C=0.3, degree=3, gamma=0.01, kernel=sigmoid;, score=0.167 total
time=   1.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.473 total time=
2.1s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.449 total time=
2.1s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=rbf;, score=0.403 total time=
2.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.816 total
time=   1.4s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.493 total time=
1.6s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.433 total time=
1.6s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=poly;, score=0.476 total time=
1.6s
[CV 1/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.093 total
time=   1.5s
[CV 2/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.074 total
time=   1.4s
[CV 3/3] END C=0.3, degree=3, gamma=0.001, kernel=sigmoid;, score=0.164 total
time=   1.3s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.376 total time=
2.2s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.381 total time=
2.0s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=rbf;, score=0.338 total time=
2.0s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.816 total
```

```
time=   1.2s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.288 total time=
1.7s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.301 total time=
1.7s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=poly;, score=0.247 total time=
1.7s
[CV 1/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.144 total
time=   1.7s
[CV 2/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.115 total
time=   1.6s
[CV 3/3] END C=0.3, degree=4, gamma=scale, kernel=sigmoid;, score=0.202 total
time=   1.7s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.364 total time=
2.1s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.370 total time=
2.0s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=rbf;, score=0.332 total time=
2.0s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.816 total
time=   1.1s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=linear;, score=0.806 total
time=   1.2s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.274 total time=
1.8s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.295 total time=
1.8s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=poly;, score=0.229 total time=
1.7s
[CV 1/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.153 total
time=   1.7s
[CV 2/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.115 total
time=   1.6s
[CV 3/3] END C=0.3, degree=4, gamma=auto, kernel=sigmoid;, score=0.203 total
time=   1.7s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.218 total time=
2.2s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.151 total time=
2.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=rbf;, score=0.181 total time=
2.3s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.827 total time=
1.3s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.816 total time=
```

```
1.1s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=linear;, score=0.806 total time=
1.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.758 total time=
0.5s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.744 total time=
0.5s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=poly;, score=0.717 total time=
0.6s
[CV 1/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.188 total
time=   1.9s
[CV 2/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.146 total
time=   1.9s
[CV 3/3] END C=0.3, degree=4, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   1.8s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.510 total time=
1.9s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.523 total time=
2.0s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=rbf;, score=0.466 total time=
1.9s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.816 total
time=   1.1s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.630 total time=
0.8s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.631 total time=
0.8s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=poly;, score=0.681 total time=
0.7s
[CV 1/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.213 total
time=   1.7s
[CV 2/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.184 total
time=   1.6s
[CV 3/3] END C=0.3, degree=4, gamma=0.01, kernel=sigmoid;, score=0.167 total
time=   1.7s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.473 total time=
2.0s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.449 total time=
2.0s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=rbf;, score=0.403 total time=
2.0s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.816 total
```

```
time=   1.1s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.2s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.503 total time=
1.4s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.457 total time=
1.5s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=poly;, score=0.508 total time=
1.4s
[CV 1/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.093 total
time=   1.5s
[CV 2/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.074 total
time=   1.4s
[CV 3/3] END C=0.3, degree=4, gamma=0.001, kernel=sigmoid;, score=0.164 total
time=   1.4s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.448 total time=
2.3s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.427 total time=
2.1s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=rbf;, score=0.389 total time=
2.0s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.812 total
time=   1.1s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.254 total time=
1.8s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.246 total time=
1.7s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=poly;, score=0.252 total time=
1.7s
[CV 1/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.152 total
time=   1.7s
[CV 2/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.106 total
time=   1.5s
[CV 3/3] END C=0.4, degree=2, gamma=scale, kernel=sigmoid;, score=0.134 total
time=   1.5s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.449 total time=
2.1s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.426 total time=
2.0s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=rbf;, score=0.385 total time=
1.9s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.812 total
```

```
time=   1.1s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.253 total time=
1.8s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.228 total time=
1.8s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=poly;, score=0.242 total time=
1.8s
[CV 1/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.150 total
time=   1.6s
[CV 2/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.108 total
time=   1.7s
[CV 3/3] END C=0.4, degree=2, gamma=auto, kernel=sigmoid;, score=0.137 total
time=   1.5s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.225 total time=
2.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.309 total time=
2.2s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=rbf;, score=0.215 total time=
2.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.827 total time=
1.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.812 total time=
1.2s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=linear;, score=0.806 total time=
1.0s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.820 total time=
0.9s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.803 total time=
0.8s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=poly;, score=0.793 total time=
0.9s
[CV 1/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.191 total
time=   1.9s
[CV 2/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.149 total
time=   1.8s
[CV 3/3] END C=0.4, degree=2, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   1.9s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.543 total time=
1.8s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.554 total time=
2.1s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=rbf;, score=0.514 total time=
2.1s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.812 total
```

```
time=   1.2s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.2s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.816 total time=
1.0s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.796 total time=
0.9s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=poly;, score=0.766 total time=
0.9s
[CV 1/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.217 total
time=   1.6s
[CV 2/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.214 total
time=   1.7s
[CV 3/3] END C=0.4, degree=2, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.7s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.508 total time=
2.0s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.504 total time=
2.1s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=rbf;, score=0.446 total time=
2.0s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.812 total
time=   1.3s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.472 total time=
1.8s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.455 total time=
1.6s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=poly;, score=0.475 total time=
1.8s
[CV 1/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.4s
[CV 2/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.077 total
time=   1.4s
[CV 3/3] END C=0.4, degree=2, gamma=0.001, kernel=sigmoid;, score=0.178 total
time=   1.3s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.448 total time=
2.0s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.427 total time=
2.0s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=rbf;, score=0.389 total time=
1.9s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.812 total
```

```
time=   1.1s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=linear;, score=0.806 total
time=   1.2s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.281 total time=
1.8s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.300 total time=
1.7s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=poly;, score=0.252 total time=
1.9s
[CV 1/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.152 total
time=   1.6s
[CV 2/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.106 total
time=   1.6s
[CV 3/3] END C=0.4, degree=3, gamma=scale, kernel=sigmoid;, score=0.134 total
time=   1.6s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.449 total time=
2.0s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.426 total time=
2.0s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=rbf;, score=0.385 total time=
2.2s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.812 total
time=   1.2s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=linear;, score=0.806 total
time=   1.0s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.275 total time=
2.0s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.282 total time=
1.8s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=poly;, score=0.252 total time=
1.7s
[CV 1/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.150 total
time=   1.7s
[CV 2/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.108 total
time=   1.6s
[CV 3/3] END C=0.4, degree=3, gamma=auto, kernel=sigmoid;, score=0.137 total
time=   1.5s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.225 total time=
2.4s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.309 total time=
2.4s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=rbf;, score=0.215 total time=
2.4s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.827 total time=
1.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.812 total time=
```

```
1.1s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=linear;, score=0.806 total time=
1.2s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.778 total time=
0.7s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.768 total time=
0.8s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=poly;, score=0.761 total time=
0.7s
[CV 1/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.191 total
time=   2.0s
[CV 2/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.149 total
time=   2.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   1.9s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.543 total time=
1.9s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.554 total time=
2.0s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=rbf;, score=0.514 total time=
1.9s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.812 total
time=   1.2s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.745 total time=
0.8s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.755 total time=
0.8s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=poly;, score=0.736 total time=
0.8s
[CV 1/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.217 total
time=   1.7s
[CV 2/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.214 total
time=   1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.508 total time=
2.0s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.504 total time=
1.9s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=rbf;, score=0.446 total time=
2.0s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.2s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.812 total
```

```
time=   1.1s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.499 total time=
1.7s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.458 total time=
1.6s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=poly;, score=0.515 total time=
1.6s
[CV 1/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.5s
[CV 2/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.077 total
time=   1.4s
[CV 3/3] END C=0.4, degree=3, gamma=0.001, kernel=sigmoid;, score=0.178 total
time=   1.3s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.448 total time=
2.3s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.427 total time=
2.0s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=rbf;, score=0.389 total time=
1.9s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.812 total
time=   1.2s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.315 total time=
1.7s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.322 total time=
1.8s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=poly;, score=0.277 total time=
1.7s
[CV 1/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.152 total
time=   1.6s
[CV 2/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.106 total
time=   1.6s
[CV 3/3] END C=0.4, degree=4, gamma=scale, kernel=sigmoid;, score=0.134 total
time=   1.5s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.449 total time=
2.0s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.426 total time=
2.1s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=rbf;, score=0.385 total time=
2.1s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.812 total
```

```
time=   1.2s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.298 total time=
1.7s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.315 total time=
1.7s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=poly;, score=0.266 total time=
1.6s
[CV 1/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.150 total
time=   1.6s
[CV 2/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.108 total
time=   1.5s
[CV 3/3] END C=0.4, degree=4, gamma=auto, kernel=sigmoid;, score=0.137 total
time=   1.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.225 total time=
2.2s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.309 total time=
2.2s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=rbf;, score=0.215 total time=
2.3s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.827 total time=
1.2s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.812 total time=
1.2s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=linear;, score=0.806 total time=
1.1s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.758 total time=
0.5s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.744 total time=
0.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=poly;, score=0.717 total time=
0.5s
[CV 1/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.191 total
time=   1.9s
[CV 2/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.149 total
time=   2.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.1, kernel=sigmoid;, score=0.114 total
time=   1.7s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.543 total time=
1.9s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.554 total time=
2.0s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=rbf;, score=0.514 total time=
1.9s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.827 total
time=   1.3s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.812 total
```

```
time=   1.2s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.654 total time=
0.7s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.638 total time=
0.8s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=poly;, score=0.708 total time=
0.7s
[CV 1/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.217 total
time=   1.5s
[CV 2/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.214 total
time=   1.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.01, kernel=sigmoid;, score=0.212 total
time=   1.6s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.508 total time=
2.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.504 total time=
1.9s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=rbf;, score=0.446 total time=
1.9s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.827 total
time=   1.1s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.812 total
time=   1.1s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=linear;, score=0.806 total
time=   1.1s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.527 total time=
1.4s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.485 total time=
1.4s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=poly;, score=0.525 total time=
1.4s
[CV 1/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.094 total
time=   1.4s
[CV 2/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.077 total
time=   1.5s
[CV 3/3] END C=0.4, degree=4, gamma=0.001, kernel=sigmoid;, score=0.178 total
time=   1.3s

 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': 0.2, 'degree': 2, 'gamma': 'scale', 'kernel': 'linear'}
```

```
['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)
```

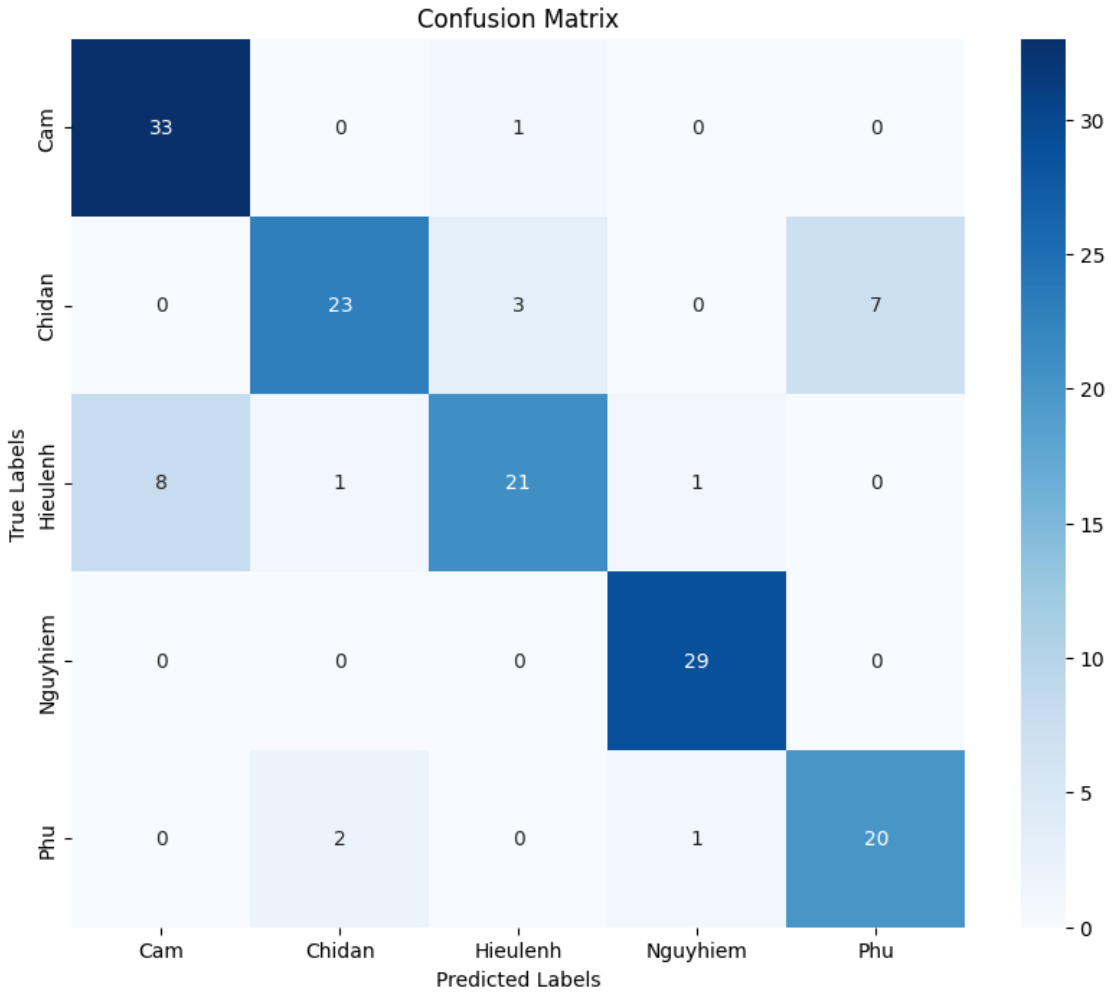
```
              precision    recall  f1-score   support

         Cam       0.80      0.97      0.88        34
      Chidan       0.88      0.70      0.78        33
    Hieulenh       0.84      0.68      0.75        31
    Nguyhiem       0.94      1.00      0.97        29
         Phu       0.74      0.87      0.80        23

    accuracy                           0.84       150
   macro avg       0.84      0.84      0.84       150
weighted avg       0.85      0.84      0.84       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)
```

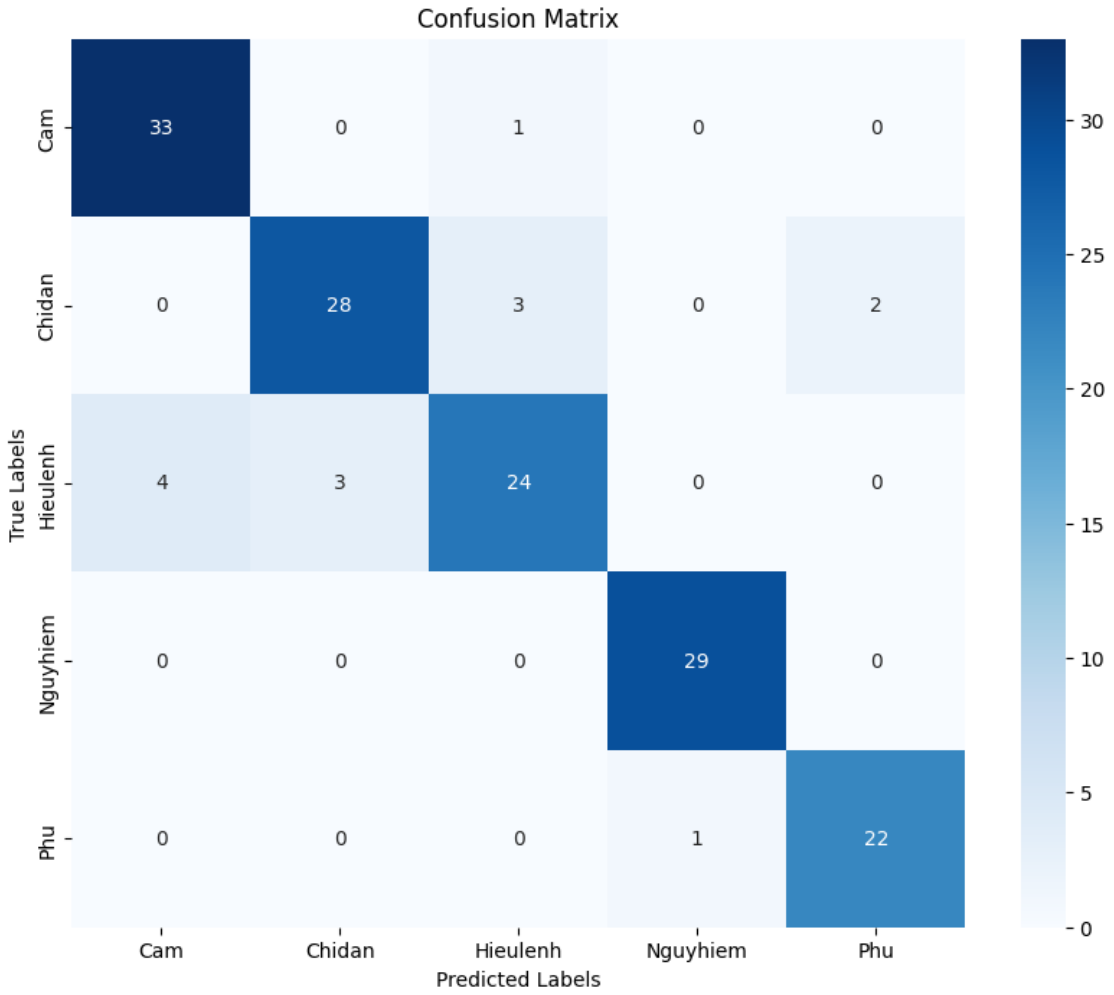
```
              precision    recall  f1-score   support

         Cam       0.89      0.97      0.93        34
      Chidan       0.90      0.85      0.88        33
    Hieulenh       0.86      0.77      0.81        31
    Nguyhiem       0.97      1.00      0.98        29
         Phu       0.92      0.96      0.94        23

    accuracy                           0.91       150
   macro avg       0.91      0.91      0.91       150
weighted avg       0.91      0.91      0.90       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)
```