```
from sklearn.datasets import make_classification
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
import numpy as np
import collections
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score
import random
```

```
x,y = make_classification(n_samples=10000, n_features=2,
n_informative=2, n_redundant= 0, n_clusters_per_class=1,
random_state=60)
X_train, X_test, y_train, y_test = train_test_split(x,y,test_size
=0.25,stratify=y,random_state=42,)
```

```
standard=StandardScaler()
X_train=standard.fit_transform(X_train)
X_test=standard.transform(X_test)
```

```
X_train.shape,X_test.shape
```

```
((7500, 2), (2500, 2))
```

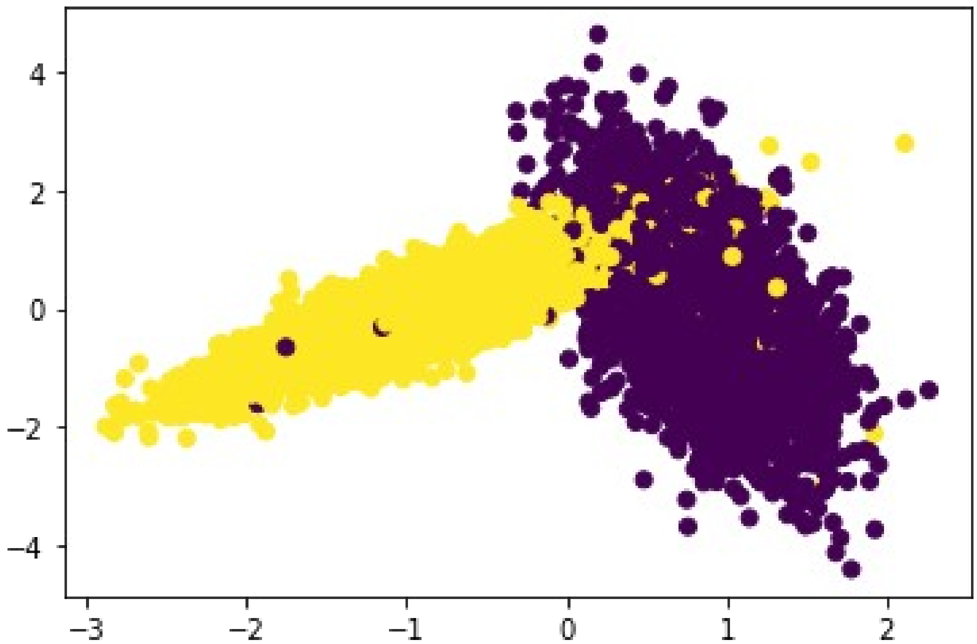
```
print("Number of classes {}".format(np.unique(y_train)))
```

```
Number of classes [0 1]
```

```
for k,v in collections.Counter(y_train).items():
  print("class {1} has {0} data points".format(v,k))
```

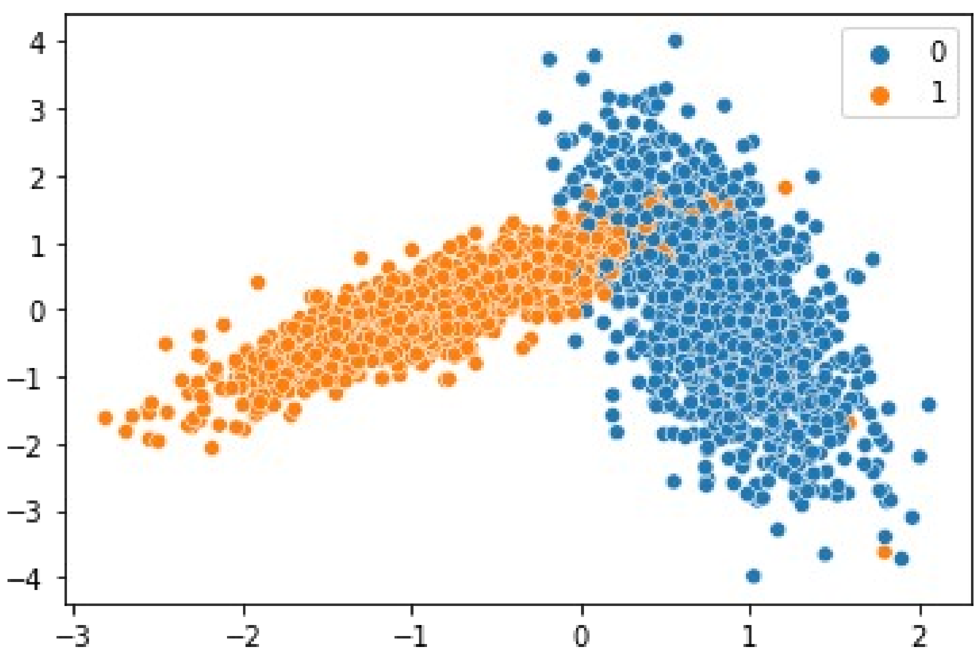
```
class 0 has 3740 data points
class 1 has 3760 data points
```

```
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
plt.scatter(X_train[:,0], X_train[:,1],c=y_train)
plt.show()
```




```
sns.scatterplot(X_test[:,0], X_test[:,1],hue=y_test)
plt.show()
```

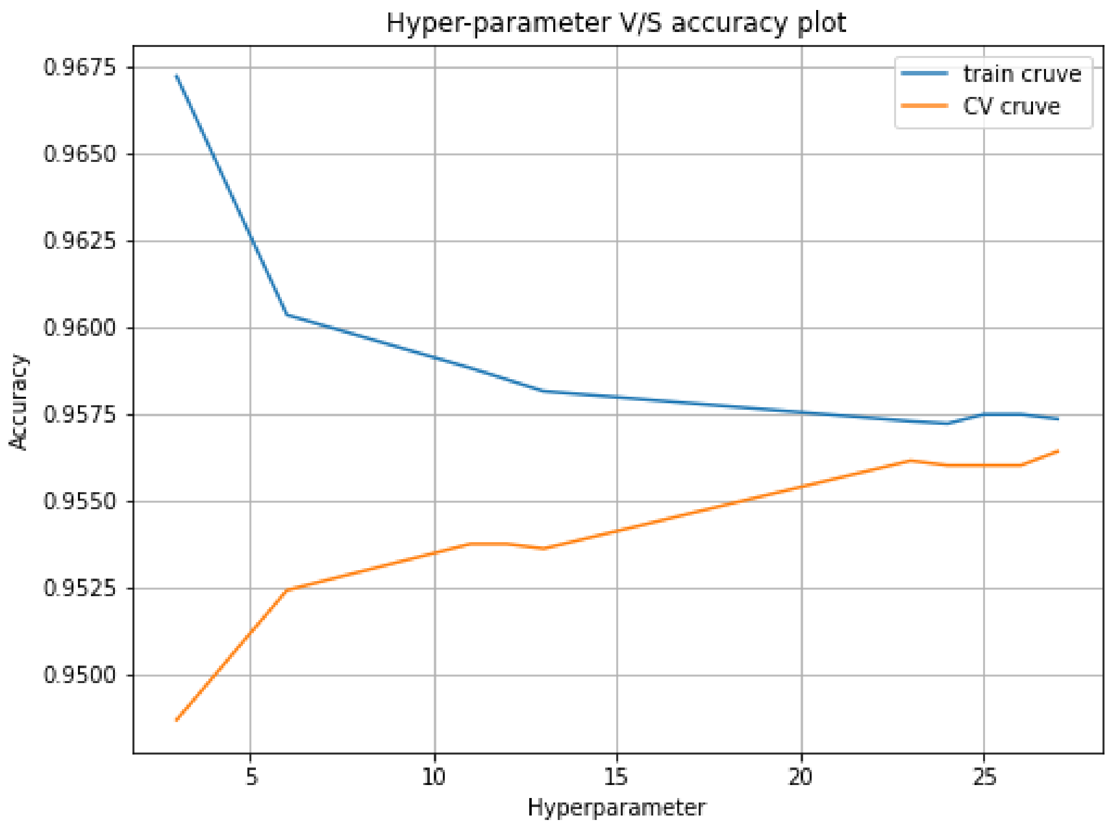
```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43:
FutureWarning: Pass the following variables as keyword args: x, y.
From version 0.12, the only valid positional argument will be `data`,
and passing other arguments without an explicit keyword will result in
an error or misinterpretation.
  FutureWarning
```



Implementing Custom RandomSearchCV

```
def params_gen(t):
  A=random.sample(range(t[0],t[1]),10)
  #print(sorted(A))
  return sorted(A)

def RandomSearchCV(X,Y,knn, param_range, folds):
  params=params_gen(param_range)
  CV=[]
  train=[]
  for p in params:
    cv_accuracies=[]
    train_accuracies=[]
    for f in range(0,folds):
      start_idx=round(len(X)/folds)*(f)
      end_idx=round((len(X)/folds)*(f+1))-1
      #-----------------------------------------------------------
      cv_indices=set(np.arange(start_idx,end_idx+1))
      train_indices=list(set(np.arange(0,len(X)))-cv_indices)
      cv_indices=list(cv_indices)
      #-----------------------------------------------------------
      knn.n_neighbors=p
      knn.fit(X[train_indices],Y[train_indices])
      #----------predicting train points-----------------------------
      y_train_pred=knn.predict(X[train_indices])
      #------------------predicting test points--------------------
      y_cv_pred=knn.predict(X[cv_indices])

      #--------AUC scores-----------------------------------------
      cv_accuracies.append(accuracy_score(Y[cv_indices],y_cv_pred))

train_accuracies.append(accuracy_score(Y[train_indices],y_train_pred))

    CV.append(np.mean(cv_accuracies))
    train.append(np.mean(train_accuracies))
  return train,CV,params

cll=KNeighborsClassifier()
folds=3
param_range=(1,30)
train_auc,cv_score,params=RandomSearchCV(X_train,y_train,cll,
param_range, folds)

plt.figure(figsize=(8,6))
plt.plot(params,train_auc, label='train cruve')
plt.plot(params,cv_score, label='CV cruve')
plt.title('Hyper-parameter V/S accuracy plot')
plt.legend()
plt.xlabel("Hyperparameter")
plt.ylabel("Accuracy")
```

```
plt.grid()
plt.show()
#print(params)
```




```
#params,cv_score

cll.n_neighbors=23
cll.fit(X_train,y_train)
y_pred=cll.predict(X_test)
test_AUC=accuracy_score(y_test,y_pred)
print("Accuracy on test data "+str(test_AUC*100))

Auccuracy on test data 96.8
```

#Compairing with sklearn's implementation

```
from sklearn.model_selection import RandomizedSearchCV

p= {'n_neighbors':[3, 6, 11, 12, 13, 23, 24, 25, 26, 27]}

obj=KNeighborsClassifier()
R_CV=RandomizedSearchCV(obj, param_distributions=p,cv=3)
R_CV.fit(X_train,y_train)

RandomizedSearchCV(cv=3, estimator=KNeighborsClassifier(),
                   param_distributions={'n_neighbors': [3, 6, 11, 12,
13, 23,
```

```
                                                        24, 25, 26,
27]})
```

```
R_CV.best_estimator_, R_CV.best_params_, R_CV.best_score_
```

```
(KNeighborsClassifier(n_neighbors=23), {'n_neighbors': 23},
0.9561333333333333)
```

```
R_CV.best_index_
```

```
5
```

```
# Our custom implemetation of Random Search CV is matching with
sklearn's implementation.
params[5], cv_score[5]
```

```
(23, 0.9561333333333333)
```