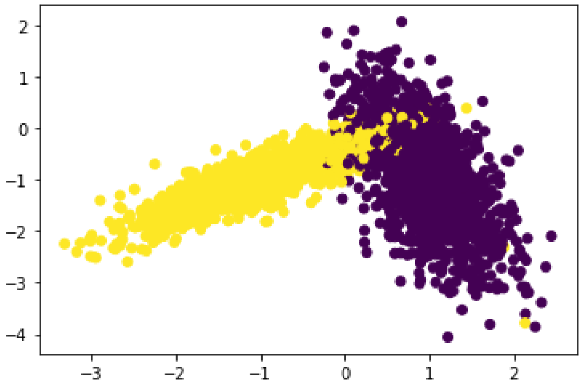
In [1]:

```
from sklearn.datasets import make_classification
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
import numpy
from tqdm import tqdm
import numpy as np
from sklearn.metrics.pairwise import euclidean_distances


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,stratify=y,random_state=42)

# del X_train,X_test
```

In [2]:

```
%matplotlib inline
import matplotlib.pyplot as plt
#colors = {0:'orange', 1:'blue'}
plt.scatter(X_test[:,0], X_test[:,1],c=y_test)
plt.show()
```



Implementing Custom GridSearchCV

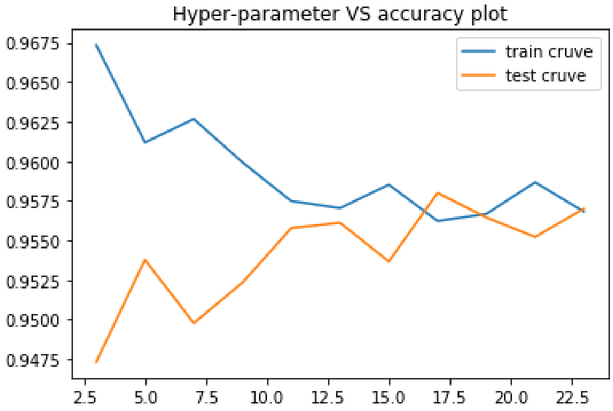
In [3]:

```
# it will take classifier and set of values for hyper prameter in dict type dict({hyper parmeter:
[list of values]})
# we are implementing this only for KNN, the hyper parameter should n_neighbors
from sklearn.metrics import accuracy_score
def randomly_select_60_percent_indices_in_range_from_1_to_len(x_train):
    return random.sample(range(0, len(x_train)), int(0.6*len(x_train)))

def GridSearch(x_train,y_train,classifier, params, folds):
    trainscores = []
    testscores  = []
    for k in tqdm(params['n_neighbors']):
        trainscores_folds = []
        testscores_folds  = []
        for j in range(0, folds):
            # check this out: https://stackoverflow.com/a/9755548/4084039
            train_indices = randomly_select_60_percent_indices_in_range_from_1_to_len(x_train)
            test_indices  = list(set(list(range(1, len(x_train)))) - set(train_indices))

            # selecting the data points based on the train_indices and test_indices
            X_train = x_train[train_indices]
            Y_train = y_train[train_indices]
            X_test  = x_train[test_indices]
            Y_test  = y_train[test_indices]

            classifier.n_neighbors = k
            classifier.fit(X_train,Y_train)

            Y_predicted = classifier.predict(X_test)
            testscores_folds.append(accuracy_score(Y_test, Y_predicted))

            Y_predicted = classifier.predict(X_train)
            trainscores_folds.append(accuracy_score(Y_train, Y_predicted))
        trainscores.append(np.mean(np.array(trainscores_folds)))
        testscores.append(np.mean(np.array(testscores_folds)))
    return trainscores,testscores
```

In [4]:

```
from sklearn.metrics import accuracy_score
from sklearn.neighbors import KNeighborsClassifier
import matplotlib.pyplot as plt
import random
import warnings
warnings.filterwarnings("ignore")


neigh = KNeighborsClassifier()

params = {'n_neighbors':[3,5,7,9,11,13,15,17,19,21,23]}
folds = 3

trainscores,testscores = GridSearch(X_train, y_train, neigh, params, folds)


plt.plot(params['n_neighbors'],trainscores, label='train cruve')
plt.plot(params['n_neighbors'],testscores, label='test cruve')
plt.title('Hyper-parameter VS accuracy plot')
plt.legend()
plt.show()
print(trainscores)
print(testscores)
```

```
100%|██████████████████████████████████████████| 11/11 [00:13<00:00,  1.31s/it]
```



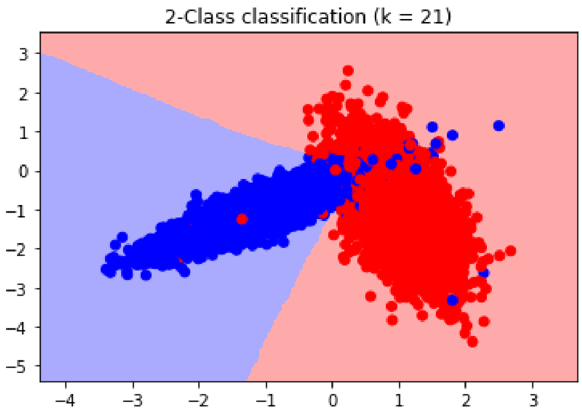
```
[0.9673333333333334, 0.9611851851851853, 0.9626666666666667, 0.959925925925926,
0.9574814814814815, 0.957037037037037, 0.9585185185185185, 0.9562222222222222, 0.9566666666666667,
0.9586666666666667, 0.9568148148148148]
[0.9473212922826127, 0.9537727020117815, 0.9497664036160202, 0.9523333333333334,
0.9557727390611687, 0.9561111111111111, 0.9536666666666666, 0.9579954429254197, 0.9564444444444443,
0.9552123670853248, 0.957]
```

In [5]:

```
# understanding this code line by line is not that importent
def plot_decision_boundary(X1, X2, y, clf):
        # Create color maps
    cmap_light = ListedColormap(['#FFAAAA', '#AAFFAA', '#AAAAFF'])
    cmap_bold = ListedColormap(['#FF0000', '#00FF00', '#0000FF'])

    x_min, x_max = X1.min() - 1, X1.max() + 1
    y_min, y_max = X2.min() - 1, X2.max() + 1
    xx, yy = np.meshgrid(np.arange(x_min, x_max, 0.02), np.arange(y_min, y_max, 0.02))
    Z = clf.predict(np.c_[xx.ravel(), yy.ravel()])
    Z = Z.reshape(xx.shape)

    plt.figure()
    plt.pcolormesh(xx, yy, Z, cmap=cmap_light)
    # Plot also the training points
    plt.scatter(X1, X2, c=y, cmap=cmap_bold)

    plt.xlim(xx.min(), xx.max())
    plt.ylim(yy.min(), yy.max())
    plt.title("2-Class classification (k = %i)" % (clf.n_neighbors))
    plt.show()
```

In [6]:

```
from matplotlib.colors import ListedColormap
neigh = KNeighborsClassifier(n_neighbors = 21)
neigh.fit(X_train, y_train)
plot_decision_boundary(X_train[:, 0], X_train[:, 1], y_train, neigh)
```



In [ ]: