```
import numpy as np
from scipy import stats
import matplotlib.pyplot as plt
import matplotlib.font_manager
from pyod.models.knn import KNN
from pyod.utils.data import generate_data, get_outliers_inliers
```

```
pip install pyod
```

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```

```
# generating a random dataset with two features
X_train, y_train = generate_data(n_train = 300, train_only = True,
            n_features = 2)

# Setting the percentage of outliers
outlier_fraction = 0.1

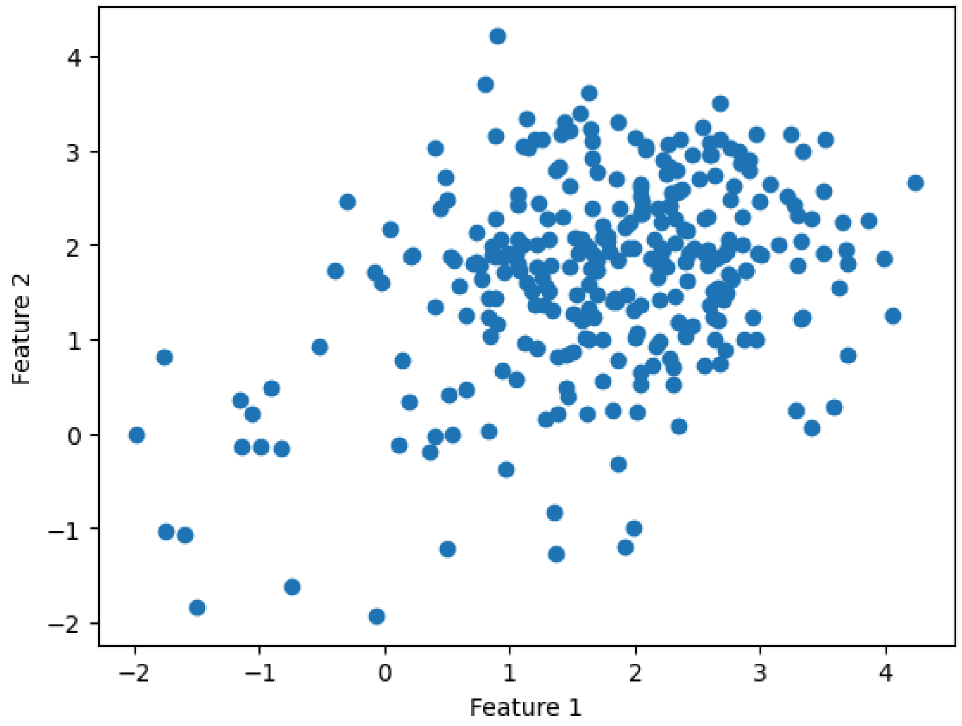
# Storing the outliers and inliners in different numpy arrays
X_outliers, X_inliers = get_outliers_inliers(X_train, y_train)
n_inliers = len(X_inliers)
n_outliers = len(X_outliers)

# Separating the two features
f1 = X_train[:, [0]].reshape(-1, 1)
f2 = X_train[:, [1]].reshape(-1, 1)
```

```
  # Visualising the dataset
  # create a meshgrid
  xx, yy = np.meshgrid(np.linspace(-10, 10, 200),
       np.linspace(-10, 10, 200))

  # scatter plot
  plt.scatter(f1, f2)
  plt.xlabel('Feature 1')
  plt.ylabel('Feature 2')
```

```
Text(0, 0.5, 'Feature 2')
```



```
# Training the classifier
clf = KNN(contamination = outlier_fraction)
clf.fit(X_train, y_train)

# You can print this to see all the prediction scores
scores_pred = clf.decision_function(X_train)*-1

y_pred = clf.predict(X_train)
n_errors = (y_pred != y_train).sum()
# Counting the number of errors

print('The number of prediction errors are ' + str(n_errors))
```

```
The number of prediction errors are 26
/usr/local/lib/python3.10/dist-packages/pyod/models/base.py:430: UserWarning: y should not be
  warnings.warn(
```

```
# threshold value to consider a
# datapoint inlier or outlier
threshold = stats.scoreatpercentile(scores_pred, 100 * outlier_fraction)

# decision function calculates the raw
# anomaly score for every point
Z = clf.decision_function(np.c_[xx.ravel(), yy.ravel()]) * -1
Z = Z.reshape(xx.shape)

# fill blue colormap from minimum anomaly
# score to threshold value
subplot = plt.subplot(1, 2, 1)
subplot.contourf(xx, yy, Z, levels = np.linspace(Z.min(),
    threshold, 10), cmap = plt.cm.Blues_r)

# draw red contour line where anomaly
# score is equal to threshold
```

```
a = subplot.contour(xx, yy, Z, levels =[threshold],
     linewidths = 2, colors ='red')

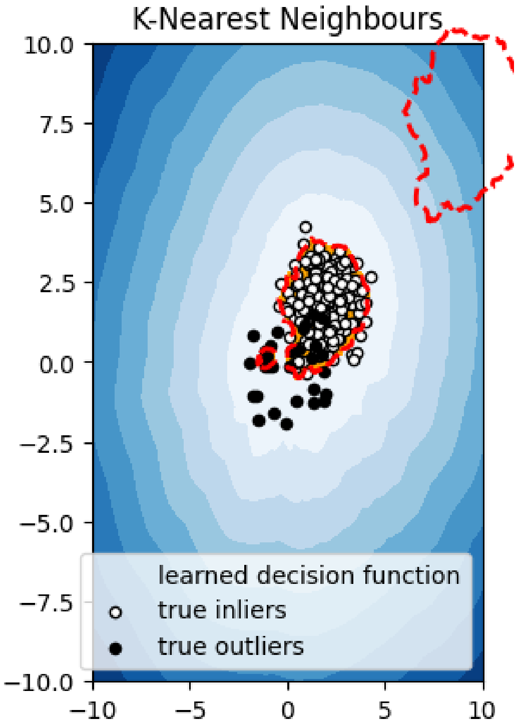
# fill orange contour lines where range of anomaly
# score is from threshold to maximum anomaly score
subplot.contourf(xx, yy, Z, levels =[threshold, Z.max()], colors ='orange')

# scatter plot of inliers with white dots
b = subplot.scatter(X_train[:-n_outliers, 0], X_train[:-n_outliers, 1],
         c ='white', s = 20, edgecolor ='k')

# scatter plot of outliers with black dots
c = subplot.scatter(X_train[-n_outliers:, 0], X_train[-n_outliers:, 1],
         c ='black', s = 20, edgecolor ='k')
subplot.axis('tight')

subplot.legend(
 [a.collections[0], b, c],
 ['learned decision function', 'true inliers', 'true outliers'],
 prop = matplotlib.font_manager.FontProperties(size = 10),
 loc ='lower right')

subplot.set_title('K-Nearest Neighbours')
subplot.set_xlim((-10, 10))
subplot.set_ylim((-10, 10))
plt.show()
```


K-Nearest Neighbours
learned decision function
○ true inliers
● true outliers