outliers_part_one

January 20, 2019

In [1]:
```
# outliers values (one dimension)
from sklearn.datasets import load_boston
boston = load_boston()

continuous_variables = [n for n in range(boston.data.shape[1]) if n!=3]
print(continuous_variables)
```

```
[0, 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12]
```

In [2]:
```
import numpy as np
from sklearn import preprocessing
normalize_data = preprocessing.StandardScaler().fit_transform(boston.data[:,continuous_
ouliers_rows, outliter_columns = np.where(np.abs(normalize_data)>3)
print(ouliers_rows)
print(outliter_columns)
```

```
[ 55  56  57 102 141 199 200 201 202 203 204 225 256 257 262 283 284 347
 351 352 353 353 354 355 364 365 367 373 374 374 380 398 404 405 406 410
 410 411 412 412 414 414 415 416 418 418 419 423 424 425 426 427 427 429
 431 436 437 438 445 450 454 455 456 457 466]
[ 1  1  1 10 11  1  1  1  1  1  1  4  1  4  4  1  1  1  6  6  1  6  6  6
  4  4  4 11  4 11  0  0  0  0  4  0 10 10 10 11  0 11 10 10  0 10 10 10
 10 10 10  0 10 10 10 10 10 10 10 10 10 10 10 10 10]
```

In [3]:
```
print(list(zip(ouliers_rows, outliter_columns)))
```

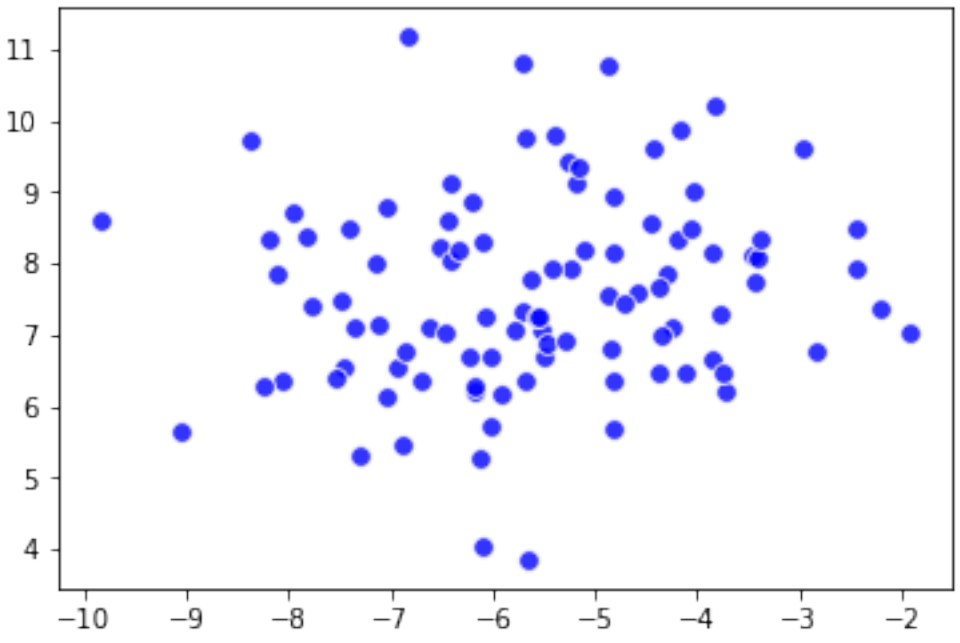
```
[(55, 1), (56, 1), (57, 1), (102, 10), (141, 11), (199, 1), (200, 1), (201, 1), (202, 1), (203
```

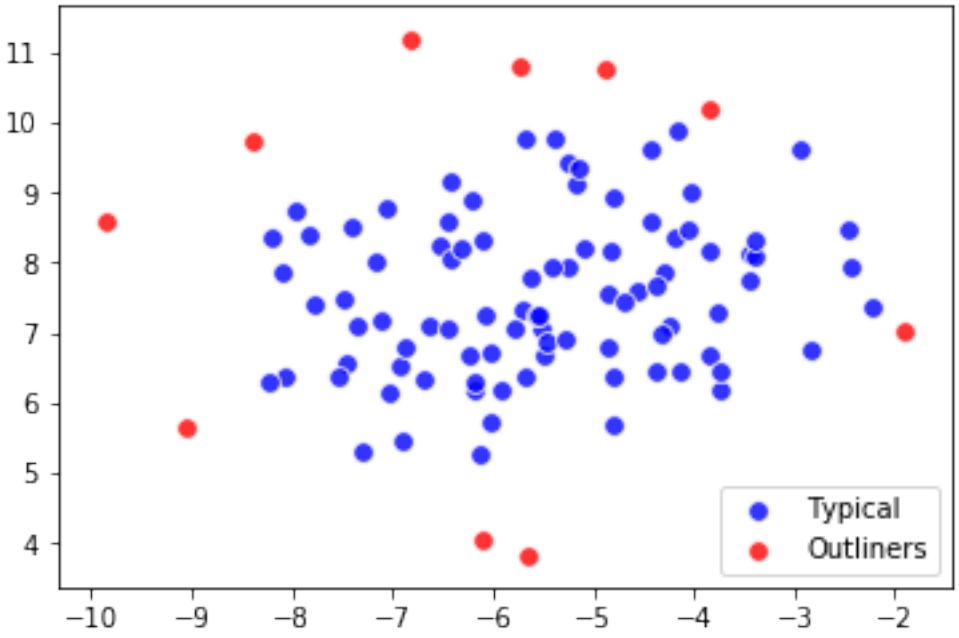
In [4]:
```
# EllipticEcvelop distribution
from sklearn.datasets import make_blobs
from sklearn.covariance import EllipticEnvelope
from matplotlib import pyplot as plt
def generate_distribiution(blobs):
    blob = make_blobs(n_samples=100, n_features=2, centers=blobs, cluster_std=1.5, shu
```

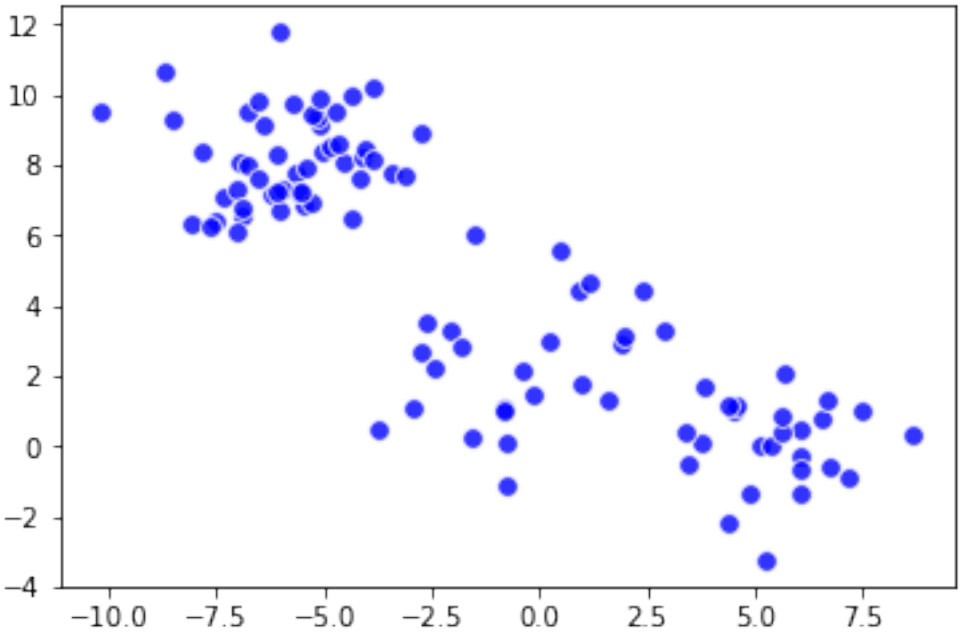
```
        robust_covariance_est = EllipticEnvelope(contamination=.1).fit(blob[0])# contamina
        detection = robust_covariance_est.predict(blob[0])
        outliers = np.where(detection == -1)[0]
        inliers = np.where(detection == 1)[0]

        plt.scatter(blob[0][:,0],blob[0][:,1], c='blue', alpha=0.8, s=60, marker='o', edge
        plt.show()
        return (outliers, inliers, blob)
```

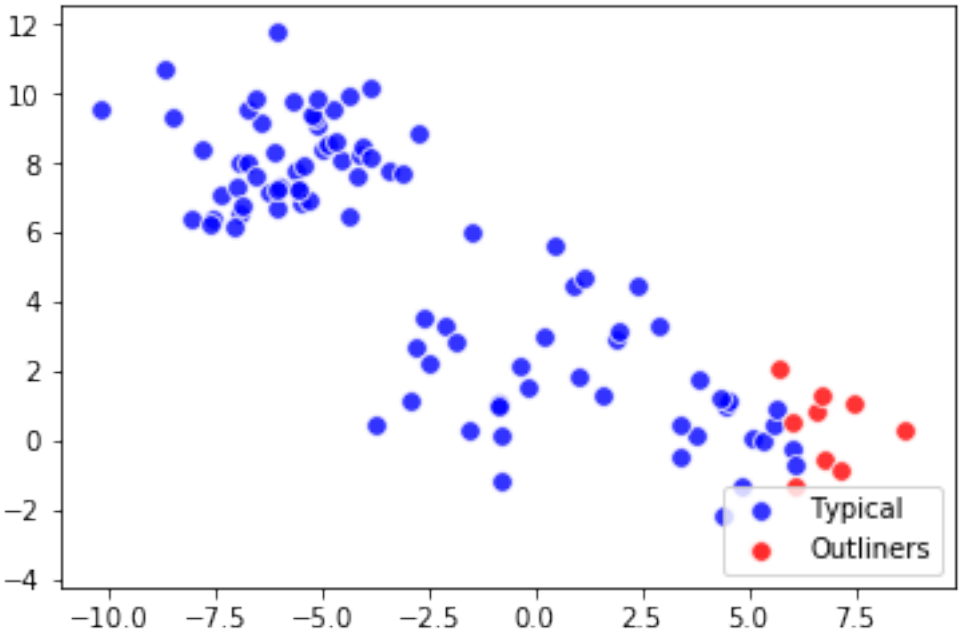
In [5]:
```
# EllipticEcvelop distribution and outliers
def plot_outliers(outliers, inliers, blob):
    in_points = plt.scatter(blob[0][inliers,0], blob[0][inliers,1],
                            c='blue', alpha=0.8, s=60, marker='o', edgecolors='white')
    out_points = plt.scatter(blob[0][outliers,0], blob[0][outliers,1],
                            c='red', alpha=0.8, s=60, marker='o', edgecolors='white')
    plt.legend((in_points,out_points),('Typical','Outliners'),scatterpoints=1, loc='lo
    plt.show()
```

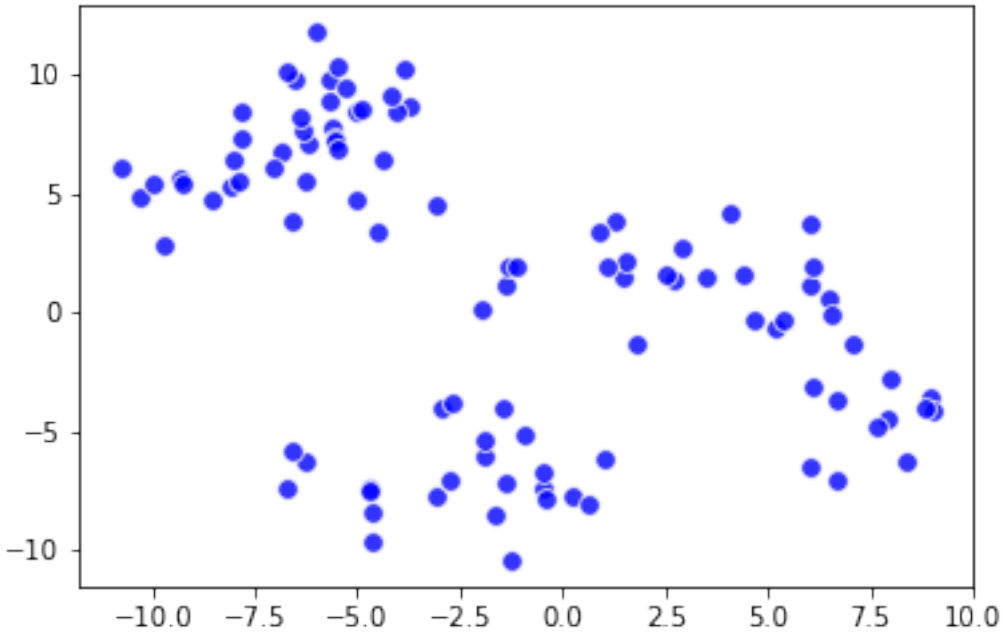
In [6]:
```
plot_outliers(*generate_distribiution(1))
plot_outliers(*generate_distribiution(4)) # algorithm doesn't work well for more than
plot_outliers(*generate_distribiution(8)) # it will onlu show outliers data in one, sm
plot_outliers(*generate_distribiution(24))
```

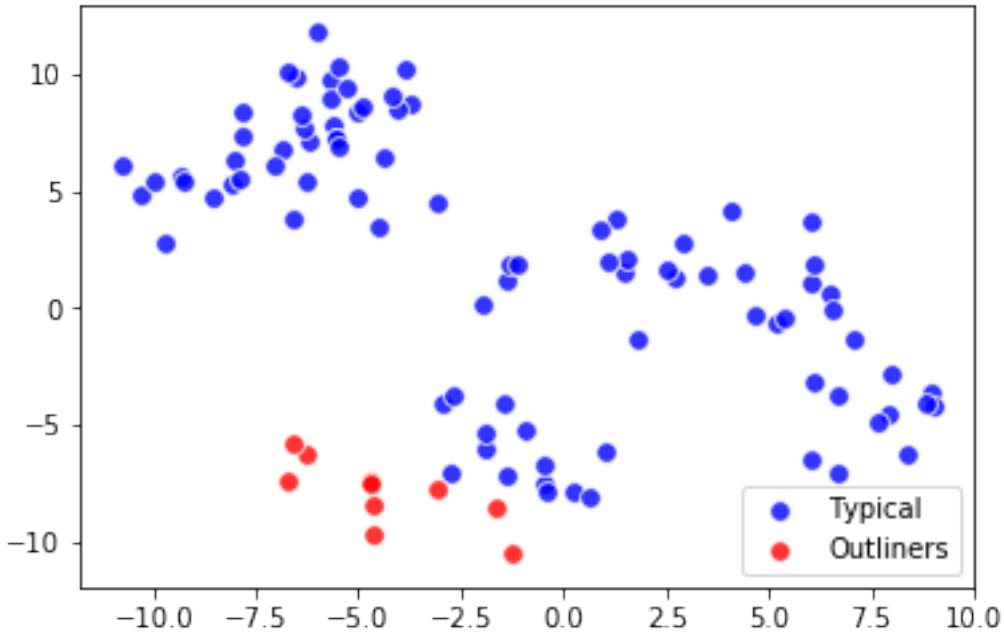


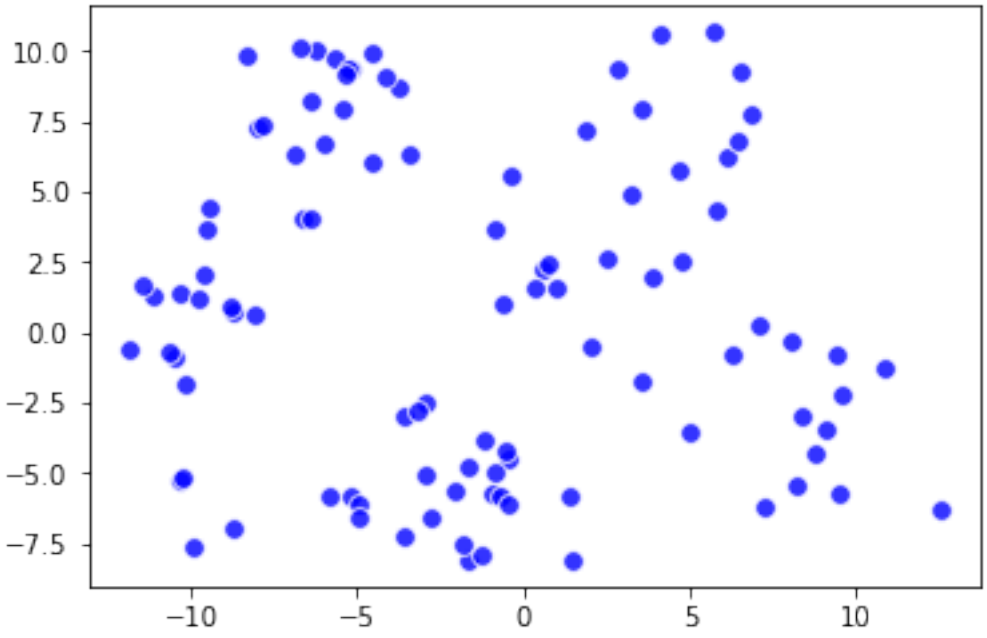

Typical
Outliners

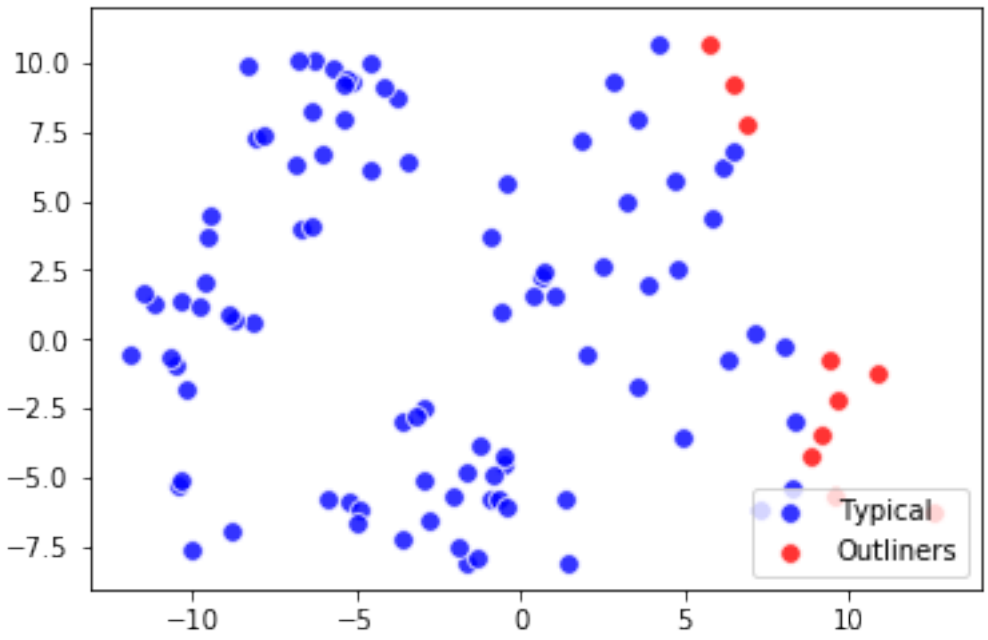



12
10
8
6
4
2
0
−2
−4
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
Typical
Outliners


10
5
0
−5
−10
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0

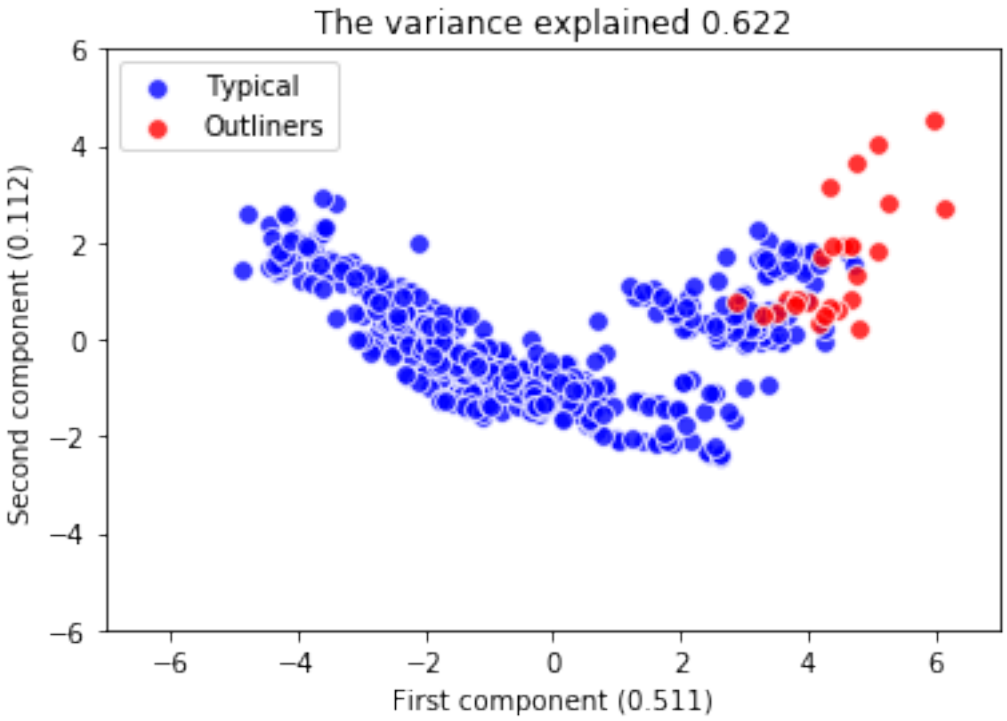

10
5
0
−5
−10
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
Typical
Outliners


10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10
−5
0
5
10




```
In [11]: from sklearn.decomposition import PCA
         boston = load_boston()
         # outliers in boston data 1
         continuous_variables = [n for n in range(boston.data.shape[1]) if n!=3]
         normalized_data = preprocessing.StandardScaler().fit_transform(boston.data[:,continuou
         pca = PCA(n_components=2)
         Zscore_components = pca.fit_transform(normalize_data)
         vtot = "The variance explained " + str(round(np.sum(pca.explained_variance_ratio_),3))
         v1 =  str(round(np.sum(pca.explained_variance_ratio_[0]),3))
         v2 =  str(round(np.sum(pca.explained_variance_ratio_[1]),3))

In [12]: # outliers in boston data 2
         robust_covariance_est = EllipticEnvelope(store_precision=False, assume_centered = Fals
         robust_covariance_est.fit(normalized_data)
         detection = robust_covariance_est.predict(normalized_data)
         outliers = np.where(detection == -1)
         regular = np.where(detection == 1)

In [13]: # outliers in boston data 3
         #
         from matplotlib import pyplot as plt
         in_points = plt.scatter(Zscore_components[regular,0],Zscore_components[regular,1],
                                 color='blue', alpha=0.8, s=60, marker='o', edgecolors='white'
         out_points = plt.scatter(Zscore_components[outliers,0],Zscore_components[outliers,1],
                                 color='red', alpha=0.8, s=60, marker='o', edgecolors='white')
```

```
plt.legend((in_points,out_points),('Typical','Outliners'),scatterpoints=1, loc='best')
plt.xlabel('First component (%s)' % v1)
plt.ylabel('Second component (%s)' % v2)
plt.xlim([-7,7])
plt.ylim([-6,6])
plt.title(vtot) # EllipticEnvelope only shows outliers data in the one, smallest clus
plt.show()
```



In [ ]: