# hw1.3

28 февраля 2017 г.

```
In [1]: %pylab inline
        from scipy import stats
```

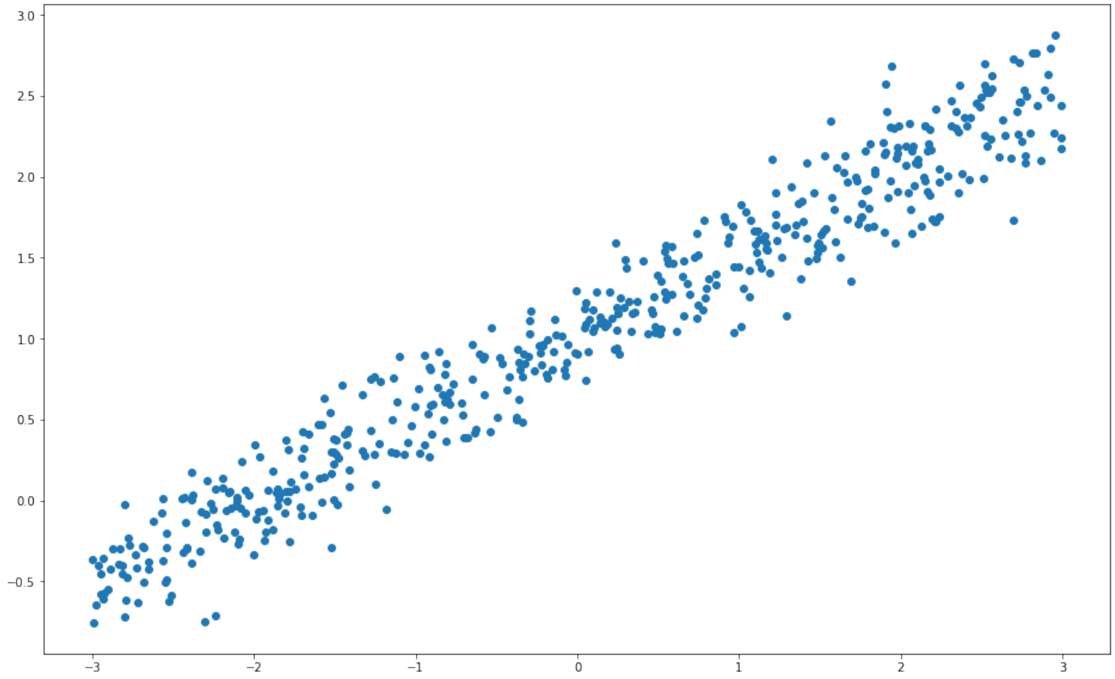
```
Populating the interactive namespace from numpy and matplotlib
```

## 1 Generating sample

```
In [2]: def gen(sz, k, b):
            x = stats.uniform.rvs(loc=-3, scale=6, size=sz)
            y = k * x + b + stats.norm.rvs(scale=0.2, size=sz)
            return x, y
```

```
In [3]: x, y = gen(500, 0.5, 1)
```

```
In [4]: plt.figure(figsize=(16, 10))
        plt.scatter(x, y)
        plt.show()
```



## 2 MSE optimization

```
In [5]: from scipy import optimize
        from sklearn.metrics import mean_squared_error, mean_absolute_error
```

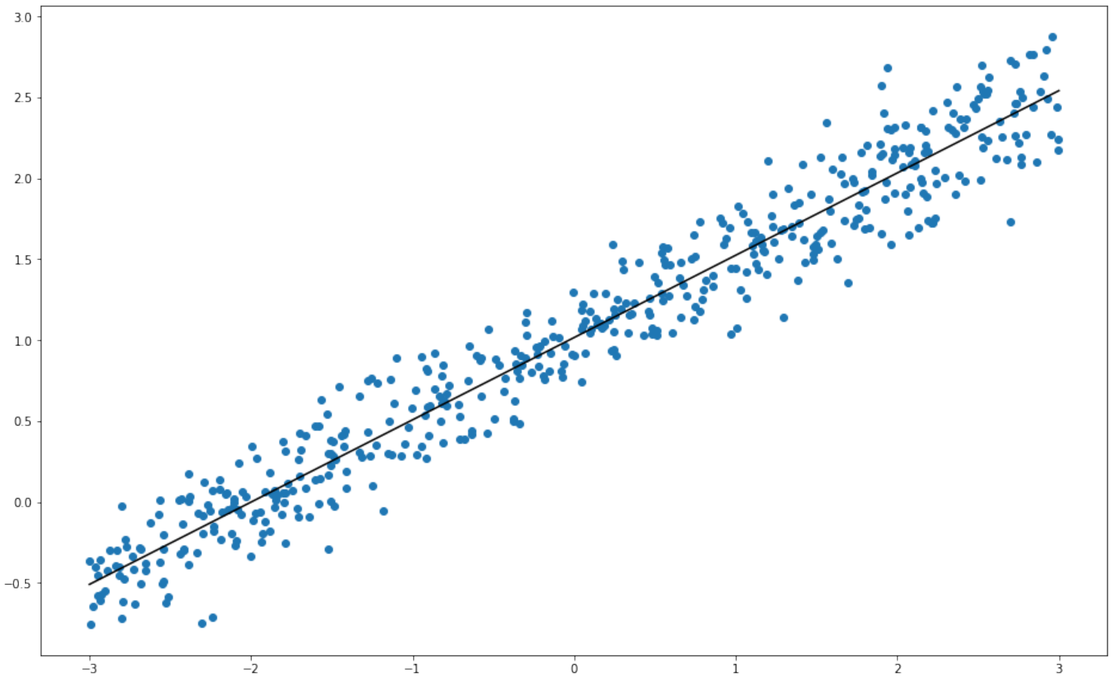
```
In [6]: def mse(c, x, y):
            return mean_squared_error(c[0] * x + c[1], y)
```

```
In [7]: k, b = optimize.minimize(mse, [0, 0], args=(x, y)).x
        print(k, b)
```

```
0.508239860383 1.01649868598
```

```
In [8]: def draw(x, y, k, b):
            plt.figure(figsize=(16, 10))
            plt.scatter(x, y)
            grid = np.linspace(-3, 3, 1000)
            plt.plot(grid, k * grid + b, c="black")
            plt.show()
```

```
In [9]: draw(x, y, k, b)
```



## 3 Modifying sample

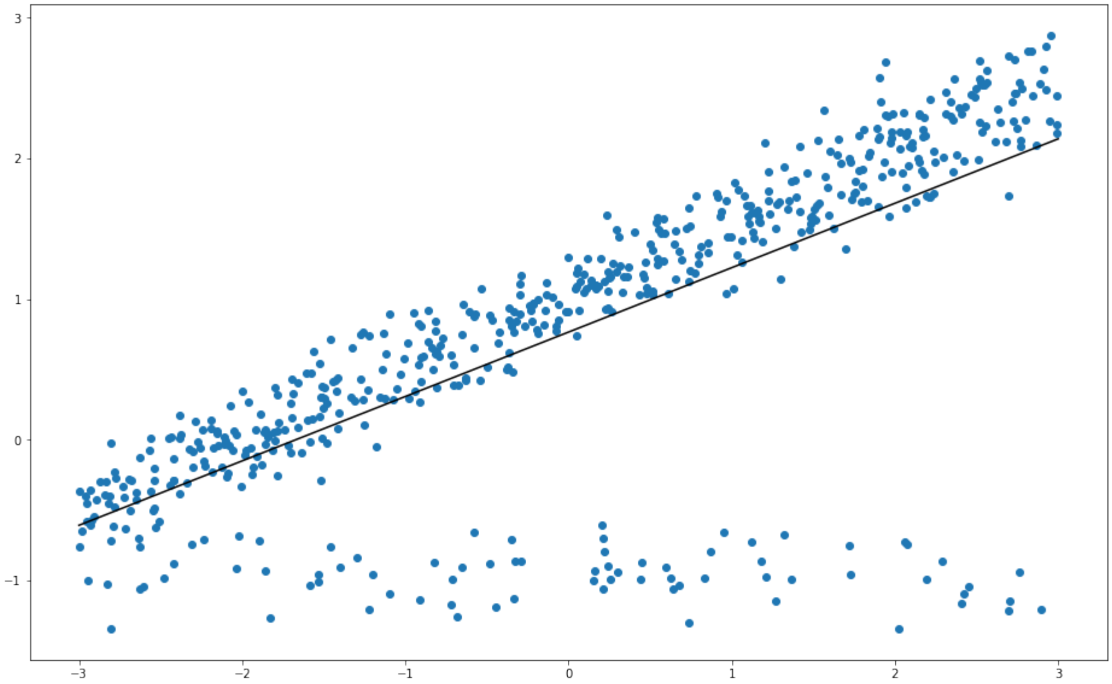
```
In [10]: x2, y2 = gen(75, 0, -1)
         x2 = np.append(x, x2)
         y2 = np.append(y, y2)
```

## 4 MSE optimization on modified sample

```
In [11]: k2, b2 = optimize.minimize(mse, [0, 0], args=(x2, y2)).x
         print(k2, b2)
```

```
0.457969322278 0.764998914513
```

```
In [12]: draw(x2, y2, k2, b2)
```



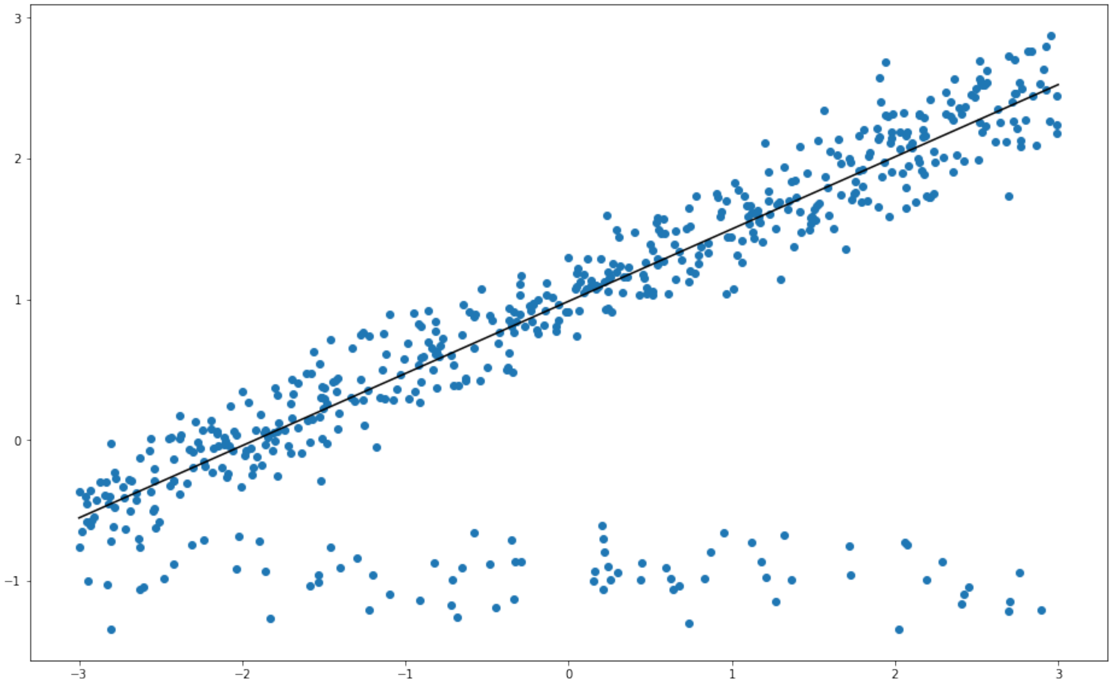
## 5 MAE optimization on modified sample

```
In [13]: def mae(c, x, y):
             return mean_absolute_error(c[0] * x + c[1], y)
```

```
In [14]: k3, b3 = optimize.minimize(mae, [0, 0], args=(x2, y2)).x
         print(k3, b3)
```

```
0.51309384638 0.985544185779
```

```
In [16]: draw(x2, y2, k3, b3)
```



## 6 Results

MAE metric is more robust for outliers than MSE.

```
In [ ]:
```