Outliers

December 20, 2016

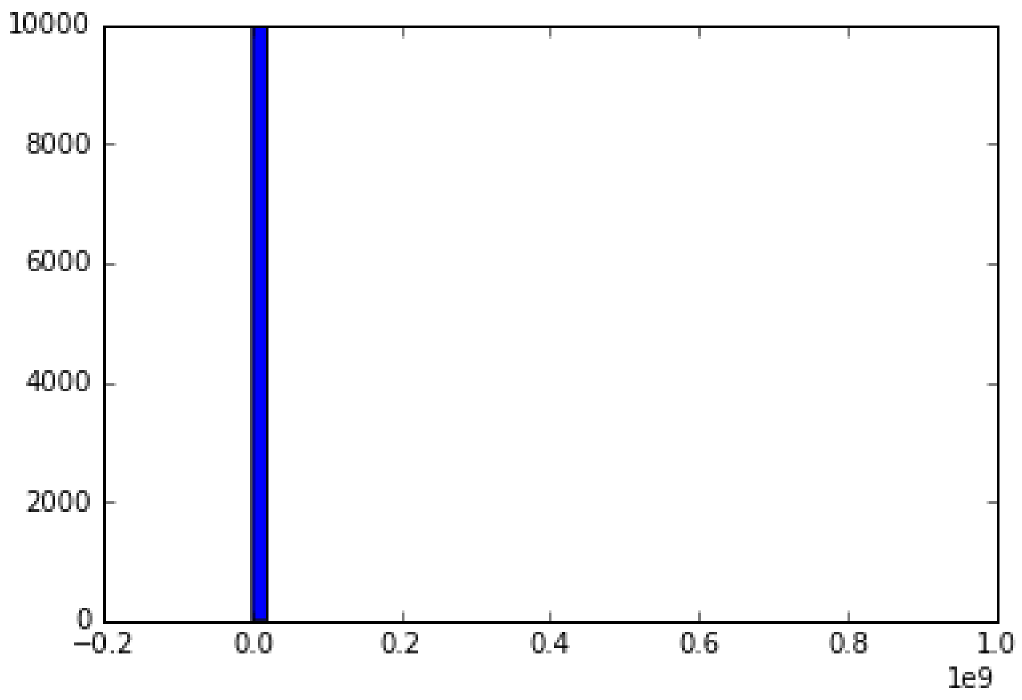
1 Dealing with Outliers

Sometimes outliers can mess up an analysis; you usually don't want a handful of data points to skew the overall results. Let's revisit our example of income data, with Donald Trump thrown in:

```
In [2]: %matplotlib inline
        import numpy as np

        incomes = np.random.normal(27000, 15000, 10000)
        incomes = np.append(incomes, [1000000000])

        import matplotlib.pyplot as plt
        plt.hist(incomes, 50)
        plt.show()
```



That's not very helpful to look at. One billionaire ended up squeezing everybody else into a single line in my histogram. Plus it skewed my mean income significantly:

```
In [3]: incomes.mean()
```

```
Out[3]: 127148.50796177129
```

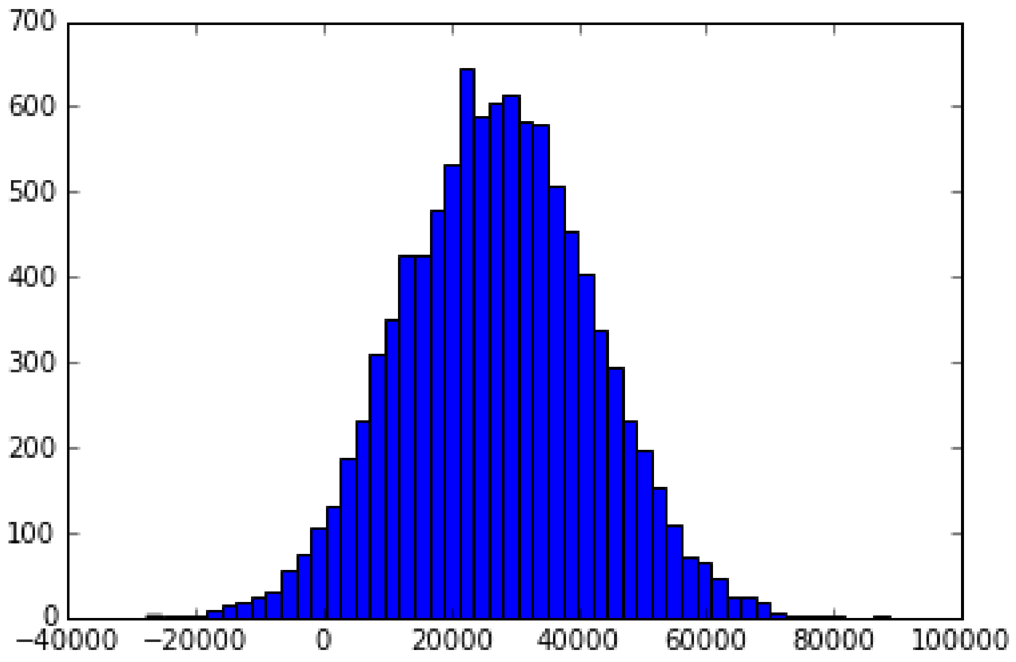
It's important to dig into what is causing your outliers, and understand where they are coming from. You also need to think about whether removing them is a valid thing to do, given the spirit of what it is you're trying to analyze. If I know I want to understand more about the incomes of "typical Americans", filtering out billionaires seems like a legitimate thing to do.

Here's something a little more robust than filtering out billionaires - it filters out anything beyond two standard deviations of the median value in the data set:

```
In [4]: def reject_outliers(data):
            u = np.median(data)
            s = np.std(data)
            filtered = [e for e in data if (u - 2 * s < e < u + 2 * s)]
            return filtered

        filtered = reject_outliers(incomes)

        plt.hist(filtered, 50)
        plt.show()
```



That looks better. And, our mean is more, well, meangingful now as well:

```
In [5]: np.mean(filtered)
```

```
Out[5]: 27161.222812567459
```

1.1 Activity

Instead of a single outlier, add several randomly-generated outliers to the data. Experiment with different values of the multiple of the standard deviation to identify outliers, and see what effect it has on the final results.

```
In [ ]:
```