Statistical Features - Working With Box Plots

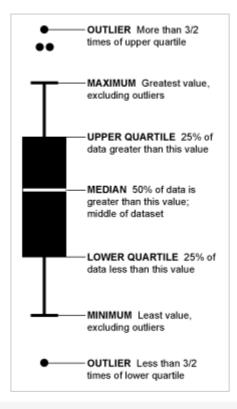
WE'LL COVER THE FOLLOWING ^

- Anatomy of a Box Plot
- Five-Number Summary
- Interpreting A Box Plot

Another important statistical concept is that of percentile, so let's get a good understanding of this essential feature. Also, let's learn to interpret statistical features from plots.

Anatomy of a Box Plot

Do you remember the box plots from the lessons on data visualization? As we saw earlier, we can write some very simple code using Matplotlib's boxplot() method to obtain statistical features in the form of box plots:



How to read a box-plot (Image credits: flowingdata.com)

A boxplot is basically a graph that presents information from a **five-number summary**. If we look at the diagram above, we can see that in a box plot:

- The ends of the box are the first (lower) and third (upper) quartiles the box spans the so-called interquartile range. The first quartile basically represents the 25th percentile, meaning that 25% of the data points fall below the first quartile. The third quartile is the 75th percentile, meaning that 75% of the points in the data fall below the third quartile.
- The median, marked by a horizontal line inside the box, is the middle value of the dataset, the 50th percentile. Median is used instead of mean because it is more robust to outlier values (we will talk about this again later and understand why).
- The whiskers are the two lines outside the box that extend to the highest and lowest (or min/max) observations in our data.

Five-Number Summary

To recap, a five-number summary is made up of these five values: the maximum value, the minimum value, the lower quartile, the upper quartile, and the median.

These values are presented together and ordered from lowest to highest:

- Minimum value
- Lower quartile (Q1/25th Percentile)
- Median value (Q2/50th Percentile)
- Upper quartile (Q3/75th Percentile)
- Maximum value

These five numbers give us a summary of the data as each value describes a specific part of a dataset: the median identifies the center of a dataset; the upper and lower quartiles span the middle half of a data set; and the highest and lowest observations give us insights into the actual dispersion of the data. The five-number summary is a **useful measure of spread in the dataset**.

Interpreting A Box Plot

• A short box plot tells us that many of our data points are similar, we have

many values in a small range. On the other hand, a tall box plot implies

that much of the data points are quite different, we have values that are spread over a wide range.

- A median value that is closer to the bottom tells us that most of our data points have lower values. While a median value closer to the top tell us that most of our data has higher values. Basically, a median line that is not in the middle of the box is an indication of skewed data.
- What about the length of those whiskers?

 Long whiskers tell us that our data has a high standard deviation and variance, i.e., the values are spread out and vary a lot. If there are long whiskers on one side of the box, but not the other, then it's an indication that our data varies, but only in one direction.

Isn't this a lot of useful information from a few simple statistical features that are easy to calculate? Remember to make use of them while doing a **preliminary investigation of a large dataset**, when comparing two or more datasets, and when you need a **descriptive analysis including data skewedness or outliers** of your data.