**Understanding the Interquartile Range (IQR) and the 1.5 × IQR Rule for Outlier Detection**

The Interquartile Range (IQR) measures the spread of the middle 50% of a dataset. It is calculated as:

* **Q1 (25th percentile)**: The value below which 25% of the data points fall
* **Q3 (75th percentile)**: The value below which 75% of the data points fall

**IQR = Q3 – Q1**

This range captures the central portion of the data, providing a robust measure of variability that is less affected by extreme values.

**The 1.5 × IQR Rule**

Introduced by the renowned statistician John Tukey, the 1.5 × IQR rule has become a universal standard for identifying mild outliers in data analysis. This rule defines outliers as values that lie beyond:

* **Lesser Outlier: Q1 – 1.5 × IQR**
* **Greater Outlier: Q3 + 1.5 × IQR**

**Why 1.5 × IQR?**

The multiplier 1.5 strikes a balance between **sensitivity and accuracy**, effectively identifying unusual values without mislabeling normal variation as outliers.

| **Multiplier** | **Effect** | **Interpretation** |
| --- | --- | --- |
| **1 × IQR** | Too strict | Many normal values are incorrectly marked as outliers |
| **1.5 × IQR** | Just right | Captures only true, unusual values |
| **2 × IQR** | Too loose | Some real outliers may be missed |
| **4 or 5 × IQR** | Extremely loose | Almost no values are marked as outliers |

**Conclusion:**The 1.5 × IQR rule is the “correct value” for outlier detection, neither too strict nor too moderate, making it widely adopted in boxplots and statistical tools.