Accuracy vs Precision

Accuracy and **Precision** are two important concepts often used in scientific measurements and data analysis. They describe the quality and reliability of measurements but are distinct in their meanings.

Accuracy

- **Definition**: Accuracy refers to how close a measured value is to the true or accepted value. It indicates the correctness of a measurement.
- **Example**: If the true length of a rod is 100 cm and you measure it to be 99 cm, the measurement is accurate because it is close to the true value.
- **Representation**: Accuracy can be represented by the degree of agreement between the measured values and the true value.

Precision

- **Definition**: Precision refers to how close the measured values are to each other, regardless of whether they are close to the true value. It indicates the repeatability or consistency of measurements.
- **Example**: If you measure the length of a rod multiple times and get values of 99 cm, 99.1 cm, and 98.9 cm, the measurements are precise because they are very close to each other.
- **Representation**: Precision can be represented by the degree of spread or variability in the measured values.

Key Differences

1. **Accuracy** is about correctness.
2. **Precision** is about consistency.

Visualization

Imagine a target with a bullseye representing the true value:

- **High Accuracy, High Precision**: Measurements are both close to the true value and close to each other, clustered around the bullseye.
- **High Accuracy, Low Precision**: Measurements are close to the true value but not close to each other, scattered around the bullseye.
- **Low Accuracy, High Precision**: Measurements are not close to the true value but are close to each other, clustered away from the bullseye.
- **Low Accuracy, Low Precision**: Measurements are neither close to the true value nor close to each other, scattered widely.