



OVERVIEW

Even the best data can contain errors. This module explores two major sources of uncertainty—noise and inaccuracy—and how they can affect your analysis. Learn how to spot, reduce, and account for these issues so your insights are reliable and your decisions are sound.

Definition

Noise:

- **Definition:** Random variation that obscures true patterns.

Sources:

- **Measurement Errors:** Human mistakes, faulty tools, or incorrect procedures.
- **Sampling Variation:** Natural randomness from partial data collection.
 - **Example:** Inconsistent client intake forms at Pierce County create noise, hindering service analysis.

Inaccuracy:

- **Definition:** Systematic, repeatable errors leading to consistently wrong data.
- **Sources:** Flawed tools (e.g., GPS misreporting construction progress), biased methods.
- **Example:** A clock always 10 minutes fast skews project timelines.

Key Differences

Aspect	Noise	Innaccuracy
Error Type	Random	Systematic
Fixability	Reduced but not eliminated	Often fixable with better methods

Reducing Uncertainty

- **For Noise:**
 - Use visualizations (box plots, scatter plots) to spot outliers.
 - Standardize procedures and calibrate tools.
 - Increase sample size to smooth random fluctuations.
- **For Inaccuracy:**
 - Regularly calibrate tools and test software.
 - Identify and adjust for recurring errors (e.g., subtract 5 units from biased measurements).

Accuracy vs. Precision

Scenario	Description
High Precision, Low Accuracy	Consistent but incorrect results (e.g., always hitting the same wrong target spot).
High Accuracy, Low Precision	Results near true value but inconsistent (e.g., scattered around the target center).
High Accuracy + Precision	Ideal: Consistent and correct results.

Real-World Impact

- Ignoring uncertainty leads to:**
- Misleading charts and conclusions.
 - Poor decisions in policy, healthcare, or business.
 - **Example:** Inaccurate GIS data misrepresents construction progress, affecting resource allocation.

Key Takeaways

- **Noise ≠ Inaccuracy:** Random vs. systematic errors require different solutions.
- **Prioritize Fixes:** Address inaccuracy first (systematic errors are correctable).
- **Accuracy + Precision:** Aim for both to ensure reliable data.

