

Practical Data Analysis

Doru Constantin
Institut Charles Sadron, CNRS

All science is data science.

Performing research in experimental physics involves acquiring, processing, analyzing and interpreting data with much higher proficiency than typically required during undergraduate studies. In particular, a rigorous treatment of measurement uncertainties is crucial for a proper validation of the hypotheses motivating the experiments. We aim to bridge this gap both at the theoretical and the practical level, so each session will consist of a lecture to introduce the concepts and a computer-based practical part where they will be applied. We will discuss the following topics:

- Probabilities: random variables, distribution laws, moments
- Sampling and statistics
- Error and uncertainty: definitions, error propagation and composition
- Linear fitting: weighting, parameter uncertainty. Confidence intervals
- Nonlinear fitting: algorithms, constraints, difficulties
- Introduction to Bayesian theory

Due to space constraints, attendance will be limited to **15 participants, who should bring along their laptop computers with the data treatment software they expect to use during their PhD work**. The course will be given in **English**.

Pre-requisites: The practicals involve a fair amount of programming, so all participants should be able to perform simple tasks (e.g. reading data from a file, doing simple manipulations and implementing mathematical functions) in a programming environment such as Python, MATLAB, Igor Pro etc. If you are uncertain about your programming level, please contact the lecturer before registering.

Eight four-hour sessions (two-hour lecture and two-hour practicals)

Schedule: from **13:30 to 17:30** every Tuesday from **February 20 to April 09 2024**.

Location: Nouvelle salle de Conseil (room E282, 2nd floor), Institut Charles Sadron (on the Cronenbourg campus of the CNRS).

Contact: Doru Constantin, constantin@unistra.fr