



# École doctorale de Physique en Île de France

ED564

PSL – UPMC – USPC – U-PSaclay

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## COURS Practical Data Analysis

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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
- Error and uncertainty: definitions, error propagation and composition
- Linear fitting: weighting, parameter uncertainty. Confidence intervals
- Nonlinear fitting: algorithms, constraints, difficulties
- Machine learning: Singular Value Decomposition, Principal Component Analysis etc. Neural networks
- 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 thesis**. Depending on the audience, the course will be given in either **English or French**.

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

From **13:00 to 17:00** every Tuesday from **April 23<sup>rd</sup>** to **July 2<sup>nd</sup>** 2019, except for May 28<sup>th</sup>.

In the « Moyen Amphi » (ground floor, South wing) at the Laboratoire de Physique des Solides, bâtiment 510, Université Paris-Sud, ORSAY

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