

UF Plans d'expériences et métamodèles

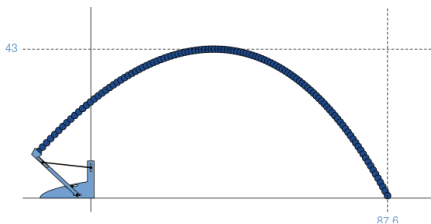
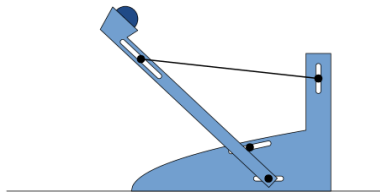
INSA Toulouse - 5 ModIA

Resp.: O. Roustant

In this UF, we can CREATE DATA (= DESIGN EXPERIMENTS), by doing PHYSICAL or SIMULATED experiments.

The question is: HOW can we do this in order to have ACCURATE MODELS, to OPTIMIZE, to QUANTIFY UNCERTAINTY, ...?

Example: How can we tune the 4 variables of a catapult in order to launch a projectile as far as possible?



In the real life, the catapult can be A PHYSICAL EXPERIMENT, A SIMULATOR, AN ALGORITHM (that we want to tune)...
When the experiment is TIME-CONSUMING, we need to construct a FAST PROXY MODEL or METAMODEL.

UF structure

- METAMODELING and APPLICATIONS (September - October)
Following the pioneering works on mining by D. Krige
 - Course: Olivier ROUSTANT (INSA) + Amine AZIZ ALAOUI (Doc INSA & IRT St-Exupéry)
 - Case study: Matthias DE LOZZO (IRT St-Exupéry)

- DESIGN of EXPERIMENTS (November - December)
Historically the first theory developed, for linear (meta)models.
 - Mélanie ROCHOUX (Cerfacs)

Moodle: <https://moodle.insa-toulouse.fr/course/view.php?id=1744>

- METAMODELING and APPLICATIONS (September - October)
 - Individual exam (coef 1/3)
 - Case study (coef 1/3)

- DESIGN of EXPERIMENTS (November - December)
 - Individual exam (coef 1/3)

Focus on Metamodeling

The 'Metamodeling' course has three parts.

Part I - Metamodeling and optimization

- Gaussian process regression (or Kriging)
- Bayesian optimization

Part II - Uncertainty quantification

- Uncertainty propagation
- Sensitivity analysis

Part III - Case study

- About a simulator of a hydrogen-powered aircraft prototype

Focus on Metamodeling - Evaluation

Individual exam

Similar problems than in class. In particular, you should be able:

- To do computations on Gaussian processes and kernels
- To compute ANOVA decomposition and Sobol indices

Report on the case study

By groups of 3 or 4