INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

Metamodelling

Introducing

Description

Program (detailed contents):

* Introduction: computer experiments and metamodeling. Examples.
* Metamodeling with Gaussian process (GP) and kriging. a) Probabilistic and functional (RKHS) interpretation of the approximation problem. b) Simulation of GPs. c) Customization of covariance models. Physically informed GPs.
* Design of computer experiments. a) Initial designs: focus on space-filling designs. b) Adaptive methods. Example of Bayesian optimisation.
* Uncertainty quantification. a) Uncertainty propagation. b) Global sensitivity analysis: focus on the ANOVA decomposition (Sobol-Hoeffding decomposition).
* Case study.

Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

* Metamodeling for optimization / uncertainty quantification of a computer code, with a limited computational budget
* Gaussian processes
* Kernel customization to account for external knowledge
* Design of computer experiments
* Global sensitivity analysis

The student will be able to:

At a theoretical level, to do computations for:
* covariance kernels and Gaussian process
* ANOVA decomposition, Sobol indices

At a practical level, to perform the complete methodology for analyzing a computer code
* design of experiments
* metamodel construction / evaluation
* application to optimization / uncertainty quantification

Necessary prerequisites

Gaussian vectors (Complements of Probability, 3rd year)

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

Toulouse