Physics contrained machine learning

ECTS
3 crédits

Hourly volume
59h

Introducing

Objectives

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

-Main approaches for solving time dependent problem (EDP and Data assimilation) using ML
-Relevance of using physical constraints for solving problems with underling physics (feature engineering), design of Neural networks
-Methods for handling nonlinearity and large scale (use of latent space, high performance computing)
-Performance of ML for solving problems with physical constraints.

At the end of this module, the student should be able to:

-Use ML for solving time dependent PDE and analysis the accuracy
-Analysis the HP performance of the solvers, and propose algorithmic enhancements
-Design a full data assimilation system based on ML, starting from a description of a system using partial differential equation and and observational system
-Assess the performance of a system, question the relevance of the mathematical assumptions

Necessary prerequisites

Numerical algebra for large scale, statistical estimation, non-convex smooth optimization, numerical solution of PDEs, data assimilation, machine learning

Practical info

Location(s)

Toulouse