UE Machine learning for mechanics

Niveau d'étude
Bac +4

ECTS
3 crédits

Composante
UFR Physique, Ingénierie, Terre, Environnement, Mécanique (PhITEM)

Période de l'année
Automne (sept. à dec./janv.)

Diplômes intégrant cet élément

- Master Génie civil

Langue(s) d'enseignement: Anglais

Ouvert aux étudiants en échange: Oui

Présentation

Description

The course aims to provide the students with both theoretical foundations and practical skills to design, implement and evaluate machine learning (ML) models tailored to applications and open challenges in the field of (geo)mechanics.
The course is structured around six blocks:
1. Regression methods (linear and polynomial regression, Ridge/Lasso regularization)
2. Classification methods (logistic regression, decision trees, random forests, SVM)
3. Unsupervised learning and dimensionality reduction (PCA, autoencoders, clustering)
4. Artificial neural networks (feed-forward architectures, backpropagation, deep learning)
5. Physics-informed machine learning (hard-wiring conservation laws and constraints into neural networks, hybrid data-driven/ physics-based modeling)
6. Final project and practical sessions: development of an end-to-end ML pipeline based on numerical simulations and quantitative experimental imaging, practical (hands-on) sessions with Python and dedicated libraries.

Informations non contractuelles.
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