
Programme de Formation

Fundamentals of Machine Learning with Python - Advanced Level

UMPA

Organisation

Durée : 18 heures

Mode d'organisation : À distance

Contenu pédagogique



Public visé

Researchers, engineers and data scientists



Objectifs pédagogiques

- For a knowledgeable audience in Machine Learning, introduction and further exploration of some modern artificial intelligence methods
- Implementation of Deep Learning methodologies (and others) on various types of data
- Use of development frameworks such as scikit-learn and PyTorch



Description

Part 1 - Convolutional neural networks:

- The notion of invariance and how to cope with it
- Data augmentation
- Classical deep architecture - the example of Resnet18

Part 2 - Transformers and Learning on sequential data:

- Auto-regressive models
- The notions of transformers and attention
- Text data: Tokenizers and how to use them

Part 3 - ML pipeline and Model Fine-tuning:

- Efficient baseline models: Random Forest, XGBoost
- Hyperparameter tuning with optuna
- Few shot learning, domain adaptation
- Example on images and/or text



- Finetuning with Low Rank Adaptation (LoRA)

Part 4 - Time series:

- Dynamic Time Warping
- Specific crossvalidation and evaluation procedures
- Clustering time series
- Dictionary learning

Part 5 - Physics-informed Neural Networks:

- Physics-informed loss
- Neural Operators
- Examples on ODEs, PDEs and data assimilation

Part 6 – Generative methods

- Unconditional, class-conditional, and embedding-conditional generative models
- Foundational techniques like normalizing flows
- Diffusion models and flow matching
- Text-to-image models such as Stable Diffusion or DALL-E

The learning of these concepts will be illustrated and put into practice through the handling of the scikit-learn and PyTorch libraries throughout the training.



Prérequis

Solid knowledge of scientific Python (manipulation of data tables with numpy and/or pandas, class concepts). Generalist knowledge in linear algebra and statistics.



Modalités pédagogiques

- Lectures based on interactive Jupyter notebooks, application exercises.



Moyens et supports pédagogiques

A file in PDF format will be given to the trainees at the end of the training.



Modalités d'évaluation et de suivi

Throughout the training, corrected exercises and interactive quizzes will allow the trainee to evaluate the acquisition of knowledge.



Informations sur l'admission

Admission to this training course does not involve any prior assessment, test or selection process. Registration is confirmed once the completed application has been received and confirmed by the training provider.



Informations sur l'accessibilité

Notre organisme s'engage à garantir l'accessibilité de ses formations à distance et en présentiel aux personnes en situation de handicap. Un référent handicap est mobilisable afin d'analyser les besoins



spécifiques et de mettre en place, lorsque cela est possible, les adaptations pédagogiques, techniques ou organisationnelles nécessaires.