DATA SCIENCE & AI
| TRAINING FOR ACADEMICS 2023/25 |

Basic courses - Mondays from 5 to 8 pm, Estrapade

— Foundations of supervised and unsupervised learning (30h) with Vincent Divol

10 lectures: from 1/7/24to 4/11/24

o Introduction *(Beginner) 1/7/24*
o Linear regression *(Beginner) 8/7/24*
o Classification and logistic regression *(Advanced) 15/7/24*
o Regularization 1 *(Advanced) 23/9/24*
o Regularization 2 *(Expert) 30/9/24*
o Beyond linear methods 1 *(Beginner) 7/10/24*
o Beyond linearmethods 2 *(Advanced) 14/10/24*
o Beyond linear methods 3 *(Expert) 21/10/24*
o Unsupervised learning1 *(Beginner) 28/10/24*
o Unsupervised learning2 *(Advanced) 4/11/24*

— Deep Learning (30h) with Nicolas Schreuder

10 lectures: from 12-11-24 to 3/2/25

o Machine learning reminder : linear model, loss minimization *(Beginner) 12/11/24*
o Multi-Layer Perceptron : expressivity, back-propagation *(Beginner) 18/11/24*
o Deep-Learning Tricks : activation function, batch-norm, drop-out *(Beginner) 25/11/24*
o Introduction to Pytorch, MLP *(Beginner) 02/12/24*
o Convolution Neural Network *(Beginner) 9/12/24*
o Recurrent Network *(Advanced) 6/01/25*
o Transformers *(Advanced) 13/01/25, 20/01/25*
o Generative models *(Advanced) 27/01/25 03/02/25*

— Optimization & machine learning (18h) with Kimia Nadjahi

6 lectures: from 10/2/25 to 17/3/25

o Introduction *(Beginner) 10/02/2025*
o Convexity *(Beginner) 17/02/2025*
o Gradient descent and Newton's method *(Advanced) 24/02/2025*
o Linear and nonlinearconstrained optimization *(Advanced) 3/03/2025*
o Advanced deterministic methods *(Expert) 10/03/2025*
o Stochastic optimization *(Advanced) 17/03/2025*

Advanced courses - from 5 to 8 pm, Estrapade

— Web scraping (12h) with Bruno Chaves

4 lectures on Thursdays: from 20/03/25 to 10/04/25

This lecture only requires basic knowledge of Python & SQL.
o Lectures 1 and 2 (total 6 hours): the basics *20/03/2025 and 27/03/2025*
o Lectures 3 and 4 (total 6hours): advanced topics and legal aspects *3/04/2025 and 10/04/2025*

— SQL in practice, NoSQL and vector databases (9h) with Bruno Chaves

3 lectures: on Mondays from 19/05/25 to 2/6/25

This lecture only requires basic knowledge of Python & SQL.
o SQL in practice *19/05/2025*
o Hands on SQL databases *26/05/2025*
o Vector databases *2/06/2025*

— Natural Language Processing (21h)

7 lectures: on Mondays from 24/03/25 to 12/05/25

o Background (refresh): basic concepts from Machine Learning and Neural Networks *24/03/2025*
o Word vectors: Latent Semantic Analysis (LSA), word2vec and GloVe *31/03/2025*
o Language Models: from N-gram models to Recurrent Neural Networks *7/04/2025*
o Sequence-to-sequence modelling and Machine Translation (MT) *14/04/2025*
o Attention, self-attention and Transformer-based language models *28/04/2025*
o Pretraining and Finetuning large language models *5/05/2025*
o Understanding ChatGPT *12/05/2025*

— Reinforcement learning (18h) with Ana Busic

6 lectures on Thurdays

o Introduction to reinforcement learning *15/05/25*
o Markov decision processes and dynamic programming *22/05/25*
o Bandit algorithms *05/06/25*
o From dynamic programming to reinforcement learning *12/06/25 & 19/06/25*
o Reinforcement learning with approximation *26/06/25*