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

Basic courses – Mondays from 6 to 9 pm, PariSanté Campus

— IA/ML Overview (24h) with Frédéric Lechenault
8 lectures: from 16/10/23 to 4/12/23
All these lectures correspond to a "beginner" level.
o Data Science basics 1: overview and methodology
o Data Science basics 2: methods
o Data Science basics 3: dimensionality reduction techniques
o Introduction to AI 1: history and overview
o Introduction to AI 2: machine learning without neurons
o Introduction to AI 3: neural networks basics
o Introduction to AI 4: neural networks for vision
o Introduction to AI 5: neural networks for times series, NLP (excluding transformers, diffusion)

— Statistics, probability, linear algebra (21h) with Jorge Fernández de Cossio Diaz
7 lectures: from 11/12/23 to 5/2/24
o Linear Algebra 1 *(beginner)*
o Linear Algebra 2 *(advanced)*
o Calculus 1 *(beginner)*
o Calculus 2 *(beginner)*
o Probability and statistics 1 *(beginner)*
o Probability and statistics 2 *(advanced)*
o Probability and statistics 3 *(advanced)*

— Data structures and algorithms Python (21h) with Muni Sreenivas Pydi
7 lectures: from 26/2/24 to 8/4/24
o Introduction to Python Programming *(beginner)* * 26/2/24
o Introduction to Data Structures *(beginner)* * 4/3/24
o Algorithm Analysis and Complexity *(advanced)* * 11/3/24
o Sorting Algorithms *(advanced)* * 18/3/24
o Searching Algorithms (advanced) * 25/3/24
o Advanced Data Structures and Algorithms *(advanced)* * 2/4/24
o Applications of Data Structures and Algorithms *(beginner)* * 8/4/24

— Data management and SQL (18h) with Muni Sreenivas Pydi
6 lectures: from 29/4/24 to 3/6/24
o Introduction to Databases *(beginner)* * 29/4/24
o Introduction to SQL *(beginner)* * 6/5/24
o Joins and Relationships *(beginner)* * 13/5/24
o Creating a SQL database *(beginner)* * 21/5/24
o Advanced Queries *(advanced)* * 27/5/24
o Data Manipulation and Control *(advanced)* * 3/6/24

— Foundations of supervised and unsupervised learning (30h) with Vincent Divol
10 lectures: from 1/7/24 to 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 linear methods 2 *(advanced)* * 14/10/24
o Beyond linear methods 3 *(expert)* * 21/10/24
o Unsupervised learning 1 *(beginner)* * 28/10/24
o Unsupervised learning 2 *(advanced)* * 4/11/24

— Deep Learning (30h) with Nicolas Schreuder
8 lectures: from 18/11/24 to 3/2/25
o Machine learning reminder : linear model, loss minimization *(Beginner)*
o Multi-Layer Perceptron : expressivity, back-propagation *(Beginner)*
o Deep-Learning Tricks : activation function, batch-norm, drop-out *(Beginner)*
o Introduction to Pytorch, MLP *(Beginner)*
o Convolution Neural Network *(Beginner)*
o Recurrent Network *(Advanced)*
o Transformers *(Advanced)*
o Generative models *(Advanced)*

— Optimization & machine learning (18h) with Vincent Divol
6 lectures: from 10/2/25 to 31/3/25
o Introduction *(beginner)*
o Convexity *(beginner)*
o Gradient descent and Newton's method *(advanced)*
o Linear and nonlinear constrained optimization *(advanced)*
o Advanced deterministic methods *(expert)*
o Stochastic optimization *(advanced)*

Advanced courses – Thursdays from 6 to 9 pm, PariSanté Campus

— Advanced SQL and data preparation (6h) with Bruno Chaves
2 lectures: 17/6/24 and 24/6/24
This lecture only requires basic knowledge of Python & SQL.
o Hands on SQL databases
o Data exploration/preparation

— Web scraping (15h) with Bruno Chaves
5 lectures: from 11/1/24 to 8/2/24
This lecture only requires basic knowledge of Python & SQL.
o Discovery (total 6 hours)
o Hands-on (total 9 hours)

— Natural Language Processing (21h) with Yair Lakretz
7 lectures: from 23/5/24 to 04/7/24
o Background (refresh): basic concepts from Machine Learning and Neural Networks
o Word vectors: Latent Semantic Analysis (LSA), word2vec and GloVe
o Language Models: from N-gram models to Recurrent Neural Networks
o Sequence-to-sequence modelling and Machine Translation (MT)
o Attention, self-attention and Transformer-based language models
o Pretraining and Finetuning large language models
o Understanding chatGPT

— Reinforcement learning (18h) with Ana Busic
6 lectures: 28/3/24; 4/4/24; 25/4/24; 2/5/24 ; 7/5/24; 16/5/24
o Bandit problems
o Markov decision processes and dynamic programming
o Reinforcement learning: stochastic approximation, algorithms, actor-critic, model-based
o Reinforcement with approximation

Training dedicated to Université PSL researchers, PhD students and postdoc | Website | *Please note: No classes during vacations.*