

Deep Learning			14X050	
François FLEURET (PO)				
Nombre d'heures par semaine	cours	2	Semestre d'automne	<input checked="" type="checkbox"/>
	exercices	2	Semestre de printemps	
	pratique	2	Total d'heures	84
Cursus		Type		Crédits ECTS
Master en sciences informatiques (120 ECTS)		Obligatoire		6

OBJECTIFS :

The objective of this course is to provide a complete introduction to deep machine learning: how to design a neural network, how to train it, and what are the modern techniques that specifically handle very large networks.

CONTENU :

The course aims at providing an overview of existing processings and methods, and at teaching how to design and train a deep neural network for a given task, and the theoretical basis to go beyond the topics directly seen in the course.

The course will touch on the following topics:

- What is deep learning, introduction to tensors.
- Basic machine-learning, empirical risk minimization, simple embeddings.
- Linear separability, multi-layer perceptrons, back-prop.
- Generalized networks, autograd, batch processing, convolutional networks.
- Initialization, optimization, and regularization. Drop-out, batchnorm, resnets.
- Deep models for Computer Vision.
- Analysis of deep models.
- Auto-encoders, embeddings, and generative models.
- Recurrent and attention models, Natural Language Processing.

Concepts will be illustrated with examples in the pytorch framework (<http://pytorch.org>).

Forme de l'enseignement	Ex-cathedra lectures and practical sessions
Documentation	Course slides and handouts / https://fleuret.org/dlc
Préalable requis	<p>Required :</p> <ul style="list-style-type: none"> • Linear algebra (vector, matrix operations, Euclidean spaces). • Differential calculus (Jacobian, Hessian, chain rule). • Python programming. • Basics in probabilities and statistics (distributions, conditional probabilities, Bayes, PCA) <p>Recommended :</p> <ul style="list-style-type: none"> • Basics in optimization (notion of minima, gradient descent). • Basics in algorithmic (computational costs). • Basics in signal processing (Fourier transform, wavelets).
Préparation pour	-
Mode d'évaluation	Final written exam + mini projects
Sessions d'examens	J/AS