

4.00 credits

15.0 h + 9.5 h

Q2

Teacher(s)	Caelen Olivier ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Knowledge in machine learning (e.g. LELEC2870, LINFO2262, LDATS2310)
Main themes	The course explores advanced approaches to generative modelling and large-language-model technologies, with a focus on their underlying principles, capabilities, and practical use. The course emphasises hands-on experimentation, critical evaluation, and responsible usage of generative AI systems. The content is updated regularly to reflect rapid technological evolution in the field.
Learning outcomes	At the end of this learning unit, the student is able to : With regard to the AA framework of the Master [120] in Data Science : Statistic, this activity contributes to the development and acquisition of the following AAs: • as first priority: 1.2 – 1.3 – 1.6 – 2.2 – 2.4 – 2.5 – 6.3 • as secondary: 3.1 – 3.2 – 5.3 – 5.6 – 6.1 With regard to the AA framework of the Master [120] in Statistics: General, this activity contributes to the development and acquisition of the following AAs: • as first priority: 1.3 – 3.2 – 3.3 – 4.1 – 6.3 – 6.4 • as secondary: 2.4 – 2.5 – 5.6 – 6.1
Evaluation methods	Oral exam.
Teaching methods	The course combines Ex-cathedra course supported by slides with practical computer sessions in which students apply each concept using Python notebooks.
Content	• Reminders on deep learning fundamentals. • Attention mechanisms and Transformer architectures • LLMs: usage, prompting, inference, fine-tuning • Generative models (VAEs, GANs). • Diffusion models. TPs focus on running local LLMs, prompting methods, and lightweight fine-tuning.
Bibliography	"Inside Deep Learning: Math, Algorithms, Models", Edward Raff, Manning Publications, ISBN-13: 978-1617298639. "Mastering PyTorch - Second Edition: Create and deploy deep learning models from CNNs to multimodal models, LLMs, and beyond", Ashish Ranjan Jha, Packt Publishing, ISBN-13: 978-1801074308.
Faculty or entity in charge	LSBA

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science : Statistic	DATS2M	4		
Master [120] in Actuarial Science	ACTU2M	4		
Certificat d'université : Statistique et science des données (15/30 crédits)	STAT2FC	4		