

DATI2M - Introduction

Introduction

Introduction

The digital transformation of society has led to explosive growth in the volume of data available. Most of the players in society now place great importance on using this data to help make objective decisions and develop their disciplinary focus. These specific needs have resulted in the emergence of **new data-oriented careers**.

The master's in data science: Information Technology a course in **scientific methods and technology tools** for answering social or scientific questions based on **the processing of frequently massive data sets** ("big data"). This discipline usually requires a structured model of the problem in question to be combined with statistics and mathematics to deliver a rigorous, quantitative, operational solution to the question posed. Computer infrastructure and complex calculation algorithms thus complement scientific methods in structuring and processing the data.

A computer infrastructure and complex calculation algorithms also complement these scientific methods to enable the structuring and processing of data.

- 6.2. Trouver des solutions qui vont au-delà des enjeux strictement techniques, en intégrant les enjeux de dimension éthique d'un projet (y compris la confidentialité des données et la protection de la vie privée) et de développement durable
- 6.3. Faire preuve d'esprit critique vis-à-vis d'une solution technique pour en vérifier la robustesse et minimiser les risques qu'elle présente au regard du contexte de sa mise en Œuvre.
- 6.4. S'autoévaluer et développer de manière autonome les connaissances nécessaires pour rester compétent dans son domaine.

Programme structure

The 120-credit Master in Data Science programme consists of the following items.

A common curriculum of 46 credits, including a final thesis and teaching units in:

- Databases
- Machine Learning
- Statistics
- A seminar
- Professional integration work.

One focus of 30 credits will be taken among a choice of two:

- The data analytics focus offers a range of algorithmic and statistical methods for data mining, learning, and visualization of large data sets.
- The cybersecurity focus is structured around 5 pillars: cryptography, hardware, software and system security, and privacy, as well as an introduction to information theory.

Elective courses and/or options are chosen so as to reach at least 120 credits.

To the 120-credit programme may be added an additional preparatory module for students who do not have all the prerequisites for the Master. These teaching units will be selected with the study advisor.

For a programme-type, and regardless of the focus, options/or elective courses selected, this master will carry a minimum of 120 credits divided over two annual units, corresponding to 60 credits each.

DATI2M Programme

Detailed programme by subject

CORE COURSES [46.0]

- Mandatory
- ⊗ Optional
- △ Not offered in 2023-2024
- ⊙ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- ⊕ Open to incoming exchange students
- ⊗ Not open to incoming exchange students
- (FR) Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

		Year	
		1	2
● LDATI2990	Master thesis <i>The graduation project can be written and presented in French or English, in consultation with the supervisor. It may be accessible to exchange students by prior agreement between the supervisors and/or the two universities.</i>	[q1+q2] [] [25 Credits] ⊕ <i>> French-friendly</i>	x x

				Year	
				1	2
○ LEPL2020	Professional integration work Les modules du cours LEPL2020 sont organisés sur les deux blocs annuels du master. Il est fortement recommandé à l'étudiant.e de les suivre dès le bloc annuel 1, mais il.elle ne pourra inscrire le cours qu'au plus tôt l'année où il.elle présente son travail de fin d'études.	Myriam Banaï Francesco Contino (coord.) Delphine Ducarme Jean-Pierre Raskin	EN [q1+q2] [30h+15h] [2 Credits] > French-friendly	x	x
○ LINFO2172	Databases	Siegfried Nijssen	EN [q2] [30h+30h] [6 Credits] > French-friendly	x	x
○ LSTAT2120	Linear models	Christian Hafner	EN [q1] [30h+7.5h] [5 Credits] > French-friendly	x	x
○ LINFO2262	Machine Learning :classification and evaluation	Pierre Dupont	EN [q2] [30h+30h] [5 Credits] > French-friendly	x	x

⊗ One course to choose from



⊗ LINFO2399	Industrial seminar in computer science	Yves Deville Bernard Geubelle	EN		
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LIST OF FOCUSES

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o Content:

o Compulsory courses :

o LINFO2145	Cloud Computing	Etienne Riviere	EN [q1] [30h+15h] [5 Credits]  > French-friendly	X	X
o LINFO2241	Architecture and performance of computer systems	Tom Barbette	EN [q1] [30h+30h] [6 Credits]  > French-friendly	X	X

o Elective courses

⊗ LINFO2347	Computer system security	Ramin Sadre	EN [q2] [30h+15h] [5 Credits]  > French-friendly	X	X
⊗ LINFO2143	Concurrent systems : models and analysis	Charles Pecheur	EN [q1] [30h+15h] [5 Credits]  > French-friendly	X	X
⊗ LINFO2349	Networking and security seminar	Etienne Riviere Ramin Sadre	EN [q1] [30h] [3 Credits]  > French-friendly	X	X
⊗ LINFO2146	Mobile and Embedded Computing	Ramin Sadre	EN [q2] [30h+15h] [5 Credits]  > French-friendly	X	X
⊗ LINFO2355	Multicore programming	Etienne Riviere	EN [q2] [30h+15h] [5 Credits]  > French-friendly	X	X

MAJOR IN NUMERICAL METHODS AND OPTIMISATION

- Mandatory
- ✘ Optional
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- Activity with requisites
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[Click on the course title to see detailed informations \(objectives, methods, evaluation...\)](#)

The student who wishes to validate this option chooses 15 credits among:

Year

1 2

o Content:

o Compulsory courses



ELECTIVE TECHNICAL COURSES

- Mandatory
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- Activity with requisites
- 🌐 Open to incoming exchange students
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- (FR) Teaching language (FR, EN, ES, NL, DE, ...)

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Year

1 2

o Content:

⊗ Statistics

				Year	
				1	2
⊗ LSTAT2200	Survey and Sampling	Séverine Guisset Christian Ritter	(FR) [q2] [15h+5h] [4 Credits] 🌐	X	X
⊗ LSTAT2380	Statistical consulting	Christian Ritter	(EN) [q1+q2] [30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2390	Applied statistics workshops	Christian Ritter Laura Symul	(EN) [q1+q2] [15h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2150	Nonparametric statistics: smoothings methods	Rainer von Sachs	(EN) [q1] [15h+5h] [4 Credits] 🌐	X	X
⊗ LSTAT2450	Statistical learning. Estimation, selection and inference	Eugen Pircalabelu	(EN)		

OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES
[3.0]

BUSINESS RISKS AND OPPORTUNITIES

- Mandatory
- ✂ Optional
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Year

MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

Commune à la plupart des masters de l'EPL, cette option a pour objectif de familiariser l'étudiant-e avec les spécificités de l'entrepreneuriat et de la création d'entreprise afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise.

Cette option rassemble des étudiants de différentes facultés en équipes interdisciplinaires afin de créer un projet entrepreneurial. La formation interdisciplinaire en entrepreneuriat (INEO) est une option qui s'étend sur 2 ans et s'intègre dans plus de 30 Masters de 9 facultés/écoles de l'UCLouvain. Le choix de l'option INEO implique la réalisation d'un mémoire interfacultaire (en équipe) portant sur un projet de création d'entreprise. L'accès à cette option, ainsi qu'à chacun des cours, est limité aux étudiant-es sélectionnés sur dossier. Toutes les informations sur <https://uclouvain.be/fr/etudier/ineo> (<https://uclouvain.be/fr/etudier/ineo>).

COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

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OTHERS ELECTIVE COURSES

Les cours au choix recommandés et accessibles aux étudiant-es du master ingénieur en sciences des données ou du master en sciences des données sont listés ci-dessus, dans les options et autres listes de cours au choix. L'étudiant-e est également libre de proposer d'autres cours des programmes de Masters EPL qui seraient pertinentes à son parcours personnel, pour autant que cela respecte les règles de constitution de programme du Master. Ces cours doivent être approuvés par le jury restreint.

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Course prerequisites

The **table** below lists the activities (course units, or CUs) for which there are one or more prerequisites within the programme, i.e. the programme CU for which the learning outcomes must be certified and the corresponding credits awarded by the jury before registering for that CU.

These activities are also identified in **the detailed programme**: their title is followed by a yellow square.

Prerequisites and student's annual programme

As the prerequisite is for CU registration purposes only, there are no prerequisites within a programme year. Prerequisites are defined. the

DATI2M - Information

Access Requirements

Master course admission requirements are defined by the French Community of Belgium Decree of 7 November 2013 defining the higher education landscape and the academic organisation of courses.

General and specific admission requirements for this programme must be satisfied at the time of enrolling at the university.

Unless explicitly mentioned, the bachelor's, master's and licentiate degrees listed in this table or on this page are to be understood as those issued by an institution of the French, Flemish or German-speaking Community, or by the Royal Military Academy.

In the event of the divergence between the different linguistic versions of the present conditions, the French version shall prevail.

SUMMARY

- > [General access requirements](#)
- > [Specific access requirements](#)
- > [University Bachelors](#)
- > [Non university Bachelors](#)
- > [Holders of a 2nd cycle University degree](#)
- > [Holders of a non-University 2nd cycle degree](#)
- > [Access based on validation of professional experience](#)
- > [Access based on application](#)
- > [Admission and Enrolment Procedures for general registration](#)

Specific access requirements

This programme is taught in English with no prerequisite in French. A certificate is required for the holders of a non-Belgian degree, see selection criteria of the Access on the file.

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			
Bachelor in Computer Science		Direct access	
Bachelor in Engineering		Direct access	
Other Bachelor	Have acquired skills equivalent to those of the minor in computer science or the minor in applied mathematics .	Access based on application	Maximum 60 additional credits integrated into their Masters's degree programme.
Others Bachelors of the French speaking Community of Belgium			
Bachelor in Computer Sciences		Direct access	
Bachelor in Engineering Sciences		Direct access	
Other Bachelor	Have acquired skills equivalent to those of the minor in computer science or the minor in applied mathematics .	Access based on application	See "Personalized access"
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in Computer Sciences		Direct access	
Bachelor in Engineering Sciences		Direct access	
Other Bachelors	Have acquired skills equivalent to those of the minor in computer science or the minor in applied mathematics .	Access based on application	See "Personalized access"
Foreign Bachelors			
Bachelor in Computer Sciences		Access based on application	See "Personalized access"

Non university Bachelors

> Find out more about [links](#) to the university

Diploma	Access	Remarks
BA en informatique, orientation développement d'applications - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation informatique industrielle - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation réseaux et télécommunications - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation sécurité des systèmes - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation technologies de l'informatique - crédits supplémentaires entre 30 et 60		

Teaching method

Active learning and soft skills

You will play an active role in your training. The teaching approach is a balanced mix of lectures, exercises, projects to be carried out alone or in groups. The teaching methods are varied. At certain times, you will be led to discover concepts or techniques independently, and the teaching staff is then seen as a resource made available to you to support your learning.

At other times, the pedagogy is more transmissive and provides you with the necessary keys to carry out subsequent tasks. An important place is reserved for non-technical skills (autonomy, organisational skills, time management, communication in different modes, etc.). In particular, through a pedagogy that emphasises project activities (including a large-scale project that puts groups of students in a semi-professional situation), the course develops a critical mind capable of designing, modelling, implementing and validating complex computer systems.

Languages

The lingua franca of data science is mainly English. The use of English throughout the programme allows you to develop your command of this language, which will facilitate your professional integration. Course materials and supervision are in English. However, you can always ask questions or take the exam in French if you wish. In addition, the programme offers the possibility of attending extra language courses and participating in exchange programmes abroad.

Interdisciplinarity

Like many academics, the data scientist will be required to manage projects and a team in the course of his or her career, and will have to take an interest in the complex socio-economic context in which data science is embedded. You will therefore be invited to open up your training to other disciplines via elective courses or certain options such as the option "interdisciplinary program in entrepreneurship".

Evaluation

The evaluation methods comply with the

Jury

- Président: Claude Oestges (<https://uclouvain.be/repertoires/claude.oestges>)
- Secrétaire du Jury: Sébastien Jodogne (<https://uclouvain.be/repertoires/sebastien.jodogne>)

Useful Contact(s)

- Secrétariat: Pascale Premereur (<https://uclouvain.be/repertoires/pascale.premereur>)

