

DATI2M - Introduction

Introduction

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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.

Finally, cybersecurity has become an essential element in a data-centric world: it will be a question of understanding and being able to manage the risks associated with the data itself, but also of being able to protect stored data and circulate it securely.

The **fields of application** of data science are extremely varied: political and security decision-making, e-commerce, processing network data, processing financial and industrial production data, natural language processing, biomedical research based on microbiological or imaging data.

Your profile

You have completed a bachelor's or master's degree in which you have acquired solid skills and a taste for the three basic building blocks of data science: mathematics, statistics and computer science, as well as a curiosity for the application areas of these disciplines.

You have a good command of technical English and are able to follow lectures, read scientific literature, write reports and express yourself orally in this language. You have the general skills and personal qualities necessary for a scientific master's degree, such as autonomy, critical thinking, rigour, self-learning and the ability to research and process information.

An additional teaching block (of maximum 60 credits) may be offered to students who lack some of these skills.

Your future job

Your degree in data science prepares you for the posts of

DATI2M - Teaching profile

Learning outcomes

Acquérir de solides bases méthodologiques en analyse, traitement et sécurité des données et les appliquer dans des domaines variés tel que sciences humaines, ingénierie, marketing, finance, assurance ou sciences du vivant...

Les étudiants acquerront des connaissances et développeront des compétences nécessaires pour :

- devenir des spécialistes en analyse de données – finalité Analyse de données (AD) (éventail d'algorithmes et de méthodes

- 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 2024-2025
- ⊙ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- ⊕ Open to incoming exchange students
- ⊗ Not open to incoming exchange students

[FR]

● LEPL2020

Professional integration work

The modules of LEPL2020 course are organized over the two annual blocks of the master's degree. It is strongly recommended that students take them from year 1, but they will only be able to register for the course at the earliest the year in which they present their final graduation project.

Students who have other professional integration activities in their personal programme, or who can demonstrate an equivalent activity could be exempted




Year

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x x




x x

x x

○ LINFO2347	Computer system security	Ramin Sadre	EN [q2] [30h+15h] [5 Credits]  > French-friendly	x	x
○ LINFO2144	Secured systems engineering		EN [q2] [30h+15h] [5 Credits]  > French-friendly	x	x
○ LMAT2450	Cryptography	Olivier Pereira	EN [q1] [30h+15h] [5 Credits]  > French-friendly	x	x
○ LELEC2348					

				Year	
				1	2
○ LINFO2241	Architecture and performance of computer systems	Tom Barbette	EN [q1] [30h+30h] [6 Credits]  > French-friendly	x	x

○ 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

ELECTIVE TECHNICAL COURSES

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

BUSINESS RISKS AND OPPORTUNITIES

- Mandatory
- ✘ Optional
- △ Not offered in 2024-2025
- ⊙ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 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

○ **Content:**

● LEPL2211	Business issues introduction	Benoît Gailly	EN [q2] [30h] [3 Credits] 🌐 > French-friendly	X	X
● LEPL2212	Financial performance indicators	Anne-Catherine Provost	EN [q2] [30h+5h] [4 Credits] 🌐 > French-friendly	X	X
● LEPL2214	Law, Regulation and Legal Context	Vincent Cassiers			

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>.

L'étudiant.e qui choisit de valider cette option doit sélectionner au minimum 20 crédits et au maximum 25 crédits. Cette option n'est pas accessible en anglais et ne peut être prise simultanément avec l'option « Enjeux de l'entreprise ».

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

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

Year

1 2

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COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

- Mandatory
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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.

OTHERS ELECTIVE COURSES

- Mandatory
 - ✘ Optional
 - △
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Supplementary classes

To access this Master, students must have a good command of certain subjects. If this is not the case, in the first annual block of their Masters programme, students must take supplementary classes chosen by the faculty to satisfy course prerequisites.

To enter the Master in Data Science, Information Technology orientation, the student must have a minimum of previous skills in mathematics, computer science, algorithms and probability-statistics. If this is not the case, he/she must add additional courses to his/her Master's program. The content of this additional training is determined by the program commission. The skills to be mastered correspond to those of the following courses:

- Mandatory
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⊗ Mathematics - Calculus and linear algebra

The student follows one of the following blocks:

⊗ Module 1



○ LINFO1111	Analysis	Pierre-Antoine Absil François Glineur	(FR) [q1] [45h+37.5h] [7 Credits] 🌐
○ LINFO1112	Algebra	Christophe Craeye Enrico Vitale	(FR) [q2] [30h+30h] [5 Credits] 🌐

⊗ Module 2

○ LINGE1114	Mathematics I: analysis	Heiner Olbermann	(FR) [q1] [30h+30h] [5 Credits] 🌐
○ LINGE1121	Mathematics II: algebra and matrix calculus	Cécile Coyette (compensates Tom Claeys)	(FR) [q2] [30h+30h] [5 Credits] 🌐

○

○ Un cours parmi :

⊗ LINMA2111	Discrete mathematics II : Algorithms and complexity	Jean-Charles Delvenne Jean-Charles Delvenne (compensates Vincent Blondel)	EB [q1] [30h+22.5h] [5 Credits]  > French-friendly
⊗ LINFO1121	Algorithms and data structures	Pierre Schaus	EB [q1] [30h+30h] [5 Credits] 

⊗ Computer systems:

The student follows one of the following blocks:

○ LINFO1341	Computer networks	Olivier Bonaventure	EB [q2] [30h+30h] [5 Credits] 
○ LINFO1252	Informatic Systems	Etienne Riviere	EB [q1] [30h+30h] [5 Credits] 

⊗ Numerical methods and optimisation:

The student follows one of the following blocks:

○ LINMA1702	Optimization models and methods I	François Glineur	EB [q2] [30h+22.5h] [5 Credits] 
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○ Un cours parmi :

⊗ LEPL1104	Numerical methods	Vincent Legat	
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Course prerequisites

There are no prerequisites between course units (CUs) for this programme, i.e. the programme activity (course unit, CU) whose learning outcomes are to be certified and the corresponding credits awarded by the jury before registration in another CU.

The programme's courses and learning outcomes

For each UCLouvain training programme, a [reference framework of learning outcomes](#) specifies the the skills expected of every graduate on completion of the programme. Course unit descriptions specify targeted learning outcomes, as well as the unit's contribution to reference framework of learning outcomes.

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 (Louvain-la-Neuve)		Direct access	
Bachelor in Computer Science (Charleroi)		Direct access	
Bachelor in Engineering		Direct access	
Other Bachelor	Have acquired skills equivalent to those of the minor in computer science or the minor		

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 de gestion - crédits supplémentaires entre 30 et 60	Les enseignements supplémentaires éventuels peuvent être consultés dans le module complémentaire .	Type court
BA en informatique et systèmes, orientation informatique industrielle - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation réseaux et télécommunications - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation sécurité des systèmes - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation technologie de l'informatique - crédits supplémentaires entre 30 et 60		
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		

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			

Masters			
		Direct access	
Master [120] ingénieur civil en science des données, orientation technologies de l'information - deuxième finalité		Direct access	Au terme du master 120, chaque finalité du Master [120] ingénieur civil en science des données, orientation technologies de l'information peut être obtenue dans un nouveau programme de 30 crédits seulement.

Holders of a non-University 2nd cycle degree

Access based on validation of professional experience

> It is possible, under certain conditions, to use one's personal and professional experience to enter a university course without having the required qualifications. However, validation of prior experience does not automatically apply to all courses. Find out more about [Validation of priori experience](#).

Access based on application

Access based on application : access may be granted either directly or on the condition of completing additional courses of a maximum of 60 ECTS credits, or refused.

Admission and Enrolment Procedures for general registration

Contacts

Curriculum Management

Entity

Structure entity

SST/EPL/DACS

Denomination

(DACS)

Faculty

Louvain School of Engineering (EPL)

Sector

Sciences and Technology (SST)

Acronym

DACS

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Website

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Academic supervisor: [Laurent Jacques](#)

Jury

- Président: [Claude Oestges](#)
- Secrétaire du Jury: [Siegfried Nijssen](#)

Useful Contact(s)

- Secrétariat: [Pascale Premereur](#)

