UCLouvain

DATI2M

2024 - 2025

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 langage 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 « data scientist », « data analyst», « security analyst », « data and analytics manager », « data engineer », « security engineer », or « security architect » .

Your programme

The master's programme: Data Science : Information Technology at UCLouvain is based on a common core that provides a technical foundation in the fields of learning theory, databases, and linear statistical models.

This common core is completed by the choice of a focus on data analysis or a focus on cybersecurity.

The data analysis 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 five pillars: cryptography, privacy, and hardware, software and system security, as well as an introduction to information theory.

These pillars are completed by majors and elective courses that allow students to deepen their knowledge of algorithmic, computer science, statistical, application or entrepreneurial aspects.

Your parcours

You will primarily develop strong, in-depth, cross-disciplinary skills to be able to address a broad spectrum of data science and cybersecurity problems and to carry out projects or develop research in the field.

Your programme will offer you opportunities to explore, through projects, internships or applied courses, the extremely varied fields of application of data science.

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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...

Year
1 2

LIST OF FOCUSES

> Professional Focus : Data Analytics *[en-prog-2024-dati2m-ldati210s]*

				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					

MAJOR IN NUMERICAL METHODS AND OPTIMISATION

- O 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...)

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

O Content:

O Compulsory courses

				Year 1	Year 2
O LINMA2471	Optimization models and methods II	François Glineur Geovani Nunes Grapiglia	EN [q1] [30h+22.5h] [5 Credits] > *French-friendly*	x	x
O LINMA2380	Matrix computations	Raphaël Jungers	EN [q1] [30h+22.5h] [5 Credits] > *French-friendly*	x	x

O One course between

⊠ LINFO2266	Advanced Algorithms for Optimization	Pierre Schaus	EN [q1] [30h+15h] [5 Credits] > *French-friendly*	x	x
⊠ LINMA2450	Combinatorial optimization	Julien Hendrickx Geovani Nunes Grapiglia	EN [q1] [30h+22.5h] [5 Credits] > *French-friendly*		x

⊠ Elective courses

⊠ LINMA2470	Stochastic modelling	Philippe Chevalier Mehdi Madani (compensates Philippe Chevalier)	EN [q2] [30h+22.5h] [5 Credits] > *French-friendly*	x	x

ELECTIVE TECHNICAL COURSES

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'entreprenariat 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 entrepeneuriat (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 ».

- O Mandatory
- Optional
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- 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

O

COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

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
- 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...)

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)	EN [q1] [30h+22.5h] [5 Credits] *> French-friendly*
LINFO1121	Algorithms and data structures	Pierre Schaus	FR [q1] [30h+30h] [5 Credits]

Computer systems:

The student follows one of the following blocks:

LINFO1341	Computer networks	Olivier Bonaventure	FR [q2] [30h+30h] [5 Credits]
LINFO1252	Informatic Systems	Etienne Riviere	FR [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	FR [q2] [30h+22.5h] [5 Credits]

Un cours parmi :

LEPL1104	Numerical methods	Vincent Legat	FR [q2] [30h+30h] [5 Credits]
LINFO1113	Numerical algorithmic	Sébastien Jodogne Estelle Massart	FR [q2] [30h+30h] [6 Credits]

Other EU to be determined with the Study Advisor

Depending on his / her previous academic background, the student (in consultation with the study advisor) can add other UEs in order to acquire the necessary prerequisites for the program.

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

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 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 de gestion - crédits supplémentaires entre 30 et 60 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		

Admission and Enrolment Procedures for general registration

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 regulations concerning studies and exams. More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".

Each unit of the programme includes an oral or written examination, often supplemented by a project leading to a report which is part of the assessment. The optional internship and the master thesis each involve the writing of a document which is defended orally before a jury.

To compute the final grade, the marks obtained for the teaching units are weighted by their respective credits.

Mobility and/or Internationalisation outlook

Over the years, EPL has developed over a hundred partnerships with partners in more than 36 countries (EU and non-EU) to offer exchange programmes to its students. We also offer the possibility of obtaining Double degrees, Joint Degrees or Dual Masters in several fields. The EPL is currently participating in two Erasmus Mundus programmes: FAME and STRAINS.

In addition to exchange programmes under the Erasmus+ programme, numerous agreements have been established with a wide range of universities through various partner networks such as:

- TIME network (Top Industrial Managers in Europe).
- CLUSTER network
- Magalhães network
- Circle U. network through several networks and European University Alliance

So, there's no shortage of opportunities to gain an additional qualification and/or spend part of the year abroad during your two-year Master's degree! It's the perfect opportunity to discover or improve your knowledge of a foreign language, tackle subjects from a new angle and gain unique experience in Europe or the rest of the world.

If you would like more information, please visit the dedicated pages of the EPL International Office to discover all the destinations, testimonials from former students and all the procedures to follow to make these opportunities a success.

Possible trainings at the end of the programme

The master's degree in data science, information technology orientation can be followed, under certain conditions, by by a PhD thesis.

Contacts

Curriculum Management

Entity

Structure entity	SST/EPL/DACS
Denomination	(DACS)
Faculty	Louvain School of Engineering (EPL)
Sector	Sciences and Technology (SST)
Acronym	DACS
Postal address	Avenue Georges Lemaître 4-6 - bte L4.05.01 1348 Louvain-la-Neuve
Website	www.uclouvain.be/epl

Academic supervisor: Laurent Jacques

Jury

- Président: Claude Oestges
- Secrétaire du Jury: Siegfried Nijssen

Useful Contact(s)

- Secrétariat: Pascale Premereur