

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In French

Dissertation/Graduation Project : **YES** - Internship : **optional**

Activities in English: **YES** - Activities in other languages : **NO**

Activities on other sites : **optional**

Main study domain : **Sciences**

Organized by: **Faculty of Science (SC)**

Programme acronym: **DATS2M** - Francophone Certification Framework: 7

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DATS2M - Introduction

Introduction

Introduction

The digitalization is at the origin of the considerable increase of available data. From then on, most of the actors of the society rely on an analysis of these data to objectify their decision-making and develop their disciplinary axes. From these specific needs, we attend to the emergence of new jobs oriented to "data".

The Master's degree in Data Science proposes a training in scientific methods and technological tools to answer societal or scientific questions by processing data that are often massive ("Big Data"). This discipline requires associating a model structured by the problem of interest, with computer sciences, statistics and mathematics to bring a rigorous, quantitative and operational solution to the asked question. An IT infrastructure and algorithms of complex calculations also complement these scientific methods to allow the data structuring and processing.

The fields of application of data sciences are extremely varied: the political and security decision taking, the real time on-line advertising, the e-commerce, the data processing of network, the processing of financial data or industrial production, the biomedical research based on o-mics data or of imaging.

Your profile

You hold an undergraduate diploma or a Master's degree and you have acquired solid skills and the taste for the three pillars of the sciences of the data: the mathematics, the statistics and the computing as well as a curiosity for the fields of application of these disciplines.

You master technical English and are capable of attending class, reading scientific documents, to draft reports and to express you orally in this language. You have general skills and necessary personal qualities to approach a diploma of scientific Master's degree such as of the autonomy, a critical mind, the rigor, a capacity of auto-apprenticeship and to look for or to deal with the information.

A block of additional courses (of maximum 60 credits) is proposed to students having no all these skills.

Your future job

Your diploma of Master's degree in Data Science, statistical orientation, prepares you for positions of "data scientist", "data analyst", "data and analytics manager" or simply "statistician" and prepares to set of responsibility in these domains.

Your programme

The Master's degree in Data Science, declined in two orientations, leans on the following four common pillars:

- Statistical inference and modelling.
- Learning theory, Data mining and visualization of large-dimension data.
- The industrial aspects and the business of data sciences and data analytics.

The "Statistical" orientation offered by the LSBA (Louvain School in statistics, biostatistics and actuarial sciences) proposes, in complement to these four common pillars, a training more specialized in useful statistical methods for data sciences and a strong opening towards the implementation of tools in various fields of application, in management, finance and human sciences.

The Louvain School of Engineering (EPL) offers a second orientation, which complements the four common pillars with a [specialization in "Information technology" via two options in "Computer systems" and "Digital methods and optimization"](#).

Your parcours

You will develop firstly interdisciplinary fundamental skills, solid and deepened to be capable of approaching a wide spectrum of problems in data science. You will also be able to bring to a successful conclusion projects or of to develop research in the domain.

Your program will offer you opportunities to discover, via projects, internships or applied courses, extremely varied scopes of data sciences: political and security decision-making, the real time online advertising, the e-commerce, the data processing of network, the data processing financiers or of industrial production, the biomedical research based on –omics data or of imaging...

DATS2M - Teaching profile

Learning outcomes

Acquire robust methodological bases in analysis and data processing and apply them in varied domains such as human sciences, engineering, marketing, finance, insurance, or scientific research.

After completing the training, the student will master the fundamental concepts in statistics, algorithmic, data mining, and machine learning that are necessary for the job of «data scientist». He will develop skills in communication and will be capable of analyzing a complex problem, of collaborating in a research project. According to the objectives aimed by the student, several elective modules are proposed: applied data, dated sciences in linguistics, algorithmic and computing, statistics and sampling, dated sciences applied to management.

On successful completion of this programme, each student is able to :

1.

Demonstrate the control of a robust corpus of knowledge in data sciences, allowing him(her) to solve the problems which are a matter of his(her) discipline

1.1

The structures of data and algorithms for the analysis of data.

1.2

The theories of the learning, the data mining and the visualization of large-dimension data.

1.3

The statistical inference, the modelling and statistical computing. The student in the orientation information technologies specializes via compulsory or electives courses.

1.4

The industrial and entrepreneurial aspects of data sciences.

1.5

The computer systems, including parallel computing, the networks and the safety(security).

1.6

Numerical methods and optimization, constrained optimization included, operational research, identification and applied mathematics.

2.

Organize and to lead to its term an initiative of development of a data operating system, fulfilling to complex needs of a customer.

2.1

Analyze the problem or solving the functional needs and to formulate the corresponding specifications.

2.2

Formalize and model the problem and design one or several original technical solutions answering these specifications.

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To the program of 120 credits, a module of additional teachings can be added for the student not possessing all the prerequisites of the Master's degree. This module is selected with the advisor of the program.

DATS2M Programme

Detailed programme by subject

CORE 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...)

Year

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● Statistical modelling

● LSTAT2120	Linear models	Christian Hafner	EN
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o **Content:**

o Content:

⊗ Cours au choix

Maximum one course among the two courses (As they are bachelor course, the amount of credits is reduced to 5)

⊗ LINFO1113	Numerical algorithmic	Sébastien Jodogne Estelle Massart	FR [q2] [30h+30h] [6 Credits]	X	
⊗ LINFO1114	Discrete Mathematics	Marco Saerens	FR [q1] [30h+15h] [5 Credits]	X	
⊗ LINFO1252	Informatic Systems	Etienne Riviere	FR [q1] [30h+30h] [5 Credits]	X	X
⊗ LINFO2266	Advanced Algorithms for Optimization	Pierre Schaus	FR [q1] [30h+15h] [5 Credits] > French-friendly	X	X
⊗ LINFO2145	Cloud Computing	Etienne Riviere	FR [q1] [30h+15h] [5 Credits] > French-friendly		X

STAGE

- 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...)

1 internship maximum, chosen among the two following (optional):

o Content:

⊗ LDATS2940	Stage en science des données		FR [q1 or q2] [] [10 Credits]		X
⊗ LDATS2945	Stage en science des données en lien avec le mémoire		FR [q1 or q2] [] [5 Credits]		X

DATA SCIENCES APPLIQUÉES À LA GESTION

- Mandatory
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- ⊙ 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 following courses are taught on two-month periods and the first three ones are taught on the Campus of UCL Mons. Thus, we ask

The student is invited to meet the program advisor to decide which courses should be followed. The restricted jury must next approve his program.

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⊗ Mathématique - Analyse et algèbre linéaire

Each of the following three modules allows acquiring similar skills:

⊗ 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] 🌐

⊗ Module 3

○ LMAT1101	Mathematics 1	Pedro Dos Santos Santana Forte Vaz	FR [q1] [30h+20h] [4 Credits] 🌐
○ LMAT1102	Mathematics 2	Augusto Ponce	FR [q2] [30h+30h] [4 Credits] 🌐

⊗ Probabilités et Statistique

Each of the following four modules allows acquiring similar skills:

⊗ Module 1

○ LSTAT2014	Elements of probability W n 1 gprob a[E statistics	Eugen Pira[Eabelu	FR [q1] [22.5h+22.5h] [5 Credits] 🌐
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⊗ Module 2

○ LBIR1212	Probabilities and statistics (I)	Patrick Bogaert	FR [q1] [30h+15h] [4 Credits] 🌐
○ LBIR1315	Probability and statistics II	Patrick Bogaert	FR [q1] [22.5h+22.5h] [3 Credits] 🌐

⊗ Module 3

○ LINGE1113	Probability	Johan Segers	FR [q2] [30h+15h] [4 Credits] 🌐
○ LINGE1214	Further Statistics	Christian Hafner	FR [q1] [30h+15h] [4 Credits] 🌐

⊗ Module 4

○ LMAT1271	Calculation of probability W n statisticalh Walysis	Rainer von Sachs	FR [q2] [30h+30h] [6 Credits] 🌐 > English-friendly
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⊗ Programmation et informatique

Then student must acquire the skills related to these three courses:

⊗ LINFO1101	Introduction to programming	Kim Mens Siegfried Nijssen Charles Pecheur	FR [q1] [30h+30h] [5 Credits] 🌐
⊗ LEPL1402	Informatics 2	Sébastien Jodogne Ramin Sadre Pierre Schaus	FR [q1] [30h+30h] [5 Credits] 🌐
⊗ LINGE1322	Computer science: AWalysisish W nDesign of Information Systems	Jean V W erdonckt	FR [q2] [30h+15h] [5 Credits] 🌐

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 between CUs of different years and therefore influence the order in which the student will be able to register for the programme's CUs.

In addition, when the jury validates a student's individual programme at the beginning of the year, it ensures its coherence, meaning that it may:

- require the student to combine registration in two separate CUs which it considers necessary from a pedagogical point of view.
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DATS2M - 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

In addition to the access conditions described below, candidates will have to provide proof of a sufficient command of the French

			authorisation from the faculty/ school.
Bachelor in Economics and Management Bachelor in Bioengineering Bachelor in Management		Access with additional training	Straight access, but the program is completed with an additional training of maximum 10C
Other Bachelor	if no minor in computer sciences / statistics and data sciences	Access based on application	
Others Bachelors of the French speaking Community of Belgium			
Engineer in management Engineering, orientation « civil engineer » Computer sciences Mathematical sciences Physical sciences		Direct access	
Bachelor in economics or management Engineering orientation bio-engineering		Access with additional training	Straight access, but the program is completed with an additional training of maximum 10C
Other Bachelor		Access based on application	
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in de ingenieurswetenschappen Bachelor in de informatica Bachelor in de wiskunde Bachelor in de fysica Bachelor in de economische wetenschappen Bachelor in de bio-ingenieurswetenschappen		Access based on application	

Teaching method

By its professional vocation, the teaching is completed by numerous practical class having for objective the implementation of methods of analysis on real data. On the other hand, the student also has the possibility of including in his program, a company internship to develop the methodological aspects of the report there. Certain projects will also require working in multidisciplinary teams, what contributes to the development of a stimulating and friendly spirit of collaboration among the students of the program.

The majority of the courses distributed by the teachers are accompanied by an intranet site on the platform "moodle". These sites propose tools of e-learning and serve as forum to the students.

Certain specialized modules are taught by professors coming from the industry.

Finally, the program includes compulsory courses in English and in French. Thus, the student must be capable of attending class in both languages. The report can be made in English and the student can also individual ask to take his examinations in English. The choice of

Certificates

The LSBA also proposes diverse programs of continuous training (certified or not), as the university certificate in statistics and data sciences which allows to follow 15 to 30 credits of courses according to the interest or professional needs for the participant.

The SMCS also propose complementary trainings (not certified) in statistics and statistical software. (<https://uclouvain.be/fr/chercher/smcs>)

Contacts

Curriculum Management

Entity	
Structure entity	SST/SC/LSBA
Denomination	(LSBA)
Faculty	Faculty of Science (SC)
Sector	Sciences and Technology (SST)
Acronym	LSBA
Postal address	Voie du Roman Pays 20 - bte L1.04.01 1348 Louvain-la-Neuve Tel: +32 (0) 10 47 43 14

