



The more you know, the more you dare®

MSc **BIG DATA FOR BUSINESS**



LEAD THE DIGITAL TRANSFORMATION



*Eric Moulines,
Scientific Director,
École Polytechnique*



*Laurence Lehmann-Ortega,
Scientific Director, HEC Paris*



*Stéphane Madoeuf,
Scientific Director, HEC Paris*

« In the Digital Age, everything has become information: data from social media, email exchanges, consumption habits, GPS data, bank transactions... All kinds of organizations are converting this vast amount of information into strategic resources. How should these data be stored? How can they be used? These questions impact the profit contributions of many functions within companies (marketing, sales, logistics, risk management) and, therefore, must be addressed.

HEC Paris and École Polytechnique, 2 globally-recognized institutions, have united forces to create a joint degree specifically aimed at providing students with strong skills in both Big Data and business. This 2-year MSc program has been designed to combine high-level expertise in the engineering field, to train students in data sciences, with proficiency in the business field, to form data managers capable of taking strategic decisions based on data resources.

Profiles specialized in Big Data are in such high demand that often companies recruit students even before they graduate. This degree will give you an invaluable asset so that you may become a key stakeholder in the digital transformation and evolve successfully in your business career. »

Eric Moulines, Scientific Director, École Polytechnique
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HEC Paris holds the prestigious Triple Crown accreditation: AACBS, AMBA, EQUIS





HEC Paris



Ecole Polytechnique

BUILD THE FUTURE WITH

HEC PARIS IS RANKED

#2
BUSINESS SCHOOL
IN EUROPE

(2015 *Financial Times* general ranking
of European Business schools)

#5
BUSINESS SCHOOL
WORLDWIDE

(2013 *Times Higher Education* -
Alma Mater index of Fortune 500
CEO's)

This Joint Degree between HEC Paris and École Polytechnique will equip students with both the technical skills and the strategic mindset to successfully lead any business career requiring a high expertise in Big Data.

JOIN THE PARIS-SACLAY INNOVATIVE CLUSTER

HEC Paris and École Polytechnique are founding members of Université Paris-Saclay. Paris-Saclay is a leading innovative cluster, devoted to academic and scientific excellence and placed among the top 8 «innovation clusters» in the world by the MIT Technology Review. It is made up of a unique selection of 19 independent higher-education institutions and 7 research bodies.

STUDY IN TWO GLOBALLY-RECOGNIZED INSTITUTIONS

École Polytechnique and HEC Paris are both world leading academic institutions, renowned for the quality of their degrees, faculty and research. Their association within this Joint Degree represents the best Business/Engineering combination available in Europe, with considerable added value for the students.

LEAD THE DIGITAL TRANSFORMATION OF THE ECONOMY

Big data marks the beginning of a major transformation of the digital economy, which will significantly impact all industries. There are 3 main challenges to face:

- **Technological:** dealing with the explosion of data by managing the spread of vast amounts of information that is often very disorganized (IP addresses, fingerprinting, website logs, social media, etc.)
- **Scientific:** replacing mass data with knowledge, i.e. developing the expertise that makes it possible to structure information, even out of tons of vague or corrupt data
- **Economic:** managing data both to control risks and benefit from the new opportunities they offer.

A PRIZED DOUBLE PROFILE

ACQUIRE THE SKILLS TO MAKE A DIFFERENCE IN TOMORROW'S DIGITAL WORLD

Exploiting this vast amount of data requires the following:

- A mastery of the sophisticated **mathematical techniques** needed to extract the relevant information.
- An advanced understanding of the fields where this knowledge can be applied in order to be in a position to interpret the analysis results and make **strategic decisions**.
- A strong **business mindset** and an even stronger strategic expertise, to be able to fully benefit from the new opportunities involved with Big Data problematics and develop business solutions accordingly.
- The ability to suggest and then decide on the choice of **IT structures**, the ability to follow major changes in **IT systems**, etc.

Therefore the program has three objectives:

- To train students in **data sciences** which combines mathematic modeling, statistics, IT and visualization to convert masses of information into knowledge.
- To give students the tools to understand the newest data distributing structures and large-scale calculations to ease decision-making and guide them in their choices.
- To form **data 'managers'** capable of exploiting the results from analysis to make strategic decisions at the heart of our changeable businesses.

ÉCOLE POLYTECHNIQUE
IS RANKED

#4
UNIVERSITY FOR
GLOBAL EXECUTIVES

(2013 *Times Higher Education*
Ranking)

#10

MOST ATTRACTIVE
INSTITUTION IN
THE WORLD FOR
EMPLOYERS

(2016 *QS Graduate Employability*
Ranking)

BENEFIT FROM WORLD-CLASS FACULTY AND RESEARCH

HEC Paris and École Polytechnique both boast world-class faculty. HEC Paris' permanent faculty all come from the world's leading research universities such as Harvard, MIT, Princeton, Stanford, UCLA, Wharton, Yale, etc. They regularly share their work in top academic journals and international conferences. 64% are non-French and represent 29 different nationalities. École Polytechnique has 670 full-time faculty, including 39% of international.

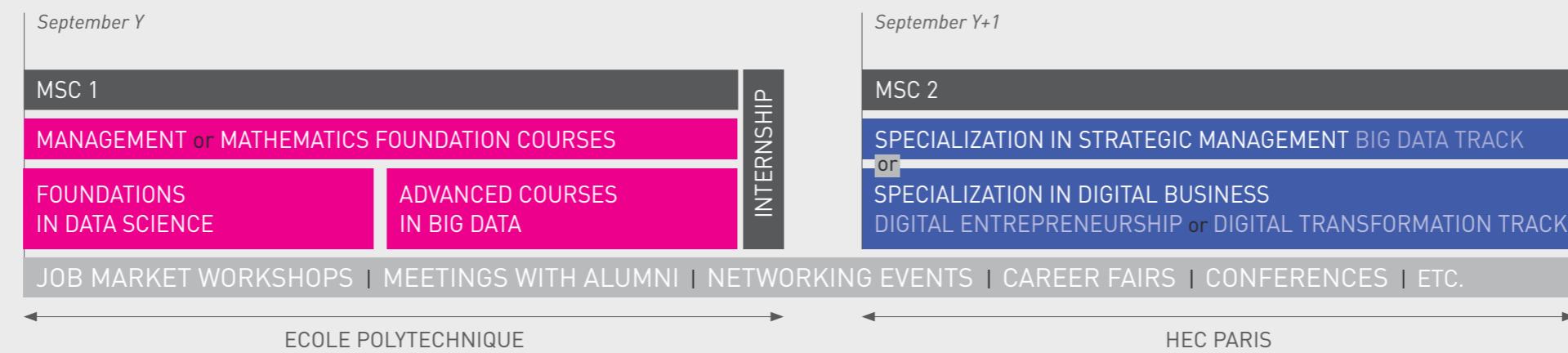
EVOLVE IN A DYNAMIC RESEARCH ECOSYSTEM

Pushing the frontier of knowledge is a shared priority between HEC Paris and École Polytechnique. Both institutions have created specialized research units in order to provide major interdisciplinary contributions to management, innovation, science, technology, and society. École Polytechnique has for example 22 joint laboratories with the CNRS (National Center for Scientific Research) or other research institutions, such as the CEA, INRIA, INSERM, Université Paris-Sud, ENSTA ParisTech and UPMC.

HEC Paris has launched chairs with major companies on contemporary issues such as leadership, innovation, and sustainability, but also interdisciplinary research centers:

- the **Society & Organizations Center**, which aims at offering new ways of understanding the world and helping organizations to reconcile economic priorities with a new series of imperatives
- the **Entrepreneurship Center**, which promotes entrepreneurship through innovative HEC Paris programs, start-ups support, academic and business partnerships
- the **Digital Transformation Center**, which addresses the challenges of digital transformation, and brings together businesses and students to work directly on such issues.





YEAR 1 CURRICULUM AT ÉCOLE POLYTECHNIQUE

The key aim of the teaching in this Joint Degree is to provide students with the tools needed to solve real problems, using structured and unstructured data masses, teaching them to ask the 'right' questions (both from statistics and 'business' perspectives), to use the appropriate mathematical and IT tools to answer these questions.

Students will be equipped to shift constantly from data to knowledge, from knowledge to strategic decisions, and from strategic decisions to operational business implementations.

All these shifts carry with them numerous challenges that each requires an interdisciplinary approach involving mathematics, computer science, business strategy and management skills.

PROGRAM FACILITATORS

- Applied Mathematics Centre (CMAP), Ecole Polytechnique
- Information Technology Laboratory (LIX), Ecole Polytechnique

'Data science' is based on the statistical processing of information (Statistics / Numerical statistics, Machine learning). A wide range of statistical methods will be explored throughout the program, along with methods derived from applied mathematics. The program aims to sharpen students' understanding of how these methods link basic, essential theories that play a considerable role in practice. The teaching will focus largely on the data produced by 'real-life' cases obtained in association with the program's industrial partners. We will teach students the newest and most commonly used tools in this industry. The program will also tackle the topics of data storage as today's companies need to constantly rethink the structure of their information systems without compromising performances and security. This is particularly important for MSc Big Data's latest tools, mainly Hadoop and MapReduce (Pig Latin, Hive, etc.). Depending on the profile of the students, they will have access to either management foundation courses (accounting and marketing) or mathematics foundation courses (mathematics, statistics and probabilities).

CORE COURSES

- Statistics in Action
- Statistics with R
- Born to Code (Python programming)
- Advanced Programming
- Mathematical Foundations of Data Science
- The Art of Regression
- Data Structure & Data Management
- Data Base Management System
- Systems for Big Data Analytics
- Machine Learning
- Neural Networks and Deep Learning
- Computational Statistics
- Graphical Models for Big Data Analytics
- Big Data Mining
- Big Data Systems
- Data Camp
- Large Graphs Mining
- Text and Graph Mining.

YEAR 2 CURRICULUM AT HEC PARIS

HEC Paris offer two different options for the second year of the curriculum:

- Strategic Management - Big Data Track
- or Digital Business

Students will join the cohort of the HEC Grande Ecole students. They will seat together in the classroom and benefit from the same learning environment.

THE STRATEGIC MANAGEMENT OPTION

Core Courses

- Competing for Advantage
- Core Methodologies for Strategy Consulting
- Financial Dimension of Strategic Decisions
- Research and Writing Tools for Master Thesis
- Strategic Analysis of Negotiation Games
- Strategic Management Accounting
- Strategic Marketing.

Examples of Electives Courses

- Business Analytics
- Designing and Managing Processes for Competitive Advantage
- Digital Transformation, Media and Beyond
- From Digital to Big Data
- Internet-Based Business Models
- Managing Global Complexity
- Managing Public-Private Partnerships: Strategic and Organizational Issues
- Project Management
- Reinventing a Consulting Firm Strategy
- Strategy for Multi-Sided Platforms
- Time to Reorganize

Workshops with Consulting Firms

GlobStrat: computer-assisted business simulation

Company Project

Conferences with leaders from the industrial and service sector

Professional Dissertation

THE DIGITAL BUSINESS OPTION

Core courses

- Numerical Strategy
- Internet and Telecom Economics
- Strategic Marketing and Business Models of the Digital Age
- Digital Marketing (SEO and SEM, CRM, Display, retargeting and other digital tools, Apps)
- Social Media Management
- Big Data/ Big Business
- E-reputation, Crisis Management and Economic Intelligence
- New Digital Economy Law

Tracks

- Digital Entrepreneurship
- Digital Transformation

Case Study: Digital strategy

Challenges with Firms

- Big Data
- Connected Objects
- Digital Consumer
- E-Commerce

Study Trip

Research Thesis

WIDEN YOUR CAREER OUTLOOK

600
COMPANIES RECRUIT
ON EACH SCHOOL
CAREER FAIRS

98%
OF HEC GRADUATES
FOUND EMPLOYMENT
WITHIN 3 MONTHS

As "Big Data" affects all kinds of companies and sectors, students will have a very large range of career options upon graduation, from consulting firms to digital start-ups, not to mention well-established multinational companies.

In fact, as can be seen in all areas of cutting-edge innovation, there is a growing demand for high-level managers who can combine strong technical skill with business know-how. This is especially true when it comes to Big Data topics, and students graduating from data science and Big Data programs are therefore highly sought after on the job market.

BROADEN YOUR HORIZONS THANKS TO THE BUSINESS PARTNERSHIPS WITHIN THE PROGRAM

Students will benefit from a wide range of partnerships throughout the program and upon graduation:

- Aeronautical and transport (Peugeot-Citroen, Airbus, AirFrance, SNCF, Amadeus)
- Consultancy (McKinsey, Accenture, Cap Gemini...) and Business Intelligence (Keyris, Sopra Group, CapGemini, SAP-Business Object, SAS)
- Banking and insurance (BNP Paribas, Société Générale, Barclays, HSBC, AXA)
- Energy (Engie, EDF, AREVA, start-ups in the industry)
- Digital (IBM, Google, Facebook, Criteo, start-ups in the industry)
- Telecommunications (Orange)
- E-commerce (FNAC, Darty, Cdiscount, Criteo, start-ups in the industry)
- Media and the leisure industry.

BOOST YOUR CAREER WITH POLYTECHNIQUE AND HEC PARIS' ACTIVE SUPPORT

Providing students with high-level academics is not enough. HEC Paris and École Polytechnique also offer assistance so that students can have access to the best possible placement and business opportunities.

HEC Paris has notably designed a 6-step career roadmap, which aims at helping our students explore their options, understand the job market and give them all the tools to achieve their goals. The school also provides its students with up-to-date job & internship opportunities and organize many events throughout the year: career fairs, mock interviews with recruiters, company presentations...

École Polytechnique leads the same active policy. The X-Forum Business Fair gathers more than 2000 students, half of which are from École Polytechnique, and 150 companies, international universities and graduate schools. Additionally, interview simulation workshops take place on campus four times a year, moderated by École Polytechnique's partner companies.

FOLLOW THE PATH OF ENTREPRENEURSHIP

An increasing number of graduates from École Polytechnique and HEC Paris choose the path of entrepreneurship. The two institutions have created a 'virtuous circle of entrepreneurship' by:

- building close ties with the business world: many professionals come to share their knowledge and experience on both campuses
- creating innovative curriculums leading students to create successful companies: PriceMinister, Sarenza, Spartoo, i-Demenager - supporting research and students start-ups with the HEC Incubator, which has already assisted 90 companies and the École Polytechnique's Fibre Entrepreneur , a space dedicated to innovative businesses with a high potential
- supporting research and students start-ups with the HEC Incubator, which has already assisted 166 companies and the École Polytechnique's Fibre Entrepreneur, a space dedicated to innovative businesses with a high potential.

École Polytechnique and HEC Paris push leadership, entrepreneurship and innovation on a higher scale.

MAKE THE MOST OF WORLDWIDE NETWORKING AND ALUMNI POWER

The various events and career fairs organized with international companies include a strong participation of the alumni networks. The HEC Alumni network consists of more than 52,300 members in 132 countries, while Polytechnique counts more than 21,000. Powerful and international, both networks represent increased chances to build a successful career.





EXPERIENCE THE UNIQUE POLYTECHNIQUE AND HEC PARIS' WAY OF LIFE

400

STUDENTS' CLUBS

1.500

BEDROOMS AVAILABLE
ON EACH CAMPUS

716

CUMULATIVE ACRE
CAMPUS

HEC Paris and École Polytechnique are located in the Paris-Saclay cluster, just a few kilometers from each other. Students enrolled in the MSc Big Data for Business program can benefit from both HEC Paris and École Polytechnique's top of the range infrastructures and enjoy an enriching student life. They have the opportunity to join the many student associations and make the most of the excellent sports facilities available.

ACCESS TO A RANGE OF ACCOMMODATION AND CATERING FACILITIES

Students from the joint degree have access to accommodation at École Polytechnique during the MSc first year, and at HEC Paris during the MSc second year.

There are around 1500 student rooms available on École Polytechnique's campus and 1176 on HEC campus. Students may eat in the campus restaurants and cafeterias but also in the neighboring restaurants or supermarkets.

JOIN ONE OF OUR 400 HUNDRED SPORTS AND STUDENT CLUBS

Sport plays an important role in student life, which is why HEC Paris and École Polytechnique's campuses provide the opportunity to practice many sports with a selection of high-quality facilities, indoors or outdoors.

For example, HEC students have access to a multipurpose gymnasium, an indoor mountain climbing wall, a weight training room and facilities for aerobics, fencing and martial arts. 10,000 m² of outdoor fields include tennis courts, an athletics track and two rugby/football pitches. At École Polytechnique, students can, among other things, swim in two 25-meter pools, ride horses or go canoeing. Both schools organize competitions in many disciplines (riding, tennis, basketball...).

On HEC Paris and École Polytechnique's campuses, students can choose from almost 400 student clubs and associations, covering a great variety of cultural, artistic, social, scientific and sporting activities. Belonging to one or more clubs and associations is the best way to make friends, meet company representatives, share ideas or hobbies with others, have fun and take part in an activity. It also develops a sense of responsibility, leadership, boldness and an enterprising mind.



A PROGRAM TAILORED FOR HIGH-POTENTIAL STUDENTS

This master is just as relevant for IT specialists and applied mathematicians as it is for high-potential students with little to no former exposure to IT and statistics, as long as they have a strong level in mathematics.

ENTRY REQUIREMENTS

Students must have a strong level in Mathematics and hold at least a Bachelor's degree in the following fields:

- Bachelor in Science
- Bachelor in Engineering
- Bachelor in Business or in Economics.



INFORMATION AND APPLICATION:

www.hec.edu/Masters-programs
www.polytechnique.edu/en
portail.polytechnique.edu/graduatedegree

CONNECT WITH HEC PARIS TEAM:

hecprograms@hec.fr
Tel.: +33 (0) 1 39 67 70 88
+33 (0) 1 39 67 73 52
+33 (0) 1 39 67 95 40
+33 (0) 1 39 67 96 95
Fax: +33 (0) 1 39 67 73 04

CAMPUSES:

École Polytechnique
91128 Palaiseau Cedex
FRANCE

HEC Paris
1, rue de la Libération
78351 Jouy-en-Josas Cedex
FRANCE

ECOLE POLYTECHNIQUE PROGRAM PORTFOLIO:

- Ingénieur Polytechnicien Program
- Master's programs
- Doctoral Programs
- Executive Education programs

HEC PARIS PROGRAM PORTFOLIO:

- Grande école Master's Programs:
Master in Management (MiM),
Master in Management & Public Affairs (MPA),
Master in Management & Business Law (MBL)
- MSc/MS programs
- MBA Program
- PhD Program
- Executive Education Programs:
TRIUM Global Executive MBA,
Executive MBA,
Executive Masters Programs,
Open-Enrollment Programs,
Custom Programs and Coaching
- Summer School Programs.