Phd course in "Big data and artificial intelligence"

Coordinator: Prof.ssa Barbara Martini - SSD ING-INF/05

Administrative Office: Piazza Mattei, no. 10 - Rome (RM) 00186

Expected course start date: 01 December 2023

Duration: 3 years

Areas CUN: 06 - Medical Sciences, 08 - Civil Engineering and Architecture, 09 - Industrial and Information Engineering, 12 - Legal Sciences, 13 - Economics and Statistics, 14 - Political and Social Sciences.

Curricula:
- Big data management for the digital transition
- Artificial intelligence for industry 5.0 and circular economy

Places: n. 16 Total places, of which 12 with scholarship, 4 without scholarship.

DETAILS OF TOPICS IN THE COMPETITION
- **N. 2 scholarships funded by** *Universitas Mercatorum* **Project theme:** the projects will involve the development of methodologies of massive analysis of data for the reduction of environmental impact and the improvement of human living conditions; the intensive use of digital and communication technologies for data collection, processing and analysis, including with regard to infrastructure and security aspects; the use of data science and artificial intelligence to optimise energy efficiency in industrial sectors and the conscious and regenerative use of resources; the use of machine learning techniques for predictive analytics for more efficient resource management and better infrastructure planning; the use of sensors, satellite data and data analysis techniques for real-time monitoring for precision agriculture, integrated logistics and intelligent mobility; the study of methodologies for digital transition and sustainable development through the generation of new indicators. **Research activities:** periods of study and research at the University/Company/Public Body/ Research Centers, etc... (divided into the 3 years of the course) ; study and research periods abroad (6 months).
- **N. 2 scholarships funded by** *Università Telematica San Raffaele* ▪ **Project Theme:** Health data - seek a possible balance between the unavailability of health data and the usefulness of making available to the healthcare system databases of clinical interest, with particular regard to the liability profiles emerging from the identification of the IT element, from the methodology of data extraction, from the construction of the algorithm. **Research activities: periods** of study and research at the University/ Company/ Public Body/ Research Centers, etc... (divided into the 3 years of the course) ; study and research periods abroad (6 months). ▪ **Project Theme:** Predictive Justice - check whether and how the digitization of litigation management procedures contribute to the reduction of trial time and how much the inductive method-the probability of the data collection underlying the algorithmic decision adversely affects the legal certainty and reasonableness. **Research activities: periods** of study and research at the University/ Company/ Public Body/

Research Centers, etc... (divided into the 3 years of the course) ; study and research periods abroad (6 months).

- **N. 1 scholarship for the resources of the PNRR, pursuant to D.M. 117/2023, M4C2 - Inv. 3.3, co-funded by the Company** *"Centro servizi universitari per l'educazione sociale e professionale tre punto zero srl"*

  Project theme: Data driven economy - statistical information as an entrepreneurial tool in strategic choices for the increase of entrepreneurial performance; strategies and forms of personalized communication in order to generate innovative business models.
  Research activities: periods of study and research at the Company (18 months in 3 years) periods of study and research abroad (6 months).

- **N. 1 scholarship for the resources of the PNRR, pursuant to D.M. 117/2023, M4C2 - Inv. 3.3, co-funded by the Company** *"New Generation Sensors srl"*

  Project theme: the projects will cover the on-edge deployment of AI solutions for Industry 5.0; the study and selection of components and hardware platform acceleration of AI; study of algorithmic AI for predictive maintenance with multivariate approach; development and training of such algorithms and deployment on the selected hardware platform; integration of the PlantOne system of local intelligence features, with notifications and ergonomic approaches; assessment of integration of this system in logistics.
- **Research activities:** periods of study and research at the Company (18 months in 3 years) periods of study and research abroad (6 months).

- **N. 1 scholarship for the resources of the PNRR, pursuant to D.M. 118/2023,** *M4C1 - Inv. 3.4 in "Digital and environmental transitions"*

  Project theme: The projects will address the topic of digital transition in the perspective of circular economy and data-driven decision-making. Specifically, the projects will concern digital technologies for the study of data to support organizations in the transition to the optimization of processes (production and decision-making), industrial ecology and eco-compatibility, promoting: a widespread digital culture at all business levels through the development of skills and methodologies that allow people to work with data in a critical and conscious way, in order to draw meaningful information and make informed decisions; the study and application of advanced data analysis tools and methodologies for industrial automation, environmental conservation and the prudent and circular management of resources (natural resources or production waste) aiming at the realization of a regenerative model of the economy with the well-being of man and the environment at its centre; research towards the definition and production of new indicators using official statistics and experimental statistics derived from the use of Big Data in order to measure the growing interest in the issues of environmental impact and social responsibility of businesses.
  Research activities: periods of study and research in enterprises or research centers (min. 6 max. 12 months in 3 years); study and research periods abroad (6 months).

- **N. 3 scholarships for the resources of the PNRR, pursuant to D.M. 118/2023,** *M4C1 - Inv. 4.1 in "PNRR research"*

  Project theme: Projects will address the promotion of digital transition and sustainable growth through data-driven innovation processes in public and private ecosystem organisations; regenerative models of knowledge-intensive economic activities at the service of the environment and man; integrated data collection and management at the service of decision-making processes oriented towards environmental responsibility and industrial ecology; the automation and efficiency of production processes driven by data with attention to the ecological balance and the well-being of the worker; creation of new sustainable business opportunities and production chains with virtuous practices for the federation of data and processes for environmental conservation and reuse of materials or production waste. Particular attention will be paid to projects aiming at

technology transfer and the exploitation of research results, in line with Mission 4.
Research activities: periods of study and research at the headquarters of Universitas Mercatorum; study and research periods abroad (6 months).

- **No. 2 scholarships on the resources of the PNRR, pursuant to D.M. 118/2023, *M4C1 - Inv. 4.1 in "Public administration"***

  Project theme: the projects will involve the promotion of sustainable, ethical and inclusive development, through innovation and digitalization at the service of people, communities and territories, respecting environmental sustainability; develop data-driven governance analysis methodologies to optimize the paths of ecological and digital transition; develop methodologies that foster the digital transition that combines the horizontal nature of general purpose technologies to vertical development in use cases sector: examples in this case are applications in health (telemedicine) bringing services closer to citizens, remote monitoring sensors that increase the useful life of infrastructure and disaster resilience, autonomous vehicles that will improve traffic flow and safety.
  Research activities: periods of study and research at public administrations, companies or research centers (min. 6 max. 12 months in 3 years); study and research periods abroad (6 months).

- No. 4 places without scholarship

  Theme of the project:free.
  Research activities: periods of study and research at the University/ Company/ Public Body/ Research Centers, etc... (divided into the 3 years of the course) ; study and research periods abroad (6 months).

Admission requirements: Possession, by 31.10.2023, of one of the following master's degrees or corresponding degree obtained according to previous legislation:
LM-4 Architecture and Building Engineering-Architecture
LM-4 c.u. Architecture and construction engineering-architecture (five years)
LM-5 Archives and Librarianship
LM-6 Biology
LM-7 Agricultural Biotechnology
LM-8 Industrial biotechnology
LM-9 Medical, Veterinary and Pharmaceutical Biotechnology
LM-13 Pharmacy and industrial pharmacy
LM-16 Finance
LM-17 Physics
LM-18 Informatics
LM-20 Aerospace and Astronautical Engineering
LM-21 Biomedical Engineering
LM-22 Chemical Engineering
LM-23 Civil Engineering
LM-24 Building Systems Engineering
LM-25 Engineering of Automation
LM-26 Safety Engineering
LM-27 Engineering of Telecommunications
LM-28 Electrical Engineering
LM-29 Electronic Engineering
LM-30 Energy and Nuclear Engineering
LM-31 Management Engineering
LM-32 Computer Engineering
LM-33 Mechanical Engineering
LM-34 Marine Engineering
LM-35 Engineering for the environment and the territory

LM-40 Mathematics
LM-44 Mathematical-physical modelling for engineering
LM-51 Psychology
LM-52 International Relations
LM-53 Materials Science and Engineering
LM-54 Chemical Sciences
LM-55 Cognitive sciences
LM-56 Sciences of Economics
LM-58 Sciences of the Universe
LM-59 Public, Business and Advertising Communication Sciences
LM-60 Sciences of Nature
LM-61 Sciences of Human Nutrition
LM-62 Science of Politics
LM-63 Public Administration Sciences
LM-66 Computer Security
LM-69 Agricultural Sciences and Technologies
LM-75 Sciences and technologies for the environment and the territory
LM-76 Economics for the Environment and Culture
LM-77 Economics and Business Sciences
LM-79 Geophysical sciences
LM-80 Geographical Sciences
LM-81 Sciences for Development Cooperation
LM-82 Statistical Sciences
LM-83 Actuarial and Financial Statistics
LM-84 Historical Sciences
LM-86 Zootechnics and animal technologies
LM-88 Sociology and Social Research
LM-91 Techniques and methods for the information society
LM-92 Theories of Communication
LM-93 Theories and methodologies of e-learning and media education
LM/DS Defence and Security Sciences
LM Data science
4/S (specialized in architecture and building engineering)
5/S (specializing in archiving and librarianship)
6/S (specialized in biology)
7/S (specialists in agricultural biotechnology)
8/S (specialists in industrial biotechnology)
9/S (specialists in medical, veterinary and pharmaceutical biotechnology)
14/S (specialized in pharmacy and industrial pharmacy)
19/S (specialized in finance)
20/S (specialist in physics)
21/S (specialist in geography)
23/S (specialists in computer science)
25/S (specialist in aerospace and astronautical engineering)
26/S (specialist in biomedical engineering)
27/S (specialized in chemical engineering)
28/S (specialised in civil engineering)
29/S (specialists in automation engineering)
30/S (specialist in telecommunications engineering)
31/S (specialist in electrical engineering)
32/S (specialist in electronic engineering)
33/S (specialists in energy and nuclear engineering)
34/S (specialized in management engineering)
35/S (specialist in computer engineering)
36/S (mechanical engineering specialists)
37/S (specialist in naval engineering)

38/S (specialized in engineering for the environment and the territory)
45/S (specialist in mathematics)
48/S (specialized in methods for evaluating complex systems)
49/S (specializing in methods for empirical research in the social sciences)
50/S (specialized in mathematical-physical modelling for engineering)
58/S (specialized in psychology)
59/S (specialized in advertising and business communication)
60/S (specialist in international relations)
61/S (specialist in materials science and engineering)
62/S (specialist in chemical sciences)
63/S (specialist in cognitive sciences)
64/S (specializing in economics)
66/S (specializing in universe sciences)
67/S (specializing in social and institutional communication sciences)
68/S (specialist in nature sciences)
69/S (specialist in the sciences of human nutrition)
70/S (specializing in political science)
71/S (specialist in public administration sciences)
77/S (specializing in agricultural sciences and technologies)
79/S (specialized in agricultural sciences and technologies)
82/S (specialized in sciences and technologies for the environment and the territory)
83/S (specializing in economics for the environment and culture)
84/S (specializing in business studies)
85/S (specialist in geophysical sciences)
88/S (specialist in science for development cooperation)
89/S (specializing in sociology)
90/S (specialized in demographic and social statistics)
91/S (specialists in economic, financial and actuarial statistics)
92/S (specialized in statistics for experimental research)
100/S (specialists in techniques and methods for the information society)
101/S (specialized in communication theory)
DS/S (specialist in defence and security sciences)

In the case of a qualification obtained abroad, the assessment of the requirement will be carried out by the Selection Board.

Other requirements for foreign students:
–   qualification obtained abroad recognized as equivalent to the Italian title for the purposes of enrolling in the doctorate;
–   certified knowledge of the Italian language (level B1).

How to select:
–   **Evaluation of qualifications,** including the compulsory submission of a research project prepared according to the indications of the competition;
–   **Interview** that will be carried out in the manner indicated by art. 6 of the notice of competition;
–   **Language proficiency:** English language. For foreign candidates will also be evaluated the knowledge of the Italian language.

Procedures and timing of tests:
will be published in the dedicated web page https://www.unimercatorum.it/iscriversi-a-un-dottorato

Web page of the PhD:
https://www.unimercatorum.it/dottorato-di-ricerca-in-big-data-e-intelligenza-artificiale

Useful contacts: dottorati@unimercatorum.it