

# Artificial Intelligence for Science and Technology

## MASTER DEGREE

THE IMPACT OF ARTIFICIAL INTELLIGENCE IS TODAY VISIBLE IN OUR SOCIETY IN A VAST SPECTRUM OF APPLICATIONS, MAKING IT ONE OF THE FASTEST-GROWING TECHNOLOGIES IN INDUSTRY. THE UNIVERSITIES OF MILANO BICOCCA, MILANO STATALE AND PAVIA JOINED FORCES AND INITIATED A UNIQUE MASTER DEGREE COURSE.



LM-91 Methods and techniques for the information society



2 Years



Milan, Pavia



Open with entry requirements examination



English



Inter-university course

## Course description

The **AI4ST degree course**, organised jointly by the University of Milan-Bicocca, Milan Statale and Pavia, offers a 360-degree and inter-disciplinary approach to studying **artificial intelligence**. Students will learn to apply AI effectively in the pursuit of innovative solutions within the fields of science and technology. Over the course of their studies, they will tackle advanced issues in **computer science, mathematics, statistics, and physics**, whilst gaining an understanding of **business administration, management, and the legal aspects of AI**, which are then immediately put into practice through one of the individual tracks of study. Classroom and laboratory work will take place at each of the **three campus locations**, and be taught in English, in order to foster a genuine international academic environment, and to prepare students for professional work on a global level. At the end of the programme, students will earn a Master's degree in Artificial Intelligence for Science and Technology. **The degree is awarded jointly by the University of Milan-Bicocca, the University of Milan, and the University of Pavia.** The training offers a unique launchpad into the workplace (whether in the public or private sector). Graduates also have the option to further their studies through a second-level master's or PhD programme.

### Tuition Fee

Depending on the student country of residence, from 300 €/year up to 3.600 €/year

### Course Enrollment

The The AI4ST Master's degree programme is open to all eligible students (there is no cap on enrolment). It is a two-year programme, and requires students to earn 120 credits to obtain their degree.

Students holding a Bachelor's degree course who have completed 30 credits in science, and with English-language proficiency at or above a B2 level, are eligible for admission.

### Admissions deadline

30th of June 2022 (1st intake) - 9th of September (2nd intake)



## Study plan

The master's degree course programme begins with a set of general coursework corresponding to 42 credits which all students must complete. Through this work, students will gain a common inter-disciplinary baseline of knowledge. Following that, students will choose a track (to which 36 credits are allocated) amongst the following:

1. **Industrial and environmental applications**
2. **Embedded smart systems**
3. **Signal and image processing for use in public health and the environment**
4. **Modelling of complex systems and quantum technologies**

Each student will complete his or her individual plan of study with additional coursework in according to personal interest (12 credits), gain language proficiency (3 credits), and an internship in view of their thesis (6 credits). The final defence will award 21 credits

## Contacts

### • **Careers Office**

The Careers Office provides administrative services to students, relevant to admission and enrolment procedures, graduation, certificates issue and transfer credits from other universities (foreign ones included).

Email: [sgr.studenti.scienze@unimib.it](mailto:sgr.studenti.scienze@unimib.it)

### • **Teaching Office**

The Teaching office provides didactic support and information for students (class schedules, professors' office hours, exam schedules, study plan, internship).

Email: [ai4st@unimib.it](mailto:ai4st@unimib.it)

## General coursework

Students undertake a set of general courses completed, as a rule of thumb, during the first two years, which fall into the following subject areas:

- **IT:** advanced foundations in information technology dealing with the theory and application of artificial intelligence in the arenas of science and technology
- **Mathematics and Statistics:** advanced foundations of mathematics and statistics dealing with the theory and application of artificial intelligence in the arenas of science and technology
- **Physics:** experimental physics and advanced theory, as well as quantum technologies, from the perspective of foundational physics, and their potential applications in the field of artificial intelligence
- **Business Administration:** aspects relating in the use, implications, and impact of artificial intelligence in business organisation, processes, management, and administration, both in the public and private sectors
- **Law:** legal aspects of artificial intelligence, its social acceptability, privacy and data security.

## FIRST YEAR

	Type	CREDITS	Scientific Disciplinary Sector
Advanced Foundations of Mathematics for AI	Co-curricular activities	6	MAT/07
Advanced Foundations of Statistics for AI	B2	6	SECS-S/01
Advanced Foundations of Physics for AI	Co-curricular activities	6	FIS/01
Advanced Foundations of Artificial Intelligence	B1	12	
Module 1: Artificial Intelligence (6 CFU - ING-INF/05)			ING-INF/05
Module 2: AI for Signal and Image Processing (6 CFU - INF/01 )			INF/01
4 Professional skills training ( <i>students may choose from a set of suggested classes in one of the 4 tracks</i> )	12 credits in co-curricular activities + 18 credits in B1	30	
<b>Total CFU for Year I</b>		<b>60</b>	

## SECOND YEAR

	Type	CREDITS	Scientific Disciplinary
Data-driven organizations and management	B2	6	SECS-P/10
Advanced Foundations of Law and regulations in privacy and data protection	B3	6	IUS/04
1 Professional skills module in a complementary area ( <i>students may choose one module from amongst the complementary modules offered in the Area of Concentration they selected during their first year</i> )	Co-curricular activities	6	
Electives		12	
Additional Language Skills		3	
Academic and pre-professional internships (internship undertaken to prepare the student's Master's thesis)		6	
Final exam		21	
<b>Total CFU for Year II</b>		<b>60</b>	

### Legenda:

B1: Core coursework - Information Technology

B2: Core coursework - Business Administration

B3: Core coursework - Humanities, Social Sciences, Law and Economics

## Professional opportunities

In either the first or second year, students complete a set of educational activities (36 credits) geared toward testing their knowledge and understanding in one of the areas of concentration contemplated by the programme, such as industrial and environmental applications, embedded smart systems, signal and image processing for use in healthcare and the environment, modelling complex systems and quantum technologies.

## Track n. 1: Specialist in artificial intelligence for industry and the environment

Focused on the field of industrial and manufacturing processes, and environmental management. Students will gain specialised knowledge on the use of artificial intelligence for the control and automation of manufacturing processes, for ensuring product quality levels, and for environmental monitoring.

### SPECIFIC COURSEWORK - YEAR I

	Type	CREDITS	Scientific Disciplinary Sector
Systems for Industry 4.0 and environment (IoT)	Co-curricular activities	6	ING-INF/05
Advanced data management and decision support systems	Co-curricular activities	6	INF/01
Advanced artificial intelligence, machine learning and deep learning	B1	6	INF/01
Sensing and vision for industry and environment	\	12	
Module 1: Intelligent sensing and remote sensing (6 CFU)			ING-INF/03
Module 2: Vision for industry and environment (6 CFU)			INF/01

### COMPLEMENTARY COURSEWORK - YEAR II

*(1 module chosen from amongst the following options)*

Intelligent monitoring and control systems	Co-curricular activities	6	ING-INF/04
Environmental monitoring and management	Co-curricular activities	6	ING-INF/03

## Track n. 2: Specialist in artificial intelligence for embedded smart systems

Focused on the field of embedded smart systems for various areas of application, including consumer electronics, medical devices and systems, prosthetics, motor vehicles, and transport. Students will gain a specialised understanding in the use of artificial intelligence to develop intelligent adaptive behaviours, and cultivating organic interactions between humans and machines.

### SPECIFIC COURSEWORK - YEAR I

	Type	CREDITS	Scientific Disciplinary Sector
Embedded systems architectures and design	Co-curricular activities	6	ING-INF/05
Advanced data management and decision support systems	Co-curricular activities	6	INF/01
Advanced artificial intelligence, machine learning and deep learning	B1	6	INF/01
Ambient intelligence	B1	12	
Module 1: Advanced human-system interfaces (6 CFU)			INF/01
Module 2: Ambient intelligence and domotics (6 CFU)			ING-INF/05

### COMPLEMENTARY COURSEWORK - YEAR II

*(1 module chosen from amongst the following options)*

Embedded systems for biomedical applications	Co-curricular activities	6	ING-INF/06
Intelligent consumer technologies	Co-curricular activities	6	INF/01

## Track n. 3: Specialist in sensing and signal/image processing for healthcare and environment

Focus on the field of signal and image processing systems for use in healthcare and the environment. Students will gain specialised knowledge in the use of artificial intelligence for collecting and analysing multi-sensor data, both in the field of environmental monitoring through observations of the Earth and sensor networks, as well as in the healthcare arena, providing decision-making support through the analysis of biomedical images and signals.

### SPECIFIC COURSEWORK - YEAR I

	Type	CREDITS	Scientific Disciplinary Sector
Advanced computational techniques for big imaging and signal data	B1	6	INF/01
Machine learning for modelling	B1	12	
Module 1: Supervised learning (6 CFU)			INF/01
Module 2: Unsupervised learning (6 CFU)			ING-INF/05
Signal and imaging acquisition and modelling in healthcare	Co-curricular activities	6	FIS/07
Signal and imaging acquisition and modelling in environment	Co-curricular activities	6	FIS/01

### COMPLEMENTARY COURSEWORK - YEAR II

*(1 module chosen from amongst the following options)*

Physical sensors and systems for biomedical signals	Co-curricular activities	6	FIS/03
Physical sensors and systems for environmental signals	Co-curricular activities	6	FIS/03
Physical sensors and systems for biomedical imaging	Co-curricular activities	6	FIS/07
Physical sensors and systems for environmental imaging	Co-curricular activities	6	FIS/07

## Track n. 4: Specialist in complex systems and quantum technologies

Focused on those fields requiring the ability to understand and model complex physical systems, and to process data using quantum technologies. Students will gain specialised knowledge in the fields of artificial intelligence for the identification, modelling, and analysis of complex physical systems (including quantum systems) as well as for the processing of information using quantum techniques.

### SPECIFIC COURSEWORK - YEAR I

	Type	CREDITS	Scientific Disciplinary Sector
AI models for physics	Co-curricular activities	6	FIS/02
Machine learning for modelling	B1	12	
Module 1: Supervised learning (6 CFU)			INF/01
Module 2: Unsupervised learning (6 CFU)			ING-INF/05
Statistical learning	B1	6	INF/01
Quantum simulation	Co-curricular activities	6	FIS/03

### COMPLEMENTARY COURSEWORK - YEAR II

*(1 module chosen from amongst the following options)*

Advanced statistical mechanics and disordered systems	Co-curricular activities	6	FIS/02
Quantum information and algorithms	Co-curricular activities	6	INF/01
Statistical Mechanics of Neural Networks	Co-curricular activities	6	FIS/02
Quantum computers and technologies	Co-curricular activities	6	FIS/02