UNIVERSITÀ DI TRENTO

DEPARTMENT OF

INFORMATION ENGINEERING AND COMPUTER SCIENCE

LM Artificial Intelligence Systems

LM Sistemi di Intelligenza Artificiale

Responsabile CdS: Marco Roveri marco.roveri@unitn.it

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LM Artificial Intelligent Systems – generic learning objectives

Graduates of master's degree programs in this class must:

- Have an in-depth understanding of the **theoretical and scientific aspects of mathematics, basic sciences, and engineering, with particular emphasis on computer engineering**, and **use this knowledge to interpret, describe, and solve complex or interdisciplinary problems**, including in innovative ways.
- Be **capable of designing, planning, developing, and managing complex and/or innovative systems, processes, and services**.
- Be **capable of designing and managing highly complex experiments**.
- Possess **contextual knowledge and transversal skills**.
- Have **knowledge in the field of business organization** (corporate culture) and **professional ethics**.
- Be able to fluently use, in both written and spoken forms, at least one European Union language other than Italian, including its disciplinary lexicon.

LM Artificial Intelligent Systems – specific learning objectives

Master's degree graduates in Artificial Intelligence Systems:

a) are capable of developing and **using innovative methods and tools to address emerging challenges** by **designing, engineering, organizing, and managing complex and innovative systems based on intelligent computer systems**. To achieve this, they acquire a broad set of skills focused on Computer Engineering but extended to interdisciplinary application contexts;
b) possess a solid **theoretical and scientific background in mathematics and information engineering**;
c) are able to **identify connections between ethical principles and legal rules**, as well as **understand the implications of technology use and the impact of their design choices**.

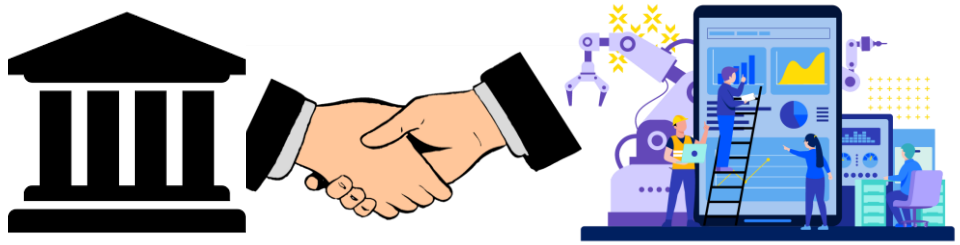
Depending on their chosen training path, they can expand their interdisciplinary skills to achieve one of the following objectives in addition to the ones listed above:

1) further **deepen their theoretical and methodological knowledge** to achieve a high level of **specialization in the design of artificial intelligence-based systems**;
2) acquire advanced knowledge in **various disciplines of information engineering for industrial, environmental, and biomedical applications**;
3) propose **strategies for marketing products, processes, and organizations based on artificial intelligence** that are competitive in terms of efficiency, productivity, and sustainability;
4) integrate **computational, behavioral, and neuroimaging approaches to better understand human behavior** and provide **inspiration for the development of new intelligent systems**.

LM Artificial Intelligent Systems – training paths

- A strong **drive toward internationalization** is one of the key factor that distinguishes Artificial Intelligent Systems at the University of Trento. The course offers the opportunity to enter the **Double Degree Programme in the frame of the EIT Digital and EIT Manufacturing Master Schools**
  - the student will spend one year in Trento and one year at the Partner University and, at the end the programme, he/she will obtain two Degrees recognized by both institutions and both Countries.

- The **connections with the industry is very close** (both with large national and international companies, as well as national and international SMEs).



LM Artificial Intelligent Systems – training paths

Common activities in the following areas of study:

- **Foundational and applied computer science disciplines of artificial intelligence**, such as knowledge representation, automated reasoning, machine learning, natural language processing, optimization, and human-machine interaction;
- Disciplines related to **industrial and service robotics, operational autonomy of mechatronic devices, and automation** of complex processes;
- Disciplines concerning the **acquisition, processing, and analysis of information** (signals, speech, images, and video), **artificial vision, and their applications**;
- Disciplines in the **legal domain**, with a particular focus on the **basic legal frameworks relevant to the design and application of artificial intelligence systems**.

Multiple tracks:

1) Further **deepening mathematical and/or computer science disciplines foundational and applied to artificial intelligence, as well as those related to robotics**.
2) Provide **advanced training in information engineering** disciplines for the design and **use of artificial intelligence systems in various application contexts**.
3) Introduces disciplines in the **economic and managerial fields, focusing on the organization, management, and innovation of decision-making and production systems based on artificial intelligence**.
4) Disciplines in **cognitive neuroscience, language, and their applications to artificial intelligence models**.

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Fundamentals of AI (12 CFU) - DISI
- Machine Learning (12 CFU) - DISI
- Natural Language Understanding (6 CFU) - DISI
- AI & Ethics (6 CFU) – JUS
- Signal, Image & Video (6 CFU) - DISI
- Artificial and Biological Neural systems (6 CFU) – CIMEC

Mandatory (48CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Automated Planning Theory and Practice (6 CFU) – DISI
- Automated Reasoning (6 CFU) – DISI
- Bio-Inspired AI (6 CFU) – DISI
- Human-Machine Dialogue (6 CFU) – DISI
- Introduction to Robotics (6 CFU) – DII
- Autonomous Software Agents (6 CFU) – DISI

In-Depth (12CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- **Intelligent Robots**
  - Distributed Robot Perception (6 CFU) – DII
  - Optimisation and Learning for Robot Control (6 CFU) – DII
  - Robot Planning and its Applications (6 CFU) – DISI

Specialization - **Methodologies and Applications** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- **Computer Vision**
  - Computer Vision (6 CFU) -- DISI
  - Advanced Computer Vision (6 CFU) -- DISI
  - Trends and Applications in Computer Vision (6 CFU) -- DISI

Specialization - **Methodologies and Applications** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- **Methodologies**
  - Advanced Topics in Machine Learning and Optimisation (6 CFU) -- DISI
  - *Two more courses taken from In-Depth*

Specialization - **Methodologies and Applications** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Business Development labs (6 CFU) -- DISI
- AI and Innovation (6 CFU) -- DISI
- Innovation and Entrepreneurship basics (6 CFU)-- DISI

Specialization – **AI and Innovation** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Software development for collaborative robots (6CFU) - DISI
- AI for food and quality control (6CFU) - DE
- Sensing and Radar Technologies (6CFU) - DISI

Specialization – **AI Systems and sustainability** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Software development for collaborative robots (6CFU) - DISI
- AI for food and quality control (6CFU) - DE
- Sensing and Radar Technologies (6CFU) - DISI

Specialization – **AI Systems and sustainability** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- Foundations of Cognitive Psychology and Neuroscience 9 CFU – CIMEC
- Grounded Language Processing 9 CFU – CIMEC
- Introduction to Human Language 6 CFU – CIMEC
- Language and Social Cognition 6 CFU – CIMEC

Specialization – **Neuro-Cognitive architectures** (18CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – training paths

- All courses offered by DISI accepted with no problems
- Courses offered by other departments needs a justification and are subject to approval by the CdS delegate for training paths

Free Choice (12CFU)

Mandatory (48CFU)

In-Depth (12CFU)

Specialization (18 CFU)

Free Choice (12CFU)

Internship and Thesis (30CFU)

LM Artificial Intelligent Systems – employment opportunities

The typical career opportunities for an Artificial Intelligence specialist include roles in both **corporate operational** sectors and **research and development centers**, particularly in:

- companies involved in the design, development, engineering, production, and operation of **intelligent solutions and systems and their applications**;
- manufacturing companies, agrifood businesses, civil-sector organizations, public administration sectors, and **service companies utilizing AI-based computer systems**;
- companies focused on the **acquisition, processing, analysis, and transmission of information** (data, voice, images, and video);
- industries specializing in **automation and robotics**, as well as manufacturing companies using systems and equipment for **process automation**;
- companies working in the design and development of embedded systems and digital platforms for **autonomous and intelligent systems**;
- companies across diverse sectors requiring expertise for the development and use of **AI-based systems to support internal organization, production, and marketing**;
- advanced service and tertiary companies operating particularly in the design, provision, and maintenance of services delivered via telematic networks, the internet, and the web;
- companies producing and/or utilizing IT components and systems;
- companies providing infrastructure and services for IT systems and networks;
- software engineering firms;
- **public and private research and development centers**;
- **postgraduate studies and second-level university master's programs**.

LM Artificial Intelligent Systems – employment opportunities

100% graduates occupied with a job in 1 year from graduation

Updated at 15/10/2024, ANVUR

LM Artificial Intelligent Systems – enrollment

To be admitted to the Master in Computer Science it is necessary:

- A **Bachelor Degree with a "reasonable" background in Computer Science Engineering** (at least 12 CFU)
- To have a minimum upper-intermediate level of English (**Level B2**)

There is **no longer a limited enrolment for EU citizens**

Limitations apply **only** for non-EU (5 grants)

https://offertaformativa.unitn.it/en/lm/artificial-intelligence-systems

Useful links

Master's degree webpage (ENG)
https://offertaformativa.unitn.it/en/LM/artificial-intelligence-systems

Ordinamento (ITA)
https://www.unitn.it/alfresco/download/workspace/SpacesStore/ee7fe524-cc1e-4f78-b429-92e21ea88d0b/Artificial%20Intelligence%20Systems%20LM32.pdf

Rules, regulations, and manifesti (ENG/ITA)
https://infostudenti.unitn.it/en/courses/masters-degrees/artificial-intelligence-systems-ais

EIT Digital and Manufacturing (ENG/ITA)
https://www.disi.unitn.it/eit-digital
https://www.disi.unitn.it/eit-manufacturing