

**Bootstrap day September 27<sup>th</sup> 2021**



# **Master Degree in Computer Science**

# Studying Computer Science is an excellent choice ...

Information technology and the digitization of all economic sectors are a fundamental lever for innovation and the transformation of society.



“At the heart of our work is the need to tackle the climate, technological and demographic changes that are transforming our societies and our way of life... The EU must lead the transition to a healthy planet and a new digital world .. . ”

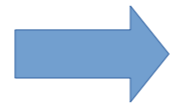
*Ursula von der Leyen,*  
President of the European  
Commission



# Studying Computer Science at the Computer Science Department of UNIMI



Research excellence in the  
main disciplinary areas of IT



Master Degree Computer Science  
courses linked to the most  
innovative research activities of our  
department

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Collaborations with research  
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Europe and all around the  
world



Students involved in  
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centers and cutting-edge  
companies in the IT, industrial,  
advanced tertiary sector,  
Healthcare

# Studying Computer Science at the Computer Science Department of UNIMI



Research excellence in the  
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Didattica Laurea Magistrale  
Informatica legata alle attività di  
ricerca più innovative del nostro  
dipartimento

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We are among the largest Italian  
CS dept. and we provide over 70  
courses for the Master degree in  
Computer Science



Possibility of work and  
research experiences in the  
numerous laboratories of the  
department

# Laboratories at DI

Laboratory of Applied Intelligent Systems (AIS Lab)



## EveryWare Lab

Data Management for Mobile and Pervasive Computing



## Computational Biology and Bioinformatics Lab

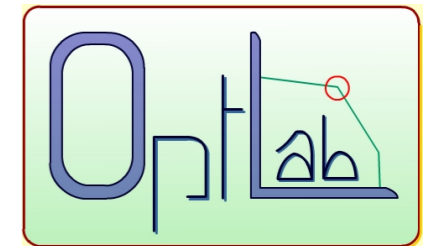
Developing new AI Approaches for Computational Genomics and Medicine

## IEBI Lab

Industrial, Environmental and Biometric Informatics Laboratory



## FALSE Lab



## Laboratorio di Informatica Musicale



## SPDP Lab

Security, Privacy, and Data Protection

## Laboratory for Web Algorithmics

## MIPS Lab



## INTERNET OF PEOPLE, THINGS AND COMPUTERS

Network Protocols and Technologies Lab - NPTLab



## PHUSE Lab

Perceptual computing and HUmAn SEnsing



## SESAR LAB

SEcure Service-oriented Architectures Research Lab



# Course objectives

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- Solid cultural background and skills in the various IT sectors:



acquire the fundamental knowledge and skills to “adapt” to the rapid evolution of Computer Science and Information Technologies



Knowing how to apply computer skills in the various sectors of the economy and society

- Ability to incorporate innovations and propose new developments
- High-level analytical and operational skills
- Open and critical view of the problems associated with information technology

# Knowledge and skills

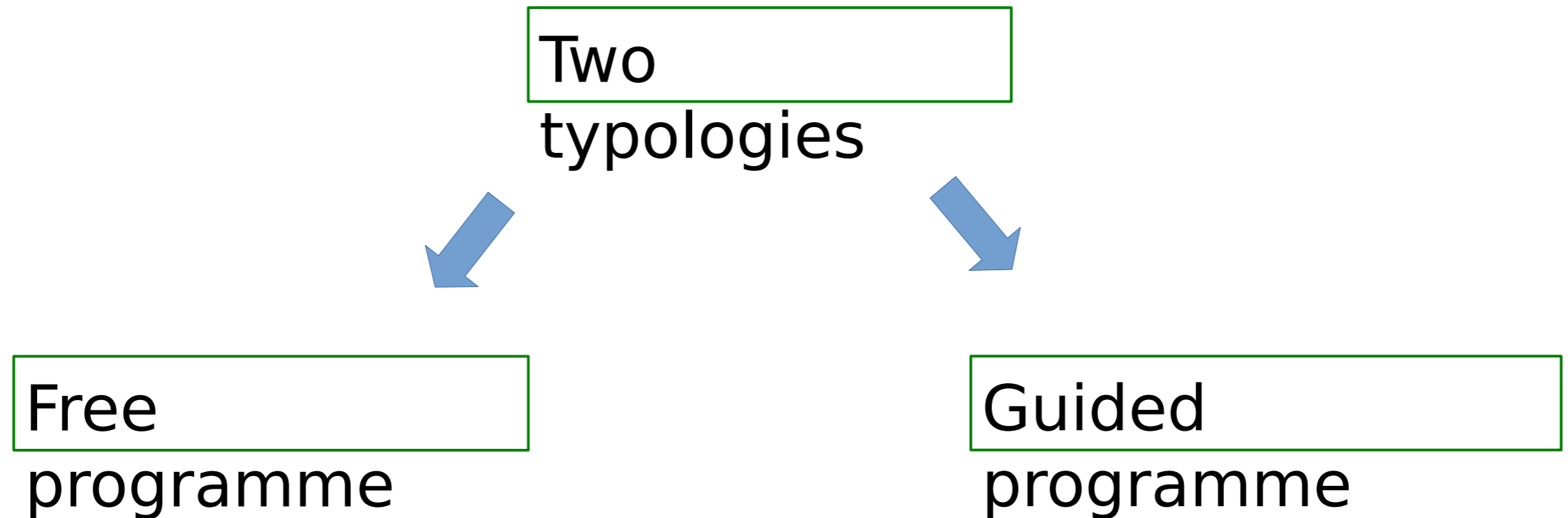
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- Algorithms, languages, logical and formal methods
- Software development and design
- Information systems and data management
- Architectures and networks
- Artificial Intelligence and Machine Learning
- Data analysis and optimization
- Processing of signals, images, videos
- Multimedia and social communication



# Study programme

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- Freely chosen by the student and modifiable from year to year

# Free and guided programme

Courses are free choice with the constraint of choosing between the 4 sets of courses - see Programme description

[https://apps.unimi.it/files/manifesti/eng\\_manifesto\\_F94of2\\_2021.pdf](https://apps.unimi.it/files/manifesti/eng_manifesto_F94of2_2021.pdf) :

- Characterizing courses (18 CFU among 10 courses + 3 CFU English language)
- Courses from Table 1 (30/36 CFU between 44 courses)
- Courses from Table 2 (12/18 CFU between 21 courses)
- Other courses provided at UNIMI (12 CFU)
- Final exam: 39 CFU

To help the choice, two types of training courses:



Free  
programme



10 predefined guided  
programmes

# Study programme: general and methodological courses:

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- English language ( B2 level )

3

**Characterizing courses: 18 CFU among the following 10 courses**

- **Artificial intelligence**

6+6+6

- **Natural interaction**

- **Advanced Programming**

- **Software development in complex teams**

- Multimedia Architectures

- **Theoretical Computer Science**

- **Information management**

- **Wireless and mobile networks**

- **Distributed and pervasive systems**

- **Statistical methods for machine learning**

# Guided study programmes

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- Algorithms and fundamentals
- Analytics and optimization
- Artificial Intelligence
- Industry and Business Informatics
- Music Information Science
- Methods and models for sw design and development
- Mobility and pervasive computing
- Perceptual computing
- Machine Learning and Data Science
- Video Game

# Algorithms and fundamentals



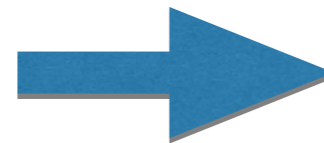
Deepen your cultural background on the **theoretical and algorithmic aspects of computer science** and develop your knowledge in one of the corresponding specialist sectors

## SECTOR "ALGORITHMS"

- Web algorithmics
- Heuristic algorithms
- GPU-Computing

## General and methodological courses

- Theoretical computer science
- Theory of languages
- Algorithms and complexity
- Probabilistic methods for computer science
- Mathematical logic
- Advanced programming
- Distributed and pervasive systems



## SECTOR "MACHINE LEARNING"

- Bioinformatics
- Statistical methods for machine learning
- Artificial vision

## SECTOR "OPERATION RESEARCH"

- Probabilistics methods for Informatics
- Operation Research Complements
- Combinatorial Optimization

## SECTOR "FORMAL METHODS"

- Formal Methods
- Software verification and validation
- Software development in complex teams

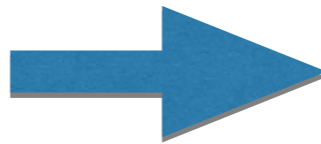
# Analytics and Optimization (english)

Knowledge and skills on **decision support methods** based on the use of digital data, **mathematical models** (descriptive, predictive and prescriptive) and on **optimization algorithms**



## Fundamental courses

- Artificial intelligence
- Information management
- Statistical methods for machine learning



## Characterizing courses

- Heuristic algorithms
- Simulation
- Algorithms for massive datasets
- Intelligent systems for industry, supply chain and environment
- Business process engineering



# Artificial Intelligence

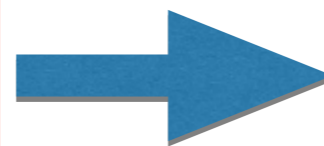
**Theoretical and methodological foundations of artificial intelligence**, courses aimed at **developing application skills** in some of the main sectors focusing on scientific, methodological and technological aspects.



Modelling, management and processing of data and knowledge:

General and methodological courses:

- Artificial Intelligence
- Information management
- Statistical methods for Machine Learning



- Natural interaction
- Intelligent systems for industry, supply chain and environment
- Algorithms for massive datasets
- Information retrieval
- Biomedical signal processing
- Bioinformatics
- Audio pattern recognition
- Affective computing
- Privacy and data protection

# Industry and Business Informatics (in english)



**Modeling the processes and information about activities of organizations** and people, and making operational decisions that allow to manage complex systems:

- **Analysis and management of business processes**, both management ones of the company, both manufacturing and logistics
- **Management of the territory and public administrations** (eg: PA, Health), environmental monitoring and management of services.
- Social interaction analysis and **data analysis in social networks**
- Integrate information through **Internet of Things**-based structures, **cloud systems, cyberinformatics systems, embedded and mobile systems.**

General and methodological courses

- Artificial Intelligence
- Information management
- Natural interaction



Modelling, management and processing of data and knowledge:

- Business process engineering
- Methods for image processing
- Intelligent systems for industry, supply chain and environment
- Simulation
- Algorithms for massive datasets
- Audio Pattern Recognition
- Biomedical signal processing
- Information retrieval

# Music Information Science



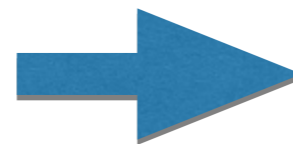
The Music Information Science programme aims to provide a **solid background and a thorough knowledge of multidisciplinary methods and technologies of sound investigation and music computing.**

Leveraging on the Bachelor's Degree Programme in Music Information Science, it focuses on the **most advanced theoretical and applicative aspects of information technology in the musical field.**

## Fondamental courses

### General and methodological courses

- Multimedia Architectures
- Artificial Intelligence
- Information Management
- Natural Interaction
- Statistical Methods for Machine Learning
- Advanced programming
- Distributed and pervasive systems



- Audio Pattern Recognition
- MIDI programming
- Programming for Music
- DSP Architectures and programming
- Multimedia technology organization and Digitization
- Sound in Interaction

# Methods and models for sw design and development



**Reliable and high quality software development**, through languages, methods and models connected with various aspects of **software production** in general (from the management and organization of the production process to analysis, design, development and maintenance, with particular regard to verification and validation ) and in specific areas such as the design and development of video games or apps for mobile computing.

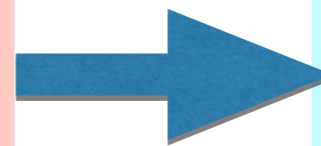
General and methodological courses

- Theoretical Computer Science
- Mathematical Logic



Fundamental courses

- Software development in complex teams
- Advanced programming
- Distributed and pervasive systems



Characterizing courses:

- 3D video games
- Sicurezza informatica
- Statistical methods for machine learning
- Tecniche speciali di programmazione
- Teoria dei linguaggi
- Software verification and validation
- Web algorithmics

# Mobility and pervasive computing



**Integration and processing of context data obtained from sensors on board mobile devices or integrated into the environment and objects of daily use (IoT).**

Georeferenced and context-aware services for personal, social and professional use;

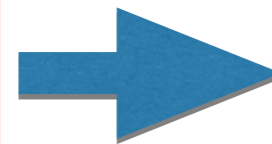
**sensors of environmental factors.**

Management of large amounts of personal data, with advanced data security techniques.

Information management, software development, cybersecurity and signal processing

General and methodological courses

- Wireless and Mobile Networks
- Algorithms for Massive Datasets
- Distributed and Pervasive Systems
- Statistical Methods for Machine Learning



- Information Management
- Geospatial Information Management
- Advanced programming
- Security
- Development of applications for mobile devices
- Software development in complex teams
- BioMedical Signal Processing



# Perceptual computing



Perceptual computing for the **interaction between human beings and the environment** in which they are immersed to operate. **Analysis techniques of classical signals** (audio, images, video, proximity, etc.) and **behavioral / emotional signals** used by human beings, for non-verbal communication: postures, facial expressions, gestures, physiological reactions

## Characterizing fundamental courses

- Artificial intelligence
- Natural interaction
- Statistical methods for machine learning



## Characterizing and integrative courses:

- Audio Pattern Recognition
- Artificial vision
- Real time graphics programming
- Probabilistic methods for Informatics
- GPU Computing
- Affective Computing
- Biomedical signal processing



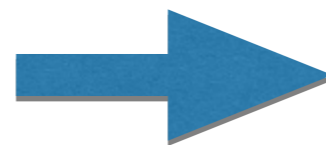
# Machine Learning and Data Science



**Organization of the acquisition of different types of data** (texts, images, relationships, genes, ...) structured in different ways (flows, hierarchies, networks, ...) and **coming from various sources** (Web, sensors, terminals mobile, ...), also taking into account problems related to the size of the data available and their structuring in appropriate databases. **Analysis of these data by combining statistical, algorithmic and machine learning techniques in order to synthesize predictive models.**

General and methodological courses:

- Artificial Intelligence
- Statistical methods for machine learning
- Information Management



Characterizing and integrative courses:

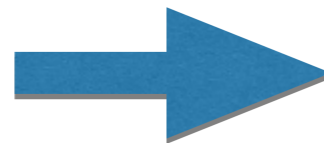
- Web algorithmics
- Bioinformatics
- Algorithms for massive datasets
- Architectures for big data
- Privacy and data protection
- GPU computing
- Simulation
- Decision methods and models
- Information retrieval

# Video Game

Provide the conceptual, methodological, design and application tools necessary for the **design and programming of videogame SW**

General and methodological courses:

- Distributed and pervasive systems
- Software development in complex teams
- Advanced Intelligent Systems
- Statistical methods for machine learning
- Advanced programming



Design of videogames:

- Game and level design
- Game design
- Artificial intelligence for video games
- Online game design
- Real-time Graphics Programming
- Video game design and programming

Architecture and programming of videogames

- Multimedia Architectures
- GPU computing
- Design of Sensor Systems
- Communication protocols for mobile, ad hoc and wireless sensor networks
- Security
- Wireless and mobile networks
- Advanced programming techniques



# High quality online teaching against COVID-19 pandemic

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Milan University and the Department of Computer Science chose to ensure online teaching:

- Responsibility for the health of students and staff and more in general for society
- High quality of lessons
- Use of the latest technologies

# Possibility of studying abroad

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- Erasmus + :
  - over 50 UE Universities.
  - 5 months abroad on the average
  - course for about 30 CFU
- Other possibilities / grants for periods of study or thesis abroad



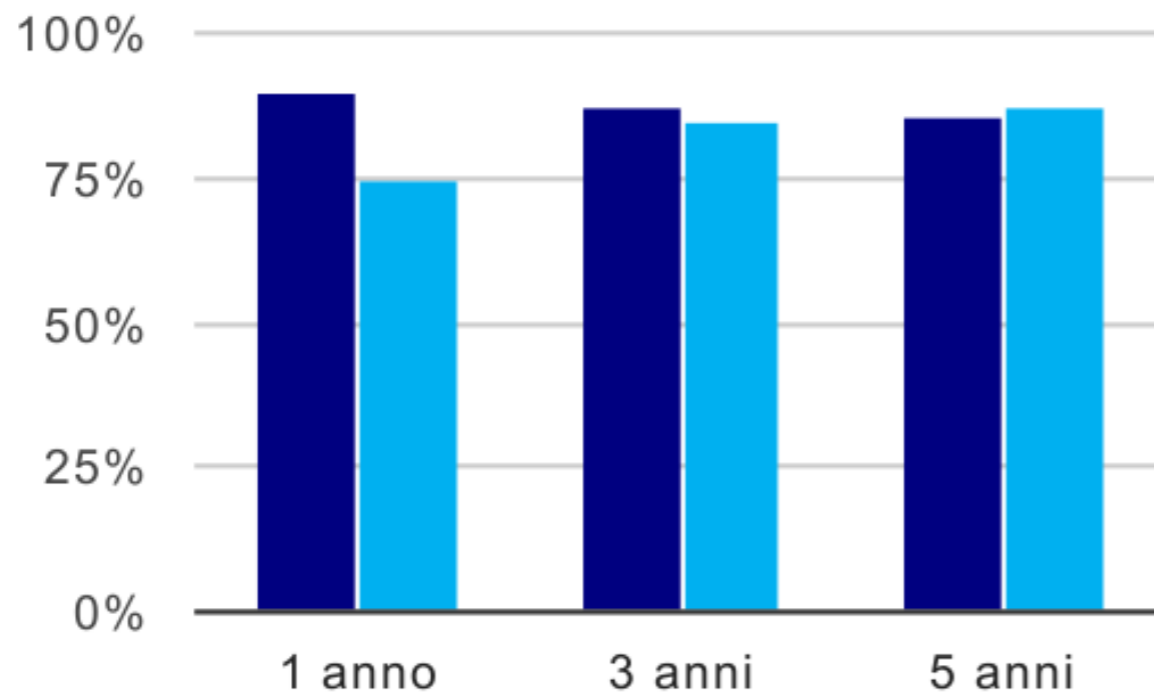
Good news for students of the Master's Degree in Computer Science at UNIMI:

full employment of master's degree graduates

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**Statistics on the employment opportunities of master's degree graduates in IT confirm the growing weight of IT in the "knowledge society" ...**

# Employment rate for Master degree CS graduates



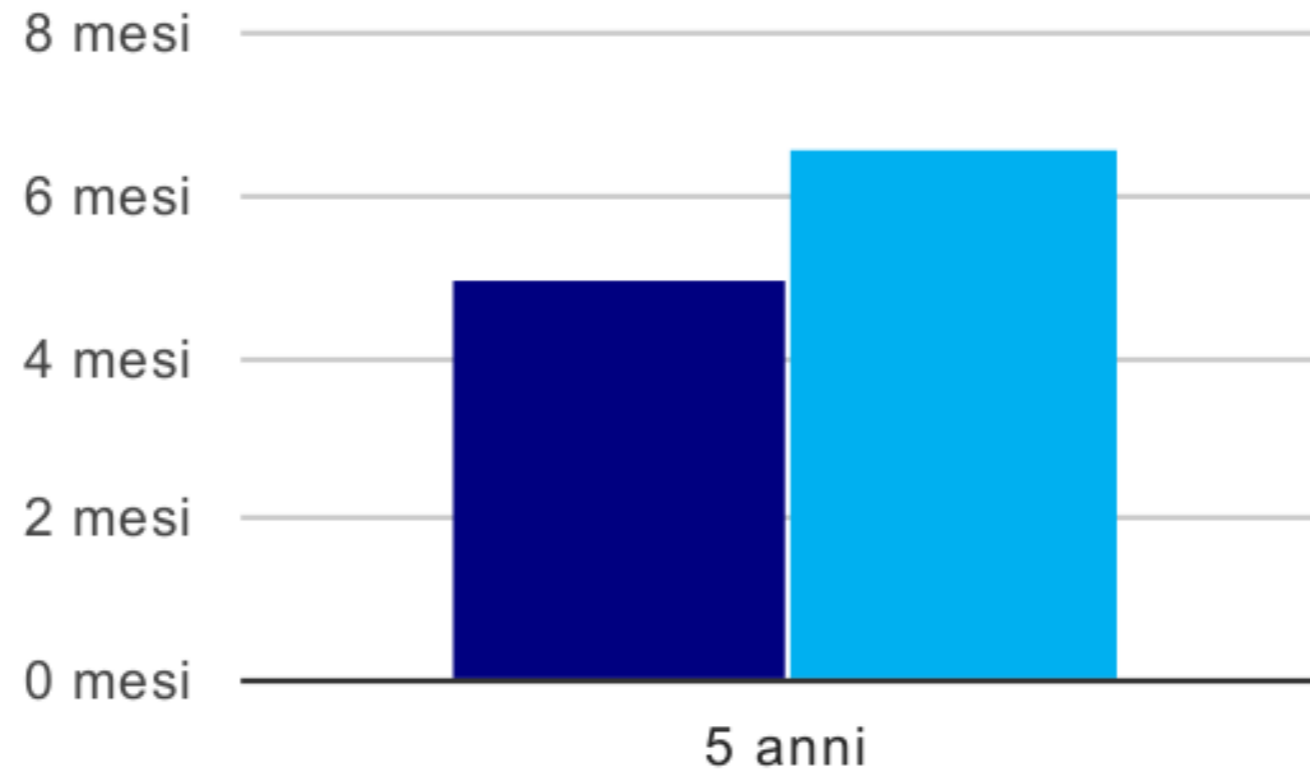
Employed	61.9%
PhD/master	28.6%
<b>Total</b>	<b>90.5%</b>

	1 anno	3 anni	5 anni
corso	90,5%	86,7%	85,7%
Ateneo	75,2%	85,5%	87,2%

Source: AlmaLaurea  
<https://www.almalaurea.it>  
 Year: 2018



# Average entry time into the labor market for Master Degree CS graduates



For current graduates, employment is practically immediate 😊

Source: AlmaLaurea  
<https://www.almalaurea.it>  
Year: 2018

# Who to contact for information and help

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- President of the Academic Board:  
*Giovanni Pighizzini* [giovanni.pighizzini@unimi.it](mailto:giovanni.pighizzini@unimi.it)
- Coordinator of the Master degree in CS:  
*Giorgio Valentini* [valentini@di.unimi.it](mailto:valentini@di.unimi.it)
- Course quality contact person:  
*Marco Tarini* [macro.tarini@unimi.it](mailto:macro.tarini@unimi.it)
- Guidance tutors:  
*Roberto Cordone* [roberto.cordone@unimi.it](mailto:roberto.cordone@unimi.it)  
*Giuliano Grossi* [giuliano.grossi@unimi.it](mailto:giuliano.grossi@unimi.it)  
*Mattia Monga* [mattia.monga@unimi.it](mailto:mattia.monga@unimi.it)  
*Beatrice Palano* [palano@di.unimi.it](mailto:palano@di.unimi.it)  
*Laura Ripamonti* [ripamonti@di.unimi.it](mailto:ripamonti@di.unimi.it)

# Master degree in CS: more information on the web

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- UNIMI site of the Master degree in CS:  
<https://informatica-lm.cdl.unimi.it/en>
- Course presentation:  
<https://informatica-lm.cdl.unimi.it/en/programme>
- Study programmes:  
<https://informatica-lm.cdl.unimi.it/en/programme/suggested-study-programmes>
- Guidance site:  
<http://orientamento.di.unimi.it/>
- International students office:  
<https://www.unimi.it/en/international/coming-abroad/international-students-office-welcome-desk>

# We look forward to seeing you in our new department ...

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- An updated teaching linked to the great research tradition of the Department of Computer Science
- State-of-the-art classrooms and laboratories and a large teaching staff capable of covering all the main areas of IT
- A dynamic environment: studying and working in collaboration with the research teams of the department also in the context of international collaborations
- Secure employment opportunities in all areas of information technology applied to industry, services, the advanced tertiary sector
- Possibility to continue your studies with a PhD in Computer Science

