MSc in Artificial Intelligence (MUIA)

MÁSTER UNIVERSITARIO EN INTELIGENCIA ARTIFICIAL POR LA UNIVERSIDAD POLITÉCNICA DE MADRID
http://www.dia.fi.upm.es/masteria

FACULTAD DE INFORMÁTICA

http://www.fi.upm.es
The Universidad Politécnica de Madrid is reference of quality in the formation of competetively and internationally qualified engineers and architects.

The Montegancedo Campus is the only campus in Spain that has been honored by the Ministry of Science and Innovation as an Excellent Campus in Research and Transfer in the area of information technology and communication. In 2010 obtained the qualification of International Campus of Excellence (ICE) by the Ministry of Education.

The Facultad de Informática (UPM), top position in the ranking (seven consecutive years) of El Mundo for the 50 most requested degree courses.

FACULTAD DE INFORMÁTICA

175 professors and 1753 students

Departments

Department of Computer Systems Architecture and Technology
Department of Artificial Intelligence
Department of Computer Languages and Systems and Software Engineering
Department of Applied Mathematics

Department Sections

Photonics Technology
Linguistics Applied to Science and Technology
HOW TO ARRIVE

Public transport users can take any of the following bus routes to the Facultad de Informática:

**Number 591:** Madrid (Aluche)-Boadilla (F.Informática) y

**Number 865:** Madrid (Ciudad Universitaria) - Campus de Montegancedo

**Number 571:** Madrid (Campamento)-Boadilla (Lomas - Bonanza)

**Number 573:** Madrid (Moncloa)-Boadilla (Urbanizaciones)

**Number 566:** Boadilla (Ronda)-Pozuelo (C. Francia)
• **Discipline of Computer Science**

• **Objective:** Create computer systems and machines that exhibit some degree of rationality.
Head of Department  
Mrs. Asunción Gómez Pérez (director.dia@fi.upm.es)

Deputy  
Mr. Jacinto González Pachón (subdirector.dia@fi.upm.es)

Secretary  
Mr. Daniel Manrique Gamó (secretario.dia@fi.upm.es)

El DIA teaches in:  
- Bachelor in Informatics Engineering  
- Bachelor in Informatics and Mathematics

Postgraduate:  
- Master in Artificial Intelligence  
- Master of Informatics Engineering  
- PhD in Artificial Intelligence
46 Members:
- 7 Professors
- 26 Associate Professors
- 4 University Lecturers
- 4 Postdoctoral Researchers (Juan de la Cierva)
- 1 Postdoctoral Researcher (Marie Curie)
- 1 Postdoctoral Researcher (campus of International Excellence)
- 3 Administration and Services stuff
- More than 50 fellows

RESEARCH GROUPS
- Decision Analysis and Statistics Group
- Computational Logic, Languages, Implementation and Parallelism Laboratory
- Natural Computing Group
- Economics and Environmental Sustainability Group
- Hydroinformatics and Water Management Group
- Biomedical Informatics Group
- Ontology Engineering Group
- Computational Intelligence Group
- Computational Cognitive Robotics Group
- Intelligent Systems and Knowledge Engineering Group
- Validation and Business Applications Group
- Artificial Intelligence Laboratory
According to the study in 2009 by the Institute of Documentary Studies on Science and Technology (IEDCYT), the Center for Humanities and Social Sciences (CCHS) and the National Research Council (CSIC) entitled Science Production Indicators in the Community of Madrid during the period 2004-2008, DIA is mentioned as the UPM Department with the highest number of scientific publications with high impact during that period.

35 research projects in competitive public national calls
In the last 5 years

National Plan of I+D+I Through national programs

Obtained financing: 3.667.795,18 €

- Plan AVANZA
- CENIT Program
- PROFIT Program
- etc.
17 research projects in competitive public international calls
(VI and VII EU Framework Programme)
In the last 5 years

Obtained Financing:
5,244,576,08 €
Consortium with 111 international research groups

54 research contracts (2,868,938,59 €)
with public or private (national and international) entities in a non-competitive environment (in the last 5 years)

Intelligent Software Components, S.A. (ISOCO)  AMPER Programas de Electrónica y Comunicaciones, S.A.
Aeropuertos Españoles y Navegación Aérea (AENA)  DAEDALUS-Data
SPRI  Atos Origin, S.A.
EADS-CASA  Centro de Estudios Universitarios Ramón Areces (CEURA)
Fundación ADIENO  Vodafone España, S.A.
Instituto Geográfico Nacional  Telefónica I+D, S.A.
Real Academia Española  Panda Security
DEIMOS Space S.L.  Decisions and Language, S.A.
Ministerio de Medio Ambiente (Dirección General del Agua)  Planet Media Studios, S.L.
Visión Artificial Desarrollos I+D, S.L.  Fundación UNDL (UNL) Ginebra
Fundación Gil Gayarre  Instituto de Salud Carlos III del Ministerio de Sanidad y Consumo
Infraestructura y Ecología, S.L.  WDC World Development Consultants, S.A.
Fundación Instituto Madrileño de Estudios Avanzados en Tecnología de Desarrollo Software (IMDEA Software) etc.
The MUIA has been featured on third position in the "Advanced Computer Science section" according to the eighth edition of the special “250 MASTER and Complete MBA Guide. Course 2012-13” published by the newspaper El Mundo.
HOW TO APPLY AT MUIA

PRE-ENROLMENT
First Period (all students) November - March.
Second Period (only for students from the European Higher Education Area or with valid visa for Spain) April - June.

https://www.upm.es/helios/

ADMISSION
Publication of the list of admitted students: for the first period in March, and for the second period in July.

REGISTRATION
Second half of July

➢ Adapted to the European Higher Education Area (EHEA).

➢ It consists of a training period associated with the PhD Programme in Artificial Intelligence, awarded a “Mención de calidad” (Quality certificate) from the Ministry of Education and Science during the academic years 2011/12, 2012/13 and 2013/14.

➢ PLACES AVAILABLE FOR NEW STUDENTS: 45 (academic course 2012/13)
TOTAL COST (Academic course 2012/13)

- 65 € * 60 ECTS = 3900.00 €
- Secretary taxes: 39.76 €
- Student insurance: 1.12 €

- Degree diploma: 176.27 €
- European supplement: 76.50 €

MUIA OBJECTIVES

To prepare students for innovation in the area of Artificial Intelligence, in two ways:

- the creation of innovative techniques and methods within the research area of Artificial Intelligence, and

- the application of these techniques and methods relative to social and business reality as well as creating processes and innovative computer solutions.
MUIA COMPETENCES

The competences are structured into three categories:

- **General Competences**
  - Royal Decree: common for Spain
  - UPM: common to all UPM degrees
  - EURO-INF: typical for a MSc in Computer Science

- **Competences concerning the research orientation** of the degree proposed, different from those shared by the professionally-oriented Masters.

- **Specific competences in Artificial Intelligence**, which differentiate the proposed degree from any other Master program offered by the UPM.

LANGUAGES: Spanish and English
(can be taken entirely in English)

DURATION: 1 academic course (60 ECTS)

<table>
<thead>
<tr>
<th>First Semester</th>
<th>7 optional modules (16 offered)</th>
<th>35 ECTS</th>
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</thead>
<tbody>
<tr>
<td>Second Semester</td>
<td>5 seminars (13 offered)</td>
<td>10 ECTS</td>
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<tr>
<td></td>
<td>Master’s Final Project</td>
<td>15 ECTS</td>
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</tbody>
</table>
SUBJECTS in which the curriculum is structured:

- Fundamentals of Research
- Decision Analysis
- Data Mining
- Natural Computing
- Logic Computing
- Knowledge Representation and Reasoning
- Robotics and Computational Perception
- Application Areas
- Seminars by visiting professors
SEMINARS

There are 15 different seminars offered (the student must attend at least 5) are organized in four categories:

• **S1: Methodology of research.** It is the only mandatory seminar.
• **Seminars whose name match the subject to which they belong (from S2 to S6 and S8).** If the student decides not to be taught any module belonging to M2 to M7, then the student must take this seminar.
• **Seminars that complement modules (S7, and from S9 to S12).**
• **Seminars by visiting professors,** in which the student acquires advanced or specialised knowledge about any of the subjects taught within the course.

MASTER STUDENT'S PROFILE

• Those students interested in specialising in one or more concrete disciplines of AI. They must study every module and seminar in the chosen subject area.

• Those students who seek a **broader perspective** and are wanting to obtain an extensive knowledge about the whole of AI. They must study modules covering all subjects.
Grants Jose Cuena

Aimed at students (up to a maximum of 12) who are starting their studies on the Master’s program in Artificial Intelligence.

The award (600 Euros) requires from the student to be a new full-time student in the MSc in AI of any nationality and to have passed the 7 subjects enrolled in the first semester and obtained the highest qualifications (GPA of the 7 subjects).

Mentoring
The CAMIA will assign a “mentor” to each enrolled student. Mentors are students that are in a research period of a PhD in Artificial Intelligence. The mentor has the task of facilitating guidance within the academic, social, and administrative issues that a new student may have.

Supervisor
CAMIA will assign, to each enrolled student, a supervisor among the teaching and research staff of the MSc. The supervisor will answer the student's queries, advise on necessary matters, and support the student in the development of their academic activity.
### TIMETABLES

**FIRST SEMESTER: MASTER MODULES**

**ACADEMIC COURSE 2012/13**

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:00-14:00</td>
<td>A6: METAHEURISTIC-BASED INTELLIGENT SEARCH</td>
<td>A10: INTELLIGENT AGENTS AND MULTI-AGENT SYSTEMS</td>
<td>A12: ONTOLOGICAL ENGINEERING</td>
<td>A6: BAYESIAN NETWORKS</td>
<td>A16: LANGUAGE ENGINEERING</td>
</tr>
<tr>
<td>15:00-16:00</td>
<td>A8: NON CONVENTIONAL COMPUTING</td>
<td>A11: ONTOLOGICAL ENGINEERING</td>
<td>A13: COMMONSENSE REASONING</td>
<td>A14: AUTONOMOUS ROBOTS</td>
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<tr>
<td>16:00-17:00</td>
<td>A9: LOGIC PROGRAMMING</td>
<td>A15: BIOMEDICAL INFORMATICS</td>
<td>A7: EVOLUTIONARY COMPUTATION</td>
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</tr>
<tr>
<td>17:00-18:00</td>
<td>A1: DECISION SUPPORT SYSTEMS</td>
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<tr>
<td>18:00-19:00</td>
<td>A6: METAHEURISTIC-BASED INTELLIGENT SEARCH</td>
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<tr>
<td>19:00-20:00</td>
<td>A8: NON CONVENTIONAL COMPUTING</td>
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<tr>
<td>20:00-21:00</td>
<td>A9: LOGIC PROGRAMMING</td>
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</tbody>
</table>

**SECOND SEMESTER: SEMINARS AND MASTER FINAL PROJECT**

**ACADEMIC COURSE 2011/12**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Seminar</th>
<th>Date</th>
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<tbody>
<tr>
<td></td>
<td>Applications of Artificial Intelligence</td>
<td>February 2 - 10th</td>
</tr>
<tr>
<td></td>
<td>Research Methodology</td>
<td>February 13 - 20th</td>
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<td></td>
<td>Decision Analysis</td>
<td>February 23 - March 2nd</td>
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<tr>
<td></td>
<td>Data Mining</td>
<td>March 5 - 8th</td>
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<tr>
<td></td>
<td>Evolutionary Robotics</td>
<td>March 11 - 15th</td>
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<td></td>
<td>Natural Computing</td>
<td>March 20 - 24th</td>
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<td></td>
<td>Co-curricular activities week</td>
<td>March 20 - 24th</td>
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<tr>
<td>April 6th</td>
<td>Sessi/ History</td>
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<tr>
<td>April 12th</td>
<td>Knowledge Representation and Reasoning</td>
<td>April 16th</td>
</tr>
<tr>
<td>April 19th</td>
<td>fuzzy logic</td>
<td>April 23rd</td>
</tr>
<tr>
<td>April 26th</td>
<td>Robotics and Computational Perception</td>
<td>April 23rd</td>
</tr>
<tr>
<td>May 2nd</td>
<td>Language Engineering</td>
<td>May 5th</td>
</tr>
<tr>
<td>May 16th</td>
<td>Systems Biology of Cell-Cell Interaction</td>
<td>May 16th</td>
</tr>
<tr>
<td>May 22nd</td>
<td>Authentication Proving</td>
<td>May 22nd</td>
</tr>
<tr>
<td>June 1st</td>
<td>Adaptable Semantic Data Management Techniques for Linked Data</td>
<td>June 4th</td>
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</tbody>
</table>

Seminars and the master’s final project can be completed as distance learning via videoconferencing.
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DOCTORADO EN INTELIGENCIA ARTIFICIAL
www.dia.fi.upm.es/doctoradoia
PhD in Artificial Intelligence

Design approved by the department (March, 2nd of 2009)

Postgraduate Studies of DIA

- Formative Period + Research Period
- MSc in Artificial Intelligence (60 ECTS) + Doctoral Program in Artificial Intelligence

Quality Support

Advertising Mobility

PhD in Artificial Intelligence

- Has started from the academic year 1985-86.
- 140 defended doctoral dissertations.
- Adapted to the European Higher Education.
- Has obtained the Quality Mention by the Ministry of Education and Science during the academic years 1996/97, 2000/01, 2001/02, 2005/06, 2006/07 and 2007/08.
- Doctoral program with Awarded Mention for Excellence by the Ministry of Education during the academic years 2011-12, 12-13 and 13-14.
PhD in Artificial Intelligence

Research Areas

- Machine Learning
- Biomolecular Computing and Synthetic Biology
- Evolutionary Computation
- Semantic Grid
- Biomedical Computing
- Knowledge Engineering
- Language Engineering
- Ontology Engineering
- Intelligente Human-Computer Interaction
- Internet in the future
- High-Level processing and parallel processing
- Data Mining
- Choice models under Bounded Rationality
- Reasoning Models
- Logical Models
- Nanocomputing
- Logic programming (LP) and LP with restrictions
- Information retrieval
- Bayesian Networks
- Neural Networks
- Decision Support Systems
- Multi-attribute Utility Theory
- Group Decision Making
- Computer Vision and Robotics
- Semantic Web

PhD in Artificial Intelligence

Decision Analysis and Statistics Group

- Bayesian Decision Theory and Statistics
- Multicriteria Decision Making
- Decision Analysis
- Simulation Methods and Metaheuristics in Decision Analysis
- Decision Support Systems within a Decision Analysis framework
- Applied Logistic Regression
- Multivariate Ordinal Regression Models

http://www.dia.fi.upm.es/grupos/dasg
Computational Logic, Languages, Implementation and Parallelism Group

- Verification, Program Assertions, Debugging
- Automatic Parallelization
- Parallel Execution Models and Task Scheduling
- Distributed/Internet Execution, Agents, and WWW
- Parallel Computer Architecture
- Programming Language Design
- Concurrency, Dynamic Scheduling, and Concurrent Languages
- Constraint Programming
- Open Source Software
- Simulation of Parallel Systems
- Graphical Communication
- Diagrammatic Reasoning

http://www.clip.dia.fi.upm.es/

Natural Computing Group

- Artificial Neural Networks
- Molecular Computing
- Networks of Evolutionary processors
- Chaos and Complex Systems

http://www.lpsi.eui.upm.es/nncg/
Hydroinformatics and Water Management Group

- Hydroelectric systems modelling and control
- Mathematical and physical modelling of hydraulic systems
- Hydraulic systems planning and management
- Security of hydraulic infrastructure
- Intelligent Systems and Knowledge Engineering

http://www.dia.fi.upm.es/grupos/I&K/HGA-home.htm

PhD in Artificial Intelligence

Biomedical Computing Group

- BBDD Management
- Clinical Practice Guidelines (GPCS)
- Image Analysis
- Information Extraction
- Science and Medicine
- Web Services

http://www.gib.fi.upm.es/
Ontology Engineering Group

- Ontological Engineering
- Natural Language Processing
- Semantic Web
- Semantic e-Science
- Real World Internet.

http://www.oeg-upm.net/

Computational Intelligence Group

- Advanced Computation
- Computer Vision
- Data Mining
- Heuristic Optimization
- Neuroscience

http://cie.fi.upm.es/
Computational Cognitive Robotics Group

- Symbolic and Language-like Communication in Robot Teams
- Data Clustering Algorithms based on Cellular Automata and Social Segregation Models
- Enactive (action-oriented) coordination in teams of mobile robots
- Car-like robots automatic parking

http://www.dia.fi.upm.es/~ccr/

Intelligent Systems and Knowledge Engineering Group

- Task-specific problem-solving methods
- Design methods of intelligent systems: multiagent systems
- Knowledge engineering
- Knowledge representation:
- Experimentation with real-life problems in civil engineering

http://www.dia.fi.upm.es/grupos/I&K/HGA-home.htm
PhD in Artificial Intelligence

**Validation and Business Applications Group**

- Applied Artificial Intelligence
- Knowledge Based Systems
- Quality - Software Quality Assurance
- Reengineering - Software Maintenance - Inverse Engineering
- Natural Language Processing - Machine Translation
- Validation, Verification & Testing Plans
- Multilingual Information Retrieval
- Information Extraction from Texts. Multilinguality
- Creation & Maintenance of Lexical Resources for NLP
- Multilingual content Representation. Interlinguas
- Text Mining

http://www.vai.dia.fi.upm.es/

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PhD in Artificial Intelligence

**Artificial Intelligence Group**

- DNA Computing
- Biomolecular and Membrane computing
- P Systems
- Synthetic Biology and Systems Biology
- Nanobiotechnology
- Evolutionary computation
- Artificial neural networks
- Formal languages and automata theory
- Knowledge and Project Management
- Synergies between Systems and Synthetic Biology and Evolutionary Computation

http://www.lia.upm.es/
PhD in Artificial Intelligence

EcSEn Natural Environment Economics and Sustainability Group

- Theory and Applications of Multiple Criteria Decision Making
- Group Decision-Making: Theory and Environmental applications
- Bounded Rationality and Satisficing Logic: Theory and Practice
- Sustainable Forest Management
- Economics of Wood-based industries
- Forest and Environmental valuation
- Forest landscape planning
- Biodiversity indicators in forest inventory and management

http://www.ecsen.es/

Job placement: 100%

- Universities (from which 97.2% are public universities)
  - 76.19%
- R&D+I Companies (International or domestic with international scope)
  - 14.29%
- Other professional fields (from Governmental sectors, or from national and international scope)
  - 9.52%
PhD in Artificial Intelligence

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