

Supervisor	Prof. Aldo Franco Dragoni <a.f.dragoni@univpm.it>
Contact	https://airtlab.dii.univpm.it/
Context of the research activity	<p>The "Università Politecnica delle Marche" (UnivPM) is a medium-sized university (50 courses of study with 15,000 students) with an excellent infrastructure, a strong ability to attract students and an excellent capacity for research. It hosted the first conference of the "Associazione Italiana per l'Intelligenza Artificiale" (AI*IA) in 1988. UnivPM offers a wide range of scientific disciplines in the fields of engineering, medicine, biology, economics and agricultural sciences.</p> <p>Three Departments support the AI-PhD Industry 4.0 Area:</p> <ul style="list-style-type: none"> • Information Engineering (DII - Engineering) • Management (DiMa - Economics) • Economic and Social Sciences (DiSES - Economics) <p>They expressed the following topics of interest: Artificial intelligence and customer experience management, Artificial intelligence and data-driven marketing, Artificial Neural Networks, Applications in Smart Living and Industry 4.0 scenarios, Model based Diagnosis for predictive maintenance, Planning for flexible problem solving in the production environment, Multi-Agent Systems for automation and processing of complex data, Confluence between Machine Learning and Model-based Control, Real-Time systems, Cyber Physical Production Systems, AI and control of autonomous vehicles.</p> <p>The candidate might collaborate with the "Artificial Intelligence & Real-time Laboratory" under the supervision of Prof. Aldo Franco Dragoni (who is in charge for the course of "Artificial Intelligence" and has belonged to AI*IA since its foundation), but several of his colleagues expressly declared their interest in being involved: Andrea Bonci (Automation Lab), Laura Burattini (Bioengineering), Emanuele Frontoni (Artificial Vision), Adriano Mancini, Francesca Mariani, Federica Pascucci (Digital Strategy and Data Intelligence Analysis Lab), Andrea Perna (Economics), Stefano Squartini (Digital Signal Processing), Claudio Turchetti (Micro-Nanoelectronics and Embedded Systems), Primo Zingaretti (Computer Graphics), Cristina Lucarelli (Risk/Benefit assessment in the economic-financial field). So the candidate will surely find an excellent context in which to fully develop his or her potential as a researcher.</p>
Objectives	<p>What happens when multiple intelligent agents interact with each other, for example in <i>business</i> or <i>automation</i>? Complex social systems can be modeled using the Multi-Agent paradigm, where intelligent agents are defined to be <i>proactive entities</i>,</p>

	<p><i>autonomous in making decisions and taking actions to achieve their goals.</i> Nowadays, software agents are even able to give themselves subsidiary goals based on their perceptions and their level of comprehension of the world in which they operates. Understanding how a community of agents succeeds to collaboratively solve a problem or how agents might compete in an open market, are typical topics of Multi-Agent Systems (a subsection of Artificial Intelligence). Agent models, interaction protocols and decision techniques are estimated on simulative and/or experimental (i.e. "empirical") bases. It is on these "decision techniques" and their "evaluation" that the objectives of this grant rest:</p> <ol style="list-style-type: none"> 1. <i>decision techniques</i>: it is important to define Bayesian probabilistic derivation methods to attribute a degree of credibility to the information acquired by the agents as well as a degree of reliability to the sources that provided it; this is crucial in order to foresee the possible <i>benefits</i> and <i>risks</i> of future actions based on information available; 2. <i>evaluation</i>: these techniques can be evaluated from an individual or social perspective, since a good solution for the individual is not guaranteed to be also good from a social (global) perspective.
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<p>Skills and competencies for the development of the activity</p>	<p>The candidate should preferably have addressed an Artificial Intelligence course. In particular s/he should be familiar with symbolic logic (for the representation of agents and their interaction protocols), knowledge representation, probability theory and reasoning under uncertainty.</p> <p>The candidate should also possess some computer programming skills; very specific and much appreciated competence may be on:</p> <ul style="list-style-type: none"> • (Probabilistic) Logic Programming • Multi Agent System programming platforms (e.g. JADE, JASON, SPADE ..)
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