Viviana Mascardi

Associate professor

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Education and training

2002

Dottorato in Informatica

Logic-Based Specification Environments for Multi-Agent Systems

Università di Genova - Genova - IT

Academic experience

2015 - ONGOING

Professore associato (Associate Professor)

Università di Genova - Genova - IT

2005 - 2015

Ricercatrice (Assistant Professor)

Università di Genova - Genova - IT

2002 - 2005

Assegnista di ricerca (post-doctoral fellow)

Università di Genova - Genova - IT

Language skills

English
Proficient

Teaching activity

I teach Algorithms and Data Structures in the Bachelor in Computer Science (Laurea Triennale in Informatica LT-31), and two courses in the Master of Science in Computer Science (Laurea Magistrale in Informatica LM-18): Data Semantics and Multiagent Systems
The Data Semantics course provides an introduction to the most challenging issues in knowledge and data representation and semantics, with particular emphasis on languages and technologies for the semantic web. Students are provided with a sound grounding of scientific, methodological and technological fundamentals in ontologies and semantic annotations of data. Students learn key elements of modeling, representation and exploitance of data semantics in the context of Semantic Web and for natural language processing. Relevant research issues and recent applications are analyzed and discussed.

Multiagent systems (MASs for short) have emerged as one of the most important areas of research and development in information technology. A multiagent system is one composed of multiple interacting software components known as agents, which are typically capable of cooperating to solve problems that are beyond the abilities of any individual member.The characteristics of MASs are that (1) each agent has incomplete information or capabilities for solving the problem and, thus, has a limited viewpoint; (2) there is no system global control; (3) data are decentralized; and (4) computation is asynchronous.Multiagent systems are important primarily because they have been found to have very wide applicability, in areas as diverse as industrial process control and electronic commerce. This course will introduce the students to the notion of an agent, and will lead them to an understanding of what an agent is, how they can be constructed, how agents can be made to cooperate effectively with one-another to solve problems.

The aims of the Multiagent Systems course are:

-- to introduce the student to the concept of an agent and multiagent system, and the main applications for which they are appropriate;

-- to introduce the main issues surrounding the design of intelligent autonomous agents, and the main approaches and techniques for the implementation of such agents;

-- to introduce the main issues surrounding the design of multiagent systems, and the main approaches and techniques for enabling communication and cooperation in such systems.

Postgraduate research and teaching activity

Supervision of PhD students, residents and post-doctoral fellows

- Supervision of the Ph. D. theses of G. Casella, D. Briola, A. Locoro, A. Ferrando at the University of Genova
- External reviewer of the Ph.D. theses of: Yu Xiu Luo and Lu Bin supervised by L. Sterling, Univ. of Melbourne; C. Grigore supervised by R. Collier, University College Dublin; A. Ben Othmane supervised by S. Villata and A. Tettamanzi, CNRS FR; R. Calegari supervised by A. Omicini and E. Denti, Univ. of Bologna
- Member of the PhD Committee of M. Sharaf , M. Franzago, F. Marzi, G. Nazzicone, M. Abusair, A. Perucci, University of L'Aquila, May 2018

Research interests

== MASs modeling, verification, rapid prototyping using computational logic
Since the beginning of her research activity, V. Mascardi worked on the application of computational logic for the specification of MASs. The most relevant and old outcome was DCaseLP, the Distributed Complex Applications Specification Environment based on Logic Programming (with M. Martelli, F. Zini et al.)
Besided working on MAS platforms she also worked on agent languages,

always taking a declarative approach into account. Together with M. Martelli and L. Sterling she wrote a survey on Logic-Based Specification Languages for Intelligent Software Agents published on the TPLP journal, 2004

From 2003 she started collaborating with D. Ancona and R. Bordini (one of the developers of the Jason declarative agent language, implementing the Belief-Desire-Intentions architecture), to extend Jason with plan exchange and with ontology-driven communication capabilities. This activity lead to the development of Coo-AgentSpeak (Ancona et al., AAMAS 2004) and CooL-AgentSpeak (Mascardi et al., WIAS Journal, 2014)

In a DALT 2012 paper, together with D. Ancona and S. Drossopoulou, she proposed a formalism (initially named "Multiparty Global Session Types", now named "Trace Expressions") for runtime verification of MASs. The trace expressions interpreter is implemented in Prolog. Trace expressions evolved during time thanks to contributions of D. Briola, A. Ferrando and others. In 2015 their adoption as a tool for driving the agents' behavior, rather than just monitoring it, was presented (Ancona et al., AAMAS 2015). Their most recent extensions involve introduction of parameters (Ancona et al., AAMAS 2017), safe decentralisation of the MAS monitoring process (Ferrando et al., AAMAS 2017), and implementation of an integrated development tool, RIVERtools IDE (Ferrando, PRIMA demo session, 2017). In a poster presented at AAMAS 2018, co-authored by A. Ferrando, L. Dennis, D. Ancona and M. Fisher, runtime verification via trace expressions is used in close connection with model checking to recognise assumption violations in autonomous systems verification

=== MASs applications

The development of applications of agents and MASs has always been a main goal in V. Mascardi's research. The most recent results are those achieved within the IndianaMAS MIUR PRIN project that she coordinated, aimed at the development of agent-oriented and ontology-driven digital libraries in the rock art domain.

Together with S. Costantini and others, V. Mascardi recently proposed an application the Multi-Context System approach - which can be seen as a further extension of the MAS approach - in the eHealth domain, introducing a system architecture denominated 'Friendly and Kind with your Health', amenable also to applications involving wearable sensors and care robots controlled by intelligent agents

More recently, she addressed the problem of improving flexibility and dependability of remote patient monitoring with agent-oriented approaches (D. Ancona, A. Ferrando, V. Mascardi, Journal of Agent-Oriented Software Engineering, to appear in 2018)

=== Multilingual semantic interoperability via Semantic Web technologies and ontologies

Agents and ontologies (and hence, Semantic Web technologies) are closely connected: on the one hand, ontologies can be seen as a natural way to model the agents' internal knowledge, when a declarative approach to agent modeling and implementation is adopted. On the other hand, ontologies can be seen as a powerful (external) tool able to boost agent communication and mutual understanding. In case different agents use different ontologies to model their domains, an ontology matching

operation is needed to allow agents to interoperate. One of the most significant results achieved in this area by V. Mascardi, together with A. Locoro and P. Rosso, is the proposal of using upper ontologies to perform ontology matching (V. Mascardi et al., IEEE TKDE journal, 2010). The relationships between agents and ontologies have been explored in a paper with J. Hendler (V. Mascardi, J. Hendler, et al., DALT 2012), one of the inventors of the Semantic Web.

Grants

2018 – ONGOING
Digital forensics evidence analysis via intelligent systems and practices
European Community (COST ACTION)
EU – Participant
Web page: http://www.cost.eu/COST_Actions/ca/CA17124
My role in the project: Leader of WG4, 'Benchmarks based on real cases'
Digital Forensics is a part of the Criminalistics Sciences which deals with digital evidence recovery and exploitation in the solution of criminal cases through the application of scientific principles. There are several and increasingly sophisticated methods for collecting digital evidence. As a matter of fact, the evolution of technology continuously pushes such kind of methods. Rough evidence must however be used to elicit hypotheses concerning events, actions and facts (or sequences of them) with the goal to obtain evidence to present in court. Evidence analysis involves examining fragmented incomplete knowledge, and reconstructing and aggregating complex scenarios involving time, uncertainty, causality, and alternative possibilities. No established methodology exists today for digital evidence analysis. The Scientific Investigation experts usually proceed by means of their experience and intuition.
The Challenge of the proposed COST Action consists in creating a Network for exploring the potential of the application of Artificial Intelligence and Automated Reasoning in the Digital Forensics field, and creating synergies between these fields. Specifically, the challenge is to address the Evidence Analysis phase, where evidence about possible crimes and crimes perpetrators collected from various electronic devices (by means of specialized software, and according to specific regulations) must be exploited so as to reconstruct possible events, event sequences and scenarios related to a crime. Evidence Analysis results are then made available to law enforcement, investigators, public prosecutors, lawyers and judges: it is therefore crucial that the adopted techniques guarantee reliability and verifiability, and that their result can be explained to the human actors.

2012 – 2015
Indiana MAS and the Digital Preservation of Rock Carvings
A multi-agent system for drawing and natural language

understanding aimed at preserving rock carvings.

MIUR (FIRB) - IT

Total budget 747.600 Euro. UO Budget 381.100 Euro - Pricipal investigator
Web page: http://indianamas.disi.unige.it/
My role in the project: PI, Unit Coordinator
The Indiana MAS research project aims at providing a framework for the digital protection and conservation of rock art natural and cultural heritage sites, by storing, organizing and presenting information about them in such a way to encourage scientific research and to raise the interest and sensibility towards them from the common people.More specifically, the purpose of the project is to design and develop a working multi-agent system (MAS) supporting archaeologists and historians (the 'domain experts') in

O1. integrating heterogeneous unstructured data (multilingual textual documents, pictures, and drawings) related to rock carvings into a single repository;
O2. normalizing data by recognizing those referring to the same object, correctly associating them with its digital representation, and removing duplicate data;
O3. classifying normalized data according to the 'Indiana ontology' that will be extracted in a semi-automatic way from the unstructured data, and that will evolve as data will;
O4. organizing classified data into a Digital Library and making the library accessible thanks to a web-based, multilingual, user-friendly interface;
O5. interpreting data stored in the Digital Library, finding relations among them, and enriching them with the semantic information extracted thanks to this interpretation and relation retrieval stage.
The five objectives above will be pursued by intelligent agents that interact with domain experts in a user-friendly way, performing the tasks required to achieve their goals in a semi-automatic way. Domain experts will be required to supervise the agents' activities, but their intervention and involvement will be kept to the minimum possible, and will be always facilitated by means of tools that will prevent them to be exposed to the technical details.
The end users of our Indiana MAS will mainly be archaeologists and historians, but also teachers, scientists, students, directors of museums, and common people.
The MAS will be general enough to be used in any cultural heritage domain where rock carving is a central feature. However, in order to demonstrate the feasibility of our proposal and to measure its results in a quantifiable way, we will apply it to the preservation of the rock art of Mt. Bego.

2012 - 2016

SAFEPOST -- Reuse and development of Security Knowledge assets for International Postal supply chains

European Community (FP7)

Total budget 14.986.407 Euro. UO Budget 255.600 Euro. - Participant
Web site: http://www.posteurop.org/SAFEPOST

My role in the project: participant
SAFEPOST, "Reuse and development of Security Knowledge assets for International Postal supply chains", is a four year Integration project addressing the FP7-SEC-2011.2.4- 1 International Postal Supply Chains. The project started on the 1st April 2012 and is funded by the European Commission DG Enterprise and Industry.

The aim of the SAFEPOST project is to further raise the current level of postal security by integrating innovative detection and screening solutions. SAFEPOST will provide the necessary and sufficient security level to satisfy evolving international regulations and standards while efficiently supporting the complexity of the evolving postal services market across Europe. Very importantly, it will do this without increasing costs, as the improvements in processing time will more than compensate for increased screening requirements, both in terms of elapsed time and overall distribution cost.

Starting from the perspective of the partner postal operators, the project will use a cost-benefit method to identify the main security gaps and will describe security measures to maintain or augment the efficient and secure operation of these posts. After making an inventory of security gaps these will be developed into generic postal security models which will be integrated into a European Security Framework for Postal Supply Chains, which will enable postal operators, customs and other relevant actors to securely exchange information related not only to security but also optimization of postal flows.

Expected Results
 SAFEPOST will provide and showcase a novel solution for postal security combining:

- Security performance enhancing solutions for postal operators;
- Postal operations efficiency improvements to compensate for time lost in screening;
- EU coverage to raise level of postal security across all member states;
- A Postal Security Platform facilitating interoperability and integration of solutions across all domains.

The results of the SAFEPOST project will have a strategic impact as it is designed to make a significant contribution in the following areas:

- Improving the EU's awareness and coordination of activities within and between EU Member States in the field of Postal Security and developments in Supply Chain Security;
- Linking EU projects from DG MOVE, DG TAXUD, DG JLS, DG ENTR or DG JRC11 and national efforts, to exploit syner

Editorial activity

PROGRAM COMMITTEE PARTICIPATION
PC Member of more than 100 editions of a wide range of National and International Conferences, including (among the best rated ones) editions

of IJCAI (International Joint Conference on Artificial Intelligence, including IJCAI/ECAI 2018); AAMAS (Agents and Multi-Agent Systems, where I also served as a Senior PC member for three editions including AAMAS 2018); AAAI Conferences on Artificial Intelligence, including AAAI 2018

STEERING COMMITTEES & EDITORIAL BOARDS

Member of the steering committee of WOA (National Workshop Dagli Oggetti agli Agenti) and GULP (Italian Association for Logic Programming, Gruppo Ricercatori e Utenti Logic Programming). Member of the Editorial Board of the International Journal of Agent-Oriented Software Engineering

RECENT WORKSHOP CO-ORGANIZATION

- Co-organizer (with D. Weyns and A. Ricci) of the EMAS@AAMAS 2018 workshop, Stockholm, 2018
- Demo session chair of PRIMA 2017, Nice, 2017
- Tutorial co-chair (with M. Spaan) of AAMAS 2017, Sao Paulo, BR, 2017
- Co-organizer (with I. Torre) of the Doctoral Consortium of AI*IA 2016, co-located with the 15th International Conference of the Italian Association for Artificial Intelligence, Genova, 2016
- Co-organizer (with D. Ancona and M. Maratea) of CILC 2015, Genova, 2015
- Co-organizer (with M. Baldoni, L. Dennis, W. Vasconcelos) of DALT@AAMAS 2012, Valencia, 2012
- Co-organizer (with M. Baldoni, C. Baroglio, J. Bentahar) of MALLOW-AWESOME 2009, Torino, 2009

RECENT INTERNATIONAL COOPERATIONS (last 4 years)

- FACIN-PUCRS, BR (WIAS journal paper with R. Bordini (et al.), 2014)
- Katholieke Universiteit Leuven, BE (co-organization of the EMAS@AAMAS2018 workshop with D. Weyns (& A. Ricci, IT))
- University of Liverpool, UK (AAMAS paper with M. Fisher and L. Dennis (et al.), 2018)
- Delft University of Technology, NL (AAMAS 2017 Tutorial co-chair with M. Spaan)
- LIRS Lyon, FR (IxD&A journal paper with R. Laurini (et al.), 2017)
- Imperial College, UK; University of Lisbon, PT; CNRS - Université Paris Diderot, FR; University of Glasgow, UK; University of Oslo, NO (FTPL journal paper with N. Yoshida, V. T. Vasconcelos, G. Castagna, S. Gay, E. Broch Johnsen (et al.) 2016)
- Polytechnic University of Valencia, SP (MultiLingMine@ECIR 2016 workshop paper with P. Rosso, 2016)

RECENT NATIONAL COOPERATIONS (last 4 years)

- University of L'Aquila (S. Costantini, G. De Gasperis, A. Di Marco, F. Aielli)
- Free University of Bozen (V. Del Fatto)
- University of Bologna (A. Ricci)
- University of Salerno (V. Deufemia)
- Milano Bicocca University (D. Briola)
- University of Torino (L. Padovani, V. Bono)

RECENT INVITED SEMINARS AND TUTORIALS

- 2012: invited tutorial at the 28th International Conference on Logic Programming, ICLP 2012, Budapest, on Logic-Based Agents and the Semantic Web
- 2011: invited talk at the Institute of Archeology and Museology Faculty of

Arts, Masaryk University, Brno, on Artificial Intelligence at Disposal of
Archeology