Enrico Franconi
Curriculum Vitæ

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Statement of intent

I am full professor with tenure at the Free University of Bozen-Bolzano, Italy. My duties include teaching, supervising activities, projects and theses of BSc, MSc and PhD students, doing scientific research, coordinating research projects, supporting the administration of the faculty, being the director of a research group, being the president of an international master of science degree programme, and other academic duties.

The research area I am working on is related to the logical foundations of databases, artificial intelligence, knowledge representation, and logic-based semantic technologies, also applied to concrete problems in information systems design and maintenance, in data intensive applications, in natural language interfaces, in intelligent data integration and access. This area is quite vast, interdisciplinary, and it involves both theoretical and practical skills: an appropriate balance between these two aspects should be given, so to provide a unique added value to the research area. My goal is to let practitioners to apply foundational results, and push theoreticians to understand the complex nature of the real applications' issues. I have achieved this together with my research group which has a critical mass to include a variety of perspectives in the entire range from theory to practice. The interdisciplinary aspects of this research area are also crucial: together with the theory vs practice aspect, these are system aspects, methodological aspects, interaction and communication aspects, usability aspects, complexity aspects, correctness aspects, efficiency aspects, deployability aspects. I have also applied artificial intelligence techniques in different disciplines: for example, in the telecom area, in the space domain, in Business Intelligence, in natural language applications.

The research projects coordinated by me as principal investigator gathered so far around 1,700,000 Euro of external non-university fundings. I have been pro-rector for research at the Free University of Bozen-Bolzano, and I have been the founder in 2002 and the director since, of the KRDB Research Centre for Knowledge and Data, which has grown to count now 19 faculty members (full, associate, and assistant professors) and more than 30 research fellows and PhD students. I have substantially contributed to the development of the young faculty of Computer Science of the Free University of Bozen-Bolzano since 2002, when the faculty was founded and I was the second hired professor, until now, when the faculty is ranked (by the 2019 Times Higher Education ranking) fourth best Computer Science faculty overall in Italy, 21st best Computer Science faculty in the world for citations, and best for citations and for international outlook in Italy.

In the attached CV, in the section "Research", I describe in details the different

aspects of my research in the area of computational data science and artificial intelligence, showing a record of excellence in research with international impact.

Because of the intrinsic goals of my research activity, an interaction with the concrete enterprise and societal worlds is needed as well. Collaborations with developers, industries, and SME/users have an important role in my activity. Recently, I have increased the collaborations with industry, on topics such as intelligent conceptual modelling, semantic interoperability, and chatbot design. In the CV, in the section "Applied research and third mission", I describe how I have built industry engagement, showing how I contribute to the leadership, service and engagement missions of the university.

Teaching is central in my interests. I have taught bachelor, master, and PhD courses: I believe that a rigorous and expert presentation of topics and methodologies is needed by students, together with hands-on practice strictly interconnected with both the theory and the actual real world needs. I have taught courses on topics related to logic, discrete mathematics, databases, information systems, computer systems architecture, software engineering, artificial intelligence, knowledge representation. I have been teaching since several years a course on Scientific Writing for Computer Science PhD students. I have been so far supervisor of eleven PhD students - mainly on foundations of databases, artificial intelligence, and knowledge representation topics. Three of them are still ongoing, one is currently Vice-President for Engineering, Search, and Artificial Intelligence at eBay (USA), and four have continued their career in academia.

In 2004 I have founded and directed two successful international MSc programmes supported by the European Union in the Erasmus Mundus programme, one of which is still active: I'm currently director of the European Masters Program in Computational Logic (EMCL), a two-years international joint Master of Science degree in cooperation with four major European universities. The programme has graduated more than 170 students. The EMCL received more than 6,000,000 Euro of student grants from the Erasmus Mundus co-operation and mobility European programme.

In the CV, in the section "Teaching", I describe in details my teaching experience, showing a commitment to delivering high quality and innovative teaching at undergraduate and graduate levels.

In 2011 I have adopted two kids from Poland, aged 10 and 11 at the time. For few years I have slowed down my full time involvement in academic activities (I took a part-time leave of absence), and now I'm back full time.

Educational and professional experience

From/to	Job title	Institution	Responsibilities
1987	Master of Science, degree in Physics	University of Rome "La Sapienza"	Thesis on knowledge representation for physics experiment data at CERN, 110/110 cum laude
1988-1997	Research fellow R1 with tenure	Istituto per la Ricerca Scientifica e Tecnologica ITC-IRST (now FBK, Fondazione Bruno Kessler), Trento, Italy	Research in the groups headed by O. Stock and by F. Giunchiglia. Activity in Knowledge Representation, Formal Ontology, Computational Logic, Natural Language Semantics, Conceptual Modelling.
1991-92	Guest scientist	Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI) in Saarbrücken, Germany	3 months within the WIP project, headed by W. Wahlster, under the supervision of B. Nebel.
1998	Guest professor	Dresden University of Technology, Germany	2 months teaching Description Logics at the "Computational Logic International Masters Programme".
1998-2002	Senior lecturer with tenure	Department of Computer Science, University of Manchester, UK	In the Information Management Group, deputy director of the PhD board, PI in a national research project.

2002-2016	Associate professor with tenure	Faculty of Computer Science, Free University of Bozen-Bolzano, Italy	
2005-2006	Pro-rector for research	Free University of Bozen-Bolzano, Italy	With the rector Rita Franceschini.
2006-2007	Visiting professor	Univ. Nacional del Sur (Argentina); Univ. of Otago (New Zealand); National ICT Australia - NICTA (Australia)	On sabbatical, visiting professor and visiting researcher
2008	Visiting researcher	National ICT Australia - NICTA (Australia)	3 months visiting researcher
2013	Visiting fellow	Macquarie University in Sydney (Australia)	1 month visiting fellow
2015	Full professor habilitation in Computer Science	Awarded by the National Scientific Qualification Committee of the Italian Ministry for Higher Education (MIUR)	
2016-	Full professor	Free University of Bozen-Bolzano, Italy	Current position
2017	Visiting fellow	Univ. of Waterloo (Canada)	2 months visiting fellow

Spoken languages: Italian (native), English (certified C2), German (certified B1).

Professional associations: IEEE (Institute of Electrical and Electronics Engineers), ACM (Association for Computing Machinery), AI*IA (Italian Association for Artificial Intelligence, *founding member*), CLAIRE (Confederation of Laboratories for Artificial Intelligence Research in Europe, *research group representative*).

Academic Activities

- The Free University of Bozen-Bolzano has been founded in 1997. I have been the second professor hired in the faculty after its establishment in 2001. In the first years of life of the faculty I've been very active in forming the nature, the spirit, and the structure of the faculty, and I have substantially contributed to its development towards the successful faculty which is now - see the bibliometric data below. In the period when the BSc and MSc degree councils were not yet activated, I was acting as the responsible of the first MSc programme. I also cooperated a lot with the central university administration to set up from scratch the regulations for the post-docs and the research assistants, for the management of external and internal research projects, for the travels.

- In 2005-2006 I have been **pro-rector for research** at the Free University of Bozen-Bolzano, ("Delegato alla ricerca") under the rector prof. Rita Franceschini. My main tasks have been related to the setting up of regulations for the management of external and internal research projects, and to initiate an evaluation procedure for the research activities of academics and of departments.

- I founded in 2002 and I am currently director of the *KRDB Research Centre for Knowledge and Data*. The centre includes 19 faculty members (full, associate, and assistant professors), 11 research fellows, 11 PhD students, and some young research assistants. The Scientific Advisory Board of the KRDB Research Centre is composed by: Ron Brachman (Director of the Joan & Irwin Jacobs Technion-Cornell Institute), Thomas Eiter (Professor, Technische Universität Wien, Head of the Institute of Information Systems), Alon Halevy (Executive director of the Recruit Institute of Technology (R.I.T)), Rick Hull (Research Manager, IBM Research), and John Mylopoulos (Professor, Università di Trento and University of Toronto). The centre managed 10 major European research projects so far, gathering only from those projects more than 3,000,000 Euro of external non-university fundings. The vital and dynamic research activities of the centre are playing a crucial role in the scientific success of the faculty - see the bibliometric data below. The KRDB centre is a member of the CLAIRE network, the Confederation of Laboratories for Artificial Intelligence Research in Europe. The KRDB web site describes the activities of the centre: `http://krdb.eu`

- Among the more recent duties, I am representative of the faculty at the na-

tional association of university computer scientists, and for the educational activities for the academic personnel organised by the university.

- I have been expert evaluator for research project proposals submitted to the British Engineering and Physical Sciences Research Council (EPSRC), to The Netherlands Organisation for Scientific Research (NWO) division Physical Sciences, to the Austrian public funding scheme FIT-IT at the Austrian Research Promotion Agency FFG, to the Natural Sciences and Engineering Research Council of Canada (NSERC), to the Academy of Finland, to the European Research Council (ERC), and to Italian university research fundings.

Research   Bibliometric Data and Rankings

- H-index: 38; citations: 5113 (source: Google Scholar `http://scholar.google.com/citations?user=QI5asAEAAAAJ`)

- Research quality evaluation (VQR) by the Italian governmental Agency for the Evaluation of Universities and Research (ANVUR):

  - (2011-2014) I got the mark "high" for all publications.
  - (2004-2010) I got the mark "3 out of 3" for all publications.

- I have the 7th highest h-index among all the academics at the Free University of Bozen-Bolzano (source: Google Scholar `https://scholar.google.com/citations?view_op=view_org&org=17829143710397673419`).

- I am ranked as having the 31st h-index among all computer scientists in Italy (source: Top Italian Scientists Ranking `http://www.topitalianscientists.org/TIS_HTML/Top_Italian_Scientists_Computer_Sciences.htm`).

- The ranking of the KRDB centre, of the Faculty, and of the University:

  - Among the top 12 most cited academics in the Faculty of Computer Science of the Free University of Bozen-Bolzano, 8 are from the KRDB Research Centre of which I am director (source: Google Scholar `https://scholar.google.com/citations?view_op=view_org&org=17829143710397673419`).

- Research quality evaluation (VQR) by the governmental Agency for the Evaluation of Universities and Research (ANVUR):
  * (2011-2014) Our Faculty of Computer Science (INF/01) is the fourth best Italian computer science department in research.
  * (2004-2010) Our Faculty of Computer Science (INF/01) is the second best Italian computer science department in research.
- The *Times Higher Education World University Rankings* 2019:
  * The Free University of Bozen-Bolzano is the *ninth world's best small university*.
  * The Free University of Bozen-Bolzano is the *second best young Italian university*.
  * The Faculty of Computer Science of the Free University of Bozen-Bolzano ranks in the *126–150 range in the world*.
  * The Faculty of Computer Science of the Free University of Bozen-Bolzano is the *21st best Computer Science department in the world* for citations.
  * The Faculty of Computer Science of the Free University of Bozen-Bolzano is the *fourth best Italian computer science department*.
  * The Faculty of Computer Science of the Free University of Bozen-Bolzano is the *best for international outlook Italian computer science department*.
  * The Faculty of Computer Science of the Free University of Bozen-Bolzano is the *best for citations Italian computer science department*.

Research grants

Since I am at the Free University of Bozen-Bolzano, the research projects of which I have been principal Investigator gathered around 1,460,000 Euro of external non-university fundings, and around 560,000 Euro of university basic research fundings.

1983-84 Coordinator of the master students research grant funded by the Univ. of Rome "La Sapienza": *Computer Education and Artificial Intelligence*.

1987-89 Co-investigator of the research project "Onion: A memory supporting Dynamic Data Structures", based on a particular connectionist model of

Boltzmann Machine. The project was conducted at the G-18 Lab, headed by Prof. Maurizio Bonori, Physics Dept., Univ. of Rome "La Sapienza", supported by the Natl. Inst. for Nuclear Physics (INFN).

1989-94 ITC-irst Scientific Coordinator of the Italian National Research Council (CNR) funded project "Sistemi Informatici e Calcolo Parallelo", area "Hybrid Systems". Co-members are: University of Rome (Prof. Maurizio Lenzerini, coordinator), CNR-IP, Rome (C. Castelfranchi), CNR-Computational Linguistics Institute, Pisa (A. Cappelli), CNR-LADSEB, Padova (N. Guarino), Quinary SpA, Milano (L. Spampinato). Goal of the project was the study and the development of hybrid knowledge representation systems, based on Description Logics. The YAK knowledge representation system – developed by me – was chosen as the final prototype of the project. ITC-irst was funded for 50,000,000 Italian lire (25,800 Euro) per year (total: 5 years).

1994-96 ITC-irst Principal Investigator of the Italian National Research Council (CNR) project "*Ontological and Linguistic Tools for Conceptual Modelling*" (Strumenti ontologico-linguistici per la modellazione concettuale). Co-members are: Università di Trento (R. Poli), Ladseb-CNR, Padova (N. Guarino), Università di Modena (F. Bonfatti), ILC-CNR, Pisa (A. Cappelli), Università di Torino (L. Lesmo). Goal of the project is the study of ontological and linguistic tools for the domain analysis phase within the conceptual design of data and knowledge bases. ITC-irst activity was funded for 4,000,000 Italian lire (2,000 Euro) per year (total: 2 years).

1994-1998 *Contact person* for the ITC-irst node of the ESPRIT funded European Network of Excellence *Compulog Net*, in computational logics. Goal of Compulog-Net is the study of the foundations of an integrated software tool for the development of knowledge based systems, by extending the logic programming paradigm with enrichments from areas such as databases, artificial intelligence, knowledge representation and logics.

1996 Principal Investigator of the ITC-irst project *Conceptual Modelling and Intelligent Integration of Information* (Modellazione Concettuale ed Integrazione Intelligente dell'Informazione). Goal of the project was the study and implementation of description logics based techniques for conceptual modelling, aggregation, and intelligent integration of information and their

evaluation in some experimental applicative contexts, in the domains of databases and natural language semantic interpretation.

1996 Member of the ITC-irst project *Large Multimedia Libraries*, whose aim is the study of advanced solutions for the management of large multimedia libraries in the Public Administration. Within this project, co-author of the document for the reorganisation of the information system of the "Commissione Terrorismo e Stragi del Senato della Repubblica" committee of Italian Parliament.

1996-99 Principal Investigator of the European ESPRIT-4 Long Term Research (LTR) project *Foundations of Data Warehouse Quality* "**DWQ**", No. 22469. Co-partners are: *National Technical University of Athens (NTUA), Greece* – Prof. Yannis Vassiliou (coordinator), Prof. Timos Sellis; *DFKI Saarbrücken, Germany* – dr. Werner Nutt; *INRIA Rocquencourt, France* – Prof. Eric Simon, Prof. Mokrane Bouzeghoub; *RWTH University Aachen, Germany* – Prof. Matthias Jarke, Prof. Franz Baader; *Università di Roma 'La Sapienza', Italy* – Prof. Maurizio Lenzerini. The goal of the DWQ project is to develop a semantic foundation that will allow the designers of data warehouses to link the choice of deeper models, richer data structures and rigorous implementation techniques to quality-of-service factors in a systematic manner, thus improving the design, the operation, and the evolution of data warehouse applications in the *telecom* domain. My research is funded for 42,000 Euro per year (total: 3 years).

1997-98 Principal Investigator in the Italian Space Agency (**ASI**) funded project "Integrazione ed Accesso a Basi di Dati Eterogenee" (*Integration and Access to Heterogeneous Databases*). Project partners are the leading Italian research groups in knowledge representation applied to databases. The goal of this project is to study and develop methodologies, techniques, algorithms, and software modules specifications for the integration of and the access to heterogeneous databases. The research activity will be evaluated in its wholeness in a experimental domain of data in the space sciences, including images, spectra and other data products from a wide range of space-based missions. My research is funded for 30,000,000 Italian lire (15,500 Euro) per year (total: 2 years).

1997-98 Scientific Coordinator of the ITC-irst coordinated project on "*Conceptual Modelling and Databases*", leading to a methodology for the organisation,

the classification, and the conceptual modelling of scientific databases, and to a tool supporting the flexible access to data in different modalities with the aid of the information schema. This project is in cooperation with the scientific department of CSM (Centro Sviluppo Materiali), Pomezia, Roma, an industry interested in developing tools for managing and reusing corporate technical knowledge.

1997-98 Principal Investigator of the Italian National Research Council (CNR) special project "Strumenti ontologici per l'organizzazione e l'integrazione di conoscenze eterogenee" (*Ontological tools for the management and the integration of heterogeneous knowledge*). The project studies theories and tools, derived from the field of formal ontology, for applications in information systems. My research is funded for 8,000,000 Italian lire (4,100 Euro) per year (total: 2 years).

1999-2000 Co-leader of the workpackage *Reasoning* within the European ESPRIT **AgentLink** Network of Excellence on Agent-based Computing, Special Interest Group on *Intelligent Information Agents*, Working Group WG-1 on *Agent-Based Data and Knowledge Management*. The goal is to study existing metadata and domain standards in electronic commerce, digital libraries and the web, and to develop a general and well founded approach for the design of reusable conceptualisations (i.e., ontologies) which can be combined with reasoning services at a higher conceptual and formal level.

1999-2002 Co-Investigator of the British Engineering and Physical Sciences Research Council (EPSRC) project in the Distributed Information Management (DIM) programme "Flexible source integration in distributed knowledge-based query processing for bioinformatic information sources" (**TAMBIS-II**, EPSRC GR/M76607). TAMBIS aims to aid researchers in biological science by providing a single access point for biological information sources round the world. The access point will be a single interface (via the World Wide Web) which acts as a single information source. It will find appropriate sources of information for user queries and phrase the user questions for each source, returning the results in a consistent manner which will include details of the information source. The research is funded for 60,000 Euro per year (total: 3 years).

2000-2001 Principal Investigator of the British Engineering and Physical Sciences Research Council (EPSRC) project *Knowledge Representation meets*

Databases: Tools for Conceptual Modelling and Query Management (**KRDB**, EPSRC GR/R04348/01). The aim of the project is to devise and evaluate algorithms, methodologies, techniques, and interaction paradigms to build a tool for conceptual modelling and query management of complex data repositories, based on a framework with solid formal foundations. We wish that this will contribute to a better understanding of the cross-fertilisations between the Knowledge Representation and Database technologies. The research is funded for 90,000 Euro and it lasts 18 months.

2002-2005   *Principal investigator* of the 5th framework European RTD project "**Se-WAsIE**" – *SEmantic Webs and AgentS in Integrated Economies*, a 3 years project funded by the European Commission. SeWAsIE will design and implement an advanced search engine enabling intelligent access to heterogeneous data sources on the web via semantic enrichment to provide the basis of structured secure web-based communication. Partners are: University of Modena, Italy; University of Roma "La Sapienza", Italy; Confederazione Nazionale dell'Artigianato e della Piccola e Media Impresa, CNA SERVIZI Modena, Italy; IBM Italia SpA, Italy; Technical University of Aachen – RWTH, Germany; Thinking Networks AG, Aachen, Germany. My research is funded 260,000 Euro for 3 years.

2002-2012   *Principal investigator* of the research project "Technologies for Knowledge Representation meets Databases" (KRDB-TECH). The research focus is on basic foundational issues in knowledge representation applied to database technologies. My research is funded for 10 years by UniBZ for 130,000 Euro and by external funds for 150,000 Euro.

2004-2007   *Principal investigator* of the 6th Framework European Network of Excellence "**KnowledgeWeb**", a 4 years Network of Excellence project funded by the European Commission. Knowledge Web began on January 1st, 2004. Supporting the transition process of Ontology technology from Academia to Industry is the main and major goal of Knowledge Web. Partners are: University of Innsbruck, Ecole Polythechnique Federale de Lausanne, France Telecom, Freie Universitat Berlin, Institut National de Recherche en Informatique et en Automatique, Informatics and Telematics Institute (Greece), Learning Lab Lower Saxony, National University of Ireland Galway, The Open University, Universidad Politecnica de Madrid, University of Karlsruhe, University of Liverpool, University of Manchester, University of Sheffield, University of Trento, Vrije Universiteit Amsterdam,

Vrije Universiteit Brussels. My research is funded for 220,000 Euro for four years.

2004-2007 *Principal investigator* of the 6th Framework European Network of Excellence "**Interop**" – *Interoperability Research for Networked Enterprises Applications and Software*, a 3 years Network of Excellence project funded by the European Commission. The Interop Network of Excellence aims to create the conditions of an innovative and competitive research in the domain of Interoperability for Enterprise Applications and Software. This project is an association of 50 partners from 15 countries coming from numerous sectors spanning academic institutions, research centres, industrial stakeholders and standards communities. My research is funded for 60,000 Euro for three years.

2005-2008 *Co-investigator* of the 6th Framework European STREP FET basic research project "**Tones**" – *Thinking ONtologiES*, a 3-years project funded by the European Union. The aim of the project is study and develop automated reasoning techniques for both offline and online tasks associated with ontologies, either seen in isolation or as a community of interoperating systems, and devise methodologies for the deployment of such techniques, on the one hand in advanced tools supporting ontology design and management, and on the other hand in applications supporting software agents in operating with ontologies. Partners are: University of Roma "La Sapienza" (Italy), University of Manchester (UK), Technische Universitaet Dresden (Germany), Technische Universitaet Hamburg-Harburg (Germany). The project is funded at our site for 320,000 Euro for 3 years.

2009-2010 Principal investigator of the Italian side of the joint research project "Technologies for Conceptual Modelling and Intelligent Query Formulation" funded by the Executive Programme of the Scientific and Technological Co-operation between the Republic of South Africa and the Italian Republic. The aim of the project is to devise and evaluate algorithms, methodologies, techniques, and interaction paradigms to build a tool for conceptual modelling and query management of complex data repositories, and to experiment them in the context of medical and bio-diversity South African data banks. The research cooperation is funded 45,000 Euro for 3 years.

2009-2011 *Principal investigator* of the 7th Framework European large-scale integrating project (IP) "**Ontorule**" – *ONTOlogies meet business RULEs*, a 3-

years project funded by the European Union. Ontorule aims at developing a methodological, theoretical and technological platform for the mutually aware acquisition, management, and use of ontologies and business rules. This is achieved by considering semantically well-founded combinations of rules and ontologies, together with efficient methodologies for their integrated processing. Partners are: ILOG (France), University of Innsbruck (Austria), Ontoprise (Germany), Open University (UK), Vienna University of Technology (Austria), and other technological partners. My research is funded for 576,000 Euro for 3 years.

2009-2012 *Principal investigator* of the UniBZ CRC research project "Theoretical foundations for combining Rules and Ontologies". This project aims to develop semantically well-founded combinations of rules and ontologies, together with efficient methodologies for the integrated processing of rules and ontologies. My research is funded for 63,000 Euro for 3 years.

2010-2013 *Principal investigator* of the 7th Framework European ICT Marie Curie research exchange action on a Network for Enabling Networked Knowledge "**NET2**". Partners are: National University of Ireland; Universität Koblenz-Landau, Germany; Technische Universiteit Delft, The Netherlands; Technische Universität Wien, Austria; Universidad de Chile, Santiago de Chile; University of South Africa, Pretoria; Shanghai Jiao Tong University, China. My exchange activity is funded for 65,000 Euro for 3 years.

2012-2013 *Principal investigator* of the CNR (Italian National Research Council) research project "Business Process Engineering" (**BPE**). The topic of the research has been the study and testing of a business process (re)engineering software environment for conceptual modelling of processes and organisations. My research is funded for 30,000 Euro for 16 months.

2013-2015 *Principal investigator* of the UniBZ CRC research project "An intelligent query interface based on ontologies". In this project we have devised and evaluated algorithms, methodologies, techniques, and interaction paradigms to build a tool based on artificial intelligence technologies for natural language query formulation of relational data repositories. The research is funded for 50,000 Euro for 2 years.

2014-2015 *Principal investigator* of the UniBZ CS Faculty research project "Fluent User Interface for Discovery". The research, in collaboration with the Art

and Design faculty of UniBZ has focused on the Semantic Media Browser, an interaction concept and interface system for exploratory search and media discovery. The research is funded for 15,000 Euro for 15 months.

2015-2017 *Principal investigator* of the UniBZ CRC research project "Conceptual Modelling with the ORM Inference Engine" (**ORMiE**). The project focuses on the study and deployment of a plugin extending with artificial intelligence technologies the Microsoft Visual Studio conceptual modelling system. The research is funded for 42,000 Euro for 3 years.

2018-2020 *Principal investigator* of the UniBZ CRC research project "From Ontologies to SAT" (**FO2S**). The research activity focuses on the topic of handling imperfect knowledge (uncertainty, preferences, defeasibility, and others) with ontology languages. The research is funded for 100,000 Euro for 3 years.

2018-2020 *Principal investigator* of the UniBZ CRC research project "Semantic Enrichment and Interoperability" (**SemInt**) in cooperation with the European Space Agency (ESA). In the context of complex Space Information Systems, the activity is about the foundations and the realisation of supporting tools for the semantic enrichments of the information sources, and for their semantic-based integration. The research is funded for 83,000 Euro for 2 years.

2018-2019 *Principal investigator* of the *applied research* project "Semantic modelling and semantic interoperability" funded by the European Space Agency (ESA). Support in modelling the "Space System Reference Database" of ESA, to capture, verify and validate all data required to operate the spacecraft in-flight. The activity is funded for 30,000 Euro for 6 months.

2018-2020 *Principal investigator* of the *applied research* project "Smart Data Integration 4.0" funded by the Datatellers startup. The applied research activity is in the area of semantic enrichment of information sources and their semantic integration for the so-called data preparation phase in the context of Business Intelligence. The research is funded for 80,000 Euro for 2 years.

2018-2019 *Principal investigator* of the *applied research* project "Legal Opinion Generator" (LEOGEN) funded by the uLegale startup. The activity supports the design of the LEOGEN chatbot system, which provides legal advice,

using artificial intelligence techniques. The activity is funded for 18,000 Euro for 1 year.

2018-2019 *Principal investigator* of the *applied research* project "Augmented Marketing" funded by the Datef S.p.A. company. The activity is about methodologies for the elicitation, design, verification, development, and evaluation of decision systems in declarative format, based on knowledge representation and artificial intelligence techniques. The activity is funded for 10,000 Euro for 1 year.

2019-2020 *Principal investigator* of the UniBZ CRC research project "Expressive Bayesian Ontological Reasoning" (**ORBE**) studying advanced techniques for reasoning in expressive ontology languages capable to handle uncertainty. The research is funded for 62,500 Euro.

2019-2020 *Principal investigator* of the *applied research* project "Intelligent Reasoner for Fact Based Models" funded by the European Space Research and Technology Centre (ESTEC) of the European Space Agency (ESA). The activity is about the design and development of a conceptual modelling tool based on Microsoft Visual Studio to support semantic integration in space systems engineering. The activity is funded for 70,000 Euro for 9 months.

Invited and keynote talks at scientific events

- Invited Speaker on *Temporal Description Logics* at the Workshop on *Combinations of Temporal and Modal Logics '98* (CMTL'98), Manchester Conference Centre, Manchester, UK, 16 December, 1998.

- Invited Speaker on *Conceptual Modelling with Temporal Description Logics* at the *British Colloquium for Theoretical Computer Science*, sponsored by EPSRC, London Mathematical Society, and Microsoft Research, University of Keele, UK, 15 April 1999.

- Invited Speaker on *Temporal Description Logics* at the *6th International Symposium on Temporal Representation and Reasoning* (TIME'99), Orlando, Florida, USA, May 1-2, 1999.

- Invited Speaker at the Dagstuhl Seminar on *Logics for Emerging Applications of Databases*, 16-21 July 2000, Schloß Dagstuhl, Germany, organised by J. Chomicki, R. van der Meyden, G. Saake.

- Invited Speaker on *Conceptual Modelling with Description Logics* at the *8th International Conference on Conceptual Structures* (ICCS-2000), 14-18 August 2000, Darmstadt, Germany.

- Invited Speaker, together with Prof. Gio Wiederhold, on *Ontology-driven Information Integration* at the *Information Integration Workshop at CERN*, 19 June 2000, Geneva, Switzerland.

- Invited Speaker on *Tools for Knowledge Engineering* at the 2° workshop *Methods for Modalities* (M4M-2), 29-30 Novembre 2001, Amsterdam, Olanda.

- Tutorial on "Description Logics for Conceptual Design, Information Access, and Ontology Integration: Research Trends" at the 1st International Semantic Web Conference (ISWC-2002), Chia, Sardinia (Italy), 9-12th June 2002.

- Invited Speaker on "(Description) Logics for Information Modelling and Access" at the Fifth International Conference on Flexible Query Answering Systems (FQAS-2002), Copenhagen, Denmark, October 27 - 29, 2002.

- Invited speaker at the Workshop on Logic-based Methods for Information Integration, Vienna, Austria, on 23 August 2003.

- Invited tutorial at the 2nd Italian Semantic Web Workshop Semantic Web Workshop (SWAP'05), Trento, Italy, 15-16/12/2005.

- Invited speaker at the 25th ACM Symposium on Principles of Database Systems (PODS-2006) Chicago IL, on 26-28/6/2006.

- Invited speaker at the 3rd workshop on Logic and MultiAgent Systems (LAMAS-2007), the University of Otago in Dunedin, New Zealand, 15-16/2/2007.

- Keynote speaker at the 26th International Conference on Conceptual Modeling (ER-2007), in Auckland, New Zealand, 5-9/11/2007.

- Joint invited speaker at both the 4th Workshop on Ontologies-based Techniques for DataBases in Information Systems and Knowledge Systems (ODBIS-2008) and the International Workshop on New Trends in Information Integration (NTII-2008), colocated with VLDB-08 in Auckland, New Zealand, 23 August 2008.

- Invited tutorial at the 34th International Conference on Very Large Data Bases (VLDB-2008), in Auckland, New Zealand, 23-28 August 2008.

- Invited speaker at the Knowledge Representation Ontology Workshop (KROW-2008), colocated with KR-08 in Sydney, Australia, 17 September 2008.

- Invited lecturer on Description Logics at the 3rd International ALP/GULP Spring School on Computational Logic (ISCL-2011), held in Bertinoro, Italy, 10-15 April 2011.

- Invited to give a lectio magistralis on Description Logics at the AILA Summer School, held in Gargnano del Garda, Italy, 22-27 August 2011.

- Keynote speaker at the 2nd European Semantic Web Conference (ESWC) Summer School, held in Crete May 21st to May 26th 2012.

- Invited keynote speaker at the Brazilian Ontology Research Seminar (ONTOBRAS), held on September 8th to 11th, 2015 in São Paulo, Brazil.

Chair of scientific committees

- Chair of the workshop on *Events, Actions and Plans: Representation, Reasoning and Applications*, ITC-irst Trento, Italy, October 23-24 1994.

- General Chair of the 1998 *International Workshop on Description Logics* (DL'98), Trento, Italy, June 6-8 1998. Co-editor of the proceedings, published by ITC-irst, Trento, Italy, Ref. No. 9805-03; also electronically available as CEUR Publication Vol. 11, RWTH Aachen, Germany. Co-author of a report on the workshop in the *Journal of Logic and Computation* (JLC), 9(3):449–456, 1999, Oxford University Press. The workshop received sponsorships from the Italian National Research Council (CNR) and COMPULOG ESPRIT European Network of Excellence for a total of 3,500 Euro. Web page: <http://www.dl.kr.org/dl98/>.

- Publicity Chair of *6th International Conference on Principles of Knowledge Representation and Reasoning* (KR'98), Trento, Italy, June 2-5 1998. Web page: <http://www.kr.org/kr98/>.

- Co-organiser of the *AAAI'99 Fall Symposium on Modal and Temporal Logics based Planning for Open Networked Multimedia Systems*, North Falmouth, Cape Cod MA, USA, November 5-7, 1999.

- General co-Chair, together with Prof. Michael Kifer (University at Stony Brook, USA), of the *6th International Workshop on Knowledge Representation Meets Databases* (KRDB'99), Linköping, Sweden, July 29-30, 1999; KRDB'99 is an affiliate event with IJCAI'99 and DL'99. Co-editor of the proceedings, published by Linköping University, Sweden, July 1999; also electronically available as CEUR Publication, Vol. 21, RWTH Aachen, Germany, July 1999. The workshop is sponsored by the COMPULOG ESPRIT European Network of Excellence for a total of 2,000 Euro. Web page: <http://www.cs.man.ac.uk/img/krdb99/>.

- Co-editor of the special issue on *Methods for Modalities* of the Logic Journal of the IGPL, a Journal on Pure and Applied Logic, vol. 8, no. 3, May 2000, Oxford University Press.

- Chair of the Programme Committee of the *12th European Summer School in Logic, Language and Information* (ESSLLI'2000), Birmingham, UK, August 2000. The summer school has been highly successful, attracting around 500 students from Europe and elsewhere. The school has developed into an important meeting place and forum for discussion for students and researchers interested in the interdisciplinary study of Logic, Language and Information. ESSLLI'2000 is organised under the auspices of the European Association for Logic, Language and Information (FoLLI). Web page: <http://www.folli.uva.nl/Esslli/2000/esslli-2000.html>.

- General Chair of the *International Workshop on Foundations of Models for Information Integration* (FMII'2001), the 10th workshop in the series "Foundations of Models and Languages for Data and Objects" (FMLDO), Viterbo, near Rome, Italy, 16-18 September 2001, in conjunction with VLDB'2001 and KRDB'2001. The main principle of this workshop series is to focus on one selected theme different from year to year, and to offer the opportunity for in-depth exchange of ideas and experiences between the best database researchers in the area. FMII'2001 will enjoy the talks of three invited speakers: Amr El Abbadi, Serge Abiteboul, and Tamer Özsu. Web page: <http://www.fmldo.org/FMII-2001/>.

- Co-chair of the Organising Committee of the 9th International Symposium on Temporal Representation and Reasoning (TIME-2002), Manchester (UK), 4-6 July 2002.

- Co-chair the 2003 International Workshop on Description Logics (DL'2003), 5-7/9/2003 in Rome, Italy.

- Co-chair the Dagstuhl Seminar on Logic Based Information Agents, in Schloss Dagstuhl, Germany, 18-24/4/2004.

- Chair of the organising committee of the 13th Italian Symposium on Advanced Database Systems (SEBD-2005); Brixen-Bressanone, Italy, 20-22/6/2005.

- Chair of the 2nd International Workshop on Exchange and Integration of Data (EID-2006), Brixen-Bressanone, Italy, 9-11/6/2006.

- Co-chair of the program committee of the International Conference on Rules and Rule Markup Languages for the Semantic Web (RuleML-2006), Athens GA, USA, 9-10/11/2006.

- General chair of the 4th Annual European Semantic Web Conference (ESWC-2007), in Innsbruck, Austria, 3-7/6/2007.

- Co-chair of the 2007 International Description Logics workshop (DL-2007), in Brixen-Bressanone BZ, Italy, 8-10/6/2007.

- Co-chair of the 2009 Reasoning Web Summer School, in Brixen-Bressanone, Italy September 2009.

- Chair the 3rd KRDB school on Trends in the Web of Data (KRDBs-2010), held in Brixen-Bressanone (near Bozen-Bolzano), Italy, 17-18 September 2010.

- Co-chair the Dagstuhl Seminar on Foundations and Challenges of Change and Evolution in Ontologies, held in Schloss Dagstuhl, Germany, 3-7 September **2012**.

- Chair of the Foundations and Challenges of Change in Ontologies and Databases Research School, held on 29-31 January **2014** in Bozen-Bolzano, Italy.

- Co-Chair of the International Workshop on Fact-Oriented Modeling (ORM 2014), held in Bolzano, Italy, 22-23 September **2014**.

- Co-chair of the program committee of the 1st International Joint Conference on Semantic Rules and Reasoning (RuleML-RR 2017), held in London (UK), 12-15 June 2017.

Memberships in scientific committees

- Founding member of the *AI*IA Italian Association for Artificial Intelligence* (Associazione Italiana per l'Intelligenza Artificiale) (1989-...).

- Former member of the *Advisory Board* of *KR, Inc.*, Jon Doyle (MIT, Boston MA, USA) president. KR, Inc. is a charitable organisation incorporated in the state of Massachusetts of the United States of America concerned with fostering research and communication on knowledge representation and reasoning. Its primary activities include organising the series of *Conferences on Principles of Knowledge Representation and Reasoning*.

- Former member of the Advisory Committee of the World Wide Web Consortium (W3C). The W3C was created in October 1994 to lead the World Wide Web to its full potential by developing common protocols and standards that promote its evolution and ensure its interoperability. The Advisory Committee reviews proposals for new Activities and proposed Recommendations.

- Former delegate and Member of the Board of STI (Semantic Technology Institute) International, Vienna, whose mission is to exploit semantic technologies to address the various challenges associated with communication and collaboration at large scales. `http://www.sti2.org`

- Area Scientific Editor for Logic and Databases of the Journal of Applied Logic (JAL), published by Elsevier.

- Member of the editorial board of the AAAI Press, which co-publishes books with MIT Press.

- Member of the Scientific Program Committees:

  - Italian Association for Artificial Intelligence (AI*IA) workshop on *Temporal Reasoning*, Parma, Italia, 28/9/1994.

- IJCAI-95 workshop on *The Next Generation Of Plan Recognition Systems*, Montreal, Canada, 20/8/1995.
- Italian Association for Artificial Intelligence (AI*IA) 1996 workshop on *Access, Extraction and Integration of Knowledge*, Napoli, Italia, 28/9/1996.
- 1996 *International Workshop on Description Logics* (DL'96), Boston MA, USA, 2-4/11/1996. Co-editor of the proceedings, published by AAAI Press - American Association for Artificial Intelligence, TR-WS-96-05, Cambridge MA, USA.
- 1997 *International Workshop on Description Logics* (DL'97), Paris, France, 27-29/9/1997. Co-editor of the proceedings, published by Université Paris-Sud, Centre d'Orsay, Laboratoire de Recherche en Informatique LRI, URA-CNRS 410.
- *7th European/Japanese Conference on Information Modeling and Knowledge Bases* (EJIMKB'97), Toulouse, France, 27-30/5/1997.
- *2nd International and Interdisciplinary Workshop Intelligent Information Integration* (I^3'98), Brighton, UK, 25/8/1998, associated with the 13th European Conference on Artificial Intelligence (ECAI'98).
- International Workshop *Methods for Modalities* (M4M), Amsterdam, 6-7/5/1999.
- *CAiSE'99 Workshop on Design and Management of Data Warehouses*, Heidelberg, Germany, 14-15/6/1999.
- *Third International and Interdisciplinary Workshop on Intelligent Information Integration*, (I^3'99), associated with IJCAI'99, Stockholm, 31/7/1999.
- *International Conference on Conceptual Modeling* (ER'99), Paris, France, 15-18/11/1999.
- *14th European Conference on Artificial Intelligence* (ECAI'2000), Berlin, Germany, 20-25/8/2000.
- *7th International Workshop on Knowledge Representation meets Databases* (KRDB'2000), Berlin, Germany, 21-22/8/2000, associated with ECAI'2000 and DL'2000.
- *8th International Workshop on Knowledge Representation meets Databases* (KRDB-2001), Roma, Italia, 15/9/2001, associated with VLDB-2001 and FMII-2001.

- Workshop on Formal Ontology, Knowledge Representation and Intelligent Systems for the World Wide Web (SemWeb@KR02), Tolouse (France), 19-20/4/2002, colocated with KR-2002.

- 9th International Workshop on Knowledge Representation meets Databases (KRDB-2002), Toulouse (France), 21/4/2002, colocated with KR-2002.

- British National Conference on Databases (BNCOD-2002), Sheffield (UK), 17-19/7/2002.

- 18th American National Conference on Artificial Intelligence (AAAI-2002), Edmonton, Alberta, Canada, 28/7-1/8/2002.

- Workshop on Foundations for the Semantic Web, at the European Summer School in Logic, Language and Information (ESSLLI-2002), 5-16/8/2002, Trento Italy.

- Workshop on Ontologies for multi-agent systems, at the 13th International Conference on Knowledge Engineering and Knowledge Management (EKAW-2002), Siguenza (Spain), 1-4/10/2002.

- Second International Workshop on Evolution and Change in Data Management (ECDM-2002), Tampere, Finland, 11/10/2002, in conjunction with the 21st International Conference on Conceptual Modelling - ER 2002.

- Italian National Database Conference (SEBD-2003), Cosenza, Italy, 24-27/6/2003.

- Joint 10th international symposium on "Temporal Representation and Reasoning" and 4th International Conference on Temporal Logic (TIME-ICTL-2003), Cairns, Queensland, Australia, 8-10/7/2003.

- 5th International Workshop on Design and Management of Data Warehouses (DMDW'2003), 8/9/2003, in conjunction with the 29th International Conference on Very Large Databases (VLDB 2003), in Berlin, Germany.

- Int. Conf. on Logic for Programming, Artificial Intelligence and Reasoning (LPAR'2003), 22-26/9/2003, in Almaty, Kazakhstan.

- 10th International Workshop on Knowledge Representation meets Databases (KRDB'2003), in Hamburg, Germany, 15-18/9/2003.

- 3rd workshop on Methods for Modalities (M4M-3), 22-23/9/2003, in Nancy, France.

- XXIII International Conference of the Chilean Computer Science Society (SCCC'2003), in Chillan, Chile, 3-8/11/2003.

- 2nd CoLogNET-ElsNET Symposium on Questions and Answers: Theoretical and Applied Perspectives, Amsterdam, NL, on 18/12/2003.

- 1st European Semantic Web Symposium (ESWS-2004), Heraklion, Greece, on 10-12/5/2004.

- 13th International World Wide Web Conference (WWW2004) for the Semantic Web area; in New York (US) 17-22/5/2004.

- 2004 International Workshop on Description Logics (DL'2004), Whistler, British Columbia, Canada, 6-8/6/2004.

- 11th International Symposium on Temporal Representation and Reasoning (TIME-2004), Caen, France, 7/2004.

- 2nd Workshop on Principles and Practice of Semantic Web Reasoning (PPSWR-2004), St. Malo, France, 6-10/9/ 2004.

- Workshop on The Model-driven Semantic Web: Enabling Knowledge Representation and MDA; Technologies to Work Together (MDSW-2004), Monterey CA, USA, 20-24/9/2004.

- 14th International World Wide Web Conference (WWW-2005) for the Semantic Web area; Chiba, Japan, 10-14/5/2005.

- 12th International Symposium on Temporal Representation and Reasoning (TIME-2005), Burlington, Vermont, USA, 23-25/5/2005.

- International Workshop on Principles and Practice of Semantic Web Reasoning (PPSWR'05), Dagstuhl, Germany, 11-16/9/2005.

- International Conference on Ontologies, Databases and Applications of SEmantics (ODBASE'05), Cyprus, 31/10-4/11/2005.

- 3rd International Workshop on Regulatory Ontologies (WORM'05), Cyprus, 31/10-4/11/2005.

- International Workshop on OWL: Experiences and Directions, Galway, Ireland, 11-12/11/2005.

- International Workshop on Methods for Modalities (M4M'05), Berlin, Germany, 1-2/12/2005.

- 2nd Italian Semantic Web Workshop Semantic Web Workshop (SWAP'05), Trento, Italy, 15-16/12/2005.

- International Workshop on Inconsistency and Incompleteness in Databases (IIDB-2006), Munich, Germany, 26/3/2006.

- 2006 International Workshop on Description Logics (DL'2006), the Lake District, UK, 30/5-1/6/2006.

- 10th International Conference on Principles of Knowledge Representation and Reasoning (KR-2006), the Lake District, UK, 2-5/6/2006.

- 3rd European Semantic Web Conference (ESWS-2006) Budva, Montenegro, on 11-14/6/2006.

- 14th Italian Symposium on Advanced Database Systems (SEBD-2006) Portonuovo AN, Italy, on 18-21/6/2006.

- 21st National (USA) Conference on Artificial Intelligence (AAAI-2006), Boston, USA, 16-20/7/2006.

- 2nd Summer School on Reasoning Web (Reasoning Web 2006), Lisbon, Portugal, 4-8/9/2006.

- European Conference on Logics in Artificial Intelligence (JELIA-2006), Liverpool, UK, 13-15/9/2006.

- 7th ACM International Workshop on Web Information and Data Management (WIDM-2006), Bremen, Germany, 10/11/2006.

- 4th Semantic Web and Databases Workshop (SWDB-2007), Vienna, Austria, 9/2007.

- 5th European Semantic Web Conference (ESWC-2008), Tenerife, Spain, 1-5/6/2008.

- 20th European Summer School in Logic, Language and Information (ESSLLI-2008) for the Logic and Computation area, Hamburg, Germany, 4-15/8/2008.

- 11th Intl. Conference on Principles of Knowledge Representation and Reasoning (KR-2008), Sydney, Australia, 16-19/9/2008.

- Logic in Databases workshop (LID-2008), Rome, Italy, 19-20 May 2008.

- 5th European Semantic Web Conference (ESWC-2008), Tenerife, Spain, 1-5 June 2008.

- 25th International Conference on Data Engineering (ICDE-2009), Shanghai, China, March 29 - April 4, 2009.

- 32nd Annual Conference on Artificial Intelligence (KI-2009), Paderborn, Germany, 15-18 September 2009.

- 21st International Joint Conference on Artificial Intelligence (IJCAI-2009), Pasadena CA, USA, 11-17 July 2009.

- 17th Italian Symposium on Advanced Database Systems (SEBD-2009), Camogli, Genova, Italy, 21-24 June 2009.

- Workshop on Controlled Natural Language (CNL-2009), Marettimo Island, Italy, 8-10 June 2009.

- Alberto Mendelzon Workshop on Foundations of Data Management (AMW-2009), Arequipa, Peru, May 12–15, 2009.

- 2010 International Workshop on Description Logics (DL-2010), Waterloo, Canada, 4-7 May 2010.

- 12th International Conference on the Principles of Knowledge Representation and Reasoning (KR-2010), Toronto, Canada, 9-13 May 2010

- 9th International Semantic Web Conference (ISWC-2010), held in Shangai, China, 7-11 November 2010.

- 10th International Semantic Web Conference (ISWC-2011), held in Koblenz, Germany, 23-27 October 2011.

- 24th International Description Logics workshop (DL-2011), held in Barcelona, Spain, 13-16 July 2011.

- 19th Italian Symposium on Advanced Database Systems (SEBD-2011), held in Maratea, Italy, 26-29 June 2011.

- 2011 SIGMOD conference on databases (SIGMOD-2011), held in Athens, Greece, 12-16 June 2011.

- 11th International Semantic Web Conference (ISWC-2012), held in Boston, USA, 11-15 November 2012.

- 25th International Description Logics workshop (DL-2012), held in Rome, Italy, from June 7 to June 10, 2012.

- 20th Italian Symposium on Advanced Database Systems (SEBD-2012), held in Venice, Italy, 24-27 June 2012.

- 12th International Semantic Web Conference (ISWC-2013), held in Sydney, Australia, 21- 25 October 2013.

- Member of the *senior* program committee of the 23rd International Conference on Artificial Intelligence (IJCAI-2013), held in Beijing, China from August 3-9, 2013.

- 29th "Convegno Italiano di Logica Computazionale" (CILC-2014), held in Torino, Italy, 16-18 June 2014.

- 27th International Description Logics workshop (DL-2014), held on 17–20 July 2014, in Vienna.

- 21st European Conference on Artificial Intelligence (ECAI-2014), held in Prague, Czech Republic, 18-22 August 2014.

- 13th International Semantic Web Conference (ISWC-2014), held on October 19-23, 2015, in Riva del Garda, Italy.

- 29th AAAI Conference on Artificial Intelligence (AAAI-15), held on January 25–29, 2015, in Austin Texas, USA.

- 14th International Semantic Web Conference (ISWC-2015), held on October 11-15, 2015, in Betlehem PA, USA.

- 2016 ACM Principles of Database Systems (PODS-2016) Conference, held in San Francisco, USA, on June 26th - July 1st, 2016.

- Member of the *senior* program committee of the 26th International Joint Conference on Artificial Intelligence (IJCAI-2017), held in Melbourne (Australia), 19-25 August 2017.

- 36th International Conference on Conceptual Modeling (ER-2017), held in Valencia (Spain), on 6th-9th November 2017.

- 16th International Semantic Web Conference (ISWC-2017), held in Wien (Austria), 21-25 October 2017.

- Member of the *senior* program committee of the 27th International Joint Conference on Artificial Intelligence (IJCAI-2018), held in Stockholm, Sweden, 13-19 July 2018.

- Member of the *senior* program committee of the 27th ACM International Conference on Information and Knowledge Management (CIKM 2018), held in Torino, Italy on 22-26 October 2018.

- Member of the program committee of the 33rd AAAI Conference on Artificial Intelligence (AAAI-2019), held January 27 - February 1 2019 in Honolulu, Hawaii, USA.

- Member of the program committee of the IEEE International Conference on Artificial Intelligence and Knowledge Engineering (IEEE AIKE 2019), held on June 3-5, 2019 in Cagliari, Sardinia, Italy.
- Member of the program committee of the 32nd International Workshop on Description Logics (DL 2019), held in Oslo, Norway on 18-21 June 2019.
- Member of the _senior_ program committee of the 28th International Joint Conference on Artificial Intelligence (IJCAI-2019), held in August 10-16, 2019, Macao, China.
- Track chair of the program committee of the 6th Italian Conference on Computational Linguistics (CLiC-it 2019), held in Bari, Italy, on 13-15 November 2019.
- Member of the _senior_ program committee of the 29th International Joint Conference on Artificial Intelligence (IJCAI-2020), held on 11-17 July 2020, Yokohama, Japan.

Applied research and third mission

My activity as a university professor is not limited to education (qualifying the human capital) and research (producing new knowledge). My activity is motivated by and connected to societal needs and market demands. Coherently with the two above activities, my third mission activities are mainly devoted to get from the industry and the community at large motivations, problems, use cases, testbeds for my applied research. My idea of third mission service is to try to seriously connect research ideas with applications needed in the real market, without shortcuts and looking for real advances which could not have been obtained without the involved academic activities.

In the past I have collaborated with software service provider companies related to my research areas in order to support them in testing new ideas, making their tools better, experimenting with their settings – for example IBM/ILOG, IBM/CAS, Ontoprise (now _semafora_, Semantic Web infrastructures), ORM Solution LLC (main developer of Microsoft Visual Studio – still active collaboration). I also collaborated with large service companies in order to find real world motivations for my research, experimenting with real data, supporting the development of tools – for example Telecom Italia, France Telecom, CNA (Small Enterprises Services), CSM (Centre for the Development of Materials), ASI (Italian Space Agency), ESA (European Space Agency – still active collaboration).

In 2018 I have started several funded applied research / industrial projects funded by SMEs and startups mainly on data integration and data preparation for complex information systems and for Business Intelligence, and on knowledge representation and artificial intelligence technologies for chatbots.

The following are the *tools* I've developed coherently with my research.

YAK YAK is a fully implemented knowledge representation description logics based system. The YAK system has been developed initially as the KR module of the AlFresco natural language system, a multi-modal dialogue prototype for the exploration of Italian art history. The YAK project ended in 1991. YAK is being used as main module for the multimedia presentation system BEHEIM, at the Erlangen University, Germany; the aim of the system is to explore the information regarding the oldest globe of the world – the Beheim globe (1492). YAK has been licensed to 15 international research centres.

CRACK The aim of the CRACK project is the research and the development of a knowledge representation system based on description logics. The CRACK language differentiates itself from previous knowledge representation systems for its high expressivity and its provably sound and complete reasoning procedures. The CRACK project ended in 1998. Among the various installations of CRACK in different research institutes, it is relevant the use of CRACK as the main reasoning module for a *process modelling* application in the domain of chemical plants, developed by the Technical University of Aachen (RWTH), Germany.

i•com The i•com tool supports the conceptual design phase of an information system, and in particular of an integration information system such as a data warehouse. i•com allows for the specification of multiple Entity/Relationship (ER) and UML diagrams and inter- and intra-schema (OCL-like) constraints. i•com adopts an extended conceptual data model, enriched with multidimensional aggregations and very expressive constraints. i•com has been installed at 3,500+ sites since 2001. Web site: `http://www.inf.unibz.it/~franconi/icom/`

coDBz The coDBz project studies the problem of efficient query processing in a network of databases, possibly with different schemas, interconnected by means of mapping rules at the schema level. The system has been demonstrated at the 30th International Conference on Very Large Data Bases

(VLDB 2004). Web site: `http://www.inf.unibz.it/~franconi/coDBz/`

Quelo The Quelo project studies the problem of supporting the user in the task of formulating a precise query – which best captures her information needs – even in the case of complete ignorance of the vocabulary of the underlying information system holding the data. Our intelligent interface is driven by means of appropriate automated reasoning techniques over an ontology describing the domain of the data in the information system. This project is still active. Web site: `http://www.inf.unibz.it/~franconi/quelo/`

ORMiE The ORMiE tool is a plugin for Microsoft Visual Studio, and it provides intelligent reasoning capabilities during the design phase of an information system with ORM diagrams. It is the i•com successor project. ORMiE is being natively integrated in NORMA for Microsoft Visual Studio, so it will become available for free to all the ORM designers with Microsoft Visual Studio. This project is still very active, and it is currently co-funded by the European Space Agency (ESA).

Teaching

1990-1998 Supervisor of 6 Master ("Laurea") Theses at various Italian Universities (Milano, Padova, Udine, Verona), in Artificial Intelligence, Knowledge Representation, and Databases.

1996 Lecturer of the *Introduction to Prolog* course (Introduzione al Prolog) at the first Master on "Tecnologie Avanzate dell'Informazione e della Comunicazione" (Information and Communication Advanced Technologies), organised by the IIASS - International Institute for Advanced Scientific Studies, Vietri sul Mare SA, Italy, funded by the European Union.

1997 Lecturer of the *Database Design* and *Deductive Databases and Logic Programming* courses at the second Master on "Tecnologie Avanzate dell'Informazione e della Comunicazione" (Information and Communication Advanced Technologies), organised by the IIASS - International Institute for Advanced Scientific Studies, Vietri sul Mare SA, Italy, funded by the European Union.

1997 Lecturer of *Applied Logics for Information Systems and Artificial Intelligence* (Logica Applicata per Sistemi Informativi e Intelligenza Artificiale) within the *Applied Computer Science* (Informatica Applicata) programme at the University of Verona, Italy.

1998 Lecturer of the *Description Logics* winter semester course of the "Computational Logic International Masters Programme" at the Dresden University of Technology, Germany, sponsored by *Compulog Net* – the ESPRIT European Network of Excellence in Computational Logic.

2000 Lecturer of the *Logics and Databases* (CT481) Master course at the Department of Computation, UMIST University, Manchester, UK.

2001 Lecturer of the "Description Logics and Ontologies" course within the PhD program at the Computer Science department of the University of Milan, Italy.

2002 Lecturer of the *Description Logics* course within the International Doctoral school of Technology and Science of Aalborg University, Denmark.

2002 Lecturer of the "Description Logics for Conceptual Design, Information Access, and Ontology Integration: Research Trends" within the PhD program "Representation Formalisms for Ontologies" at the Copenhagen Business School, Denmark.

1998-2002 The following teaching activities have been carried on as part of my teaching duties as Senior Lecturer at the Department of Computer Science, University of Manchester.

- Personal tutor of 17 1st year Undergraduate students (1998/1999, 1999/2000, 2000/2001).
- Supervisor of 7 Master projects and 10 Undergraduate projects (1998/1999, 1999/2000, 2000/2001).
- Lecturer of the *Advanced Knowledge Based Systems* (CS341) 3rd year Undergraduate course (1999).
- Lecturer of the *Advanced Database Models and Languages* (CS336) 3rd year Undergraduate course (2000, 2002).
- Lecturer of the *Advanced Database Technologies* (CS636) Master in Advanced Computer Science course (2000, 2001, 2002).

- Lecturer of the *Data Modelling and databases* (CS530) Master in Computer Science course (2001).

- Various support activities for other courses:

CS231 Fundamentals of Databases: lectures, laboratories, example classes (1998/1999, 1999/2000, 2000/2001); 2nd year compulsory UG course.

CS102 Discrete Mathematics: example classes, tutorial and exam marking (1999/2000, 2000/2001); 1st year compulsory UG course.

CS235 Software Engineering 2: lecture (1999/2000); 2nd year compulsory UG course.

2002-now The following teaching activities have been carried on as part of my teaching duties as Associate Professor at the Faculty of Computer Science, Free University of Bozen-Bolzano.

- Supervisor of several Undergraduate and Master projects and theses (2002-).

- Lecturer of the *Logic* 2nd year undergraduate course (2002, 2003, 2004, 2005, 2007, 2008, 2009, 2012).

- Lecturer of the *Databases and Data Modelling* 2nd year undergraduate course (2002, 2003, 2004).

- Lecturer of the *Knowledge Representation* master course (2004, 2005, 2007, 2008, 2009).

- Lecturer of the *Computer Systems Architecture* 1st year undergraduate course (2007, 2008, 2009).

- Lecturer of the *Seminars in Knowledge Representation* master course (2007).

- Lecturer of the *Intelligent Systems* 3rd year undergraduate course (2012, 2014, 2015, 2016, 2017).

- Lecturer of the *Discrete Mathematics and Logics* 2nd year undergraduate course (2014).

- Lecturer of the *Semantic technologies* 2nd year master course (2015, 2016, 2017, 2018, 2019).

- Lecturer of the *Artificial Intelligence* 2nd year undergraduate course (2018, 2019).

I've been teaching the following PhD courses:

- *"Good scientific writing style"* (2015, 2016, 2017, 2018, 2019), as part of the Research Methods module.
- *"Introduction to LATEX"* (2018, 2019), a 20 hours course for PhD students and academic research staff.

Supervision of PhD theses

- External supervisor of the PhD Thesis by Carlos Areces on Logic Engineering at the University of Amsterdam (Netherlands) with supervisors Prof. J. van Benthem and Prof. M. de Rijke (2000).
- External supervisor of the PhD Thesis by David Rudloff on Natural Language and Databases at the Ecole Nationale Supérieure des Arts et Industries de Strasbourg, France (2000).
- Supervisor of the PhD Theses by Anand Kamble – currently Director at the Department of Information Technology, Govt. of India – on Data Warehouse Conceptual Data Modelling at the University of Manchester (2000-2003).
- Supervisor of the PhD Theses by Andrei Lopatenko – currently Vice-President for Engineering, Search and Artificial Intelligence at eBay (USA) – on Knowledge Representation and Databases at the University of Manchester (2002-2005).
- Supervisor of a PhD Thesis by Paolo Dongilli – currently inspector for school technologies at the Province of Bozen-Bolzano – on Natural Language Generation Applied to Intelligent Query Interfaces at the Free University of Bozen-Bolzano (2004–2008).
- Supervisor of a PhD Thesis by Marijke Keet – currently Associate Professor at the University of Cape Town– on Knowledge Representation and Bioinformatics at the Free University of Bozen-Bolzano (2005-2007).
- External examiner of the PhD Research Thesis of Yuan An on Conceptual Modelling at the University of Toronto (Canada) (2007).
- Supervisor of a PhD Thesis by Inanç Seylan – currently at ZF Friedrichshafen AG (Germany) – on Query Answering in Description Logics at the Free University of Bozen-Bolzano (2008-2010).

- Supervisor of a PhD Thesis by Paolo Guagliardo – currently lecturer at the University of Edinburgh (UK) – on Database View Updates at the Free University of Bozen-Bolzano (2010-2014).

- Supervisor of a PhD Thesis by Volha Kerhet – currently research fellow at the Free University of Bozen-Bolzano – on Query Reformulation at the Free University of Bozen-Bolzano (2010-2014). This thesis has been the only computer science thesis published so far by **bu,press** in the series *unibz junior researcher* (ISBN: 978-88-6046-134-6).

- External examiner of the PhD Research Thesis of Héctor Pérez-Urbina at the University of Oxford (UK) (2010).

- Supervisor of a PhD Thesis by Nhung Ngo – currently post-doc at the University of Karlsruhe - Karlsruhe Institute of Technology (Germany) – on Reasoning and Query Answering with Complete Data at the Free University of Bozen-Bolzano (2012-2017).

- Supervisor of a PhD Thesis by Francesco Sportelli on Intelligent Conceptual Modelling Support for Data Intensive Applications at the Free University of Bozen-Bolzano (2015-...).

- Supervisor of a PhD Thesis by Nonyelum Ndefo on Reverse Engineering Big Data at the Free University of Bozen-Bolzano (2016-...).

- Supervisor of a PhD Thesis by Theo Abgrall on Foundations of Query Engineering at the Free University of Bozen-Bolzano (2019-...).

Teaching organisational matters

- I am currently director – and the founder in 2004 – at the Free University of Bozen-Bolzano of the *European Masters Program in Computational Logic* (EMCL), an international joint Master of Science degree in cooperation with the Technische Universität Dresden, Germany, the Universidade Nova de Lisboa, Portugal, and the Technische Universität Wien, Austria. I am also president of the *Master Degree Council* of the EMCL at the Free University of Bozen-Bolzano. This is one of the few European Masters of Science awarded since its first year of existence in 2004 by the European Union's Erasmus Mundus programme; the Erasmus Mundus programme is a co-operation and mobility programme which promotes the European Union as a centre of excellence in learning around the world by supporting

European top-quality Masters Courses. So far, the European Master had graduated more than 170 students, and it received students grants from the European Union for more than 6,000,000 Euro. The Web site: `http://www.computational-logic.eu`

- I am the founder (in 2004) and director until 2013 at the Free University of Bozen-Bolzano of the *European Master Program on Language and Communication Technologies* (EMLCT), an international joint Master of Science degree, also sponsored by the Erasmus Mundus programme of the European Union, in cooperation with 9 European universities. Since 2013 the EMLCT programme is not held at the Free University of Bozen-Bolzano anymore. Web site: `http://www.lct-master.org`

- I have published on the web a self-standing introductory course on *description logics*, including slides, course material, reference literature, exercises `http://www.inf.unibz.it/~franconi/dl/course/`. The course has been adopted by more than 20 university courses around the world, and it had an average of up to 1,500 unique accesses every month. The material includes the above-mentioned software tools developed by me and my research group *Quelo* and *ORMiE* to experiment with the use of ontologies and description logics as knowledge representation and conceptual modelling languages.

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