CENTRIA
Centro de Inteligência Artificial – UNL

Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
Quinta da Torre, Monte da Caparica
2829-516 Caparica, Portugal

2004 Report of Activities

Director: Luís Moniz Pereira
Other board members: José Alferes
Pedro Barahona
Irene Rodrigues

May 2005

Contents

1 CENTRIA 2004 report of activities

CENTRIA was evaluated in January 2004, for the third time, by an international panel named by the Ministry of Science, Technology and Higher Education. The global evaluation was, for the third time too, "Very Good"". Below we reproduce the official evaluation report.

1.1 Evaluation report by international panel

Global evaluation: "Very Good"

Panel of "Engenharia Electrotécnica e Informática": Hans-Dieter Burkhard, Hyong Kim, Bruce MacDowell Maggs, Yale Patt, Adel Razek, Marwan A. Simaan, José Manuel Fonseca de Moura (Coordinator).

Panel's report: Centria (CENTRO DE INTELIGÊNCIA ARTIFICIAL DA UNIVERSIDADE NOVA DE LISBOA) is the largest and best known AI center in Portugal. It is led by Professor Luís Moniz Pereira who is one of the pioneers in Logic Programming. The unit has an advisory board with outstanding international members (R.Michalski, F. Pereira, D.S.Warren, J.Siekmann) and remains a well established research unit with high international visibility.

Management: 4 *[out of 5]*
In 2003, Centria had a good personnel basis with 41 researchers (23 PhD, 18 PhD and MSc students). Compared with 1999, the number of PhDs has increased (from 14).

The work is arranged around three main areas:

- Knowledge Representation and Reasoning (KRR) & Logic Programming (LP) :4.5
- Soft Computing and Constraints (SCC): 3.5
- Intelligent Information Systems.(IIS): 4

According to the recommendations of the 1999 panel, there were ongoing efforts for growth outside the Logic based paradigms. Some of these efforts concerned the enlargement of logical programming by further methods like fuzzyness, constraints, and non-monotonic approaches. This is a reasonable way to combine the outstanding skills in LP with other paradigms and therewith to keep their leading position in LP related fields. Further efforts are related to application driven research for semantic webs, information systems, and biophysical modelling. Again, the group tries to exploit their LP related skills for these fields. But on the other hand, it turns out that other fields (like those based on probabilistic methods) remain under-represented.

Group: Knowledge Representation, Reasoning, and Logic Programming (KRRLP)
This group is pursuing several interesting research directions. First, they have modified the Prolog programming language to allow for "fuzzy" truth values. After adding the new functionality to the language definition, the group modified the public-domain GNU Prolog compiler to implement it. This compiler generates native code (avoiding run-time interpretation). Modifications were needed to ensure that the compiler output remained efficient. This compiler is claimed to be the most efficient implementation of Prolog. The claim is that their understanding of the compiler and architecture results in faster resulting execution of the resulting native code.

This groups work on updating non-monotonic knowledge bases and logic programs has been published in the best international journals including "The Journal of Logic Programming" and "Artificial Intelligence".

Group: Intelligent Information Systems (IIS) This group has been working on the automatic creation of ontologies of concepts contained in text documents. An ontology here means a database indicating which subjects applied to which verbs to which objects in which documents. After creation, it should be possible to conduct sophisticated searches of the ontology. The approach is to use OWL ("Ontology Web Language") and logic programming. This work led to the development of the ISCO specification and query language and its successor. The group is working with the Portuguese Attorney Generals office to create an ontology of documents recording legal opinions and rulings. This work has not yet received a large amount of international recognition, although a recent Ph.D. graduate has written a very impressive thesis. Like the KRRLP-group, the IIS-group has a strong focus on logic programming.

Group: Soft Computing and Constraints (SCC) We were given only a very brief overview of the work in this group. Among other things, this group is working on fuzzy optimization techniques. For example, these techniques might be used to identify "eddies" or other features in ocean currents apparent in satellite images. There was some discussion about whether using fuzzy approaches with no intrinsic model of the underlying physical phenomena, even when such models exist, was an effective method of solving these identification problems.

The group also worked on protein folding prediction using hybrid techniques. The idea is to use both the known protein DNA sequence as well as measurements of inter-amino-acid distances to generate a 3-dimensional model of the protein. (The distances can be found using NMR techniques that are easier and faster than crystallography.)

Some of the groups research on fuzzy optimization has been published in flagship journals such as the IEEE Transactions on Fuzzy Systems.

Strength of the institute as a whole:

- Worldwide leadership for LP techniques, development of programming systems for enlarged LP
- Good representation in leading international journals and conferences
- Cooperation with industry. Two spin-offs, Heuristica, and Declarativa, each employing 5-10 people, based on technology developed at Centria.
- International MSc and PhD programs, large amount of foreign researchers
- International cooperation, especially with a large EU project

Weaknesses and recommendations: The group is on the way to a better balance between their outstanding strength in logic programming on the one hand, and the large amount of other AI-paradigms on the other side. Claiming to be the leading AI-institute in Portugal, the Centria should also be at the forefront in other fields. The connections to biochemistry seem promising and should be strongly encouraged.

To be not misunderstood: Centria should preserve their outstanding expertise in LP and keep being a worldwide observed reference institute. This includes ongoing work in enlarging the applications and tools for LP in combination with other methods. But considering the large amount of human resources, Centria has to develop a strategy for research besides LP. Therefore the panel was disappointed that several researchers from machine learning and natural language processing have recently left. On the other hand side, there are several foreign researchers from different areas working at Centria. This strategy should be continued. Moreover, efforts should be strengthened to hire faculty who have earned their Ph.D.s or studied at other institutions.

There should be more real interaction with other LP and Prolog groups (like in Porto). The activity on Prolog in Portugal seems unusually large relative to the rest of the world. It is not clear if such extensive effort is justified, but in any case, their should be more interactions.

1.2 General comments on the 2004 activity

The present activity report was unanimously approved by the Scientific Committee of CENTRIA beginning of June 2005. The plans approved in 2003 for 2004 were on the whole successfully carried out.

The centre's director, Luís Moniz Pereira, was on sabbatical leave during academic year 2003/04, and spent 4 months in U. Bologna (March-June 04) as an elected fellow of its Istituto di Studi Avanzati. During the sabbatical, he launched a "European MSc in Computational Logic", between UNL and four other European universities, supported at UNL by CENTRIA members[1]. This MSc began in September 04, and obtained the support of the European Erasmus Mundus programme, being one of the first 14 so supported, in all academic areas. The objective of the program is to impart to the student a profound theoretical and practical knowledge required for professional practice in the field, to give him a survey of the individual disciplines of Computational Logic and to develop his ability to work according to scientific methods. In addition, the student is given the opportunity to plan his studies to fit a particular practical application. To acquire practice-oriented knowledge he may choose appropriate combinations of modules. By means of visits abroad and English as the language of instruction, the student is to be prepared for the increasing internationalism of science, commerce and industry.

Also noteworthy, a 3-year European funded Asia-Link project "Computational Logic as a Foundation for Computer Science and Intelligent Systems" began in September 04[2], in partnership with T.U. Dresden, Germany, U. Indonesia at Jakarta, and T.U. Hanoi, Vietnam. The objective of the project is to promote the area of formal computational foundations of logic, computer science and intelligent systems, i. e., the area of Computational Logic, in South East Asia. The European partners are already engaged in an effort to turn Europe into the leading place for education and training in this area. The three-year project aims at upgrading the staff of the Asian partners within a joint team schema, joint supervision of MSc and PhD students within a sandwich schema, courses of European professors and lectures at the Asian universities, the organization of international summer schools, the development of curricula for single modules at the Asian universities, and the incorporation of video-teaching methods in cooperation and teaching.

Also of general significance, the 4-year European funded project, "REWERSE - Reasoning on the Web with Rules and Semantics", involving all areas of CENTRIA, was initiated in March 04 (Cf. http://www.rewerse.org/ for project details). REWERSE strives for advanced Web systems and applications sometimes referred to as Semantic Web, a term coined in 2001 by Tim Berners-Lee et. al. in the article "The Semantic Web" in Scientific American. The term refers to one of the major current endeavours world wide in Information Technologies. Its goal may be briefly described as enriching the existing Web with meta-data and data processing (and meta-data processing) so as to provide Web-based systems with advanced (so-called intelligent) capabilities, in particular with context-awareness and decision support, strengthening a person centred, everyday use of the Web.

CENTRIA's participation involves a coordinating role in one of the major workpackages, "Evolution and Reactivity". CENTRIA is a major participant in REWERSEs Education and Training workpackage, besides its major participation in other important workpackages mentioned in the project, namely "Rule Markup", and "Bioinformatics", so that all of CENTRIA's areas are involved.

It is noteworthy that, pursuant to its new strategic ends, the centre hired or renewed in 2004, 3 foreign postdocs, from 3 different countries: China, Italy, and the USA.

The reconfiguration of MEI, the departments MSc in Computer Science, began in 2003/04, continued in 2004/05, and afforded us with the opportunity to include in it AI and Information Technology profiles, the latter including a semantic net component, also figuring prominently in the new Computational Logic MSc.

Our evolution can then best be gauged by comparing the plans with the present report: an overall positive evolution. The global indicators in the tables in Section 7 show and highlight, with

[1] See http://ssdi.di.fct.unl.pt/masters/mcl/ for details.

[2] See http://www.computational-logic.org/content/projects/asialink/ for details.

respect to 2004 compared with 2003, that:

- Regarding publications: There is overall steady progress, as we continue to recover from the exit of four members in 2000. The total number of publications increased from 58 to 62. The number of journal publications increased from 6 to 9. Nevertheless, we should still be increasing journal publications, and we will continue to do so by means of funding incentives to members accomplishing it. The number of publications in SCI (Science Citation Index) venues has kept to 21. Let's hope more of these will find their way into journals shortly. The publications in collaboration with non-members have, for a second time, increased notably, now up from 29 to 40, through increased international involvement, not national, which is pleasing.

- Regarding Projects: The number of ongoing projects remains roughly at the same level, with a slight increase from 15 to 16, including a voluminous international European project, called REWERSE, in abeyance to the recommendations of the international board of evaluators.

- Regarding Events Organization: This figure went from a high of level of 4 in 2003, to an exceptional 7 in 2004. This provides an added impact on the visibility of the centre.

- Postgraduate MSc and PhD students: The overall attraction of the centre for these postgraduate students continues. Their overall of number has increased from 23 in 2003 to 32 in 2004, with the number of concluded theses increased from 7 in 2003 to 14 in 2004. It is expected that with the launching of international MSc distributed course Computational Logic in 2004, the overall number will increase further in 2005. One must understand though that the national funding for postgraduate scholarships has not only diminished, but the usual two calls per year were reduced to 1 in 2004...

Other indicators, including a more detailed examination of types of publication, and publications by each subarea, are to be found in the annexes, and mentioned in each of the subarea reports.

In an effort to identify potential bridges to future startup companies or to joint projects with existing companies and institutions, a brief survey was done on "Potential applications for existing CENTRIA technology". The effort was conducted by Miguel Calejo, a CENTRIA member and managing partner of two external companies, and consisted on an enquiry to all members followed by individual meetings. The resulting memorandum [66] was shared with all; although no immediate actions resulted of it, it contributed to the overall group awareness and focus.

The 2004 budget was executed according to plan. Unfortunately, the delay in CENTRIA's international evaluation by FCT scheduled initially for September 2001 has meant that no strategic (also called programmatic) funding was considered (let alone awarded). The situation has been redressed finally, with significant strategic awarded by the evaluation panel for the next 4 years, starting in 2005.

However, during 2004 no strategic funding was available at all, and hence, to continue the previously programmatically supported scholarships for foreign postdocs recommended by the evaluators, the centre had to resort to running costs funding. The distribution of the running funds among the members was made as usual on the basis of publication productivity, in number and type, according to a pre-defined set of rules we have been using for the past years. We intend to make good in the 2005 budget the revision of points assigned to each publication type to further encourage publication in journals and highly recognized conferences.

The Advisory Committee was duly notified of last year's report and informally congratulated us on the activities reported. No specific recommendations were made.

The detailed rendition of each of the subareas' activities is to be found below. A number of scientific bridges were pursued between the subareas, to reinforce the unity and cross-fertilization within the Centre. The activities of 2005 and beyond will further promote the construction of these bridges.

1.3 Subarea: Knowledge Representation and Reasoning, and Logic Programming

The research work on "Knowledge Representation and Reasoning, and Logic Programming" continued in 2004 on the foundations of logic programming for knowledge representation and reasoning, applications and implementation of logic programming systems, as can be gauged from the publications. A growing importance, and corresponding working load, has been devoted to applications in the domain of the Semantic Web.

The scientific projects covering this activity were REWERSE, FLUX, TARDE, "Extensions au Logiciel Libre GNU Prolog" project (with INRIA), SIIUE, and the network Network of Excellence in Computational Logic - CoLogNet.

CENTRIA members co-organized the following scientific meetings in this area:

- João Leite co-organized together with Jürgen Dix, the 4th Workshop on Computational Logic and Multi-Agent Systems (CLIMA IV) [4] which took place January 2004 in Fort Lauderdale, FL, USA, in conjunction with LPNMR 7.
- Miguel Calejo organized the ICEIS (International Conferences on Enterprise Information Systems) Doctoral Consortium, which took place in Porto, April 2004 [2].
- Reinhard Kahle co-organized the ICCL Summer School 2004 *Proof Theory and Automated Theorem Proving* and the *PCC* Workshop 2004 hold at Technische Universität Dresden, June 14-25, 2004.
- João Leite co-organized together with Andrea Omicini, Paolo Torroni and Pinar Yolum, the 2nd International Workshop on Declarative Agent Languages and Technologies, (DALT"04), [5] which took place July 2004 in New York, USA, in conjunction with AAMAS'04.
- José Alferes and João Leite organized the 9th European Conference on Logics in Artificial Intelligence, [1] which took place September 2004 in Lisbon, Portugal.
- João Leite co-organized together with Paolo Torroni, the 5th Workshop on Computational Logic and Multi-Agent Systems (CLIMA V) [6, 16] which took place September 2004 in Lisbon, Portugal, in conjunction with JELIA'04.
- Miguel Calejo co-organized, with Alberto Silva, the panel session on "Desenvolvimento Rápido Baseado em Modelos" of the 5th Conference of the Portuguese Association for Information Systems (APSI).

The international collaboration was strengthened and continued with U. Ferrara, U. Bologna, U. Pisa, U. Malaga, U. Dresden, INRIA, U. Linköping, T.U. Dresden, Stony Brook, U.P. Madrid, U. Goettingen, T. U. Hannover through projects and visits, as witnessed in most cases by the publication of co-authored papers.

The education and training aspects have been covered by our MSc in Computer Science, and a joint Distributed Masters in Computational Logic being put together in the context of CoLogNet, as explained in the introduction.

A major successful line of work in 2004 (namely as a result of Carlos Damásio's one year sabbatical) was reasoning with imprecise, incomplete, vague and paraconsistent information in logic programming, where we have followed two main directions, in international collaboration. On the one hand, we have proposed a sorted multi-adjoint logic programming framework and studied the termination conditions of the immediate consequences operator, and appeared in [34]. This work has been improved in subsequent papers [39, 37], resulting in an ECAI publication [38] specifying tabling algorithms for these languages. The embeddings of a large number of logic programming based semantics in the sorted framework have been extensively studied, and have been published in 2004 [40, 37]. This work resulted in part from the cooperation with Manuel Ojeda-Aciego and Jesús Medina from the group of Dept. Matemática Aplicada E.T.S.I. Informática

da Universidade de Málaga. On the other hand, we have explored the use of Paraconsistent Answer Sets to represent Rough Knowledge Bases, in particular quantitative measures [61], in collaboration with Aida Vitória and Jan Maluskinski from Linköping University. A model theory for Paraconsistent Disjunctive Answer Sets based on Substructural Logics has been produced [25]. In the same line of research, we have explored answer set programming for implementing a subset of statistical default logic [63]. Other work by us on statistical defaults in 2004 is reported in [62].

During 2004 we returned to the investigations on model-based diagnosis. Namely, we conducted a comparative study of various methods for diagnosis [26], and also made an application to the diagnosis of protection systems of electrical power distribution networks with a portuguese a company. This latter is the subject of a submitted MSc. thesis by Rui Dias Jorge. A comparison of several several deductive diagnosis techniques for digital circuits appears in [26].

Publication of [8] in the TPLP journal, on abduction in the well-founded semantics, consolidated work being developed for the past few years. This work was applied to power grid diagnosis, reported in [35], a summary of a MSc thesis.

Mainly within the ongoing project FLUX, foundational work on logic programming updates has been developed, and applications studied. Regarding foundational work, a study of the semantics of logic programs updates has been carried out, principles were identified to characterize some less desired result of the extant approaches and a new semantics obeying those principles has been defined [28]. A well-founded based semantics obeying the principles was also defined [29], and systematic comparison between all existing semantics for Dynamic Logic Programming [46] made. Another sustained work on LP semantics is [55], with possible relevance to updates, and the subject of a MSc thesis is due (and was actually delivered) in February 05.

Some research in the direction of establishing bridges between Commitment Machines and Evolving Logic Programs (EVOLP), defined by our group in the past, was started by João Leite. An MSc dissertation on this subject is being supervised. Moreover, a detailed comparison with so-called "action-languages" has been made [27, 30], that shows how logic programs updates, and in particular of the language EVOLP, can be used to model dynamic environments, and how it compares in this respect to the other approaches. Another application of the work on knowledge bases updates led to the publication [49], a summary of a MSc thesis.

This work on updates of knowledge has been applied to the context of the Semantic Web, in the context of the above mentioned IST project Rewerse, where CENTRIA heads the working group of "Evolution and Reactivity". First requirements for an evolving and reactive web have been detailed in [48].

The development of standard Prolog technology for the Semantic Web continued in collaboration with Martin Balaz from the Faculty of Mathematics, Physics and Informatics of the University of Bratislava, who visited CENTRIA for 3 months. The effort was focused in the benchmarking and correction of a XML Parser for Prolog. The implementation of the RuleML compiler has been suspended waiting for the clarification and definition of the language. We also started the investigation of the semantics of RDF graphs with negation, and some preliminary results appear in [9].

Regarding implementation of logic programming the work has continued in the collaboration with INRIA, and centered on improvements to the GNU Prolog language implementation (which also happens to be the basis for ISCO and ISTO, developed in project SIIUE as described in the next section)

There has also been work on the connection of Java and Prolog, namely by a system, Interprolog, making the connection to XSB-Prolog [33], and in a M.Sc. Thesis.

Also related to implementations, we have developed and benchmarked distributed tabling procedures with termination detection, for definite logic programs. This work is reported in an approved MSc. dissertation by Miguel Bento Alves. It has been shown that a centralized termination detection is preferable to a fully distributed one, with linear overhead in message complexity. These results attracted the interest both from Prof. Terrance Swfit from the XSB group as well as from the group of Prof. Wolfgang Nejdl (University of Hannover). Prof. Terrance Swift visited CENTRIA for 3 weeks for discussing the distributed tabling algorithms and satellite implementations. These distributed tabling algorithms have been applied to Peer-to-Peer system in collaboration

with Daniel Olmedilla, from the L3S Laboratory of the Hannover University, which also visited CENTRIA. Joint publications are in preparation.

The increasing concern with epistemology and logical AI, a promising research area, lead to the publication of [12], of [18], of [64], and of the Journal of Applied Logic special issue [3] edited by us. The modelling of cognitive decisions led to a PhD thesis, and publication [59].

1.4 Subarea: Intelligent Information Systems

In this area, research work was done in following topics: tools for semantic web,integration of heterogeneous databases, intelligent agents for automatic classification of documents, definition of semantic web ontologies, and natural language dialogue systems for information retrieval from intelligent Information systems.

The research work was partly developed within the following projects: REWERSE - Reasoning in The Web with Rules and Semantics (IST506779); COOPERATIVE - Automatic Clustering and Visualization of Legal Documents in a Cooperative Information Retrieval Web System (POSI/40197/CHS/2001); ABC Intelligent Access to Legal Knowledge Bases(POSI-I&D in consortium ref. 6192); DIRPI - Development and Integration of Resources for Information Retrieval (ICCTI/CAPES bilateral project); SIIUE -Univ. Évora's Integrated Information System (funded by Univ Évora); AJACS – Yet Another Java Constraint Programming System (POSI/40197/CHS/2002); Extensions au Logiciel Libre GNU Prolog (INRIA/ICCTI, April 2002); LOIS – Lexical Ontologies for legal Information Sharing (Funding EEC).

The European project Rewerse started in March 2004, and CENTRIA heads the working group of "Evolution and Reactivity". First requirements for an evolving and reactive web have been detailed in [48].

During 2004 the project DOMIR – Dialogs and Ontologies for Multimedia Information Retrieval – was submitted and approved by FCT. This is a joint project of CENTRIA and INESCN/FEUP coordinated by the INESCN/FEUP team.

This year, a prototype of a system for Question-Answer was built using results from our research in the topics: definition of semantic web ontologies, and natural language dialogue systems for information retrieval from intelligent Information systems.

This QA system was build in order to participate in the CLEF – Cross Language Evaluation Forum (http://www.clef-campaign.org) that, in cooperation with Linguateca, added the Portuguese language as query language and target documents language. The target documents were a collection of news published by the Portuguese newspaper "Público" from 1994 to 1995. The campaign consisted in getting answers to 200 questions (Wh-questions) suported by a sentence of the target set of documents. Our QA system (*Alentejo*) achieved 33% of correct and well supported answers: it scored first place in 3 for the Portuguese language and 9th overall out of 42.

In the area of integration of heterogeneous databases the SIIUE project has been continuing to expand its scope. SIIUE is based on the ISCO language, which integrates several paradigms around Logic Programming. Developments were made in 2004 which explore the initial specification and implementation of a new language, ISTO, based on our previous work and making use of an improved form of Contextual Logic Programming together with Constraint reasoning which will lead to a powerful tool for the construction of real-world information systems.

ISCO is presently being used to construct a non-academic application in the Business Intelligence area, which is expected to have a fully operational prototype in mid 2005.

The SIIUE project will continue its growth by means of several related yet shorter projects, some of which are application-related while others are more research-oriented. The former deal with management issues and include a system for handling research activity reports at the University level, providing intefaces for researchers, management and the outside world.

The other line of projects include the integration of Contextual Logic Programming (CxLP) concepts into ISCO and the development of language features to support:

- Temporal information: this is strongly tied to the work on ISTO.
- Schema evolution.

- Reliable and convenient access control.
- Semantic Web integration.

The bilateral project "Extensions au Logiciel Libre GNU Prolog" with INRIA is to be extended as there is mutual interest. Expected results include the implementation of a thread model and a graphical user-interface toolkit for GNU Prolog.

In the area of intelligent agents for automatic classification of documents we had use the Linear Support Vector Machine paradigm applied to datasets written in the English and the European Portuguese languages – the Reuters and the Portuguese Attorney General Offices datasets, respectively. The study can be seen as a search, for the best document representation, in three different axes: the feature reduction (using linguistic information), the feature selection (using word frequencies) and the term weighting (using information retrieval measures). The results reported in [44, 45]

International cooperation was mainly supported by the projects: DIRPI – Development and Integration of Resources for Information Retrieval (ICCTI/CAPES bilateral project), LOIS – Lexical Ontologies for legal Information Sharing (Funding EEC) and Extensions au Logiciel Libre GNU Prolog (INRIA/ICCTI, April 2002). Some results are reported in [32, 31, 58, 24, 56]. We also had the visits of Rodrigo Goulart and Renata Vieira.

1.5 Subarea: Soft Computing and Constraints

Constraints Project Proteins, aiming at finding the 3D-structure of proteins from distance constraints between pairs of atoms obtained from Nuclear Magnetic Resonance data, has been completed. Marco Correia has finished his M.Sc. thesis on heuristics to be used to speed up the search interleaved with the propagation of distance constraints for this problem of 3D-structure determination. These heuristics were developed with the support of supervised learning (neural network) on a number of geometrical parameters (for example, volumes of curent domains, distances between centre of these domains) available during search. A number of interesting results were obtained regarding the robustness of the method and lower bound thresholds for the percentage of correct guesses needed to improve significantly the accuracy of the constraint propagation phase. These conclusions were presented in [36].

An important pitfall was also identified on the technique used, namely the lack of biochemical parameters used in machine learning (e.g. hydropathy of the protein amino-acids). Such parameters, as well as a wealth of information regarding similar proteins, is currently available in a number of biochemical sites (PDB, SCOP, DSSP, etc) and the use of that information was begun to be studied under in the Bioinformatics workpackage of the Rewerse Network of Excellence, that started work in March 2004, and of which we organised a meeting in December in Lisbon. In particular, work has begun in datamining these sites (mostly PDB) in order to find useful heuristics to be used in the search for solutions. A new M.Sc. student, José Carlos Santos has started work on this subject. A complementary approach, that will aim at using energy functions and other deeper modelling aspects of protein folding will be pursused y a new Ph.D. student, João Borges, that was granted a Ph.D. scholarship to start at the beginning of 2005.

Still integrated in the Proteins project, Jorge Cruz has carried out further work on continuous constraints solvers, and a number of articles were finalised and published in relevant journals, mostly regarding applications of the techniques developed [10, 15, 11]. Study has also begun on extending the techniques used in constraining the search space to include some sort of soft constraint solving, searching with priority regions of the search space where solutions are more "likely" or prefered. This technique could be useful in many applications, namely conceptual design by incorporating constraint solving at the early stages of conception. A proposal to FET European project, in consortium with other European partners, was prepared that reformulated many aspects of a previous proposal and clarified the role of this type of constraint solving in the embodiment phase of project design. Independently of the success in applying the technique in this European project, the technique will be developed in project Precise, which was submitted to the FCT and accepted for funding. The project is expected to start in April 2005.

The work in optimal correction of unfeasible linear constraints following up Paula Amaral Ph.D. thesis was also carried out. In particular, the paper presented in CP'02 was selected for a special issue of the Constraints journal and a new and extended version, with some new results was prepared (it is due in the beginning of 2005). The paper submited to the Journal on "Linear Algebra and Its Applications" was also reformulated and accepted, and should also be pubished during 2005.

Research on set constraint solving as well as other constraint techniques for dealing with multivalued logics used in the modelling of digital circuits problems were compared with other more "logic programming oriented" techniques (e.g tabling, stable models) in a number of such problems which lead to a publication [26].

Development of an improved Cardinal (a set constraint solver with especial inferences on set functions, such as cardinality) was carried out and integrated in ECLiPSe Prolog, as a third-party library. The development of a set constraint solver has also started aimed at providing a component of the constraint solving platform that will be developed in project Practic that started effectively in 2004. The core of this platform is being implemented by Marco Correia as part of his Ph.D. work, which started officially in November 2004. The integration/hybridisation with a SAT solver, also aimed at the project was discussed with our partners but was postponed to 2005.

It is worth mentioning that the topic of constraints has been included, with some relevance, in the new European Master of Science course on Computational Logic. It is an important component in one of the Foundation topics of the course, Logic and Constraint Programming, taught in all of the Universities involved in the M.Sc. course. Moreover, in the New University of Lisbon there is a specific Advanced Module on Constraints, where more advanced constraint programming subjects will be taught (interval constraints, set constraints and optimization as well as fuzzy and soft constraints).

Machine Learning and Data Mining During 2004, Nuno Marques and Marco Castellani (a CENTRIA scholarship postdoc) have continued work on Neural Networks and Data Mining, which resulted in FeaSANNT, an evolutionary procedure for simultaneous solution of the two combinatorial search problems of feature selection and parameter learning for artificial neural network classifier systems. The novelty of the method lies in the implementation of the embedded approach in an evolutionary feature selection paradigm. The algorithm was applied on a multilayer perceptron classifier. The proposed algorithm entails lower computational costs and reduced risks of sub-optimal convergence due to the embedded feature selection strategy. This work is currently under revision aiming at a journal publication. The use of evolutionary programming in FeaSANNT is also paving the way for future research in more biologically realistic models of neural networks (namely spiking models) and in better algorithms for distributed/parallel learning.

Project RENA started in September 2004. In the context of this project several experiments were carried out regarding feature extraction from Oceanographic images. We have consolidated the results already achieved on this domain, namely regarding image preprocessing for Eddy border recognition; this can result in very specific features for Eddy Identification.

The knowledge acquired on preprocessing satellite thermal images allowed the construction of a first training set. Due to the availability of FeaSANNT, we are now more concentrated on feature extraction/generation process (namely with gradient and Law's methods) than on feature selection. First published results on this line of work are expected during 2005.

Still in the context of the RENA Project, Susana Nascimento has carried on with her research work on fuzzy clustering techniques for the problem of colour image segmentation from sea surface temperature (SST) maps. Collaboration with CENTRIA scholarship postdoc, Chen Ning, in February-March 2004, left an exploratory study needing further development. In particular, the work pursued into three stages: (i) data pre-processing: normalization and data reduction. (ii) Image segmentation by fuzzy clustering algorithms, and (iii) visualization of segmented images through defuzzyfication of membership values.

Subsequently, the work has been concentrated in the identification of the upwelling phenomena, using several sets of images where the SST maps display different patterns of upwelling in space and in time, and with distinct levels of noise (represented by cloudy regions). The FCM validity

guided (re)clustering algorithm has been applied (with and without compression) to compare with the FCM.

The experimental study performed focused in the evaluation of the best number of segments and their quality in comparison with interpreted images by oceanographers. For that, two validation criteria have been applied. One internal, the other a relative criterion that measures the correspondence of two partitions, in this case comparing the reference partition (given by the experts) with the one found by the algorithms. Analysis of these results are concordant with the experts evaluation in over 90% of cases.

The statistical analysis of the temperature maps weighted by the fuzzy membership values, shows that corresponding clusters of the images of the same group have a narrow temperature range, well separated from the remaining clusters. On the other hand, the overall range of temperatures differs among the different image groups considered.

The research line on tagged text mining was reinforced during 2004. An earlier neural network text classifier was adapted to a crawler system capable of postal address detection on the web [47]. Since then, active work on this area started with the internally funded Tagged Text Mining project. The main goal of the Project is the development of general techniques for automatic knowledge extraction on limited domain sets of texts (namely Portuguese texts). Relational databases and logic programming tools (in a perspective compatible with the semantic-web) will be used to rigorously describe each domain.

We will try to develop a general method to transform domain data written in texts into knowledge in a relational database. Once more, the core process in knowledge extraction will be the automatic annotation of each word with a corresponding semantic tag. Domain knowledge will be used for defining the appropriate semantic tag-set, namely by the use of techniques for automatic tag disambiguation. A Web interface capable of automatically detect user preferences is being developed.

We are preparing an example exploring the application of text and data mining techniques to touristic data information. With this interface we aim to provide general access to this project results and also to raise industry interest in this research, paving the way for future applied research projects. We hope to present the first publications on this work in 2005, and submit this project for external funding during late 2005 in a research consortium involving industry.

As a side result of data mining research, several data mining algorithms (namely self organizing maps and apriori) have been applied to the analysis of student grades in one of the courses taught by CENTRIA researchers. As a result of this work a paper was accepted to be presented in 2005.

2 List of ongoing projects in 2004

Name	CoLogNet - European Network of Excellence in Computational Logic
Status	Ongoing
Funding Institution	EU-IST
Funding for 2004	21.000 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	CENTRIA
Description	Computational Logic has outgrown its humble beginnings and early expectations by far: with close to ten thousand people working worldwide in research and development of logic-related methods, with several dozen international conferences and workshops and more than one hundred international and national scientific societies related to research in logic addressing the growing richness and diversity of the field, and with the foundational role and importance these methods now assume in mathematics, computer science, artificial intelligence, cognitive science, linguistics and many engineering fields –where logic-related techniques are used inter alia to state and settle correctness issues – the field has diversified in ways that the pure logicians working in the early decades of the last century could have hardly anticipated. http://www.eurice.de/colognet/

Name	REWERSE - Reasoning on the Web with Rules and Semantics
Status	Started March 2004, for 4 years
Funding Institution	EU-IST
Funding for 2004	75.000 (our part)
Principal researcher	Luís Moniz Pereira (national part)
Participants (ours)	Involve member from all 4 major areas of CENTRIA
Description	REWERSE strives for advanced Web systems and applications sometimes referred to as Semantic Web, a term coined in 2001 by Tim Berners-Lee et. al. in the article "The Semantic Web" in Scientific American. This term refers to one of the major current endeavours world wide in Information Technologies. Its goal may be briefly described as enriching the existing Web with meta-data and data processing (and meta-data processing) so as to provide Web-based systems with advanced (so-called intelligent) capabilities, in particular with context-awareness and decision support, strengthening a person centred, everyday use of the Web. Cf. http://www.rewerse.org/.
Results:	Meetings, deliverables, and publications, in the area of our responsibility for Working Group Evolution and Reactivity. And according to participation in WGs Education and Training, Rule Markup Languages, Towards a Bioinformatics Semantic Web, and Personalised Information Systems.

Name	International M.Sc. Program in Computational Logic
Status	Started September 2004, for 6 years
Funding Institution	EU Erasmus Mundus
Funding for 2004	75.000 (All partner)
Principal researcher	Luís Moniz Pereira (national part)
Participants	UNL, TU Dresden, U. Bolzano, TU Wien, UP Madrid
Description	One major activity was to setup and launcha joint distributed european MSc degree in Computational Logic with 4 other partners, initiated in the context of project CoLognet. This involved the creation of a new MSc in Computational Logic at UNL. Cf. http://ssdi.di.fct.unl.pt/masters/mcl/.

Name	Computational Logic as a Foundation for Computer Science and Intelligent Systems
Status	Started September 2004, for 3 years
Funding Institution	EU-IST Asia-Link/VN/001
Funding for 2004	75.000 (all partners)
Principal researcher	Luís Moniz Pereira (national part)
Participants	CENTRIA, TU Dresden, U. Indonesia, TU Hanoi
Description	The objective of the project is to promote the area of formal computational foundations of logic, computer science and intelligent systems, i. e., the area of Computational Logic, in South East Asia. The European partners are already engaged in an effort to turn Europe into the leading place for education and training in this area. The three-year project aims at upgrading the staff of the Asian partners within a joint team schema, joint supervision of MSc and PhD students within a sandwich schema, courses of European professors and lectures at the Asian universities, the organisation of international summer schools, the development of curricula for single modules at the Asian universities, and the incorporation of video-teaching methods in cooperation and teaching. Cf. http;//www.computational-logic.org/content/projects/asialink/.

Name	PRACTIC: Processing and Reuse of Advanced Computational Techniques to Improve Constraint Solving
Status	Approved to start at January 2005
Funding Institution	Fundação para a Ciência e Tecnologia
Funding for 2004	Not applicable
Principal researcher	Pedro Barahona
Participants	Francisco Azevedo, Marco Correia
Description	The project aims at developing advanced computing techniques, focussing in constraint programming, and to show how their integration with other techniques such as automated learning and meta-heuristics optimisation, can be used to solve a very important problem: the determination of protein structure from Nuclear Magnetic Resonance (NMR) spectroscopy

Name	PRECISE : Probabilistic Reasoning for Constraints in Science and Engineering
Status	Started January 2004, for 3 years
Funding Institution	Fundação para a Ciência e Tecnologia
Funding for 2004	16.000 Euro
Principal researcher	Pedro Barahona
Participants	Jorge Cruz, Ludwig Krippahl, Margarida Mamede, 1 scholarship student
Description	Extending the continuous constraint paradigm to handle some forms of uncertainty and preferences of interest for science and engineering applications through a) a priori likelihood distributions on variables and their aggregation; b) adaptation of constraint propagation algorithms to take into account most interesting subdomains; and c) Development of interactive interfaces to monitor constraint propagation.

Name	FLUX
Status	Ongoing
Start Date	2002
End Date	2005
Budget in 2004	18.600 Euro
Funding Institution	POSI
Principal researcher	José Alferes
Participants	CENTRIA and Declarativa - Serviços de Informática Lda.
Description	This project aims at establishing a flexible declarative language for the specification of dynamic knowledge, and to apply it to realistic application domains.
Results	14 publications

Name	TARDE - Tabulation And Reasoning in a Distributed Prolog Environment
Status	Ongoing.
Funding Institution	POSI
Start Date	2001
End Date	2004
Budget in 2004	approx. 10000 Euro
Principal researcher	Carlos Viegas Damásio
Participants	CENTRIA/UNL and CITI/UNL
Description	The combination of tabling systems, reasoning systems and distributed programming is mandatory and promising. It is expected in this much-focused project to cross-fertilise the know-how in the implementation of PROLOG distributed systems with the know-how in tabling systems and reasoning techniques. This will result in building an advanced and efficient portable distributed logic programming system, incorporating the most recent semantical and operational techniques currently available. The initial 2 year project has been extended in order to achieve its objectives. Our focus is now the development of tools for the Semantic Web.

Name	RENA
Status	Ongoing.
Budget in 2004	4168 Euro
Funding Institution	FCT/MCT
Principal researcher	Isabel Luisa Soares de Albergaria Ambar (FC/UL)
Participants	Nuno Cavalheiro Marques, Susana Nascimento, Marco Castellani
Description	The main objective of the project is the establishment of a methodology for the remote identification of Mediterranean Water (MW) eddies with a synergistic use of satellite remote sensing data from the ERS and ENVISAT missions, ocean circulation numerical models and artificial neural networks. A census of MW eddies in the Northeast Atlantic and the estimation of their generation frequency will be attempted based on the results. The project also aims at determining the physical mechanisms controlling the interaction between the MW undercurrent/eddies and the coastal upwelling current system off the Iberian Peninsula.
Results	1 prototype, 1 dataset.

Name	COOPERATIVE – Automatic Clustering and Visualization of Legal Documents in a Cooperative Information Retrieval Web System.
Status	Ongoing (2002–2004)
Budget in 2004	15.000 Euro
Funding Institution	FCT/MCES
Principal Researcher	Paulo Quaresma
Participants	Salvador Abreu, Irene Rodrigues, Teresa Gonçalves, José Saias, Luis Rosário, Luís Simões
Description	This project aims to build a cooperative web IR system applying knowledge representation, classification and clustering techniques to legal documents. Moreover, documents will be transformed from standard text bases to semantic web texts (OWL).
Results	3 papers in 2004.

Name	ABC – Intelligent Access to Knowledge Bases
Status	Ongoing (2002–2005)
Budget in 2004	25.000 Euro
Funding Institution	Agência de Inovação
Principal Researcher	Paulo Quaresma
Participants	Irene Rodrigues, Pedro Salgueiro, Ana Aires, Luís Rodrigues
Description	Development of an agent-based architecture composed by specialized interaction and information retrieval agents.
Results	2 papers in 2004

Name	DIRPI – Desenvolvimento e Integração de Recursos para a Pesquisa de Informação
Status	Ongoing (2002–2006)
Budget in 2004	3.000 Euro
Funding Institution	GRICES/CAPES
Principal Researcher	Paulo Quaresma
Participants	Renata Vieira (UNISINOS/Br)
Description	Develop natural language processing tools for the Portuguese language in order to increase the power of information retrieval systems.
Results	2 papers and 2 visits in 2004.

Name	LOIS – Lexical Ontologies for legal Information Sharing
Status	Started (2004–2006)
Budget in 2004	30.000 Euro
Funding Institution	GRICES/CAPES
Principal Researcher	Paulo Quaresma
Participants	ITTIG (Italy), U. Sheffield (UK), U. Leiden (Netherlands), Celi (Italy)
Description	Develop an European legal ontology.

Name	AJACS – Yet Another Java Constraint Programming System
Status	Ongoing
Budget in 2004	6.000 Euro
Funding Institution	FCT SAPIENS (POSI)
Principal researcher	Salvador Abreu
Participants	Irene Rodrigues Lígia Ferreira
Description	This project aims at developing a dialect for the Java programming language, implementing the Constraint Programming paradigm over a distributed network of inexpensive workstations. We will develop a model for the representation of CSPs (Constraint Satisfaction Problems), susceptible of being efficiently implemented in a network-aware object-oriented programming language, such as Java. This model will be the object of a prototype implementation on a distributed system made up of a cluster of 16 nodes, which will extend the presently existing cluster of 8 nodes. There will be two prototypes: a sequential and a parallel one. The system will also be used to prototype a class scheduling application, based on real-world data: University of Évora's Integrated Information System.
Results	Working prototype and one PhD. thesis.

Name	Extensions au Logiciel Libre GNU Prolog
Status	Finished May 2004
Funding Institution	INRIA/ICCTI
Principal researcher	Salvador Abreu
Participants	Pedro Patinho, Vítor Nogueira
Description	This project will lead to the development of several extensions to the GNU Prolog implementation, originally developed at INRIA. Planned enhancements include a novel approach to Contextual Logic Programming (CxLP), a multi-threading implementation and a graphical user-interface system.
Results	A prototype implementation of GNU Prolog/CX, various published article and several undergoing review.

Name	SIIUE.sac – Universidade de Évora's Integrated Information System
Status	Ongoing
Funding Institution	Universidade de Évora
Principal researcher	Salvador Abreu
Participants	Lígia Ferreira
Description	Design and implementation of a logic language to build web-based information systems, featuring transparent use of hetherogeneous databases. Application to the academic management of the University.
Results	several publications and a production system in 2003 and 2004.. in 2003.

3 List of M.Sc. and Ph.D. students and topics in 2004

3.1 M.Sc. Students

Name	Miguel Bento Alves
Degree	M.Sc.
Supervisor	Carlos Viegas Damásio
Topic	Distributed tabled query evaluation of logic programs
Start date	March 2001
Finish date	October 2004

Name	Marco Correia
Degree	M.Sc.
Supervisor	Pedro Barahona
Topic	Heuristic Search for Protein Structure Determination
Start date	October 2002
Finish date	July 2004

Name	David Mendes
Degree	M.Sc.
Supervisor	Salvador Abreu
Topic	Integration of Prolog and Java
Start date	June 2001
Finish date	April 2004

Name	Martin Homola
Degree	M.Sc. (Comenius University, Bratislava, Slovakia)
Supervisor	João Leite (co-supervisor)
Topic	On relations of the various semantic approaches in multidimensional dynamic logic programming
Start date	September 2003
Finish date	April 2004

Name	Jozef Siska
Degree	M.Sc. (Comenius University, Bratislava, Slovakia)
Supervisor	João Leite (co-supervisor)
Topic	Refined extension principle for multi-dimensional dynamic logic programming
Start date	September 2003
Finish date	April 2004

Name	Michal Adamski
Degree	M.Sc.
Supervisor	João Moura-Pires (co-supervisor)
Remark	ERAMUS/SOCRATES Student from Wroclaw University of Technology, during the 2th semestre of 2004
Topic	Personalization of Advertisements on the Internet
Start date	September 2003
Finish date	August 2004

Name	Luís Filipe Silva
Degree	M.Sc.
Supervisor	Luís Moniz Pereira and Dov Gabbay (Kings College, London)
Topic	Law of Evidence (Computational View)
Start date	March 2004
Finish date	April 2005

Name	Alexandre Miguel Pinto
Degree	M.Sc.
Supervisor	Luís Moniz Pereira
Topic	Revised Stable Models - a new semantics for normal logic programs
Start date	March 2004
Finish date	June 2005

Name	Rui Miguel Martinho Dias Jorge
Degree	M.Sc.
Supervisor	Carlos Viegas Damásio
Topic	Diagnostic system of protection systems of electrical power distribution networks
Start date	March 2004
Finish date	submitted in March 2005

Name	Pedro Patinho
Degree	M.Sc.
Supervisor	Salvador Abreu
Topic	Extensions to the GNU Prolog system
Start date	December 2002
Finish date	September 2005 (expected)

Name	Marta Botelho Pantoquilho
Degree	M.Sc.
Supervisor	João Moura-Pires
Topic	A Space Environment Information System for Mission Control Purposes: System Analysis and Data Integration Design
Start date	February 2004
Finish date	May 2005 (expected)

Name	Nuno Miguel Soares Datia
Degree	M.Sc.
Supervisor	João Moura-Pires
Topic	Decision Support Techniques Applied to Audiometry Data
Start date	February 2004
Finish date	Jun 2005 (expected)

Name	Nuno Carlos Santos Simões Viana
Degree	M.Sc.
Supervisor	João Moura-Pires
Topic	Analysis, Design and Development of an Extraction, Transformation and Loading Software Architecture for Space-Oriented Activities with Real-time Constraints
Start date	February 2004
Finish date	July 2005 (expected)

Name	Rosa Isabel Alves Cordeiro Matias
Degree	M.Sc.
Supervisor	João Moura-Pires
Topic	Integrating spatial information in OLAP systems
Start date	September 2004
Finish date	July 2005 (expected)

Name	Ana Sofia Carapinha da Cunha Lopes
Degree	M.Sc.
Supervisor	João Moura-Pires
Topic	Decision Support System for Environmental Data
Start date	September 2004
Finish date	September 2005

Name	José Palmeiro
Degree	M.Sc.
Supervisor	Paulo Quaresma
Topic	Logical Agents in Java
Start date	October 2004
Finish date	December 2005

Name	Pedro Salgueiro
Degree	M.Sc.
Supervisor	Paulo Quaresma
Topic	A Question-Answering System for the Portuguese Language
Start date	October 2004
Finish date	February 2005

Name	José Carlos Almeida Santos
Degree	M.Sc.
Supervisor	Pedro Barahona
Topic	Mining Protein Data Banks for Structure Prediction
Start date	September 2004
Finish date	September 2005

Name	Rúben Linhares
Degree	M.Sc.
Supervisor	João Leite
Topic	Integrating Commitment Machines in EVOLP
Start date	September 2004
Finish date	September 2005

Name	Rui Ernesto da Silva Gomes
Degree	M.Sc.
Supervisor	Irene Rodrigues (e Luis Mendonça Rato)
Topic	Representação do Conhecimento para Análise de Sistemas de Control
Start date	October 2003
Finish date	May 2005

3.2 Ph.D. Students

Name	Jorge Simão
Degree	Ph.D.
Supervisor	Luís Moniz
Topic	Computational Modelling and Simulation of Human Social Behavior and Culture
Start date	March 1999
Finish date	February 2004

Name	João Fernando Lima Alcântara
Degree	Ph.D.
Supervisor	Carlos Viegas Damásio and Luís Moniz Pereira
Topic	Abduction and Belief Revision in Uncertain Logic Programming Systems
Start date	September 2001
Finish date	September 2005 (expected)

Name	Iara de Almeida
Degree	Ph.D.
Supervisor	José Alferes
Topic	Argumentation and cooperation in multi-agent logic programming systems, with application to distributed diagnosis
Start date	October 1997
Finish date	June 2005 (Expected)

Name	Federico Banti
Degree	Ph.D.
Supervisor	José Alferes
Topic	A language for executing and reasoning about evolution of logic based agents
Start date	October 2003
Finish date	September 2006 (expected)

Name	Lígia Ferreira
Degree	Ph.D.
Supervisor	Salvador Abreu
Topic	Constraint Programming Toolkits for Parallel Execution
Start date	June 1999
Finish date	April 2005

Name	Teresa Gonçalves
Degree	Ph.D.
Supervisor	Paulo Quaresma
Topic	Using Support Vector Machines for the classification of documents
Start date	October 2003
Finish date	October 2006

Name	José Saias
Degree	Ph.D.
Supervisor	Paulo Quaresma
Topic	Ontologies and inference on the web
Start date	October 2004
Finish date	October 2007

Name	Ana Luis Leal
Degree	Ph.D.
Supervisor	Paulo Quaresma
Topic	Automatic inference of rhetorical structures in Portuguese documents
Start date	October 2004
Finish date	October 2007

Name	Juan Carlos Acosta Guadarrama
Degree	Ph.D. in Computer Science, UNL
Supervisor	Luís Moniz Pereira
Topic	Belief revision and updating in logic programs
Start date	September 2003
	Desisted December 2004 and changed to a university in Germany

Name	Vítor Nogueira
Degree	Ph.D.
Supervisor	Salvador Abreu and Gabriel David (Faculty of Engineering, University of Porto)
Topic	Constraint and Logic Languages for Heterogeneous Database Systems
Start date	October 2001
Finish date	June 2006 (expected)

Name	Valéria Pequeno
Degree	Ph.D.
Supervisor	Joaquim N. Aparício
Topic	Object Oriented DataWarehousing
Start date	2001
Finish date	(expected) 2005

Name	Luis Quintano
Degree	Ph.D.
Supervisor	Irene Pimenta Rodrigues
Topic	Natural Language Dialogues for IR from BD
Start date	October 2003
Finish date	June 2006 (expected)

Name	Marco Vargas Correia
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Architecture for Advanced Constraint Solving Techniques
Start date	October 2004
Finish date	October 2008 (expected)

Name	João Borges
Degree	Ph.D.
Supervisor	Pedro Barahona
Topic	Constraints and Machine Learning for Predicting the Structure of Proteins
Start date	December 2004
Finish date	December 2008 (expected)

4 Publications

4.1 Edited books and journal special issues

[1] José Júlio Alferes and João Alexandre Leite, editors. *Logics in Artificial Intelligence, 9th European Conference, JELIA 2004, Lisbon, Portugal, September 27-30, 2004, Proceedings*, volume 3229 of *Lecture Notes in Computer Science*. Springer, 2004.

[2] M. Calejo, editor. *Proceedings of the 2nd ICEIS Doctoral Consortium 2004*, Porto, Portugal, 2004. INSTICC Press.

[3] C. Delrieux and L. M. Pereira. Guest editors of the special arising from the third international workshop on computational models of scientific reasoning and applications. *Journal of Applied Logic*, 2(4), 2004.

[4] Jürgen Dix and João Alexandre Leite, editors. *Computational Logic in Multi-Agent Systems, 4th International Workshop, CLIMA IV, Fort Lauderdale, FL, USA, January 6-7, 2004, Revised Selected and Invited Papers*, volume 3259 of *Lecture Notes in Computer Science*. Springer, 2004.

[5] J. Leite, A. Omicini, P. Torroni, and P. Yolum, editors. *2nd International Workshop on Declarative Agent Languages and Technologies, (DALT"04), New York, USA, July 19, 2004, Pre-Proceedings*, 2004.

[6] João Leite and Paolo Torroni, editors. *Computational Logic in Multi-Agent Systems, 5th International Workshop, CLIMA V, Lisbon, Portugal, September 29-30, 2004, Pre-Proceedings*, 2004.

[7] João Alexandre Leite, Andrea Omicini, Leon Sterling, and Paolo Torroni, editors. *Declarative Agent Languages and Technologies, First International Workshop, DALT 2003, Melbourne, Australia, July 15, 2003, Revised Selected and Invited Papers*, volume 2990 of *Lecture Notes in Computer Science*. Springer, 2004.

4.2 In International Journals

[8] J. J. Alferes, L. M. Pereira, and T. Swift. Abduction in well-founded semantics and generalized stable models via tabled dual programs. *Theory and Practice of Logic Programming*, 4(4):383–428, 2004.

[9] Anastasia Analyti, Grigoris Antoniou, Carlos Viegas Damásio, and Gerd Wagner. Negation and negative information in the w3c resource description framework. *Annals of Mathematics, Computing & Teleinformatics*, 2(1):25–34, 2004.

[10] J. Cruz and P. Barahona. Constraint reasoning in deep biomedical models. *Journal of Artificial Intelligence in Medicine*, 2004.

[11] J. Cruz and P. Barahona. Constraint reasoning over differential equations. *Applied Numerical Analysis and Computational Mathematics*, 1(1):140–154, 2004.

[12] P. Dell'Acqua and L. M. Pereira. Common-sense reasoning as proto-scientific agent activity. *Journal of Applied Logic*, 2(4):385–407, 2004.

[13] C. Delrieux and L.M. Pereira. Editorial. *Journal of Applied Logic*, 2(4):381–384, 2004.

[14] Jürgen Dix, João Alexandre Leite, and Ken Satoh. Introduction. *Annals of Mathematics and Artificial Intelligence*, 42(1-3):1–3, 2004.

[15] L. Granvilliers, J. Cruz, and P. Barahona. Parameter estimation using interval computations. *SIAM Journal on Scientific Computing (SISC)*, Special Issue on Uncertainty Quantification, 2004.

[16] J. Leite and P. Torroni. Fifth international workshop on computational logic in multi-agent systems - clima v. *AgentLink News*, 16:39, 2004.

[17] Aida Vitória, Carlos Viegas Damásio, and Jan Maluszynski. From rough sets to rough knowledge bases. *Fundamenta Informaticae*, 57(2-4), 2004.

[18] G. Wheeler and L. M. Pereira. Epistemology and logical artificial intelligence. *Journal of Applied Logic*, 2(4):469–493, 2004.

[19] Gregory Wheeler. Epistemology and artificial intelligence. *The Bulletin of Symbolic Logic*, 10(3):444, 2004.

4.3 In Proceedings of International Conferences

[20] S. Abreu and D. Diaz. Contexts for organizational information system design and implementation. In *ICEIS 2004, Proceedings of the 6th International Conference on Enterprise Information Systems*, pages 227–232, 2004.

[21] S. Abreu, D. Diaz, and V. Nogueira. Gnu prolog for application development. In *V RMLL/LSM - Libre Software Meeting*. University of Bordeaux I, July 2004. Invited paper.

[22] S. Abreu, D. Diaz, and V. Nogueira. Organizational information systems design and implementation with contextual constraint logic programming. In Viljan Mahnic, editor, *EUNIS 2004 - Proceedings of the 10th International Conference of European University Information Systems*. University of Llubljana, June-July 2004.

[23] Salvador Abreu, Paulo Quaresma, Luis Quintano, and Irene Rodrigues. A dialogue manager for accessing databases. In Yasushi Kiyoki, Eiji Kawaguchi, Hannu Jaakola, and Hannu Kangassalo, editors, *Information Modelling and Knowledge Bases XV*, volume 105, pages 210–219, Amsterdam, Netherlands, 2004. IOS Press.

[24] Ana Aires, Jorge Coelho, Sandra Collovini, Paulo Quaresma, and Renata Vieira. Avaliação de centering em resolução pronominal da língua portuguesa. In *5th International Workshop on Linguistically Interpreted Corpora of the Iberamia'2004*, pages 1–8, Puebla, México, November 2004.

[25] João Alcântara, Carlos Viegas Damásio, and Luís Moniz Pereira. A declarative characterisation of disjunctive paraconsistent answer sets. In Ramon López de Mántaras and Lorenza Saitta, editors, *Proceedings of the 16th European Conference on Artificial Intelligence, ECAI'2004, including Prestigious Applicants of Intelligent Systems, PAIS 2004*, pages 951–952. IOS Press, 2004.

[26] J. J. Alferes, F. Azevedo, P. Barahona, C. V. Damásio, and T. Swift. Deductive diagnosis of digital circuits. In *In First IFIP Conference on Artificial Intelligence Applications and Innovations (AIAI'2004)*, pages 155–165. Kluwer Academic Press, 2004.

[27] J. J. Alferes, F. Banti, and A. Brogi. From logic programs updates to action description updates. In João Leite and Paolo Torroni, editors, *Computational Logic in Multi-Agent Systems, 5th International Workshop, CLIMA V, Pre-Proceedings*, Lisbon, Portugal, 2004.

[28] José Júlio Alferes, F. Banti, Antonio Brogi, and João Alexandre Leite. Semantics for dynamic logic programming: A principle-based approach. In Vladimir Lifschitz and Ilkka Niemelä, editors, *Logic Programming and Nonmonotonic Reasoning, 7th International Conference, LPNMR 2004, Fort Lauderdale, FL, USA, January 6-8, 2004, Proceedings*, volume 2923 of *Lecture Notes in Computer Science*, pages 8–20. Springer, 2004.

[29] F. Banti, J. J. Alferes, , and A. Brogi. Well founded semantics for logic program updates. In Christian Lemaître, Carlos A. Reyes, and Jesús A. González, editors, *Advances in Artificial*

Intelligence - IBERAMIA 2004, 9th Ibero-American Conference on AI, Puebla, México, November 22-26, 2004, Proceedings, volume 3315 of *Lecture Notes in Computer Science*, pages 397–407. Springer, 2004.

[30] F. Banti, J. J. Alferes, and A. Brogi. From logic programs updates to action description updates. In G. Rossi and E. Panegai, editors, *Proceedings of CILC'04 - Italian Conference on Computational Logic*, 2004.

[31] Ch. Bratsas, N. Maglaveras, and P. Quaresma. A framework to describe problems and algorithms in medical informatics via ontologies. In *4th European Symposium on Biomedical Engineering*, pages 1–4, Patras, Greece, June 2004. University of Patras.

[32] Ch. Bratsas, P. Quaresma, G. Pangalos, and N. Maglaveras. Using ontologies to build a knowledge base of cardiology problems and algorithms. In *CinC – 31st annual meeting of Computers in Cardiology*, volume 31, pages 609–612, Chicago, USA, September 2004. IEEE.

[33] M. Calejo. Interprolog: towards a declarative embedding of logic programming in java. In J. J Alferes and J. A. Leite, editors, *Logics in Artificial Intelligence, 9th European Conference, JELIA 2004*, volume 3229 of *Lecture Notes in Computer Science*, pages 714–717. Springer, 2004.

[34] Jesús Medina Carlos Viegas Damásio and Manuel Ojeda-Aciego. Termination results for sorted multi-adjoint logic programs. In *Information Processing and Management of Uncertainty in Knowledge-Base Information Systems (IMPU'04)*, pages 1879–1886, Perugia, Italy, July 2004.

[35] J. F. Castro and L. M. Pereira. Abductive validation of a power-grid expert system diagnoser. In *17th Intl.Conf. on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems, (IEA-AIE'04), Proceedings*, Ottawa, Canada, 2004. IPMU.

[36] M. Correia and P. Barahona. Machine learned heuristics to improve constraint satisfaction. In Ana L. C. Balzan and Sofiane Labidi, editors, *17th Brazilian Symposium on Artificial Intelligence, SBIA'04 (Procs.)*, volume 3171 of *Lecture Notes in Computer Science*, pages 103–113. Springer, 2004.

[37] Carlos Viegas Damásio, Jesús Medina, and Manuel Ojeda-Aciego. Sorted multi-adjoint logic programs: Termination results and applications. In J. J Alferes and J. A. Leite, editors, *Logics in Artificial Intelligence, 9th European Conference, JELIA 2004*, volume 3229 of *Lecture Notes in Computer Science*, pages 121–133. Springer, 2004.

[38] Carlos Viegas Damásio, Jesús Medina, and Manuel Ojeda-Aciego. A tabulation proof procedure for residuated logic programming. In Ramon López de Mántaras and Lorenza Saitta, editors, *Proceedings of the 16th European Conference on Artificial Intelligence, ECAI'2004, including Prestigious Applicants of Intelligent Systems, PAIS 2004*, pages 808–812. IOS Press, 2004.

[39] Carlos Viegas Damásio, Jesús Medina, and Manuel Ojeda-Aciego. A termination theorem for sorted multi-adjoint logic programs. In J. J Alferes and J. A. Leite, editors, *XII Congreso Español sobre Tecnologías y Lógica Fuzzy*, 2004.

[40] Carlos Viegas Damásio and Luís Moniz Pereira. Sorted monotonic logic programs and their embeddings. In *Information Processing and Management of Uncertainty in Knowledge-Base Information Systems (IMPU'04), Special Session on Logic Programming with Imperfect Information*, pages 807–814, Perugia, Italy, July 2004.

[41] P. Dell'Acqua. Weighted Multi Dimensional Logic Programming. In Juergen Dix and J. A. Leite, editors, *4th Int. Workshop on Computational Logic in Multi-Agent Systems (Clima IV)*, LNAI 3259, pages 178–200, Berlin, 2004. Springer-Verlag.

[42] A. Donati, F. D. Marco, N. Viana, M. Pantoquilho, A. Baumgartner, and J. Moura-Pires. Space weather and mission control: A roadmap to an operational multi-mission decision support system. In *Eight International Conference on Space Operations (SpaceOps 2004)*, 2004.

[43] I. Dorotovic, M. Pantoquilho, N. Viana, and J. Moura-Pires. Space environment information system for mission control purposes - a decision support system based on an architecture for space weather services. In *17th National Solar Physics Meeting*, 2004.

[44] Teresa Gonçalves and Paulo Quaresma. The impact of nlp techniques in the multilabel classification problem. In Slawomir T. Weirzchon Mieczyslaw A Klopotek and Krzysztof Trojanowski, editors, *Intelligent Information Processing and Web Mining 2004*, Advances in Soft Computing, pages 424–428, Zakopane, Poland, May 2004. Springer-Verlag.

[45] Teresa Gonçalves and Paulo Quaresma. Using ir techniques to improve automated text classification. In Farid Meziane and Elisabeth Metais, editors, *Natural Language Processing and Information Systems*, Lecture Notes on Computer Science 3136, pages 374–379, Salford, UK, June 2004. Springer-Verlag.

[46] João Alexandre Leite. On some differences between semantics of logic program updates. In Christian Lemaître, Carlos A. Reyes, and Jesús A. González, editors, *Advances in Artificial Intelligence - IBERAMIA 2004, 9th Ibero-American Conference on AI, Puebla, México, November 22-26, 2004, Proceedings*, volume 3315 of *Lecture Notes in Computer Science*, pages 375–385. Springer, 2004.

[47] Nuno Cavalheiro Marques and Sergio Gonçalves. Applying a part-of-speech tagger to postal address detection on the web. In *Proceedings of the IV International Conference on Language Resources and Evaluation*, pages 287–290, Lisboa, Portugal, May 2004.

[48] Wolfgang May, J. J. Alferes, and François Bry. Towards generic query, update, and event languages for the semantic web. In H. J. Ohlbach and S. Schaffert, editors, *Principles and Practice of Semantic Web Reasoning*, volume 3208 of *Lecture Notes in Computer Science*, pages 19–33. Springer, 2004.

[49] A. Monteiro and L. M. Pereira. A updating legal documents - the case of phytosanitary protection of vegetables. In *Intl.Conf. on Knowledge Engineering and Decision Support (ICKEDS'04), Porto, Portugal, July 21-23, 2004, Proceedings*. IKEDS, 2004.

[50] J. Moura-Pires, M. Pantoquilho, , and N. Viana. Real-time decision support system for space missions control. In *The International Conference on Information and Knowledge Engineering*, 2004.

[51] J. Moura-Pires, M. Pantoquilho, , and N. Viana. Space environment information system for mission control purposes: Real-time monitoring and inference of space craft status. In *IEEE Conference on Control Applications*, 2004.

[52] V. Nogueira, S. Abreu, and G. David. Temporal reasoning in cnstraint contextual logic programming. In P. Hofstedt, editor, *Proceedings of the 3rd International Workshop on Multiparadigm Constraint Programming Languages (MultiCPL'04)*, pages 119–131. TU Berlin, September 2004.

[53] M. Pantoquilho, J. Neto, J. Moura-Pires, and A. Donati. Real time monitoring of space weather and spacecraft conditions for early anomaly detection within the seis system. In *FESWW - First European Space Weather Week*, 2004.

[54] M. Pantoquilho, J. Neto, N. Viana, R. Ribeiro, and J. Moura-Pires. Online and offline monitoring and diagnosis of spacecraft and space weather status. In *EUROFUSE Workshop on Data and Knowledge Engineering*, 2004.

[55] L. M. Pereira and A. M. Pinto. Revised stable models - a new semantics for logic programs. In Dipartimento di Matematica, editor, *Convegno Italiano di Logica Computazionale (CILC'04), Parma, Italy, June 16-17, 2004, Proceedings*. Università di Parma, 2004. Invited paper.

[56] Luiz Pizzato, Paulo Quaresma, and Vera Lima. Intrinsic and extrinsic evaluation of thesaurus-based query expansion technique. In *2004 IEEE/WIC/ACM International Conference on Web Intelligence (demo and poster)*, Beijing, China, September 2004.

[57] Paulo Quaresma, Luis Quintano, Irene Rodrigues, and Pedro Salgueiro. The university of Évora approach to qa@clef-2004. In Carol Peters and Francesca Borri, editors, *Question-Answering Track of the Cross Language Evaluation Forum*, pages 403–412, Bath, UK, 2004. Istituto di Scienza e Tecnologie dell'Informazione, Consiglio Nazionale delle Richerche, ISTI-CNR, Italy.

[58] Cassiana Silva, Renata Vieira, Fernando Osório, and Paulo Quaresma. Mining linguistically interpreted texts. In *5th International Workshop on Linguistically Interpreted Corpora of the Computational Linguistic International Conference (COLING'2004)*, pages 1–4, Geneve, Switzerland, August 2004. Coling.

[59] J. Simão and L. M. Pereira. What's cool? modelling fashion-like collective behavior emergence from individual neuro-psychological conditioning. In B. Espinasse H.Coelho, editor, *5th Workshop on Agent-Based Simulation (ABS-2004) Proceedings*, Lisbon, Portugal, 2004. SCS - Society for Computer Simulation International.

[60] N. Viana, J. Moura-Pires, and A. Donati. Handling heterogeneous real-time and historical space weather and spacecraft data in the seis project. In *FESWW - First European Space Weather Week*, 2004.

[61] Aida Vitória, Carlos Viegas Damásio, and Jan Maluszynski. Towards rough knowledge bases with quantitative measures. In S. Tsumoto S., R. Slowinski, J. Komorowski, and J. W. Grzymala-Busse, editors, *Fourth International Conference on Rough Sets and Current Trends in Computing 2004 (RSCTC'2004)*, number 3066 in Lecture Notes in Computer Science, pages 153–158, Uppsala, Sweden, June 2004. Springer.

[62] Gregory Wheeler. A resource bounded default logic. In James Delgrande and Torsten Schaub, editors, *NMR 2004*, pages 416–422, 2004.

[63] Gregory R. Wheeler and Carlos Viegas Damásio. An implementation of statistical default logic. In J. J Alferes and J. A. Leite, editors, *Logics in Artificial Intelligence, 9th European Conference, JELIA 2004*, volume 3229 of *Lecture Notes in Computer Science*, pages 121–133. Springer, 2004.

4.4 In National Conferences or Journals

[64] G. Wheeler and L. M. Pereira. Chrisholm, naturalism, and the role of logic in epistemology. In *II^{O} Encontro Nacional de Filosofia Analítica (ENFA-2), U. Porto, Portugal, October 7-9, 2004, Proceedings*. Sociedade Portuguesa de Filosofia Analítica, 2004.

4.5 Other publications

[65] Jeannette Bohg, Reinhard Kahle, and Alexandre Miguel Pinto. A distributed tele-teaching environment for synchronous communication and interaction. Technical report, TU Dresden and CENTRIA, 2004.

[66] Miguel Calejo. Potential applications for existing CENTRIA technology, December 2004. CENTRIA Internal Memorandum.

5 Missions

Salvador Abreu

- Paris, France, January 2004: Salvador Abreu
  Purpose: meeting with François Fages and Pierre Deransart to prepare a new bilateral project around GNU Prolog.
- Bled, Slovenia, June 2004: Salvador Abreu and Vitor Nogueira
  Purpose: participation in the EUNIS'04 conference.
- Bordeaux, France, July 2004: Salvador Abreu and Vitor Nogueira
  Purpose: participation in the LSM/RMLL'04 meeting.
- St. Malo, France, September 2004: Salvador Abreu and Vitor Nogueira
  Purpose: participation in the ICLP'04 conference.

José Júlio Alferes

- Munich, March 2004
  Purpose: Participation in the kick-off meeting of project Rewerse, and the meeting of the I5 working group on Evolution and Reactivity.
- Munich, June 2004
  Purpose: Participation in a meeting of project Rewerse of the working groups on Querying and on Evolution and Reactivity.
- St. Malo, France, September 2004.
  Purpose: participation in the ICLP'04 and PPSWR'04 conference.
- Brussels, December 2004
  Purpose: Participation in a review panel of IST-FET projects.

João Lima Alcântara

- Valencia, Spain, August 2004
  Purpose: presentation of a poster at European Conference on Artificial Intelligence, ECAI'2004.

Francisco Azevedo

- Toulouse, France, August 2004
  Purpose: Participation and paper presentation in First IFIP Conference on Artificial Intelligence Applications and Innovations (AIAI'2004)
- Lisbon, Portugal, September, 2004
  Purpose: Participation in kick-off meetings of international MSc in Computational Logic and of AsiaLink project.

Federico Banti

- Fort Lauderdale, USA, January 2004
  Purpose: Participation, and paper presentation at LPNMR-7.
- Parma, Italy, June 2004
  Purpose: Participation, and paper presentation at CILC'04.
- Puebla, Mexico, November 2004
  Purpose: Participation, and paper presentation at IBERAMIA'04.

Pedro Barahona

- Munich, March 2004
  Purpose: Participation in the kick-off meeting of project Rewerse, and the meeting of the A2 working group on Bioinformatics.

- London, June 2004
  Purpose: Participation in the Programme Committee meeting of the CP'04 Conference.
- Dresden, July 2004
  Purpose: Participation in 2nd meeting of the A2 working group on Bioinformatics.
- Paris, September 2004
  Purpose: Preparation of a FET proposal to to the EU, with partners from Univ. of Cork, Dassault, Univ. de Nantes, EPFL Lausanne.
- Toronto, September 2004
  Purpose: Participation in the Programme in the CP'04 Conference..

Jorge Cruz

- Paris, France, September 2004
  Purpose: Participation in a meeting to prepare a FET Project proposal (C2D Project)

Carlos Viegas Damásio

- Munich, Germany, March 2004
  Purpose: Participation in the annual meeting of the Network of Excellence on Reasoning with Rules in the Semantic Web (REWERSE)
- Perugia, Italy, July 2004
  Purpose: Participation in the conference Information Processing and Management of Uncertainty, IPMU'04, presenting two papers.

Teresa Gonçalves

- Porto Alegre, Brasil, September 2004
  Purpose: Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.
- Zakopane, Poland, May 2004
  Purpose: Participation in the Intelligent Information Processing and Web Mining 2004 Conference
- Salford, UK, June 2004
  Purpose: Participation in the Natural Language Processing and Information Systems Conference

Reinhard Kahle

- Braga, January 2004
  Purpose: Talk and Participation at International Conference *Days in Logic*.
- Coimbra, April 2004
  Purpose: Talk at the Algebra Seminar of *CMUC — Centre for Mathematics, University of Coimbra*
- Dresden, June 2004
  Purpose: Organization, Talk and Participation at the International Workshop *Proof, Computation, Complexity — PCC'04*.
- Konstanz, July 2004
  Purpose: Talk and Participation at the International Conference *Degrees of Beliefs*.

João Leite

- New York, USA, July 2004
  Purpose: Participation in DALT'04, 2nd International Workshop on Declarative Agent Languages and Technologies, and in AAMAS'04, 3rd International Conference on Autonomous Agents and Multi Agent Systems.

- Fort Lauderdale, Florida, USA, January 2004
  Purpose: Participation in CLIMA IV, 4th International Workshop on Computational Logic in Multiagent Systems and in LPNMR 7, Seventh International Conference on Logic Programming and Nonmonotonic Reasoning.

Nuno C. Marques

- Lisbon, May 2004
  Purpose: Participation in LREC 2004, 4th International conference on Language Resources and Evaluation.
- Lisbon, Portugal, May 2004

Luís Moniz Pereira

- London, UK, 22-25 April 2004
  Purpose: Participation in CoLogNeg project meeting.
- Bologna, Italy, March-June 2004
  Purpose: Elected Fellow 4-month sabbatical stay as at Istituto di Studi Avanzati.
- Parma, Italy, June 16-17, 2004
  Purpose: Participation in Convegno Italiano di Logica Computazionale (CILC'04) to present invited paper.
- Valencia, Spain, August 2004
  Purpose: Participation with Poster in European Conference on AI (ECAI04), and in meeting of CoLogNet project for preparing continuation proposal.

João Moura-Pires

- Madrid, SP, December 2004
  Purpose: Participation in a metting to prepapre a project proposal for ESA: Space Environment Support System (SESS) for Navigation And Telecom Missions.
- Noordwijk, ND, December 2004
  Purpose: Participation in the conference "First European Space Weather Week", and presenting a demo of a prototype from SEIS Project

Paulo Quaresma

- Porto Alegre, Brasil, February 2004
  Purpose: Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Irene Rodrigues

- Bath, UK, 15-17 September 2004
  Purpose: Participation in CLEF (Cross-Language System Evaluation).

José Saias

- Porto Alegre, Brasil, February 2004
  Purpose: Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Gregory Wheeler

- Chicago, April 2004
  Purpose: Participation in the 2004 Spring Meeting of the Association for Symbolic Logic.

- Whistler, BC, June 2004
  Purpose: Participation in the 10th International Workshop on Non-monotonic Logic (NMR-2004)
- Lisbon, September 2004
  Purpose: Participation in 9th European Conference on Logics in AI (JELIA 2004)
- Porto, October 2004
  Purpose: Participation in the 2nd meeting of the Portuguese Society for Analytic Philosophy
- Rochester, NY, October 2004
  Purpose: Participation in a Symposium in honor of Henry E. Kyburg, Jr.

6 Visitors

Franz Baader , Technical University Dresden, Germany, 19-21 February 2004. Meeting of joint MSc in Computational Logic.

Matthias Baaz , Technical University of Vienna, Austria, 19-21 February 2004 Meeting of joint MSc in Computational Logic.

Martin Balaz , student from the Faculty of Mathematics, Physics and Informatics, University of Bratislava, 3 months, 2004.
Study and implementation of Prolog based Semantic Web tools.

Albert Burger , University of Herriot-Watt, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

Pierangelo Dell'Acqua , University of Linköping, Sweden, 4 weeks, July 2004. Collaboration in agents modelling and preferences, and writing joint papers.

Andreas Doms , University of Dresden, 5 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics, and of Rewerse I5 working group on evolution and reactivity.

Michael Eckert , University Munich, 5 days, December 2004, meeting of the Rewerse I5 working group on evolution and reactivity.

Enrico Franconi , University of Bolzano, Italy, 19-21 February 2004. Meeting of joint MSc in Computational Logic.

Rodrigo Goulart , UNISINOS, Porto Alegre, Brasil, 2 weeks, February 2004. Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Manuel Hermenegildo Madrid Polytechnical University, Spain, 19-21 February 2004. Meeting of joint MSc in Computational Logic.

Susana Muñoz Hernandez , Madrid Polytechnical University, Spain, 19-21 February 2004. Meeting of joint MSc in Computational Logic.

Steffen Hoelldobler , Technical University Dresden, Germany, 19-21 February 2004. Meeting of joint MSc in Computational Logic.

Steffen Hoelldobler , Technical University Dresden, Germany, 27 September - 1 October 2004. Consulting meeting of proposal for continuation of CoLogNet, and startup meeting of European Asia-Link project in Computational Logic.

Vaida Jakoniene , University of Linköping, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

Patrick Lambrix , University of Linköping, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

Wolfgang May , University Goettingen, 5 days, December 2004, meeting of the Rewerse I5 working group on evolution and reactivity.

Steffen Moeller , University of Rostock, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

Daniel Olmedilla , Learning Lab of the University of Hannover, 1 week, December 2004. Application of distributed termination algorithms developed by project TARDE to peer-to-peer systems.

Björn Olsson , University of Skovde, 5 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics, and of Rewerse I5 working group on evolution and reactivity.

Paula-Lavinia Patranjan , University Munich, 5 days, December 2004, meeting of the Rewerse I5 working group on evolution and reactivity.

David Pearce , Rey Juan Carlos University, Madrid, Spain, 27-28 September 2004. Consulting meeting of proposal for continuation of CoLogNet.

Francesca Rossi Padova University, Italy, 27-28 September 2004. Consulting meeting of proposal for continuation of CoLogNet.

Michael Schroeder , University of Dresden, 5 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics, and of Rewerse I5 working group on evolution and reactivity.

Sylvain Soliman , Inria - Rocquencourt, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

Yohanes Stefanus , University of Indonesia at Jakarta, Indonesia, 29 Sepetember-1 October 2004. Startup meeting of European Asia-Link project in Computational Logic.

Michael Thielsher , Technical University of Dresden, Germany, 3 weeks, November 2004. Collaboration in action modelling in FLUX, Situational Calculus, and EVOLP languages.

Nguyen Thanh Thuy , Technical University of Hanoi, Vietnam, 29 Sepetember-1 October 2004. Startup meeting of European Asia-Link project in Computational Logic.

Terrance Swift , University of SUNY at Stony Brook, USA, 2 weeks, November/December 2004. Collaboration in logic programming in the scope of project TARDE: namely semantic web, ontologies, distributed completion algorithms, semantics.

Renata Vieira , UNISINOS, Porto Alegre, Brasil, 2 weeks, September 2004. Collaboration in the scope of the GRICES/CAPES DIRPI research project for the development of computational resources for the Portuguese language.

Sebastien Will , University of Iena, 3 days, December 2004, meeting of the Rewerse A2 working group on Bioinformatics.

7 CENTRIA evolution graphics in 2004