IN PARTNERSHIP WITH:
CNRS

Université Nice - Sophia Antipolis

Activity Report 2016

Project-Team WIMMICS

Web-Instrumented Man-Machine Interactions, Communities and Semantics

IN COLLABORATION WITH: Laboratoire informatique, signaux systèmes de Sophia Antipolis (I3S)

RESEARCH CENTER
Sophia Antipolis - Méditerranée

THEME
Data and Knowledge Representation and Processing

Table of contents

Project-Team WIMMICS

Creation of the Team: 2012 January 01, updated into Project-Team: 2013 July 01

This report is dedicated to the memory of Papa Fary Diallo †, PhD student in the Wimmics team and University Gaston Berger, Saint-Louis, Sénégal.

Keywords:

Computer Science and Digital Science:

1.2.9. - Social Networks
3.1.1. - Modeling, representation
3.1.2. - Data management, quering and storage
3.1.3. - Distributed data
3.1.4. - Uncertain data
3.1.5. - Control access, privacy
3.1.7. - Open data
3.2. - Knowledge
3.2.1. - Knowledge bases
3.2.2. - Knowledge extraction, cleaning
3.2.3. - Inference
3.2.4. - Semantic Web
3.2.5. - Ontologies
3.3.2. - Data mining
3.5. - Social networks
3.5.2. - Recommendation systems
4.7. - Access control
5.1. - Human-Computer Interaction
5.1.1. - Engineering of interactive systems
5.1.2. - Evaluation of interactive systems
5.2. - Data visualization
5.8. - Natural language processing
5.10.5. - Robot interaction (with the environment, humans, other robots)
8. - Artificial intelligence
8.1. - Knowledge
8.4. - Natural language processing
8.7. - AI algorithmics

Other Research Topics and Application Domains:

1.3.2. - Cognitive science
5.6. - Robotic systems
5.8. - Learning and training
6.3.1. - Web
6.3.4. - Social Networks
6.5. - Information systems
8.2. - Connected city

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2. Overall Objectives

2.1. Presentation

2.1.1. Context and Objectives

The Web became a virtual place where persons and software interact in mixed communities. These large scale mixed interactions create many problems that must be addressed with multidisciplinary approaches [75]. One particular problem is to reconcile formal semantics of computer science (e.g. logics, ontologies, typing systems, protocols, etc.) on which the Web architecture is built, with soft semantics of people (e.g. posts, tags, status, relationships, etc.) on which the Web content is built.

Wimmics proposes models and methods to bridge formal semantics and social semantics on the Web. [74]

From a formal modeling point of view, one of the consequences of the evolutions of the Web is that the initial graph of linked pages has been joined by a growing number of other graphs. This initial graph is now mixed with sociograms capturing the social network structure, workflows specifying the decision paths to be followed, browsing logs capturing the trails of our navigation, service compositions specifying distributed processing, open data linking distant datasets, etc. Moreover, these graphs are not available in a single central repository but distributed over many different sources. Some sub-graphs are small and local (e.g. a user's profile on a device), some are huge and hosted on clusters (e.g. Wikipedia), some are largely stable (e.g. thesaurus of Latin), some change several times per second (e.g. social network statuses), etc. And each type of network of the Web is not an isolated island. Networks interact with each other: the networks of communities influence the message flows, their subjects and types, the semantic links between terms interact with the links between sites and vice-versa, etc.

Not only do we need means to represent and analyze each kind of graphs, we also do need the means to combine them and to perform multi-criteria analysis on their combination. Wimmics contributes to this understanding by: (1) proposing multidisciplinary approaches to analyze and model the many aspects of these intertwined information systems, their communities of users and their interactions; (2) formalizing and reasoning on these models using graphs-based knowledge representation from the semantic Web to propose new analysis tools and indicators, and support new functionalities and better management. In a nutshell, the first research direction looks at models of systems, users, communities and interactions while the second research direction considers formalisms and algorithms to represent them and reason on their representations.

2.1.2. Research Topics

The research objectivs of Wimmics can be grouped according to four topics we identify in reconciling social and formal semantics on the Web:

Topic 1 - users modeling and designing interaction on the Web: The general research question addressed by this objective is "*How do we improve our interactions with a semantic and social Web ?*". Wimmics focuses on specific sub-questions: "How can we capture and model the users' characteristics?" "How can we represent and reasons with the users' profiles?" "How can we adapt the system behaviors as a result?" "How can we design new interaction means?" "How can we evaluate the quality of the interaction designed?"

Topic 2 - communities and social interactions analysis on the Web: The general question addressed in this second objective is "*How can we manage the collective activity on social media?*". Wimmics focuses on the following sub-questions: "How do we analyze the social interaction practices and the structures in which these practices take place?" "How do we capture the social interactions and structures?" "How can we formalize the models of these social constructs?" "How can we analyze and reason on these models of the social activity ?"

Topic 3 - vocabularies, semantic Web and linked data based knowledge representation on the Web: The general question addressed in this third objective is "*What are the needed schemas and extensions of the semantic Web formalisms for our models?*". Wimmics focuses on several sub-questions: "What kinds of formalism are the best suited for the models of the previous section?" "What are the limitations and possible extensions of existing formalisms?" "What are the missing schemas, ontologies, vocabularies?" "What are the links and possible combinations between existing formalisms?" In a nutshell, an important part of this objective is to formalize as typed graphs the models identified in the previous objectives in order for software to exploit them in their processing (in the next objective).

Topic 4 - analyzing and reasoning on heterogeneous semantic graphs on the Web: The general research question addressed in this last objective is "*What are the algorithms required to analyze and reason on the heterogeneous graphs we obtained?*". Wimmics focuses on several sub-questions: "How do we analyze graphs of different types and their interactions?" "How do we support different graph life-cycles, calculations and characteristics in a coherent and understandable way?" "What kind of algorithms can support the different tasks of our users?".

3. Research Program

3.1. Users Modeling and Designing Interaction on the Web

Wimmics focuses on interactions of ordinary users with ontology-based knowledge systems with a preference for semantic Web formalisms and Web 2.0 applications. We specialize interaction design and evaluation methods to Web application tasks such as searching, browsing, contributing or protecting data. The team is especially interested in using semantics in assisting the interactions. We propose knowledge graph representations and algorithms to support interaction adaptation for instance for context-awareness or intelligent interactions with machine. We propose and evaluate Web-based visualization techniques for linked data, querying, reasoning, explaining and justifying. Wimmics also integrates natural language processing approaches to support natural language based interactions. We rely on cognitive studies to build models of the system, the user

and the interactions between users through the system, in order to support and improve these interactions. We extend the user modeling technique known as *Personas* where user models are represented as specific, individual humans. *Personas* are derived from significant behavior patterns (i.e., sets of behavioral variables) elicited from interviews with and observations of users (and sometimes customers) of the future product. Our user models specialize *Personas* approaches to include aspects appropriate to Web applications. Wimmics also extends user models to capture very different aspects (e.g. emotional states).

3.2. Communities and Social Interactions Analysis

The domain of social network analysis is a whole research domain in itself and Wimmics targets what can be done with typed graphs, knowledge representations and social models. We also focus on the specificity of social Web and semantic Web applications and in bridging and combining the different social Web data structures and semantic Web formalisms. Beyond the individual user models, we rely on social studies to build models of the communities, their vocabularies, activities and protocols in order to identify where and when formal semantics is useful. We propose models of collectives of users and of their collaborative functioning extending the collaboration personas and methods to assess the quality of coordination interactions and the quality of coordination artifacts. We extend and compare community detection algorithms to identify and label communities of interest with the topics they share. We propose mixed representations containing social semantic representations (e.g. folksonomies) and formal semantic representations (e.g. ontologies) and propose operations that allow us to couple them and exchange knowledge between them. Moving to social interaction we develop models and algorithms to mine and integrate different yet linked aspects of social media contributions (opinions, arguments and emotions) relying in particular on natural language processing and argumentation theory. To complement the study of communities we rely on multi-agent systems to simulate and study social behaviors. Finally we also rely on Web 2.0 principles to provide and evaluate social Web applications.

3.3. Vocabularies, Semantic Web and Linked Data Based Knowledge Representation

For all the models we identified in the previous sections, we rely on and evaluate knowledge representation methodologies and theories, in particular ontology-based modeling. We also propose models and formalisms to capture and merge representations of different levels of semantics (e.g. formal ontologies and social folksonomies). The important point is to allow us to capture those structures precisely and flexibly and yet create as many links as possible between these different objects. We propose vocabularies and semantic Web formalizations for the whole aspects we model and we consider and study extensions of these formalisms when needed. The results have all in common to pursue the representation and publication of our models as linked data. We also contribute to the transformation and linking of existing resources (informal models, databases, texts, etc.) to be published on the semantic Web and as linked data. Examples of aspects we formalize include: user profiles, social relations, linguistic knowledge, business processes, derivation rules, temporal descriptions, explanations, presentation conditions, access rights, uncertainty, emotional states, licenses, learning resources, etc. At a more conceptual level we also work on modeling the Web architecture with philosophical tools so as to give a realistic account of identity and reference and to better understand the whole context of our research and its conceptual cornerstones.

3.4. Analyzing and Reasoning on Heterogeneous Semantic Graphs

One of the characteristics of Wimmics is to rely on graph formalisms unified in an abstract graph model and operators unified in an abstract graph machine to formalize and process semantic Web data, Web resources, services metadata and social Web data. In particular Corese, the core software of Wimmics, maintains and implements that abstraction. We propose algorithms to process the mixed representations of the previous section. In particular we are interested in allowing cross-enrichment between them and in exploiting the life cycle and specificity of each one to foster the life-cycles of the others. Our results all have in common to pursue

analyzing and reasoning on heterogeneous semantic graphs issued from social and semantic Web applications. Many approaches emphasize the logical aspect of the problem especially because logics are close to computer languages. We defend that the graph nature of Linked Data on the Web and the large variety of types of links that compose them call for typed graphs models. We believe the relational dimension is of paramount importance in these representations and we propose to consider all these representations as fragments of a typed graph formalism directly built above the Semantic Web formalisms. Our choice of a graph based programming approach for the semantic and social Web and of a focus on one graph based formalism is also an efficient way to support interoperability, genericity, uniformity and reuse.

4. Application Domains

4.1. Social Semantic Web

A number of evolutions have changed the face of information systems in the past decade but the advent of the Web is unquestionably a major one and it is here to stay. From an initial wide-spread perception of a public documentary system, the Web as an object turned into a social virtual space and, as a technology, grew as an application design paradigm (services, data formats, query languages, scripting, interfaces, reasoning, etc.). The universal deployment and support of its standards led the Web to take over nearly all of our information systems. As the Web continues to evolve, our information systems are evolving with it.

Today in organizations, not only almost every internal information system is a Web application, but these applications also more and more often interact with external Web applications. The complexity and coupling of these Web-based information systems call for specification methods and engineering tools. From capturing the needs of users to deploying a usable solution, there are many steps involving computer science specialists and non-specialists.

We defend the idea of relying on Semantic Web formalisms to capture and reason on the models of these information systems supporting the design, evolution, interoperability and reuse of the models and their data as well as the workflows and the processing.

4.2. Linked Data on the Web and on Intranets

With billions of triples online (see Linked Open Data initiative), the Semantic Web is providing and linking open data at a growing pace and publishing and interlinking the semantics of their schemas. Information systems can now tap into and contribute to this Web of data, pulling and integrating data on demand. Many organisations also started to use this approach on their intranets leading to what is called linked enterprise data.

A first application domain for us is the publication and linking of data and their schemas through Web architectures. Our results provide software platforms to publish and query data and their schemas, to enrich these data in particular by reasoning on their schemas, to control their access and licenses, to assist the workflows that exploit them, to support the use of distributed datasets, to assist the browsing and visualization of data, etc.

Examples of collaboration and applied projects include: SMILK Joint Laboratory, Corese, DBpedia.fr.

4.3. Assisting Web-based Epistemic Communities

In parallel to linked open data on the Web, social Web applications also spread virally (e.g. Facebook growing toward 1.5 billion users) first giving the Web back its status of a social read-write media and then putting it back on track to its full potential of a virtual place where to act, react and interact. In addition, many organizations are now considering deploying social Web applications internally to foster community building, expert cartography, business intelligence, technological watch and knowledge sharing in general.

By reasoning on the Linked Data and the semantics of the schemas used to represent social structures and Web resources, we provide applications supporting communities of practice and interest and fostering their interactions in many different contexts (e-learning, business intelligence, technical watch, etc.).

We use typed graphs to capture and mix: social networks with the kinds of relationships and the descriptions of the persons; compositions of Web services with types of inputs and outputs; links between documents with their genre and topics; hierarchies of classes, thesauri, ontologies and folksonomies; recorded traces and suggested navigation courses; submitted queries and detected frequent patterns; timelines and workflows; etc.

Our results assist epistemic communities in their daily activities such as biologists exchanging results, business intelligence and technological watch networks informing companies, engineers interacting on a project, conference attendees, students following the same course, tourists visiting a region, mobile experts on the field, etc. Examples of collaboration and applied projects: EduMICS, OCKTOPUS, Vigiglobe, Educlever, Gayatech.

4.4. Linked Data for a Web of diversity

We intend to build on our results on explanations (provenance, traceability, justifications) and to continue our work on opinions and arguments mining toward the global analysis of controversies and online debates. One result would be to provide new search results encompassing the diversity of viewpoints and providing indicators supporting opinion and decision making and ultimately a Web of trust. Trust indicators may require collaborations with teams specialized in data certification, cryptography, signature, security services and protocols, etc. and this will raise the specific problem of interaction design for security and privacy. In addition, from the point of view of the content, this requires to foster the publication and coexistence of heterogeneous data with different points of views and conceptualizations of the world. We intend to pursue the extension of formalisms to allow different representations of the world to co-exist and be linked and we will pay special attention to the cultural domain and the digital humanities. Examples of collaboration and applied projects: Zoomathia, Seempad, SMILK,

4.5. Artificial Web intelligence

We intend to build on our experience in artificial intelligence (knowledge representation, reasoning) and distributed artificial intelligence (multi-agent systems - MAS) to enrich formalisms and propose alternative types of reasoning (graph-based operations, reasoning with uncertainty, inductive reasoning, non-monotonic, etc.) and alternative architectures for linked data with adequate changes and extensions required by the open nature of the Web. There is a clear renewed interest in AI for the Web in general and for Web intelligence in particular. Moreover distributed AI and MAS provide both new architectures and new simulation platforms for the Web. At the macro level, the evolution accelerated with HTML5 toward Web pages as full applications and direct Page2Page communication between browser clearly is a new area for MAS and P2P architectures. Interesting scenarios include the support to a strong decentralization of the Web and its resilience to degraded technical conditions (downscaling the Web), allowing pages to connect in a decentralized way, forming a neutral space, and possibly going offline and online again in erratic ways. At the micro level one can imagine the place RDF and SPARQL could take as data model and programming model in the virtual machines of these new Web pages and, of course, in the Web servers. RDF is also used to serialize and encapsulate other languages and becomes a pivot language in linking very different applications and aspects of applications. Example of collaboration and applied projects: MoreWAIS, Corese, Vigiglobe collaboration.

4.6. Human-Data Interaction (HDI) on the Web

We need more interaction design tools and methods for linked data access and contribution. We intend to extend our work on exploratory search coupling it with visual analytics to assist sense making. It could be a continuation of the Gephi extension we built targeting more support for non expert to access and analyze data on a topic or issue of their choice. More generally speaking SPARQL is inappropriate for common users and we need to support a larger variety of interaction means with linked data. We also believe linked data and natural

language processing (NLP) have to be strongly integrated to support natural language based interactions. Linked Open Data (LOD) for NLP, NLP for LOD and Natural Dialog Processing for querying, extracting and asserting data on the Web is a priority to democratize its use. Micro accesses and micro contributions are important to ensure public participation and also call for customized interfaces and thus for methods and tools to generate these interfaces. In addition, the user profiles are being enriched now with new data about the user such as his current mental and physical state, the emotion he just expressed or his cognitive performances. Taking into account this information to improve the interactions, change the behavior of the system and adapt the interface is a promising direction. And these human-data interaction means should also be available for "small data", helping the user to manage her personal information and to link it to public one or collective one maintaining her personal and private perspective as a personal Web of data. Finally, the continuous knowledge extractions, updates and flows add the additional problem of representing, storing, querying and interacting with dynamic data. Examples of collaboration and applied projects: QAKIS, Sychonext collaboration, ALOOF, DiscoveryHub, Wasabi, MoreWAIS.

Web-augmented interactions with the world: The Web continues to augment our perception and interaction with reality. In particular, Linked Open Data enable new augmented reality applications by providing data sources on almost any topic. The current enthusiasm for the Web of Things, where every object has a corresponding Web resource, requires evolutions of our vision and use of the Web architecture. This vision requires new techniques as the ones mentioned above to support local search and contextual access to local resources but also new methods and tools to design Web-based human devices interactions. These new usages are placing new requirements on the Web Architecture in general and on the semantic Web models and algorithms in particular to handle new types of linked data. They should support implicit requests considering the user context as a permanent query. They should also simplify our interactions with devices around us jointly using our personal preferences and public common knowledge to focus the interaction on the vital minimum that cannot be derived in another way. For instance the access to the Web of data for a robot can completely change the quality of the interactions it can offer. Again these interactions and the data they require raise problems of security and privacy. Examples of collaboration and applied projects: ALOOF, AZKAR, MoreWAIS.

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards & Nominees

The Wimmics team received collectively the Université Côte d'Azur Award in recognition of the ISWC best demo.

Best demo award at ISWC for *Semantic Web Technologies for improving remote visits of museums, using a mobile robot* [32].

Best poster nominee at ISWC for *Materializing the Editing History of Wikipedia as Linked Data in DBpedia* [60].

Michel Buffa was finalist for the first-ever edX Prize for Exceptional Contributions in Online Teaching and Learning (11 teachers have been selected among 2500 others and 1200 online courses) for his MOOCs on HTML5.

Valerio Basile was awarded the first prize, granted by IBM, at the *Evaluation of NLP and Speech Tools for Italian (Evalita)* workshop.

6. New Software and Platforms

6.1. Corese

COnceptual REsource Search Engine

KEYWORDS: Semantic Web - Web of Data - Search Engine - RDF - SPARQL
FUNCTIONAL DESCRIPTION

Corese is a Semantic Web Factory that implements W3C RDF, RDFS, SPARQL 1.1 Query and Update. Furthermore, Corese query language integrates original features such as approximate search. It provides a SPARQL Template Transformation Language for RDF, a SPARQL based Inference Rule Language for RDF and a Linked Data Script Language. Corese also provides distributed federated query processing, a Semantic Web server and a SPARQL endpoint. Corese development is supported by an Inria grant (ADT).

- Participants: Olivier Corby, Erwan Demairy, Catherine Faron-Zucker, Fabien Gandon. Alumni: Virginie Bottollier, Olivier Savoie, and Fuqi Song.
- Partners: I3S - Mnemotix
- Contact: Olivier Corby
- URL: http://wimmics.inria.fr/corese, http://corese.inria.fr

6.2. DBpedia.fr

FUNCTIONAL DESCRIPTION

DBpedia is an international crowd-sourced community effort to extract structured information from Wikipedia and make this information available on the Semantic Web as Linked Open Data. The DBpedia triple stores allow anyone to solve sophisticated queries against Wikipedia extracted data, and to link the different data sets on these data. The French chapter of DBpedia was created and deployed by Wimmics and is now an online running platform providing data to several projects such as: QAKIS, Izipedia, zone47, Sépage, HdA Lab, JocondeLab, etc. In addition, Wimmics extended the open source DBpedia platform with new capabilities and in particular DBpedia Historic to extract the entire edition history of a chapter as linked data.

- Participants: Fabien Gandon and Raphaël Boyer
- Contact: Fabien Gandon
- URL: http://dbpedia.fr

6.3. Discovery Hub

Discovery Hub Exploratory Search Engine
KEYWORD: Search Engine
FUNCTIONAL DESCRIPTION

Discovery Hub is an exploratory search engine built on top of linked data sources and, in particular, DBpedia. The exploratory search is a new way to search the web to find new topics the users were not aware of but which may be interesting for them. It allows users performing queries in an innovative way and helps them navigate rich results. As a hub, it proposes redirections to others platforms to let users benefit from their discoveries. It relies on an extension of spreading activation algorithms over linked data to recommend and explain results.

- Participants: Nicolas Marie, Fabien Gandon, Emilie Palagi and Alain Giboin
- Partner: Alcatel-Lucent
- Contact: Fabien Gandon
- URL: http://discoveryhub.co/

6.4. Licentia

License you Data
KEYWORDS: Licenses - Normative Reasoning - Semantic Web - RDF
FUNCTIONAL DESCRIPTION

Licentia is a web service application with the aim to support users in licensing data. Our goal is to provide a full suite of services to help in the process of choosing the most suitable license depending on the data to be licensed. The core technology used in our services is powered by the SPINdle Reasoner and the use of Defeasible Deontic Logic to reason over the licenses and conditions. The dataset of RDF licenses we use in Licentia is the RDF licenses dataset where the Creative Commons Vocabulary and Open Digital Rights Language (ODRL) Ontology are used to express the licenses.

- Participants: Serena Villata, Fabien Gandon. Alumni: Cristian Cardellino
- Partners: I3S
- Contact: Serena Villata
- URL: http://licentia.inria.fr/

6.5. Qakis

Question-Answening wiki framework based system
FUNCTIONAL DESCRIPTION

The QAKiS system (figure 2) implements question answering over DBpedia. QAKiS allows end users to submit a query to an RDF triple store in English and obtain the answer in the same language, hiding the complexity of the non-intuitive formal query languages involved in the resolution process. At the same time, the expressiveness of these standards is exploited to scale to the huge amounts of available semantic data. Its major novelty is to implement a relation-based match for question interpretation, to convert the user question into a query language (e.g. SPARQL). English, French and German DBpedia chapters are the RDF data sets to be queried using a natural language interface.

- Participants: Elena Cabrio, Julien Cojan, Amine Hallili, Alessio Palmero Aprosio, Fabien Gandon and Serena Villata.
- Contact: Elena Cabrio
- URL: http://www.qakis.org/

6.6. KNEWS

Versatile Text-to-Knowledge Pipeline
KEYWORD: NLP
FUNCTIONAL DESCRIPTION

KNEWS is a versatile text-to-knowledge pipeline for machine reading, configurable to use different external modules for word sense disambiguation and entity linking. KNEWS works by running these components separately on a text, then it aligns the output of a semantic parser (Boxer) to the output of the other two modules, to produce complete semantic structures linked to DBpedia and Wordnet and represented as RDF graphs. KNEWS provides different kind of outputs: frame instances (based on the FrameBase scheme), word-aligned frames, and first-order logic formulas.

- Participants: Valerio Basile, Elena Cabrio and Fabien Gandon.
- Contact: Valerio Basile & Elena Cabrio
- URL: https://github.com/valeriobasile/learningbyreading

7. New Results

7.1. Users Modeling and Designing Interaction

7.1.1. User-centered Heuristics for the Control of Personal Data

Participants: Patrice Pena, Alain Giboin.

This work is done in collaboration with Karima Boudaoud, SPARKS, I3S. In the context of the PadDOC FUI project, we elaborated a set of user-centered heuristics and a procedure for designing and evaluating systems allowing the control of personal data. The elaboration of the heuristics is based on: (1) the transposal of Nielsen's heuristics and of Scapin and Bastien's ergonomic criteria to the control of personal data ; (2) the user centering of the Privacy-by-Design notion of integrated privacy; and (3) the integration of Altman's interaction approach to privacy [71].

7.1.2. User Modeling of Collaborative Ontology Editors/Environments

Participant: Alain Giboin.

To demonstrate the importance of an in-depth modeling of users in the design of collaborative ontologies editors or environments (COEs), we began a study on the evolution of the user modeling techniques and the resulting user models from the origins of the design of COEs.

7.1.3. Recommendation of Pedagogical Resources Adapted to User Profile and Context

Participants: Oscar Rodríguez Rocha, Catherine Faron-Zucker.

In the continuation of the Semantic Educloud project, we constructed an ontology and associated thesaurus to represent an official standard of knowledge and skills. We proposed a process to extract knowledge and skills from the official texts describing the French educational program and to automatically populate our ontology with the knowledge extracted from the official texts which we further enrich by aligning it with the Web of Data. This work has been presented at the EKM 2016 workshop [49].

Together with researchers from DUIN (Italy), we worked on the design of a recommendation algorithm based on Linked Data, that could be used to recommend pedagogical resources. The algorithm exploits existing relationships between resources by dynamically analyzing both the categories to which they belong to and their explicit references to other resources. The algorithm has been applied in a mobile application to recommend movies by relying on DBpedia. This work has been presented at the RecSys workshop [50]

7.1.4. Requirements Analysis

Participant: Isabelle Mirbel.

Requirements representation in agile methods is often done on the basis of User Stories (US) which are short sentences relating a WHO, WHAT and (possibly) WHY dimension. They are by nature very operational and simple to understand thus very efficient. Previous research allowed to build a unified model for US templates associating semantics to a set of keywords based on templates collected over the Web and scientific literature. Since the semantics associated to these keywords is mostly issued of the i* framework [1], we overviewed in this work how to build a custom rationale diagram on the basis of a US set tagged using that unified template. The rationale diagram is strictly speaking not an i* strategic rationale diagram but uses parts of its constructs and visual notation to build various trees of relating US elements in a single project. Indeed, the benefits of editing such a rationale diagram is to identify depending US, identifying EPIC ones (EPIC: large User Story) and group them around common Themes. The results of this research have been published in [51].

7.1.5. Design of a User-Centered Evaluation Method of Exploratory Search Systems Based on a Model of the Exploratory Search Process

Participants: Emilie Palagi, Alain Giboin, Fabien Gandon.

This work was undertaken in the context of the PhD of Emilie Palagi, in cooperation with with Raphaël Troncy (Eurecom). Our method takes into account users's Exploratory Search (ES) behavior and will be based on a cognitive model of an ES task. We will specially work on Discovery Hub and 3cixty 4 (EURECOM project) ESSs.

[1] http://www.cs.toronto.edu/km/istar/

During the first year of the PhD, we were looking for a model of ES process on which the method will be based. To achieve this objective, several models of information seeking process were analyzed and we compared them with our own grid of the typical characteristics of exploratory search activities. The chosen model will fill the grid as much as possible with suitable adaptations if needed. It is an on-going work and we are actually designing an ES search model. We also performed a comparative analysis of 15 ESSs in order to identify the relevant functionalities supporting an exploratory search. We want to associate these functionalities to our grid of exploratory search characteristics. We will select some of these systems to test and validate the future method.

Contrary to lookup search engines that help users to retrieve specific items (e.g., names, numbers, short statements, or specific documents), Exploratory Search Systems (ESSs) are search engines that help users to explore a topic of interest. ES tasks are open-ended, multi-faceted, and iterative like learning or topic investigation [77], [80]. Currently, the evaluation methods of ESSs are not entirely adapted to the special features of ES tasks, and do not effectively assess that ESSs support users in performing those tasks. Our research goal is to elaborate methods that effectively lead to this assessment.

7.2. Communities and Social Interactions Analysis

7.2.1. Ontologies-Based Platform for Sociocultural Knowledge Management

Participants: Papa Fary Diallo, Olivier Corby, Isabelle Mirbel.

This work is done in the PhD Thesis of P. F. Diallo †. We designed a sociocultural platform aiming at persevering and capitalizing sociocultural events in Senegal. This platform relies on Semantic Web technologies. We provided two ontologies to support our platform: an upper level sociocultural ontology (USCO) and a human time ontology (HuTO). To build our upper level ontology we proposed a methodology based on the theory of Russian psychologist Lev Vygotsky called "Vygotskian Framework". We designed the Human Time Ontology [2] (HuTO) of which major contributions are (i) the modeling of non convex intervals (repetitive interval) like every Monday, (ii) the representation of deictic temporal expressions (e.g. *today*) which form specific relations with time speech and (iii) qualitative temporal notions which are temporal notions relative to a culture or a geographical position. The platform allows Senegalese communities to share and co-construct their sociocultural knowledge. This work was published in the Journal of Data Semantics [14].

7.2.2. SMILK - Social Media Intelligence and Linked Knowledge

Participants: Farhad Nooralahzadeh, Elena Cabrio, Molka Dhouib, Fabien Gandon.

Automated Natural Language Processing (NLP), Web Open Data (Linked Open Data) and social networks are the three topics of the SMILK ANR LabCom including their coupling studied in three ways: texts and Linked Data, Linked Data and social resources, texts and social resources. It is a Joint laboratory between the Inria research institute and the VISEO company to develop research and technologies, retrieve, analyze, and reason about linking data from textual Web resources and other to use open Web data taking into account the social structures and interactions in order to improve the analysis and understanding of textual resources.

In this context, we have developed an entity discovery tool by adopting the semantic spreading activation, and we integrated it in the SMILK framework. The goal of such a tool is to semantically enrich the data by linking the mentions of named entities in the text to the corresponding known entities in knowledge bases. In our approach multiple aspects are considered: the prior knowledge of an entity in Wikipedia (i.e. the keyphraseness and commonness features that can be precomputed by crawling the Wikipedia dump), a set of features extracted from the input text and from the knowledge base, along with the correlation/relevancy among the resources in Linked Data. More precisely, this work explores the *collective ranking approach* formalized as a weighted graph model, in which the mentions in the input text and the candidate entities from knowledge bases are linked using the local compatibility and the global relatedness. Experiments on the datasets of the

[2] http://ns.inria.fr/huto

Open Knowledge Extraction (OKE) [3] challenge with different configurations of our approach in each phase of the linking pipeline reveal its optimum mode. We investigate the notion of semantic relatedness between two entities represented as sets of neighbors in Linked Open Data that relies on an associative retrieval algorithm, with consideration of common neighborhood. This measure improves the performance of prior link-based models and outperforms the explicit inter-link relevancy measure among entities (mostly Wikipedia-centric). Thus, our approach is resilient to non-existent or sparse links among related entities.

In parallel, an approach to automatically annotate texts in the cosmetics field with the vocabularies ProVoc and GoodRelations in RDF has been proposed, resulting in a knowledge base in the format of the Semantic Web that can be used in various applications. Given the entity linking tool described before (that allows to link named entities in a text with entities in the LOD), we focused on the extraction of relations between these entities (in French texts). In the extraction process, particular attention is given to the contribution of syntactic rules, in order to improve accuracy with respect to existing systems.

7.2.3. Community Detection and Interest Labeling

Participants: Zide Meng, Fabien Gandon, Catherine Faron-Zucker.

7.2.3.1. Temporal Analysis of User and Topic

Based on previous work on overlapping community detection in Question-Answer sites, we proposed an approach to jointly model topic, expertise, activity and trends, we were able to retrieve many meaningful latent information from the user generated contents. We proposed a method to track the dynamics of topics and users. It can also track the dynamics with a specific granularity of time level such as, yearly, monthly, daily and hourly. Besides, the model can overcome a comparison problem of LDA (Latent Dirichlet Allocation) based model by modeling the reverse distribution. This work has been published in IEEE/WIC/ACM Web Intelligence [62].

7.2.3.2. Topic labeling

The output of topic model is normally a bag of words. Each topic consists of closely related words. An interesting question is to assign one or more topic label to this set in order to indicate the general meaning of a bag of words. By integrating the original dataset with linked open data sources, we are now planning to propose a generic method to automatically label the detected topics.

7.2.4. Default Knowledge based on the Analysis of Natural Language

Participants: Elena Cabrio, Valerio Basile, Fabien Gandon.

In the context of the ALOOF project, we developed new methods to build repositories of default knowledge based on the analysis of natural language. The first efforts are aimed at extracting information about common objects, in particular their location and their typical usage [24].

One of the methods to extract general knowledge from text is implemented in the KNEWS pipeline, of which a demo was presented at ECAI [25]. At the same conference, we also presented the results of another system that helps robots identifying unknown objects based on their proximity with known objects observed at the scene [52]. KNEWS was also used to automatically build a large collection of text aligned with RDF semantics representation of its meaning. The first envisioned application of such resource is to provide a basis for robust natural language generation from RDF triples using statistical methods [22].

We also explored the application of distributional semantics to the general knowledge extraction problem. We computed vector-based models of objects and used supervised statistical models to predict their typical locations (e.g. knife-kitchen, printer-office) [27]. Once our models were successfully tested experimentally against a gold standard of human judgments, we were able to build a large knowledge base of object locations freely available [4].

[3] https://github.com/anuzzolese/oke-challenge
[4] https://project.inria.fr/aloof/data/

7.2.5. Semantic Modeling of Social, Spatiotemporal and Dedicated Networks

Participants: Amel Ben Othmane, Nhan Le Thanh, Andrea Tettamanzi, Serena Villata.

During the academic year 2015/2016, we have been working partially on validating the model we proposed in [72]. A long version of this former paper, entitled *An Agent-based Architecture for Personalized Recommendations* will be published in January 2017 in the LNCS series published by Springer. For this purpose, we proposed in [29] a multi-agent based simulation on NetLogo environment in order to illustrate the usefulness and feasibility of the proposed framework in a realistic scenario. For that purpose, we evaluated the performance of the agent behaviors adopting two different strategies:

- Selfish agents: agents do not communicate with each others;
- Social agents: agents communicate and try to influence each other's to adopt some beliefs or desires.

Results show that agents achieve a better performance collectively when they are in "communities", i.e., agents with shared interests (thus similar to each other), than when they are acting as solitary agents. We believe that the issues of trust and recommendation are tightly related. For that reason, we analyzed the behavior of social agents with and without a trust model. Results show that exchanging beliefs or desires with trustworthy agents can improve the whole performance of agents.

We have been also working on extending the proposed model with spatial and temporal reasoning. A spatio-temporal belief or desire is considered as an event that is defined as a spatial relation holding in a temporal interval. For reasoning with such information, we propose to combine the Region Connection Calculus (RCC-8) formalism with Allen's intervals algebra. Spatio-temporal data is often affected by imprecision and vagueness. To tackle this problem we believe that a fuzzy set, because its ability to represent a degree of membership, is more suitable for modeling spatio-temporal data. A fuzzy version of RCC-8 and Allen's interval is proposed. Then we combined both approaches in order to represent and reason about imprecise spatio-temporal beliefs and desires. We worked also in validating this approach in a real-world scenario.

7.3. Vocabularies, Semantic Web and Linked Data based Knowledge Representation

7.3.1. Semantic Web Technologies and Natural Language

Participants: Serena Villata, Elena Cabrio.

Together with Sara Tonelli (FBK, Italy) and Mauro Dragoni (FBK, Italy), we have presented the integration, enrichment and interlinking activities of metadata from a small collection of verbo-visual artworks in the context of the Verbo-Visual-Virtual project. We investigate how to exploit Semantic Web technologies and languages combined with natural language processing methods to transform and boost the access to documents providing cultural information, i.e., artist descriptions, collection notices, information about technique. We also discuss the open challenges raised by working with a small collection including little-known artists and information gaps, for which additional data can be hardly retrieved from the Web. The results of this research have been published at the ESWC conference [37].

Together with Vijay Ingalalli (LIRMM), Dino Ienco (IRSTEA), Pascal Poncelet (LIRMM), we have introduced AMbER (Attributed Multigraph Based Engine for RDF querying), a novel RDF query engine specifically designed to optimize the computation of complex queries. AMbER leverages subgraph matching techniques and extends them to tackle the SPARQL query problem. AMbER exploits structural properties of the query multigraph as well as the proposed indexes, in order to tackle the problem of subgraph homomorphism. The performance of AMbER, in comparison with state-of-the-art systems, has been extensively evaluated over several RDF benchmarks. The results of this research have been published at the EDBT conference [39].

7.3.2. Semantic Web Languages and Techniques for Digital Humanities

Participants: Catherine Faron-Zucker, Franck Michel, Konstantina Poulida, Safaa Rziou, Andrea Tettamanzi.

In the framework of the Zoomathia project, we conducted three complementary works, with the ultimate goal of exploiting semantic metadata to help historians in their studies of knowledge transmission through texts. First, together with Olivier Gargominy and other MNHN researchers, and Johan Montagnat (I3S, UNS), we continued a work initiated last year on the construction of a SKOS (Simple Knowledge Organization System) thesaurus based on the TAXREF taxonomical reference, designed to support studies in Conservation Biology [73]. We deployed the Corese Semantic Web factory as a backend to publish this SKOS thesaurus on the Web of Linked Open Data. This work was presented at the SemWeb.Pro 2016 conference.

Second, together with Irene Pajon (UNS) and Arnaud Zucker (UNS), we continued a work initiated last year on the construction of a SKOS thesaurus capturing zoological specialities (ethology, anatomy, physiology, psychology, zootechnique, etc.). This thesaurus was constructed while manually annotating books VIII-XI of Pliny the Elder's Natural History, chosen as a reference dataset to elicit the concepts to be integrated in the Zoomathia thesaurus. This work has been published in the ALMA journal [79] (Archivum Latinitatis Medii Aevi).

Third, together with Arnaud Zucker (UNS), we developed an approach of knowledge extraction from ancient texts consisting in semantically categorizating text segments based on machine learning methods applied to a representation of segments built by processing their translations in modern languages with Natural Language Processing (NLP) methods and by exploiting the above described thesaurus of zoology-related concepts. We applied it to categorize Pliny the Elder's Natural History segments. The above describe manually annotated dataset served us as goldstandard evaluate our approach. This work has been presented at the ESWC 2016 workshop on Semantic Web for Scientific Heritage [38].

Relatedly, together with Emmanuelle Kuhry (UNS) and Arnaud Zucker (UNS), we developed an approach which originates in seeing copying as a special kind of "virtuous" plagiarism and consists in paradoxically using plagiarism detection tools in order to measure *distances* between texts, rather than similarities. We first applied it to the *Compendium Philosophie*'s tradition, whose manuscript tradition is well studied and mostly understood and can therefore be considered as a gold standard. Then we applied the validated and calibrated method to investigate the *Physiologus latinus*'s tradition, which is a complex manuscript tradition for which our knowledge is much less sure, with the aim of supporting the elaboration of stemmatological hypotheses.

7.3.3. Argumentation Theory and Multiagent Systems

Participants: Andrea Tettamanzi, Serena Villata.

Together with Célia da Costa Pereira (I3S, UNS) we have proposed a formal framework to support belief revision based on a cognitive model of credibility and trust. In this framework, the acceptance of information coming from a source depends on *(i)* the agent's goals and beliefs about the source's goals, *(ii)* the credibility, for the agent, of incoming information, and *(iii)* the agent's beliefs about the context in which it operates. This makes it possible to approach belief revision in a setting where new incoming information is associated with an acceptance degree. In particular, such degree may be used as input weight for any possibilistic conditioning operator with uncertain input (i.e., weighted belief revision operator). The results of this research have been published at the SUM conference [56].

Moreover, together with Célia da Costa Pereira (UNS) and Mauro Dragoni (FBK, Italy), we have provided an experimental validation of the fuzzy labeling algorithm proposed by da Costa Pereira et al. at IJCAI-2011 with the aim of carrying out an empirical evaluation of its performance on a benchmark of argumentation graphs. Results show the satisfactory performance of our algorithm, even on complex graph structures as those present in our benchmark. The results of this research have been published at the SUM conference [55].

Serena Villata, together with the other organizers, has also reported about the results of the first Computational Argumentation Challenge (ICCMA) in a AI Magazine paper [17].

7.3.4. RDF Mining

Participants: Amel Ben Othmane, Tran Duc Minh.

In collaboration with Claudia d'Amato of the University of Bari, Italy, we have carried on our investigation about extracting knowledge from RDF data, by proposing a level-wise generate-and-test [53] and an evolutionary [54] approach to discovering multi-relational rules from ontological knowledge bases which exploits the services of an OWL reasoner.

7.3.5. LDScript Linked Data Script Language

Participants: Olivier Corby, Catherine Faron-Zucker, Fabien Gandon.

We design and develop LDScript, a Linked Data Script Language [68]. It is a DSL (domain-specific programming language) the objects of which are RDF terms, triples and graphs as well as SPARQL query results. Its main characteristic is to be designed on top of SPARQL filter language in such a way that SPARQL filter expressions are LDScript expressions. Mainly speaking, it introduces a function definition statement into SPARQL filter language. The main use case of LDScript is the definition of SPARQL extension functions and custom aggregates. With LDScript, we were able to develop a W3C DataShape SHACL [5] validator using STTL and we provide a Web service [6].

7.3.6. Ontology-based Workflow Management Systems

Participants: Tuan-Anh Pham, Nhan Le Thanh.

The main objective of the PhD work is to improve Coloured Petri Nets (CPNs) and Ontology engineering to support the development of business process and business workflow definitions of the various fields and to develop a Shared Workflow Management System (SWMS) using the ontology engineering. Everybody can share a semi-complete workflow which is called "Workflow template", and other people can modify and complete it to use in their system. This customized workflow is called "Personalized workflow". The challenges of a SWMS is to be simple, easy to use, friendly with the user and not too heavy. But it must have all functions of a WMS. There are three major challenges in this work: How to allow the users to customize the workflow template to correspond to their requirements, but with their changes compliant with the predefined rules in the workflow template? How to build an execution model to evaluate step by step a personalized workflow?

7.3.7. A Service Infrastructure Providing Access to Variables and Heterogeneous Resources

Participants: The-Cân Do, Nhan Le Thanh.

This work is done together with Gaëtan Rey (I3S, PhD co-director). The aim of this PhD work is to develop an adaptation of applications to their context. However, in view of the difficulties of context management in its entirety, we choose to approach the problem by decomposing context management from different points of views (or contextual concerns). A concern (or point of view) may be the business process of the application, security, etc. or any other cross-functionality. In addition to simplifying the context management, sharing between different experts the analysis to be performed, this approach aims to allow the reuse of specifications of each point of view between different applications. Finally, because of the independence of points of view (from their specification to implementation), it is easily conceivable to add and/or delete dynamically points of view during the execution of the application we want to adapt. The scientific challenge of this thesis is based on the automatic resolution of conflicts between the points of view made to the adaptation of the target application. Of course, this must be done at runtime.

7.3.8. DBpdia.fr & DBpedia Historic

Participants: Raphaël Boyer, Fabien Gandon, Olivier Corby, Alexandre Monnin.

A new version of the DBpedia historic extractor has been developed and the database is publicly accessible on a dedicated Web server footnote http://dbpedia-historique.inria.fr/sparql. We redesigned the DBpedia Live mechanism from the international DBpedia community to deploy a DBpedia live instance that is able to update itself in near real time by following the edition notification feed from Wikipedia; it is available on our server [7].

[5] https://www.w3.org/TR/shacl/
[6] http://corese.inria.fr
[7] http://dbpedia-live.inria.fr/sparql

We also designed a new DBpedia extractor materializing the editing history of Wikipedia pages as linked data to support queries and indicators on the history [61], [60]. An example of application supported by this service is showed in figure 1 where we provide a Web portal based on STTL [18] crossing linked data from DBpedia.fr and DBpedia Historic to detect events concerning artists.

Finally, we redesigned the DBpedia.fr Web site with a responsive interface, a modern design and a technical documentation. The Web site is also available in English because internationalizing the document allows a wider audience8 to use the data extracted.

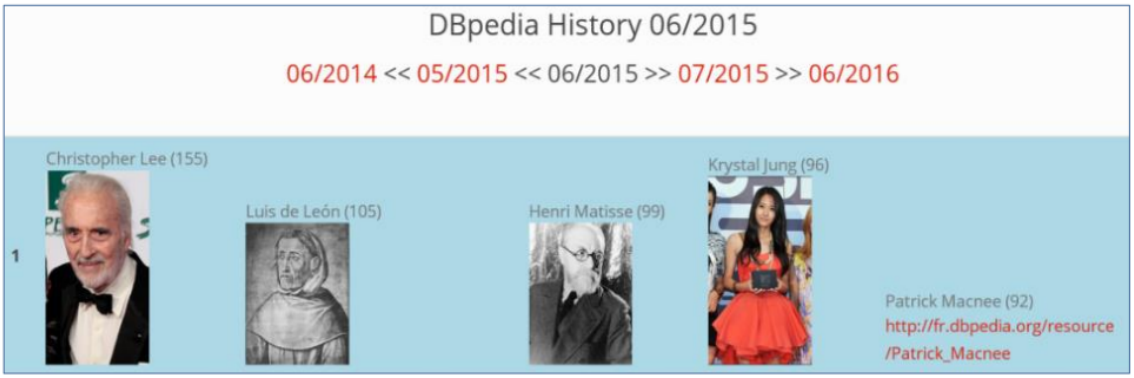

Figure 1. DBpedia Artist category with edition history

7.3.9. Provoc Ontology from SMILK

Participants: Fabien Gandon, Elena Cabrio.

ProVoc [8] (Product Vocabulary) is a vocabulary that can be used to represent information about Products and manipulate them through the Web. This ontology reflects: the basic hierarchy of a company (Group/Company, Divisions of a Group, Brand names attached to a Division or a Group) and the production of a company (products, ranges of products, attached to a Brand, the composition of a product, packages of products, etc.).

7.4. Analyzing and Reasoning on Heterogeneous Semantic Graphs

7.4.1. SPARQL Template Transformation Language

Participants: Olivier Corby, Catherine Faron-Zucker, Raphaël Gazzotti.

In the continuation of our work on the design of the STTL SPARQL Template Transformation Language [18], we showed that it can be used as a constraint language for RDF and we applied our approach to implement the semantics of OWL 2 profiles, each viewed as a set of constraints to be validated: we defined an STTL transformation to represent each of the three OWL 2 profiles (OWL RL, OWL QL and OWL EL). The application of one of these STTL transformations to an ontology (in OWL/RDF syntax) enables users to validate it against the OWL 2 profile this transformation represents. This work has been presented at the RR 2016 conference [34].

7.4.2. Exposing Heterogeneous Data Sources on the Web of Linked Open Data

Participants: Catherine Faron-Zucker, Franck Michel.

[8] http://ns.inria.fr/provoc

While the emerging Web of Data continuously grows as data sets are published as Linked Open Data, data is produced ever faster in data silos where it often remains locked. In particular, NoSQL systems have gained a remarkable success during recent years. Consequently, harnessing the data available in NoSQL databases to populate the Web of Data, and more generally achieving RDF-based data integration and SPARQL querying of NoSQL databases, are timely questions.

Together with Johan Montagnat (I3S, UNS), we previously proposed a generic mapping language, xR2RML, able to describe the mapping of most common types of databases into an arbitrary RDF representation [78]. In the continuation of this work, we developed a two-step approach to execute SPARQL queries over heterogeneous databases based on the xR2RML mapping of the database to RDF. We demonstrated the effectiveness of this approach by providing SPARQL access over MongoDB, the popular NoSQL document store. This work was undertaken in the context of the PhD of Franck Michel, and was published in the WebIST 2016 conference [43], and in the DEXA 2016 conference [44].

7.4.3. Combining Argumentation Theory and Natural Language Processing

Participants: Serena Villata, Valerio Basile, Elena Cabrio, Andrea Tettamanzi, Tom Bosc.

We have proposed a new approach to text exploration combining argumentation theory and natural language processing. They define bipolar entailment graphs, i.e., graphs whose nodes are text fragments and the edges represent the entailment or non entailment relations. They adopt abstract dialectical frameworks to define acceptance conditions for the nodes such that the resulting framework returns us relevant information for the text exploration task. The results of this research have been published at the ICAART conference [33].

Moreover, we have proposed a new approach to argument mining for Twitter data. The proposed approach consists first in detecting argumentative tweets from a stream of tweets, and second, starting from this set of argument-tweets, in predicting the relations, i.e., attack and support, holding between two argument-tweets. The annotated corpus resulting from this research line has been described in a paper published at the LREC conference [30], while the results of the argument mining task have been published at the COMMA conference [31].

Following a novel research direction, we investigated the relationship between the emotions displayed by the participants to our experiments and the sentiment expressed in the natural language of their arguments. We ran state-of-the-art sentiment analysis software on the transcriptions of the debates and compared the result with the output of the emotion reading systems. The results of our analysis were presented at the Artificial Intelligence and Cognition Workshop [26] and at the Italian Conference on Computational Linguistics [23].

Finally, together with Celia da Costa Pereira (UNS) and Mauro Dragoni (FBK, Italy), we have proposed an opinion summary application built on top of an argumentation framework, used to exchange, communicate and resolve possibly conflicting viewpoints in distributed scenarios. They show how this application is able to extract relevant and debated opinions from a set of documents containing user-generated content from online commercial Web sites. The result of this research has been published as a short paper at the IJCAI conference [35], and an extended version has been submitted to the AI Comm. journal and it is currently under review.

7.4.4. Opinion Mining

Participants: Andrea Tettamanzi, Serena Villata.

Together with Célia da Costa Pereira of I3S and Mauro Dragoni of FBK, Trento, who visited our team for three months from April to June 2014, we have proposed DRANZIERA, an evaluation protocol for the evaluation of multi-domain opinion mining methods [36] and an argumentation framework for opinion mining [35].

7.4.5. SMILK - Automatic Generation of Quizzes through Semantic Web Technologies

Participant: Oscar Rodríguez Rocha.

The research work focuses on the automatic generation of quizzes using Semantic Web technologies. It takes inspiration from the existing research works about automatic generation of multi choice questions from domain ontologies and aims to apply such existing techniques and contibute to its extension, in order to semantically generate statements that allow to describe the content of a given Web ontology. This research work is carried out in the context of SMILK. SMILK (Social Media Intelligence and Linked Knowledge) is a joint laboratory (LabCom, 2013-2016) between the Wimmics team and the Research and Innovation unit of VISEO (Grenoble). Natural Language Processing, Linked Open Data and Social Networks as well as the links between them are at the core of this LabCom. The purpose of SMILK is both to develop research and technologies in order to retrieve, analyze, and reason on textual data coming from Web sources, and to make use of LOD, social networks structures and interaction in order to improve the analysis and understanding of textual resources. Topics covered by SMILK also include: use of data and vocabularies published on the Web in order to search, analyze, disambiguate and structure textual knowledge in a smart way, but also to feed internal information sources; reasoning on the combination of internal and public data and schemes, query and presentation of data and inferences in natural formats.

7.4.6. Event Identification & Tracking

Participants: Amosse Edouard, Elena Cabrio, Nhan Le Thanh.

In the past year, we have been working on approaches for detecting, classifying and tracking events on Twitter. In the context of social media, an event is considered as "An occurrence causing change in the volume of text data that discusses the associated topic at a specific time. This occurrence is characterized by topic and time, and often associated with entities such as people and location". This definition shows that Named Entities (NE) play a key role in events on social medias and particularly on Twitter. In our approaches we exploit the NE in tweets to analyse events on Twitter.

7.4.6.1. Event Identification and Classification

We developed an approach that exploit occurrences of Named Entities in tweets to train a supervised model for two purposes:

- To classify tweets as either related or not related to events.
- To classify tweets related to events as event categories such as Economy, Politics or Sport.

We combined techniques from Natural Language Processing, Linked Open Data and Machine Learning to build a supervised model for classifying tweets. More specifically, we replaced the NE in tweets by their related class in ontologies (e.g DBpedia or YAGO) and used the modified content to train machine learning algorithms (e.g. SVM, Naive Bayes and Neural Network). Our experiments on two gold standard datasets shown that the NER mechanism helped in reducing overfitting on the output of classifiers.

7.4.6.2. Event Tracking

More recently, we started to work on an approach for tracking planned events on Twitter. In this work, we were particularly interested in tracking the evolution of existing events over time. For example, important actions in a soccer game (goal, yellow/red cards). We proposed an unsupervised approach based on NE in tweets and graph analysis to process the Twitter stream in real time. In this approach, we dynamically update a local gazetteer with actors involved in the events such as player and team names as well as terms that describe the actions of interests (e.g. goal, yellow card for football). The preliminary evaluations are quite promising since we are able to track the most important events in a soccer game as well as the player or teams involved in the actions.

7.4.7. Software and Hardware Architecture of EMOTICA: an Emotions Detection System

Participant: Nhan Le Thanh.

This work is performed with Chaka Kone (3rd year PhD student - LEAT, UNS) and Cécile Belleudy (Thesis Director - LEAT, UNS). The aim of this PhD work is to propose a complete low power system for the recognition of emotions satisfying all application constraints such as energy consumption, size and positioning of sensors. To achieve this goal, our work focuses on two main axes: the detection of emotions and the architectural exploration of objects communicating for health, with particular emphasis on the energy consumption of such systems.

7.4.8. Conversational Agent Assistant

Participants: Raphaël Gazzotti, Catherine Faron-Zucker, Fabien Gandon.

This CIFRE PhD Thesis is performed in collaboration with SynchroNext, a company located in Nice. As part of this thesis, we will be interested in setting up an ECA (Embodied Conversational Agents) for FAQs to advisers. The ECA will need to integrate a question and answer system to address the most common issue types without human intervention [76], [81]. For this purpose, it must be able to understand the questions asked in natural language by the users and to reason with the knowledge acquired. Beyond such a system of questions and answers, the ECA must be able to reopen the conversation with the Internet user according to the nature of his requests or the sequence of questions formulated. The objective is to reduce the dropout rate of Internet users on FAQs and to reduce the number of incoming calls and e-mails. This will enable to customer advisers to focus on more difficult questions.

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have CIFRE PhD funding with Synchronext for the design of a conversational agent assistant endowed with natural language and intuition.

We have CIFRE PhD funding with Educlever on the topic of semantic analysis of activities in a learning environment.

8.2. Bilateral Grants with Industry

8.2.1. Semantic EDUCLOUD Carnot Project

Participants: Oscar Rodríguez Rocha, Catherine Faron-Zucker.

Partner : GAYAtech. This project was just accepted this year on the topic of *semantic Web for e-learning*. This is a joint project with Gayatech on the recommendation of pedagogical resources adapted to user profile and context in the EDUCLOUD 06 Serious Game. To get help in his quests and various quiz testing his knowledge, the gamer can use external digital resources (books, video, TV, Web) and an in-game social network to work with his teacher and comrades. In this context, and to meet the needs of GAYATECH developing edutainment solutions, the Semantic EDUCLOUD project aims to improve the recommendation of educational resources to learners in EDUCLOUD 06, by using semantic Web and social Web models and techniques.

8.2.2. Vigiglobe Carnot Project

Participants: Elena Cabrio, Serena Villata.

Partner : Vigiglobe.

This project was just accepted this year on the topic of *Natural Language Argumentation on Twitter: Retrieval of Argumentative Structures and Reasoning*. this is a joint project with Vigiglobe on the natural language processing of argumentation on Twitter to retrieve argumentative structures and reason on them. The goal of the project is to : (1) Automate the selection and annotation of tweets, i.e., retrieval of those tweets that can be considered as arguments (2) Automate the assignment of labels to the type of relation holding between arguments - positive relation or negative relation. (3) Create an argumentation graph illustrating the relations between the arguments about a certain subject, and the further application of argumentation semantics to compute the set of ”winning” arguments This graph-based visualization provides a summary of the ongoing discussion on Twitter.

9. Partnerships and Cooperations

9.1. Regional Initiatives

9.1.1. SPARKS Team (I3S)

Wimmics is member of the I3S SPARKS team (Scalable and Pervasive softwARe and Knowledge Systems). It is structured according to three axes: FORUM, ELK and S3.

9.1.1.1. SPARKS ELK Axis

Wimmics contributes to the SPARKS ELK research axis (Knwoledge Extraction and Learning). Andrea Tettamanzi is co-animator of this axis together with Frédéric Precioso (I3S).

9.1.1.2. SPARKS FORUM Axis

Wimmics contributes to the SPARKS FORUM research axis (FORmalizing with Users and Models). Catherine Faron-Zucker and Alain Giboin are co-animators of FORUM. This year, three seminars were organized: (1) Visualisation des données liées (Emilie Palagi, Erwan Demairy, Raphaël Boyer, Olivier Corby); (2) Agents BDI possibilistes (Célia Da Costa-Pereira, Serena Villata, Andrea Tettamanzi); (3) Adaptation Dynamique : des processus métiers à l'environnement opérationnel. Application à la continuité de services ambiants (Jean-Yves Tigli, Isabelle Mirbel).

9.1.1.3. SPARKS S3 Axis

Wimmics contributes to the SPARKS S3 research group (Scalable Software Systems). Olivier Corby, Fuqi Song and Erwan Demairy contribute with federated distributed query processing in Corese with Johan Montagnat and Abdoul Macina. Catherine Faron-Zucker and Franck Michel contribute on it with Johan Montagnat on heterogeneous databases federation.

9.1.1.4. SPARKS HCI Group

The HCI Group brings together researchers from the SPARKS team conducting or wishing to conduct research related to Human-Computer Interaction. The group specifically addresses the issues of how to conduct user experiments to evaluate the UIs of the software developed in GLC. The group establishes collaborations between researchers in the design and implementation of experiments. The HCI group is animated by Anne-Marie Dery (I3S).

9.1.1.5. MSHS Axis-2: ICT, Usage and Communities

Participants: Alain Giboin, Alexandre Monnin, Fabien Gandon, Emilie Palagi.

Axis-2 of the *Maison des Sciences Humaines et Sociales (MSHS) du Sud-Est (Nice)* aims to federate interdisciplinary research on the relationships between ICT, Practices and Communities. Wimmics is mainly involved in one of the Axis-2 groups-projects, "Artifacts and Coordination." This group-project studies the impact of cognitive technologies on the social and cognitive coordination between individuals in organizational and community contexts. Alain Giboin is member of the Axis-2 scientific committee and co-animator (with Lise Arena, GREDEG, until September 2016; and Evelyne Rouby, GREDEG, from October 2016) of the "Artifacts and Coordination" group-project. He is also co-animator (with Pierre Thérouanne (Lapcos), Lise Arena and Agnès Festré (GREDEG)) of the project "Acceptabilitity of digital devices: an interdisciplinary perspective". This group is animated by Alain Giboin, Alexandre Monnin, Fabien Gandon and Emilie Palagi.

9.1.2. TCP-IP + Blockchain UCA Idex Submission

Participant: Alexandre Monnin.

We submitted a project proposal around the "TCP-IP + Blockchain (Transdisciplinary Collaborative Plaform for Internet of things and Platformcooperativism)" platform, launched and coordinated by Alexandre Monnin inside the UCA Jedi Idex (Wimmics, LEAT, Aoste, Indes, I3S, GREDEG, LAPCOS, SKEMA, Sustainable Design School, Villa Arson, module D, club Cap EF, SCITIAM, Fabrique des Mobilités, Mnémotix, etc.). A host of projects were submitted inside this platform:

- ACCEPT by Lise Arena and Alain Giboin (Idex Academy 5)

- SMART by François Verdier (Idex Academy 1)

- Polisthelia by Alexandre Monnin (ANR, PCRI with Luxemburg)

- SMARTIOT by François Verdier (ANR project on Smart Contracts)

among which ValueModels submitted by Alexandre Monnin (Idex Academy 1) was accepted.

9.2. National Initiatives

9.2.1. NiceCampus Research Lab

Participant: Nhan Le Thanh.

NiceCampus Research Lab (from training to/and through research to a Joint International Laboratory) is a framework for cooperation for research training. This framework is proposed by the University of Nice Sophia Antipolis to support the 911 Vietnamese research training program that aims to support the development of Vietnamese universities. The NiceCampus Lab Project was a winner of the AUF Call for Proposals 2016-2017. In this context, the MIRE (Maison de l'innovation et de la recherche NiceCampus) was created at University of Da Nang (Vietnam).

9.2.2. DILPROSPECT

Participant: Andrea Tettamanzi.

We participated in the interdisciplinary DILPROSPECT CNRS Project, with researchers of many other research units, including the UMR 7300 ESPACE and INRA on the study of the interface between constructed and natural land on the French Riviera.

9.2.3. AZKAR

Participants: Alain Giboin, Thierry Bergeron, Michel Buffa, Catherine Faron-Zucker.

AZKAR is a two years French project funded by BPI (Banque Publique d'Investissement), focused on *Fast Control of Mobile Robots over the Internet*.

The project started in September 2014. The first step of the project has been the evaluation and benchmarking of video and data solutions over Internet, based on the WebRTC technology. The second step consists in implementing these solutions on a real mobile robot that has been deployed in museums or in homes for helping seniors in their daily tasks. Semantic Web technologies, have been used in the project for describing the services, the context of the application domain, the content transmitted, etc. We got a best demo award at ISWC this year, for a demo that shown a robot located in France that has been remote controlled from Kobe in Japan during the conference [32].

9.2.4. ANR WASABI

Participants: Michel Buffa, Elena Cabrio.

We will be project leader of this 42 month ANR project that starts in January 2017. Partners are IRCAM, Deezer, Radio France and a french startup named Parisson. WASABI aims to build the biggest song metadata semantic database, mixing audio and cultural content analysis. Client applications target music school, sound engineer schools, composers and musicians, journalists, radios and streaming services.

9.2.5. ANR LabCom SMILK

Participants: Elena Cabrio, Catherine Faron-Zucker, Fabien Gandon, Zide Meng, Oscar Rodríguez Rocha, Molka Tounsi.

SMILK (Social Media Intelligence and Linked Knowledge) is a joint laboratory (LabCom, 2013-2016) between the Wimmics team and the Research and Innovation unit of VISEO (Grenoble). Natural Language Processing, Linked Open Data and Social Networks as well as the links between them are at the core of this LabCom. The purpose of SMILK is both to develop research and technologies in order to retrieve, analyze, and reason on textual data coming from Web sources, and to make use of LOD, social networks structures and interaction in order to improve the analysis and understanding of textual resources. Topics covered by SMILK include: use of data and vocabularies published on the Web in order to search, analyze, disambiguate and structure textual knowledge in a smart way, but also to feed internal information sources; reasoning on the combination of internal and public data and schemes, query and presentation of data and inferences in natural formats.

9.2.6. Inria LabCom EduMICS

Participants: Catherine Faron-Zucker, Fabien Gandon, Chihabeddine Bouchenaki, Olivier Corby.

EduMICS (Educative Models Interactions Communities with Semantics) is a joint laboratory (LabCom, 2016-2018) between the Wimmics team and the Educlaver company. Adaptive Learning, Social Learning and Linked Open Data and links between them are at the core of this LabCom. The purpose of EduMICS is both to develop research and technologies with the ultimate goal to adapt educational progressions and pedagogical resource recommendation to learner profiles. Topics covered by EduMICS include: ontology-based modeling of educational resources; ontology-based integration of heterogenous data sources; ontology-based reasoning; semantic analysis of a social network of learners; pedagogical resource recommendation adpated to learner profiles.

9.2.7. Ministry of Culture: DBpedia.fr

Participants: Raphaël Boyer, Fabien Gandon.

This DBpedia.fr project proposes the creation of a French chapter of the DBpedia database. This project was the first project of the Semanticpedia convention signed by the Ministry of Culture, the Wikimedia foundation and Inria.

Web site: http://dbpedia.fr

9.2.8. Ministry of Culture: GT 6 for a convention between Inria and the Ministry of Culture

Participant: Fabien Gandon.

We supervised the working group GT6 Ministry of Culture on the creation of a research convention to foster research and development at the crossroad of culture and digital sciences. This convention signed between Inria and the Ministry of Culture the 12 December 2016 will provide a framework to support projects at the cross-road of the cultural domain and the digital sciences.

9.2.9. ANR OCKTOPUS

Participants: Fabien Gandon, Catherine Faron-Zucker, Zide Meng.

OCKTOPUS is an ANR project (2012-2016) which ended during this year. Its general objective was to increase the potential social and economic benefit of the large and quickly growing amounts of user-generated content, by transforming it into useful knowledge. We showed how it is possible to considerably improve upon existing generic Information Retrieval techniques by exploiting the specific structure of this content and of the online communities which produce it. Specifically, we focused on a multi-disciplinary approach in order to address the problem of finding relevant answers to questions within forums and question-answer sites. To create metrics and predictors of content quality and use them to improve the search experience of a user, we took advantage of:

- the experience of the CRG (the management research institute of Ecole Polytechnique and CNRS) to understand better the incentives of, and interactions between individuals who produce online content within large communities;

- the experience of the Wimmics research team to analyze the structural and temporal aspects of the complex typed social graphs found within these communities;
- the ability of Alcméon (a start-up developing a search application dedicated to user-generated content) to integrate and test the results of OCKTOPUS within a common demonstration framework, in order to assess their practical usefulness when applied to concrete large-scale datasets.

Partners: Alcméon, CRG, Inria Wimmics.

Web site: http://ocktopus.alcmeon.com

9.2.10. GDRI Zoomathia

Participants: Olivier Corby, Catherine Faron-Zucker, Alexandre Monnin, Andrea Tettamanzi.

Wimmics is partner of the International Research Group (GDRI) Zoomathia funded by two CNRS institutes: INEE and INSHS. It aims at studying transmission of zoological knowledge from Antiquity to Middle-Age through material resources (bio residues, artefacts), iconography and texts.

One of the goals of the project is to design a thesaurus and semantically annotate resources, capturing different types of knowledge: zoonyme, historical period, zoological speciality (ethology, anatomy, physiology, psychology, zootechnique, etc.), litterary genre or iconography.

We collaboratively work with MNHN and CEPAM researchers on the construction of a SKOS thesaurus of zoonyms and a SKOS thesaurus of animal specialties the automatic and on the automatic semantic categorization of text fragments. The ultimate goal is the exploitation of these semantic metadata to help historians in their studies of knowledge transmission through these texts.

Web site: http://www.cepam.cnrs.fr/zoomathia/

9.2.11. FUI PadDOC

Participants: Patrice Pena, Alain Giboin.

PadDOC goal is to contribute to accelerating the digital transition of citizen, local and regional authorities, administrations and enterprises, by : (1) developing an open standard and innovative software and hardware resources to facilitate nearby or distant administrative formalities and procedures; (2) improving the security of the holder's personal data by putting these data under the exclusive control of the holder; (3) by exploiting unmarked communicating supports (such as smartphones or tablets) for all chain actors. PadDOC partners are: Docapost BPO, Anyces, ABC SmartCard and the teams Rainbow, Media-Coding and Wimmics.Wimmics will contribute to: (1) the analysis, design and evaluation of the PadDOC security-oriented user interfaces; (2) the impact assessment of the chain of actors participating in the experiment to validate the viability of the PadDOC social system. The PadDOC project officially began in November 2014.

9.3. European Initiatives

9.3.1. FP7 & H2020 Projects

9.3.1.1. MIREL RISE

Participants: Serena Villata, Elena Cabrio, Oscar Rodríguez Rocha, Raphaël Gazzotti, Fabien Gandon.

Program: Research and Innovation Staff Exchange (RISE) project, funding under Marie Skłodowska-Curie grant.

Project acronym: MIREL

Project title: MIning and REasoning with legal text

Duration: 2016-2019

Coordinator: Leendert van der Torre, University of Luxembourg

Other partners: University of Bologna (Italy), University of Torino (Italy), University of Huddersfield (UK), Inria (France), APIS (Bulgaria), Nomotika s.r.l. (Italy), DLVSystem s.r.l. (Italy), Zhejiang University (China), Research Organization of Information and Systems (Japan), University of Cape Town (South Africa), National University of La Plata (Argentina), National University of Córdoba (Argentina), Universidad Nacional del Sur in Bahía Blanca (Argentina), National ICT Australia Ltd (Australia), Stanford University (USA).

Abstract: The MIREL project will create an international and inter-sectorial network to define a formal framework and to develop tools for MIning and REasoning with Legal texts, with the aim of translating these legal texts into formal representations that can be used for querying norms, compliance checking, and decision support. MIREL addresses both conceptual challenges, such as the role of legal interpretation in mining and reasoning, and computational challenges, such as the handling of big legal data, and the complexity of regulatory compliance. It bridges the gap between the community working on legal ontologies and NLP parsers and the community working on reasoning methods and formal logic. Moreover, it is the first project of its kind to involve industrial partners in the future development of innovative products and services in legal reasoning and their deployment in the market. MIREL promotes mobility and staff exchange between SMEs to academies in order to create an inter-continental interdisciplinary consortium in Law and Artificial Intelligence areas including Natural Language Processing, Computational Ontologies, Argumentation, and Logic & Reasoning.

Web site: http://www.mirelproject.eu/

9.3.1.2. ALOOF CHIST-ERA

Participants: Valerio Basile, Elena Cabrio, Fabien Gandon.

ALOOF (Autonomous Learning of the Meaning of Objects) is a European project (CHIST-ERA 2015-2018) to enable robots to use the ever-growing amount of knowledge available on the Web, by learning from there about the meaning of previously unseen objects, expressed in a form that makes them applicable when acting in situated environments. Partners include: University of Rome La Sapienza (Italy), University of Birmingham (United Kingdom), Technische Universität Wien (Austria), Inria Sophia Antipolis Méditerranée (France).

Web site: https://project.inria.fr/aloof/

9.4. International Initiatives

9.4.1. MoReWAIS

Participants: Papa Fary Diallo, Mahamadou Toure, Olivier Corby, Isabelle Mirbel, Fabien Gandon.

Title: Mobile Read Write Access and Intermittent to Semantic Web

International Partner (Institution - Laboratory - Researcher):

UGB (Senegal) - LANI - Moussa Lo, Seydina Ndiaye

Start year: 2016

See also: https://project.inria.fr/morewais/

MoReWAIS proposes to explore the specificities (advantages and constraints) of mobile knowledge sharing. The mobile application targeted in MoReWAIS must allow communities and their users to enrich and access more easily the knowledge base using the user's context with its richness (e.g. location, other users close-by) and addressing its limitations (e.g. intermittent access, limited resources).

We will design and develop algorithms, methods and tools for mobile devices allowing users to:

- co-construct locally and on the road the Semantic Web of Data RDF triple stores representing the sociocultural shared knowledge.
- Access and visualize in context relevant data from the knowledge platform. This requires a complete rethinking of RDF storage and SPARQL querying in a mobile and unreliable network environment. This will also require dedicated interaction design to ease and encourage access and contribution.

9.4.2. SEEMPAD

Title: Social Exchanges and Emotions in Mediated Polemics - Analysis and Data

International Partner (Institution - Laboratory - Researcher):

University of Montréal (Canada) - Higher Educational Research ON tutoring systems (Heron) - Claude Frasson

Start year: 2014

See also: https://project.inria.fr/seempad/

Generating, annotating and analyzing a dataset that documents a debate. We aim at synchronizing several dimensions: social links (intensity, alliances, etc.); interactions happening (who talks to whom); textual content of the exchanged messages; social-based semantic relations among the arguments; emotions, polarity, opinions detected from the text; emotions, physical state detected from sensors.

9.5. International Research Visitors

9.5.1. Visits of International Scientists

9.5.1.1. Internships

Hatim Aouzal

Date: May – September

Institution: MIAGE UNS & EMSI Casablanca, Morocco

Title: Intelligent System for Mobile Robot Museum Visit.

Supervisor: Michel Buffa

Lautaro Petaccio

Date: July – December

Institution: Universidad de Buenos Aires (Argentina)

Title: Design and development of a Fact-Checking Framework Based on Argumentation Theory and Natural Language Processing Techniques.

Supervisors: Elena Cabrio, Serena Villata

Konstantina Poulida

Date: until January

Institution: University of Patras, Computer Engineering and Informatics Department

Title: Semantic Categorization of Segments of Ancient and Mediaeval Zoological Texts

Supervisors: Catherine Faron-Zucker, Andrea Tettamanzi

Avijit Shah

Date: September – December

Institution: NITK, National Institute of Technology Karnataka, Surathkal (India).

Title: Bootstrapping the Construction of a Knowledge Base of Objects

Supervisors: Valerio Basile and Elena Cabrio

9.5.2. Visits to International Teams

9.5.2.1. Research Stays Abroad

Tuan Anh Pham

Date: October 2016 to July 2017.

Erasmus Mundus Scholarship Exchange at University of Danang, Vietnam for 7 months to deploy the result of the PhD in a common project with UNS.

Serena Villata

Date: February-March.

Visit of the Nomotika startup in Turin, Italia, for two months as a secondment of the MIREL H2020 Project.

Topic: This secondment was in the context of WP2, and more specifically it addressed Task 2.2 (Develop NLP systems for mining named entities and concepts, in order to populate the ontology). Serena Villata worked in the past on the topic of ontology-based information extraction from licensing information applying machine learning techniques. The results of her work have been exploited to define the two tools called NLL2RDF [9] and Licentia [10].

During this secondment, she studied together with the Nomotika personnel how to generalize the approach proposed in NLL2RDF and Licentia in such a way that this kind of processing is applicable to legal texts in general, and not only to licenses. More precisely, the collaboration has been concentrated on the investigation of the following open issues: (i) find and refine (if needed) existing computational ontologies for normative reasoning, and (ii) mine legal texts to extract the main deontic components (i.e., obligations, permissions, and prohibitions) and returning a machine-readable semantic representation of such information extracted from the texts exploiting a distributional semantics approach where the meaning of a word is represented by the set of contexts in which it occurs in texts. The collaboration is still ongoing and results are expected soon (i.e., publications).

10. Dissemination

10.1. Promoting Scientific Activities

10.1.1. Scientific Events Organisation

10.1.1.1. General Chair, Scientific Chair

Valerio Basile: Area chair for Information Retrieval at CLiC-it 2016.

Elena Cabrio: Area chair (Semantics for applications). The Fifth Joint Conference on Lexical and Computational Semantics (*SEM 2016).

Scientific co-chair. Dagstuhl Seminar on Natural Language Argumentation: Mining, Processing, and Reasoning over Textual Arguments, 2016.

Fabien Gandon: co-chair and organizer of the Q4APS (Question Answering And Activity Analysis in Participatory Sites) Workshop at WWW [11].

Catherine Faron-Zucker: co-chair of the ESWC2016 workshop on Semantic Web for Scientific Heritage (SW4SH 2016),

co-chair of the first scientific day of the Inria Learning Lab, November 16th,

scientific chair of the Inria-Industry meeting (R2I) on Ed-Tech, December 1st.

Serena Villata: Chair together with Elena Cabrio, Graeme Hirst and Adam Wyner of the Dagstuhl Seminar on Mining, Processing, and Reasoning over Textual Arguments (Dagstuhl Seminar 16161), April 17-22, 2016. Local chair of the 29th International Conference on Legal Knowledge and Information Systems (JURIX 2016), December 14-16, 2016.

[9] http://www.airpedia.org/nll2rdf/
[10] http://licentia.inria.fr/
[11] https://project.inria.fr/q4aps2016/

10.1.1.2. Member of the Organizing Committees

Valerio Basile: local organizer for JURIX 2016 and for the SENTIPOLC challenge at EVALITA 2016.

Elena Cabrio: 6th Open Challenge on Question Answering over Linked Data (QALD-6), ESWC 2016.

10.1.2. Scientific Events Selection

10.1.2.1. Chair of Conference Program Committees

Catherine Faron-Zucker: PC co-chair of the 22th Int. Conference on Conceptual Structures (ICCS 2016).

10.1.2.2. Member of the Conference Program Committees

Valerio Basile: *SEM , PEOPLES workshop at COLING, EACL 2017, WebNLG workshop at INLG, ESWC, EKAW, ICRA, CLiC-it, MIREL workshop at JURIX, DSAA, AIC workshop at BICA.

Michel Buffa: Web Audio Conference (WAC), ESWC, ISWC, WWW demo W3C track, Semantic Web Collaborative Spaces (SWCS) workshop.

Elena Cabrio: Association for Computational Linguistics conference (ACL, EACL), the Computational Linguistics conference (COLING), and the Extended Semantic Web Conference (ESWC).

Olivier Corby: Arima, EKAW, GraphQ, IC, ICCS, MoreBI, Top-K Shortest Path in Large Typed RDF Graphs Challenge at ESWC.

Catherine Faron-Zucker: ESWC (European Semantic Web Conference), ISWC (Int. Semantic Web Conference, P&D), WebEd (WWW Workshop on Web Science and Technology for Education), Q4APS2016 (WWW Workshop on Question Answering And Activity Analysis in Participatory Sites), EKM (EKAW workshop on Educational Knowledge Management), ISW-LOD (Int. Workshop on Semantic Web and Linked Open Data), CNIA (Conf. Nationale d'Intelligence Artificielle), IC (Ingénierie des Connaissances), EGC 2017 (Extraction et Gestion des Connaissances).

Fabien Gandon: IJCAI , ISWC (Senior PC), WWW , WebScience (Senior PC), ESWC, FOIS, IC, Semantics, SemWeb.Pro, CNIA (Conférence Nationale en Intelligence Artificielle), Diversity-Aware AI Workshop at ECAI, EGC, Journée Intelligence Artificielle et Big Data [12].

Alain Giboin is member of the steering committee of the COOP conference series (International Conferences on the Design of Cooperative Systems). He is also member of the program committee of: COOP, ESWC (In-use & Industrial Track), IC, SEMANTICS (Research Track), SEMANTICS (Posters and Demos), UBIMOB, WebSci.

Isabelle Mirbel: 27th International Conference on Advanced Information Systems Engineering (CAISE), IEEE Tenth International Conference on Research Challenges in Information Science.

Alexandre Monnin: WWW, ESWC, SWASH (ESWC workshop), WebSci, IC.

Oscar Rodríguez Rocha: KEOD, KSE

Andrea Tettamanzi: ECG 2017, ESWC, FLAIRS-29, FUZZ-IEEE, IC, LREC, MOD, PPSN, and SAC 2017 conferences, SW4SH workshop of ESWC.

Serena Villata: IJCAI, AAAI, JURIX.

10.1.2.3. Reviewer

Olivier Corby: ESWC, ISWC, WWW, EGC.

Isabelle Mirbel: ESWC.

Alain Giboin: ISWC, WWW, IHM.

10.1.3. Journal

10.1.3.1. Member of the Editorial Boards

Catherine Faron-Zucker: Revue d'Intelligence Artificielle, special issue "Ingénierie des Connaissances".

[12] http://bigia2016.irisa.fr/

Fabien Gandon:

- Editor of the special issue of the Semantic Web Journal for best papers at ESWC 2015.
- Special issue RIA, Revue d'intelligence artificielle, Analyse intelligente des réseaux sociaux, volume 30, n. 4/2016.

Nhan Le Thanh: Journal of Science and Technology, Da Nang University- Issue on Information and Communications Technology.

Isabelle Mirbel: Ingénierie des Systèmes d'Information (Hermès).

10.1.3.2. Reviewer - Reviewing Activities

Valerio Basile: Language and Cognition (published by Cambridge University Press), Computer Speech & Language, Interacting with Computers.

Olivier Corby: Semantic Web Journal.

Catherine Faron-Zucker: Semantic Web Journal (SWJ), Journal of Web Science, ACM's Transactions on Internet Technology (TOIT), International Journal of Web Information Systems (IJWIS), International Journal of Metadata, Semantics and Ontologies (IJMSO).

Nhan Le Thanh: Journal of Science and Technology, Da Nang University- Issue on Information and Communications Technology.

Isabelle Mirbel: Neurocomp journal.

Alexandre Monnin: Minds and Machines, Big Data and Society, Revue d'intelligence artificielle.

Andrea Tettamanzi: Evolutionary Intelligence, Soft COmputing (SOCO).

Serena Villata: Journal of Logic and Computation, Argument & Computation, Artificial Intelligence.

10.1.4. Invited Talks

Valerio Basile: University of Turin, Building a default knowledge base of objects (and other stories of robots), November 16th.

Michel Buffa:

WWW 2016 W3C Track: HTML5 games, When your browser becomes a game console! Coding games for the Web + Demo of a HTML5 game developed by students in the first session of the W3Cx HTML5 Part 2 MOOC.

Discussion on the future of Web games development using HTML5, special off-conference HTML5 gaming meetup (chair and co-organizer), WWW 2016 Conference, April 13, Montreal, Canada.

AmpSim2, un simulateur d'amplificateur de guitare en Web Audio, Paris Audio #3, September 7, IRCAM.

Michel Buffa, Thierry Bergeron: "Le projet AZKAR : navigation d'un robot mobile temps réel à travers le Web en P2P avec l'API WebRTC", Conférence Blend WebMix 2016, November 2 & 3, Lyon, France.

Elena Cabrio: Bielefeld University, Germany, "Argument mining: our story so far", June 20th.

Catherine Faron-Zucker: Invited research Talk, at the Ministry of Economy and Finance (MEF- DGE), September 23rd.

Fabien Gandon:

- Keynote speaker for the conference Web Intelligence, Mining and Semantics (WIMS 2016) titled "One Web of pages, One Web of peoples, One Web of Services, One Web of Data, One Web of Things... and with the Semantic Web bind them.", June 14th;
- Joint keynote speaker for the International Conference on Conceptual Structures (ICCS 2016) and International Conference on Formal Ontology in Information Systems (FOIS 2016) titled "On the many graphs of the Web and the interest of adding their missing links.", July 7th;
- CafeLecture - Atelier de lecture transdisciplinaire - Learning Centre SophiaTech, Regards Croisés. "Dans l'esprit du Pagerank : regards croisés sur les algorithmes".

Alain Giboin (with Agnès Festré, GREDEG) gave a talk on ”Nudges, Affordances et conception d’artefacts” in ”Regards croisés” Seminar at Sophia Antipolis Campus.

Alexandre Monnin:

National interLabex symposium "Excellence in Smart Systems" (Besançon), November 17th.

Roundtable as part of the Economique numérique summer school - 3EN (Nice), May 31st.

Master Miage to deliver a talk entitled ”La philosophie à partir de l’architecture du Web” (Sophia Antipolis), March 9th.

Hypertopic seminar of Tech-Cico (UTT, Troyes, online presentation), March 21st.

Emilie Palagi:

A presentation in FORUM SPARKS seminar on the evaluation and design of the explanation features of the exploratory search system Discovery Hub, March 1st.

A presentation in Axis-2 of the ”Maison des Sciences Humaines et Sociales (MSHS) du Sud-Est (Nice)" : ”Exploratory search system and user centered evaluation method”, March 14th.

A presentation of Palagi’s PhD Subject in a new cycle of seminars on Human Computer Interaction (HCI) and UX Design called ”les lundis de l’ergonomie”, October 10th.

”Journée rencontre Inria Industrie” in Lille: A demo of Discovery Hub and the presentation of an ongoing work on the design of a user centered evaluation method of exploratory search systems, November 25th.

10.1.5. Leadership within the Scientific Community

Alexandre Monnin organizes a seminar with Lise Arena (UNS, GREDEG) and Bernard Conein (UNS, GREDEG), between Inria and MSHS, entitled "Digital artifacts and materialities". International researchers such as Jérôme Denis [13] (Mines ParisTech), Paul Smart (Southampton) [14], Michael Wheeler (Stirling), David Kirsh (San Diego) [15], Yuk Hui (Lüneburg) [16] and Brian Cantwell Smith (Toronto) participated in the seminar this year.

Alexandre Monnin and Manuel Boutet (UNS, GREDEG) organize the "ateliers de lecture transdisciplinaires" of UCA, hosted by SophiaTech learning centre and later redubbed "Regards croisés" (5 sessions took place, all organized by Alexandre Monnin, with Lise Arena and Fabien Gandon, Alexandre Monnin et Bernard Conein, Ali Douai et Gabriel Plassat, Nathalie Oriol and François Bremond, Alain Giboin and Agnès Festré). The regards croisés have been chosen to be recorded and archived on a future UCA portal and YouTube channel.

Alexandre Monnin participated to the invitation of Brian Cantwell Smith to a Morgenstern colloquium at Inria Sophia Antipolis, December 8th. Alexandre Monnin is extending Brian Cantwell Smith’s stay for the Morgenstern Colloquium thanks to fundings provided by the MSHS. Two workshops will be organized around him on Dec. 12th and 13th at the MSHS in Nice in addition to the PhiloWeb day on the 14th.

Alexandre Monnin organized a PhiloWeb conference with B.C. Smith and Harry Halpin,

Alexandre Monnin participated in two events as part of the $Transition^2$ initiative set up by Inria and FING. In January, he created the W3C Community Group "Web We Can Afford" whose goal is to discuss the future of the Web at the time of the Anthropocene [17].

”Les lundis de l’ergonomie” is a new cycle of seminars on Human Computer Interaction (HCI) and UX Design. Organized by Emilie Palagi and Louise Chaussade, this multidisciplinary series of talks may attract academic and professional profiles but also anyone interested in social science’s approach to digital matters. Two presentations took place in October (with Emilie Palagi and Louise Chaussade) and December (Patrice Pena).

[13] http://mshs.unice.fr/?p=6799
[14] http://mshs.unice.fr/?p=6725
[15] http://mshs.unice.fr/?p=6908
[16] http://mshs.unice.fr/?p=7644
[17] https://www.w3.org/community/wwca/

10.1.6. Scientific Expertise

Elena Cabrio was reviewer for French ANR projects.

Olivier Corby was reviewer for Atlanstic 2020 (Pays de la Loire) project submission.

Catherine Faron-Zucker is the scientific reference of the Inria Learning Lab.

Catherine Faron-Zucker reviewed project proposals for the Academic Research Community (ARC) 6 of Rhône Alpes Region.

10.1.7. Research Administration

Michel Buffa is director of the MIAGE of Nice Sophia Antipolis, composed of Licence, Master 1 and four Master 2 diplomas with about 350 students [18]. He is member of the OpenMiage committee that aims at proposing an online version of the whole MIAGE cursus.

Olivier Corby is member of the PostDoc Inria Sophia committee.

Catherine Faron-Zucker is General Treasurer of the French Society for Artificial Intelligence (AFIA).

She was member of the 2016 recruitment committee of Telecom Saint Etienne, University Jean Monnet.

She coordinates the Web option of the 5th year of Polytech Nice Sophia engineering school and is in charge of continuous training for the computer science department of Polytech Nice Sophia Antipolis.

Fabien Gandon is:

- representative of Inria at W3C consortium.
- representative of Inria in the Web Science Trust Network.
- member of the Steering Committee of the Scientific Board of Inria Sophia Antipolis (Bureau CP).
- member of the scientific committee of the Labex UCN.
- member of the Scientific Committee academy 1 of IDEX.
- member of the Steering Committee academy 5 of IDEX.
- member of ESWC Steering committee.
- member of IW3C2 Steering committee for WWW conference series.

Alain Giboin serves as scientific correspondent for Inria Sophia of COERLE (Inria Comité Opérationnel d'Evaluation des Risques Légaux et Ethiques), in tandem with the legal correspondent Nadège Camelio-Laurent. Alain Giboin is member of the Commission "Médiation et Animation des MAthématiques, des Sciences et Techniques Informatiques et des Communications" (MASTIC) of Inria Sophia Antipolis – Méditerranée.

Nhan Le Thanh is Animator of a multidisciplinary Idex working group "Connected Healthcare and well Aging INnovative Services" (CHAINS) at UNS. He is animator of a multidisciplinary join working group (TRT eHealth), UNS and Da Nang University, on the themes of IoT services for eHealth and smart city. He is coordinator of the bilateral scientific cooperation program NiceCampus between UNS and Da Nang University. He is director of the computer science department, IUT, UNS.

Isabelle Mirbel is Vice Dean of Science Department at University Nice-Sophia Antipolis.

Andrea Tettamanzi is coordinator of the 3rd year of the *Licence* in Business Informatics (MIAGE) at the UFR Science of the Université Nice Sophia Antipolis (UNS). He is co-animator, together with Johan Montagnat (I3S), of the SPARKS team who hosts Wimmics at I3S.

[18] http://miage.unice.fr

10.2. Teaching - Supervision - Juries

10.2.1. Teaching

Licence: Amel Ben Othmane, Oracle Database, 64h, L1, IUT Institute of Technology of Nice, France.

Licence: Elena Cabrio, Web Server Programming, 45h, L1, UNS, France.

Licence: Amosse Edouard, Object Oriented Design, 33h, L3, UNS, France.

Licence: Amosse Edouard, Introduction to Web Programming, 16h, L3, UNS, France.

Licence: Catherine Faron-Zucker, Web languages, 36h, Licence 3, Polytech UNS.

Licence: Catherine Faron-Zucker, Statistics, 36h, Licence 3, Polytech UNS.

Licence: Nhan Le Thanh, Databases, 150h, DUT Info S2 at IUT, UNS, France.

Licence: Nhan Le Thanh, Advanced Databases, 105h, DUT Info S3 at IUT, UNS, France.

Licence: Nhan Le Thanh, Logical Data Models and languages, 24h, L3 LPSIL at IUT, UNS, France.

Licence: Nhan Le Thanh, Design and Development of DBMS services, 24h, L3 LPSIL at IUT, UNS, France.

Licence: Isabelle Mirbel, Databases, 58h, L3 MIAGE, UNS, France.

Licence: Isabelle Mirbel, Web programming (Persistence), 54h, L3 MIAGE, UNS, France.

Licence: Alexandre Monnin, Analyse des controverses, 4h30, L1, Telecom ParisTech, France.

Licence: Alexandre Monnin, Analyse des controverses and climate change, 6h, ESC Clermont-Ferrand, France.

Licence: Andrea Tettamanzi, Algorithmique, Programmation Objet, Python, L2, 50h, UNS, France.

Licence: Andrea Tettamanzi, Programmation Web Avancée coté client, L2, 39h, UNS, France.

Licence: Andrea Tettamanzi, Web, 18h, L3 MIAGE, UNS, ETD;

Master: Valerio Basile, Knowledge Engineering, 7h, Master 2 IFI, UNS, France.

Master: Michel Buffa, Web technologies, 40h, M1, UNS, France.

Master: Michel Buffa, Server Side JavaScript, 20h, M2 UNS, France.

Master: Michel Buffa, Web 2.0/Web Services/HTML5, 40h, M2, UNS, France.

Master: Michel Buffa, Java Certification, 25h, M2, Polytech'Nice UNS, France.

Master: Michel Buffa, Programmable Web, 40h, M2, Polytech'Nice students, UNS, France.

Master: Michel Buffa, Distributed Web development, 40h, M2, UNS, France. This course is also given by video conference to M2 students in Marroco, Madagascar and Haïti, that gets the same diploma as students from the UNS, France.

Master: Elena Cabrio, Web Science, 5h, M2, UNS, France.

Master: Olivier Corby, Oscar Rodríguez Rocha, Catherine Faron-Zucker, Fabien Gandon, Semantic Web, 45h, M2, UNS, France.

Master: Olivier Corby, XML, 15H, M2, UNS, France.

Master: Olivier Corby, Semantic Web, 3H, M2, University of Toulouse, France.

Master: Olivier Corby, Semantic Web, 3H, M2, University of Montpellier, France.

Master: Amosse Edouard, Development on the Android platform, 38h, M2, UNS, France.

Master: Amosse Edouard, Web Services, 17h, M2, UNS, France.

Master: Amosse Edouard, Introduction to Near Field Communication, 20h, M2, EMSI, Morocco.

Master: Catherine Faron-Zucker, Web languages, 24h, M1, Polytech UNS.

Master: Catherine Faron-Zucker, Web Science, 4h, M1 IFI, UNS.

Master: Catherine Faron-Zucker, Network Programming, 12h, M1, Polytech UNS.

Master: Catherine Faron-Zucker, XML technologies, 24h, M2 IMAFA, UNS.

Master: Catherine Faron-Zucker, Semantic Web technologies, 28h, M2 IFI, Polytech, UNS.

Master: Catherine Faron-Zucker, Knowledge Engineering, 9h, M2 IFI, Polytech, UNS.

Master: Fabien Gandon, Web Science, 4h, M1 IFI, UNS.

Master: Fabien Gandon, Semantic Web technologies, 4h, M2 IFI, Polytech, UNS.

Master: Fabien Gandon, Semantic Web technologies, 25h, Data Science Technical Institute, Paris.

Master: Alain Giboin, Human-Computer-Interaction Design and Evaluation, 54h, M2, UNS.

Master: Alain Giboin, Interaction Techniques and Multimodality, 8h, M2, UNS.

Master: Alain Giboin, Task and Activity Analysis for HCI design and evaluation, 6h, M2 Sociology and Ergonomics of Digital Technologies, UNS.

Master: Alain Giboin, HCI Design and Evaluation, 10h, M2 Sociology and Ergonomics of Digital Technologies, UNS.

Master : Alain Giboin, Economics and ICT: Ergonomics, 15h, M2 Economics and ICT, ISEM, UNS.

Master: Isabelle Mirbel, Requirement Engineering, 42h Master MIAGE 1, UNS, France.

Master: Isabelle Mirbel, Advanced databases, 48h Master MIAGE 1, UNS, France.

Master: Alexandre Monnin, Ingénierie des connaissances, 11h, M2, UNS, France.

Master: Oscar Rodríguez Rocha, Ingénierie des connaissances, 12h, M2, UNS, France.

Master: Andrea Tettamanzi, Systèmes Distribués, 18h, M1 MIAGE, UNS, France.

Master: Andrea Tettamanzi, Concurrency and Parallelism, 18h, M1 International, UNS, France.

Master: Andrea Tettamanzi, Fuzzy Description Logics and Ontology Learning, *in Ingénierie des connaissances*, 10h, M2, Polytech'Nice, UNS, France.

E-learning

MOOC: Fabien Gandon, Olivier Corby & Catherine Faron-Zucker, Introduction au Web Sémantique, 7 weeks, https://www.fun-mooc.fr/, Inria, France Université Numérique, Education for Adults, 4870 registered.

MOOC: Fabien Gandon, Olivier Corby & Catherine Faron-Zucker, Introduction to a Web of Linked Data, 4 weeks, https://www.fun-mooc.fr/, Inria, France Université Numérique, Education for Adults, 1703 registered.

MOOC: Michel Buffa, two MOOCs HTML5 for W3Cx / edX (MIT/Harvard). More than 300k registered students since 2015. Finalist for the first-ever edX Prize for Exceptional Contributions in Online Teaching and Learning (11 teachers have been selected among 2500 others and 1200 online courses).

10.2.1.1. Internships

Mihai-Alexandru Dusmanu

Date: June – August

Institution: ENS Paris

Title: Argument Detection on Twitter

Supervisors: Elena Cabrio, Serena Villata

Safaa Rziou

Date: April – September

Title: Semantic Categorization of Segments of Ancient and Mediaeval Zoological Texts

Institution: Université Nice Sophia Antipolis, Master 2 MIAGE

Supervisors: Catherine Faron-Zucker, Andrea Tettamanzi

10.2.2. Supervision

PhD: **Papa Fary Diallo**, *Co-Construction of Community Ontologies and Corpus in a Limited Technological Environment*, Inria, UNS, UGB, September 16th, Isabelle Mirbel, Olivier Corby, Moussa Lo.

PhD: **Zide Meng**, *Temporal and Semantic Analysis of Richly Typed Social Networks from User-Generated-Content Sites on the Web*, UNS, November 7th, Fabien Gandon, Catherine Faron-Zucker.

PhD in progress: **Amel Ben Othmane**, *Temporal and Semantic Analysis of Information Retrieved from Short and Spatio-Temporal Messages in Social Networks*, UNS, Nhan Le Than.

PhD in progress: **Chihabeddine Bouchenaki**, *Semantic Analysis of Activities in a Learning Environment*, UNS, September 2016, Fabien Gandon, Catherine Faron-Zucker.

PhD in progress: **Amosse Edouard**, *Studies of Spatial Semantic Aspect, Real Time Filtering Mechanisms and Semantic Enrichment of Short Messages on Dynamic Spatio-Temporal Social Networks*, UNS, Nhan Le Thanh and Elena Cabrio.

PhD in progress: **Raphaël Gazzotti**, *Conversational Agent Assistant Endowed with Natural Language and Intuition*, UNS & SynchroNext, Fabien Gandon, Catherine Faron-Zucker.

PhD in progress: **Franck Michel**, *Heterogeneous Databases Federation in Distributed Environment*, UNS, Johan Montagnat, Catherine Faron-Zucker.

PhD in progress: **Tran Duc Minh**, *Learning Ontologies from Linked Open Data*, Andrea Tettamanzi, UNS and Nguyen Thanh Binh, University of Danang.

PhD in progress: **Emilie Palagi**, *Design of a Model-based Method for Evaluating Exploratory Search Systems*, UNS, Labex UCN@Sophia, Alain Giboin, Fabien Gandon with Raphaël Troncy (Eurecom).

PhD in progress : **Tuan Anh Pham**, *Study and integration of the mechanism of workflow control in MVC (Model View Controler) architecture: design and implementation of an APM (Activity Process Management) platform for dynamic information systems on the networks*, UNS, Nhan Le Thanh.

10.2.3. Juries

Olivier Corby was jury member for the PhD Thesis of Géraud Fokou Pelap on *Conception d'un framework pour la relaxation des requêtes SPARQL*, November 21st, ENSMA, Poitiers.

Fabien Gandon was:

- President HDR Fabrice Huet entitled "From HPC to Big Data: Models and Tools for Large Scale Middleware", February 15th.
- Reviewer HDR Olivier Dameron entitled "Ontology-based methods for analyzing life science data", IRISA, Université de Rennes, January 11th.
- Reviewer PhD Thesis Andrei-Nicolae Ciortea entitled "Weaving a Social Web of Things: Enabling Autonomous and Flexible Interaction in the Internet of Things", École Nationale Supérieure des Mines de Saint-Étienne and University Politehnica of Bucarest, January 14th.
- Reviewer PhD Thesis Gabriela Montoya entitled "Answering SPARQL Queries using Views", LINA, Université de Nantes Angers Le Mans, March 3rd.
- Reviewer PhD Thesis Luis Redondo Garcia, "Semantically Capturing and Representing Contextualized News Stories on the Web", Eurecom, TELECOM ParisTech, March 4th.
- Jury member PhD Thesis Mazen Alsarem entitled "Semantic Snippets via Query-Biased Ranking of Linked Data Entities", Insa Lyon, University Lyon, Villeurbanne, May 5th.
- Jury member PhD Thesis Luis Galárraga entitled "Rule Mining in Knowledge Bases", TELECOM ParisTech, September 9th.

Nhan Le Thanh was jury member for the PhD of Nourhène Alaya, *Managing The Empirical Hardness of the Ontology*, Paris 8 University, October 13rd; Cheikh Hito Kacfah Emani, *Formalisation automatique et sémantique de règles métier*, Lyon 1 University, December 1st.

Andrea Tettamanzi was reviewer for the PhD Thesis of Regina Ticona Herrera, *Towards RDF Normalization*, Université de Pau et des Pays de l'Adour, Anglet, July 6th.

He was President of the jury for the PhD Thesis of

Papa Fary Diallo, UNS, September 16th (see above); Romaric Pighetti, *Une méthode hybride pour la classification d'images à grain fin*, UNS, November 28th; Atheer Al-Najdi, *Une approche basée sur les motifs fermés pour résoudre le problème de clustering par consensus*, UNS, November 30th.

Alexandre Monnin was president of the jury of 11 Master thesis of graphic design students of ESAD Valence (Ecole supérieure d'art et de design), May. He was president of the "diplôme de fin d'études" of the same students of ESAD Valence, June.

10.3. Popularization

Catherine Faron-Zucker: Article on the Web of Data in the Interstices online journal of scientific culture [19].

Fabien Gandon:

- Les Révolutions de la Planète Web, Lycée Calmette, – Nice – April 26th.
- Retour d'expérience sur le Mooc Web Sémantique, Journée Pédagogie innovante June 6th.
- SPARKS Day: How to supervise your supervisor?
- Meeting "Alumni" with students from Insa Rouen.

Alexandre Monnin: Café-in (June 2) : *Transition numérique et effondrement écologique : quel monde d'après ?* Stage Maths C2+ (June 16) : same presentation as above. Invitation by the FING to address the issues of "Small Science".

11. Bibliography

Major publications by the team in recent years

[1] S. BENLAMINE, M. CHAOUACHI, S. VILLATA, E. CABRIO, C. FRASSON, F. GANDON. *Emotions in Argumentation: an Empirical Evaluation*, in "International Joint Conference on Artificial Intelligence, IJCAI 2015", Buenos Aires, Argentina, Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence, IJCAI 2015, July 2015, pp. 156-163, https://hal.inria.fr/hal-01152966

[2] E. CABRIO, S. VILLATA. *Natural Language Arguments: A Combined Approach*, in "20th European Conference on Artificial Intelligence (ECAI 2012)", Montpellier, France, August 2012, https://hal.inria.fr/hal-00724780

[3] E. CABRIO, S. VILLATA, F. GANDON. *A Support Framework for Argumentative Discussions Management in the Web*, in "ESWC - 10th International Conference on The Semantic Web: Semantics and Big Data", Montpellier, France, Lecture Notes in Computer Science, Springer, May 2013, vol. 7882, pp. 412-426, Best Paper Award, https://hal.inria.fr/hal-00907877

[4] O. CORBY, R. DIENG-KUNTZ, C. HEBERT. *A Conceptual Graph Model for W3C Resource Description Framework*, in "Conceptual Structures: Theory, Tools and Applications, Proc. of the 8th Int. Conference on Conceptual Structures (ICCS'2000)", Darmstadt, Allemagne, B. GANTER, G. W. MINEAU (editors), Springer-Verlag, LNAI n. 1867, August 13 -17 2000, pp. 468-482

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[5] O. CORBY, C. FARON-ZUCKER, F. GANDON. *A Generic RDF Transformation Software and its Application to an Online Translation Service for Common Languages of Linked Data*, in "Proc. 14th International Semantic Web Conference, ISWC", Bethlehem, Pennsylvania, USA, October 2015

[6] L. COSTABELLO, S. VILLATA, F. GANDON. *Context-Aware Access Control for RDF Graph Stores*, in "ECAI - 20th European Conference on Artificial Intelligence - 2012", Montpellier, France, August 2012, https://hal.inria.fr/hal-00724041

[7] C. DA COSTA PEREIRA, A. G. B. TETTAMANZI. *A Syntactic Possibilistic Belief Change Operator: Theory and empirical study*, in "Web Intelligence and Agent Systems: An International Journal", 2014, vol. 12, n° 2, pp. 155-169 [*DOI :* 10.3233/WIA-140290], https://hal.archives-ouvertes.fr/hal-00983200

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[9] G. GOVERNATORI, A. ROTOLO, S. VILLATA, F. GANDON. *One License to Compose Them All - A Deontic Logic Approach to Data Licensing on the Web of Data*, in "ISWC - 12th International Semantic Web Conference - 2013", Sydney, Australia, Lecture Notes in Computer Science, Springer, October 2013, vol. 8218, pp. 151-166, https://hal.inria.fr/hal-00907883

[10] S. VILLATA, L. COSTABELLO, N. DELAFORGE, F. GANDON. *A Social Semantic Web Access Control Model*, in "Journal on Data Semantics", March 2013, vol. 2, n° 1, pp. 21-36, https://hal.inria.fr/hal-00907866

Publications of the year

Doctoral Dissertations and Habilitation Theses

[11] P. F. DIALLO. *Sociocultural and Temporal Aspects in Ontologies for Virtual Communities*, Université Nice Sophia Antipolis [UNS] ; Université Gaston Berger - Saint-Louis, September 2016, https://hal.inria.fr/tel-01402394

[12] Z. MENG. *Temporal and semantic analysis of richly typed social networks from user-generated content sites on the Web*, Université Nice Sophia Antipolis [UNS], November 2016, https://hal.inria.fr/tel-01402612

Articles in International Peer-Reviewed Journals

[13] E. CABRIO, S. VILLATA, A. PALMERO APROSIO. *A RADAR for Information Reconciliation in Question Answering Systems over Linked Data*, in "Semantic Web – Interoperability, Usability, Applicability", 2016, https://hal.inria.fr/hal-01332595

[14] P. F. DIALLO, O. CORBY, I. MIRBEL, M. LO, S. M. NDIAYE. *Ontologies-Based Platform for Sociocultural Knowledge Management*, in "Journal on Data Semantics", June 2016, 23 p. [*DOI :* 10.1007/s13740-016-0065-4], https://hal.inria.fr/hal-01342912

[15] H. HALPIN, A. MONNIN. *The Decentralization of Knowledge: How Carnap and Heidegger influenced the Web*, in "First Monday", December 2016, vol. 21, n° 12, https://hal.archives-ouvertes.fr/hal-01397931

[16] D. LANDIVAR, A. MONNIN, E. RAMILLIEN. *Cartographier l'ontologie d'un territoire sur le web : Le cas de la Bolivie*, in "NETCOM : Réseaux, communication et territoires", May 2016, vol. 29, n° 3/4, pp. 297-324, https://hal.archives-ouvertes.fr/hal-01327060

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Articles in National Peer-Reviewed Journals

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International Conferences with Proceedings

[21] F. BARBIERI, V. BASILE, D. CROCE, M. NISSIM, N. NOVIELLI, V. PATTI. *Overview of the Evalita 2016 SENTIment POLarity Classification Task*, in "Proceedings of Third Italian Conference on Computational Linguistics (CLiC-it 2016) & Fifth Evaluation Campaign of Natural Language Processing and Speech Tools for Italian. Final Workshop (EVALITA 2016)", Naples, Italy, December 2016, https://hal.inria.fr/hal-01414731

[22] V. BASILE. *A Repository of Frame Instance Lexicalizations for Generation*, in "Proceedings of the 2nd International Workshop on Natural Language Generation and the Semantic Web", Edinburgh, United Kingdom, September 2016, https://hal.inria.fr/hal-01389398

[23] P. BASILE, V. BASILE, E. CABRIO, S. VILLATA. *Argument Mining on Italian News Blogs*, in "Third Italian Conference on Computational Linguistics (CLiC-it 2016) & Fifth Evaluation Campaign of Natural Language Processing and Speech Tools for Italian. Final Workshop (EVALITA 2016)", Naples, Italy, December 2016, https://hal.inria.fr/hal-01414698

[24] V. BASILE, E. CABRIO, F. GANDON. *Building a General Knowledge Base of Physical Objects for Robots*, in "13th International Conference, ESWC 2016", Helaklion, Greece, The Semantic Web. Latest Advances and New Domains, May 2016, Poster paper, https://hal.inria.fr/hal-01330142

[25] V. BASILE, E. CABRIO, C. SCHON. *KNEWS: Using Logical and Lexical Semantics to Extract Knowledge from Natural Language*, in "Proceedings of the European Conference on Artificial Intelligence (ECAI) 2016 conference", The Hague, Netherlands, August 2016, https://hal.inria.fr/hal-01389390

[26] V. BASILE, E. CABRIO, S. VILLATA, C. FRASSON, F. GANDON. *A Pragma-Semantic Analysis of the Emotion/Sentiment Relation in Debates*, in "4th International Workshop on Artificial Intelligence and Cognition", New York, United States, Proceedings of the 4th International Workshop on Artificial Intelligence and Cognition, July 2016, https://hal.inria.fr/hal-01342438

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[35] M. DRAGONI, C. DA COSTA PEREIRA, A. G. B. TETTAMANZI, S. VILLATA. *SMACk: An Argumentation Framework for Opinion Mining*, in "International Joint Conference on Artificial Intelligence (IJCAI)", New York, NY, United States, S. KAMBHAMPATI (editor), Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence, IJCAI 2016, New York, NY, USA, 9–15 July 2016, IJCAI/AAAI Press, July 2016, pp. 4242-4243, https://hal.archives-ouvertes.fr/hal-01353931

[36] M. DRAGONI, A. G. B. TETTAMANZI, C. DA COSTA PEREIRA. *DRANZIERA: An Evaluation Protocol For Multi-Domain Opinion Mining*, in "Tenth International Conference on Language Resources and Evaluation (LREC 2016)", Portorož, Slovenia, N. CALZOLARI, K. CHOUKRI, T. DECLERCK, M. GROBELNIK, B. MAEGAARD, J. MARIANI, A. MORENO, J. ODIJK, S. PIPERIDIS (editors), Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC 2016), European Language Resources Association (ELRA), May 2016, pp. 267-272, https://hal.archives-ouvertes.fr/hal-01322949

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