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IN PARTNERSHIP WITH:
CNRS

**Université Nice - Sophia
Antipolis**

Activity Report 2019

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**

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Project-Team WIMMICS

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- A1.3.4. - Peer to peer
- A2.1. - Programming Languages
- A2.1.1. - Semantics of programming languages
- A3.1.1. - Modeling, representation
- A3.1.2. - Data management, quering and storage
- A3.1.3. - Distributed data
- A3.1.4. - Uncertain data
- A3.1.5. - Control access, privacy
- A3.1.6. - Query optimization
- A3.1.7. - Open data
- A3.1.9. - Database
- A3.1.10. - Heterogeneous data
- A3.2. - Knowledge
- A3.2.1. - Knowledge bases
- A3.2.2. - Knowledge extraction, cleaning
- A3.2.3. - Inference
- A3.2.4. - Semantic Web
- A3.2.5. - Ontologies
- A3.2.6. - Linked data
- A3.3.2. - Data mining
- A3.4. - Machine learning and statistics
- A3.4.1. - Supervised learning
- A3.4.6. - Neural networks
- A3.4.8. - Deep learning
- A3.5. - Social networks
- A3.5.2. - Recommendation systems
- A4. - Security and privacy
- A4.7. - Access control
- A5.1. - Human-Computer Interaction
- A5.1.1. - Engineering of interactive systems
- A5.1.2. - Evaluation of interactive systems
- A5.2. - Data visualization
- A5.7.2. - Music
- A5.8. - Natural language processing
- A5.10.5. - Robot interaction (with the environment, humans, other robots)
- A7.1.3. - Graph algorithms

- A7.2.2. - Automated Theorem Proving
- A8.2.2. - Evolutionary algorithms
- A9. - Artificial intelligence
 - A9.1. - Knowledge
 - A9.2. - Machine learning
 - A9.4. - Natural language processing
 - A9.5. - Robotics
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- B1.2.2. - Cognitive science
- B2. - Health
- B5.6. - Robotic systems
- B5.8. - Learning and training
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- B6.3.2. - Network protocols
- B6.3.4. - Social Networks
- B6.5. - Information systems
- B8.2. - Connected city
- B8.5. - Smart society
 - B8.5.1. - Participative democracy
- B9. - Society and Knowledge
 - B9.1. - Education
 - B9.1.1. - E-learning, MOOC
 - B9.1.2. - Serious games
 - B9.5.1. - Computer science
 - B9.5.6. - Data science
 - B9.6. - Humanities
 - B9.6.1. - Psychology
 - B9.6.2. - Juridical science
 - B9.6.5. - Sociology
 - B9.6.8. - Linguistics
 - B9.6.10. - Digital humanities
 - B9.7. - Knowledge dissemination
 - B9.7.1. - Open access
 - B9.7.2. - Open data
 - B9.9. - Ethics
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2. Overall Objectives

2.1. Context and Objectives

The Web became a virtual place where persons and software interact in mixed communities. The Web has the potential of becoming the collaborative space for natural and artificial intelligence, raising the problem of supporting these worldwide interactions. These large scale mixed interactions create many problems that must be addressed with multidisciplinary approaches [60]. 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 [59] in order to address some of the challenges in building a Web as a universal space linking many different kinds of intelligence.

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 to 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.

2.2. Research Topics

The research objectives of Wimmics can be grouped according to four topics that 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 more and more complex and dense ?”*. Wimmics focuses on specific sub-questions: *“How can we capture and model the users’ characteristics?”* *“How can we represent and reason 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 and Artificial Intelligence formalisms 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 - artificial intelligence processing: learning, 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 and Artificial Intelligence Formalisms on the Web

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 all the aspects that 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. Artificial Intelligence Processing: Learning, 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 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 with 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. 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 of 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 that we built targeting more support for non experts to access and analyze data on a topic or an 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 her current mental and physical state, the emotion she just expressed or her 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 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, accessibility, etc. 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

28th International Joint Conference on Artificial Intelligence (IJCAI-2019) Runner-up (second place) for the Application Impact Award for the paper “DISPUTool – A tool for the Argumentative Analysis of Political Debates”, for Shohreh Haddadan, Serena Villata and Elena Cabrio [22].

Best Poster Runners-Up at the 34th ACM/SIGAPP Symposium On Applied Computing (SAC 2019), for the paper: Pinar Arslan, Michele Corazza, Elena Cabrio, Serena Villata, *Overwhelmed by negative emotions?: maybe you are being cyber-bullied!* [7].

Hai Huang and Fabien Gandon received the Université Côte d’Azur Research Award.

Fabien Gandon, Andrea Tettamanzi and Serena Villata were nominated Fellow of the 3IA Côte d’Azur.

5.1.1. Awards

BEST PAPERS AWARDS:

[24]

H. HUANG, F. GANDON. *Learning URI Selection Criteria to Improve the Crawling of Linked Open Data*, in "ESWC2019 - 16th Extended Semantic Web Conference", Portoroz, Slovenia, June 2019, <https://hal.inria.fr/hal-02073854>

[33]

S. REN, S. LETZ, Y. ORLAREY, R. MICHON, D. FOBER, M. BUFFA, E. AMMARI, J. LEBRUN. *FAUST online IDE: dynamically compile and publish FAUST code as WebAudio Plugins*, in "WAC 2019 - 5th Web Audio Conference", Trondheim, Norway, December 2019, <https://hal.inria.fr/hal-02366725>

6. New Software and Platforms

6.1. CORESE

COncceptual REsource Search Engine

KEYWORDS: Semantic Web - Search Engine - RDF - SPARQL

FUNCTIONAL DESCRIPTION: Corese is a Semantic Web Factory, it implements W3C RDF, RDFS, OWL RL, SHACL, SPARQL 1.1 Query and Update as well as RDF Inference Rules.

Furthermore, Corese query language integrates original features such as approximate search and extended Property Path. It provides STTL: SPARQL Template Transformation Language for RDF graphs. It also provides LDScript: a Script Language for Linked Data. Corese provides distributed federated query processing.

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

6.2. DBpedia

KEYWORDS: RDF - SPARQL

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 then 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, S epage, HdA Lab., JocondeLab, etc.

RELEASE FUNCTIONAL DESCRIPTION: The new release is based on updated Wikipedia dumps and the inclusion of the DBpedia history extraction of the pages.

- Participants: Fabien Gandon and Elmahdi Korfed
- Contact: Fabien Gandon
- URL: <http://wiki.dbpedia.org/>

6.3. Discovery Hub

Discovery Hub Exploratory Search Engine

KEYWORD: Search Engine

FUNCTIONAL DESCRIPTION: Recommendation system on top of DBpedia

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

6.4. Fuzzy labelling argumentation module

Fuzzy labelling algorithm for abstract argumentation

KEYWORDS: Artificial intelligence - Multi-agent - Knowledge representation - Algorithm

FUNCTIONAL DESCRIPTION: The goal of the algorithm is to compute the fuzzy acceptability degree of a set of arguments in an abstract argumentation framework. The acceptability degree is computed from the trustworthiness associated with the sources of the arguments.

- Participant: Serena Villata
- Contact: Serena Villata

6.5. Qakis

Question-Answering wiki framework based system

KEYWORD: Natural language

FUNCTIONAL DESCRIPTION: The QAKiS system implements question answering over DBpedia. QAKiS allows end users to submit a query to an RDF triple store in English and to 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: Alessio Palmero Aprosio, Amine Hallili, Elena Cabrio, Fabien Gandon, Julien Cojan and Serena Villata
- Contact: Elena Cabrio
- URL: <http://www.qakis.org/>

7. New Results

7.1. Users Modeling and Designing Interaction

7.1.1. *Design of a User-Centered Evaluation Method for Exploratory Search Systems: Consolidation of the CheXplore plugin*

Participants: Alain Giboin, Jean-Marie Dormoy, Emilie Palagi, Fabien Gandon.

Designed and implemented in the context of the PhD of Emilie Palagi [64], CheXplore is a Chrome plugin that supports the user-centered evaluation of exploratory search systems. This year, CheXplore has been consolidated, i.e., in particular, refactoring of the source code – from jQuery to JavaScript; addition of some new functionalities mentioned in Emilie Palagi's PhD thesis.

7.1.2. *User Evaluation of the WASABI demonstrators*

Participants: Alain Giboin, Michel Buffa, Elmahdi Korfed.

In the context of the ANR project WASABI, and in collaboration with Guillaume Pellerin (IRCAM), we specified a generic methodological framework for evaluating the WASABI musical demonstrators through their use. The demonstrators are targeted to six kinds of users: composers, musicologists, journalists, content providers, music school students and teachers, and sound-engineers.

7.1.3. *Territoriality-theory-based Rules and Method for Designing Multi-device Games*

Participant: Alain Giboin.

A research action performed in the context of a collaboration with Anne-Marie Dery-Pinna, Philippe Renevier (I3S, Sparks team) and Sophie Lepreux (UVHC, LAMIH Lab). Observing that "territorial behavior" occurs during human interaction at a table – i.e. that humans engaged in a collaborative task partition the table workspace into different zones (so-called personal territory, group territory and storage territory), in order to get collaborative benefits –, Scott and Carpendale [65] proposed to rely on a tabletop territoriality (or workspace partitioning) theory to support the design of collaborative digital tabletop applications. Concerned by competitive game applications involving multiple devices (e.g., tabletop, tablet, smartphone), we adapted Scott and Carpendale's theory, and, based on this adapted theory, we developed a set of rules and a method for designing the user interfaces of these multi-device applications [57]. This year, we refined this set of rules and this method after having tested them [58].

7.1.4. *Linked Data Visualization*

Participants: Yun Tian, Olivier Corby.

We started a collaboration with M. Winckler from I3S, UNS, on Linked Data visualization with Yun Tian, a Polytech'Nice Master internship. During this internship, we have connected the HAL open data server ¹ with the MGExplorer graphic library. The result is a graphic browser for copublications. This work resulted in a server prototype ².

7.1.5. *Linked Data Path Finder*

Participants: Marie Destandeau, Olivier Corby, Alain Giboin.

We started a collaboration with the ILDA Inria team from Saclay where we developed an algorithm to explore the content of remote Semantic Web triple stores.

7.2. **Communities and Social Interactions Analysis**

7.2.1. *Fake News Detection*

Participants: Elena Cabrio, Serena Villata, Jérôme Delobelle.

This work is part of the DGA project RAPID CONFIRMA (COntre argumentation contre les Fausses InfoRMAtion) aiming to automatically detect fake news and limit their diffusion. In this purpose, a framework is developed to detect fake news, to reduce their propagation and to propose the best response strategies. Thus, in addition to identifying the communities propagating these fake news, our goal is to propose a method to convince a person that the information is actually false is a key element in fighting the spread of such a kind of dangerous information. To achieve this goal, we orientate our research towards the generation of counter-argumentation. Counter-argumentation is a process aiming to put forward counter-arguments in order to provide evidences against a certain argument previously proposed. In the case of fake news, in order to convince a person that the (fake) information is true, the author of the fake news will use different methods of persuasion via arguments. Thus, identifying these arguments and attacking them by using carefully constructed arguments from safe sources is a way to fight this phenomenon and its spread along the social network. More precisely, we have identified four steps to address the counter-argumentation process: (1) Identifying the arguments used in the fake news (Argument mining); (2) Determining, for each of the arguments, whether it is for or against the topic of the fake news (Stance detection); (3) Identifying the key arguments that our system must attack (Classification task); and (4) Providing a set of arguments from safe sources to attack the targeted fake arguments (Counter-Argumentation).

We are also interested in studying, from a formal point of view, how to cast the notion of interpretability (i.e. the degree to which an observer can understand the cause(s) of a result) in abstract argumentation so that the reasons leading to the acceptability of one or a set of arguments in a framework (returned by a particular semantics) may be explicitly assessed [13]. More precisely, this research question breaks down into the following sub-questions: (i) how to formally define and characterise the notion of *impact* of an argument with respect to the acceptability of the other arguments in the framework? and (ii) how does this impact play a role in the interpretation process of the acceptability of arguments in the framework?

¹<http://sparql.archives-ouvertes.fr/sparql>

²<http://sparks-vm9.i3s.unice.fr:8080/index.html>

7.2.2. Hate Speech Detection

Participants: Elena Cabrio, Alain Giboin, Sara Tonelli, Michele Corazza, Pinar Arslan, Stefano Menini.

On the topic of cyberbullying event detection and hate speech detection, we proposed a message-level cyberbullying annotation on an Instagram dataset. Moreover, we used the correlations on the Instagram dataset annotated with emotion, sentiment and bullying labels. Finally, we built a message-level emotion classifier automatically predicting emotion labels for each comment in the Vine bullying dataset. We built a session-based bullying classifier with the use of n-grams, emotion, sentiment and concept-level features. For both emotion and bullying classifiers, we used Linear Support Vector Classification. Our results showed that “anger” and “negative” labels have a positive correlation with the presence of bullying. Concept-level features, emotion and sentiment features in different levels contribute to the bullying classifier, especially to the bullying class. Our best performing bullying classifier with n-grams and concept-level features (e.g., polarity, averaged polarity intensity, moodtags and semantics features) reached to an F1-score of 0.65 for bullying class and a macro average F1-score of 0.7520. The results of this research have been published at SAC 2019 [7].

Together with some colleagues at FBK Trento, we performed a comparative evaluation on datasets for hate speech detection in Italian, extracted from four different social media platforms, i.e. Facebook, Twitter, Instagram and WhatsApp. We showed that combining such platform-dependent datasets to take advantage of training data developed for other platforms is beneficial, although their impact varies depending on the social network under consideration. The results of this research have been published at SAC 2019 [11].

7.3. Vocabularies, Semantic Web and Linked Data Based Knowledge Representation and Artificial Intelligence Formalisms on the Web

7.3.1. Semantic Web for Biodiversity

Participants: Franck Michel, Catherine Faron Zucker, Antonia Ettore.

The development of an activity related to biodiversity data sharing and integration is going on through the sustained collaboration with the “Muséum National d’Histoire Naturelle” of Paris (MNHN).

First, at the very end of 2018, we published a journal paper about the SPARQL Micro-Services architecture and how this can be useful in the biodiversity domain [62]. Then, through the internship of a Ubinet master student, we explored how SPARQL Micro-Services can help biologists in editing taxonomic information by confronting multiple, heterogeneous biodiversity-related data sources. We presented some results of this work at the Biodiversity_Next conference 2019 [28].

Within the same internship we continued the work meant to publish biodiversity data as linked data (TAXREF-LD³). The goal is to extend the dataset from simple taxonomic data to new types of data: species interactions, multi-lingual names, conservation and legal statuses. This work should lead to a publication in 2020.

During the last two years, we have lead the biodiversity task within the Bioschemas.org W3C community group that seeks the definition and adoption of common biology-related markup terms. We proposed the creation of the Taxon term⁴ whose adoption in Schema.org is under discussion. The work now starts bearing fruits as 180.000+ webpages of the MNHN are now annotated with the Taxon term, paving the way to more biodiversity resources being published as structured data that search engines can process to provide more accurate search results.

7.3.2. Semantic Web for eEducation

Participants: Catherine Faron Zucker, Géraud Fokou Pelap.

In the framework of the EduMICS project we developed and populated an ontology to represent the students’ activity on the Educlever learning platform.

³<http://agroportal.lirmm.fr/ontologies/TAXREF-LD>

⁴<http://bioschemas.org/devSpecs/Taxon/>

7.3.3. *Semantic Web for B2B applications*

Participants: Molka Dhoub, Catherine Faron Zucker, Andrea Tettamanzi.

In the framework of the collaborative project with Silex France company aiming to model the social network of service providers and companies, as a preliminary step, we developed an ontology alignment approach combining word embedding and the radius measure to detect matching concepts and determining equivalence or hierarchical relations between them. We report and discuss the results of the evaluation of our approach on the OAEI complex alignment benchmark and on the SILEX use case: aligning reference vocabularies to annotate B2B services (ESCO to Cigref, ESCO to ROME, NAF to kompass and NAF to Silex activity domains) [35].

7.3.4. *Integration of Heterogeneous Data Sources*

Participants: Franck Michel, Catherine Faron Zucker, Fabien Gandon.

With the incentive of fostering the integration of Linked Data and non RDF data sources, we continued the work initiated around the SPARQL Micro-Service architecture that harnesses the Semantic Web standards to enable automatic combination of Linked Data and data residing in Web APIs. We published a paper at the LDOW workshop of the Web Conference that explores how we can leverage Schema.org to enable web-scale discovery and querying of Web APIs using SPARQL micro-services [27].

7.3.5. *Uncertainty in the Semantic Web*

Participants: Ahmed El Amine Djebri, Fabien Gandon, Andrea Tettamanzi.

In the framework of Ahmed El Amine Djebri's thesis, we proposed an approach to publishing uncertainty on the Semantic Web [15] and to link and negotiate uncertainty theories [14].

7.3.6. *Uncertainty in Human Geography*

Participant: Andrea Tettamanzi.

In the framework of the Incertimmo collaborative project between Université Côte d'Azur and Kinaxia, we applied machine learning and urban morphology theory to the investigation of the influence of the urban environment on the value of residential real estate [6].

7.3.7. *Ontology Design Rule*

Participants: Olivier Corby, Catherine Faron Zucker, Philippe Martin.

We worked on the topic of Ontology Design Rules with Philippe Martin, from université de la Réunion, during his visit to the Wimmics team. This work resulted in a publication at Semantics [25].

7.3.8. *Suggestion of Data Sources for SPARQL Queries over Linked Open Data*

Participants: Hai Huang, Fabien Gandon.

For querying processing over Linked Open Data, suggestion of relevant data sources with respect to a SPARQL query is crucial since it highly affects the performance of querying. In this work, we focus on the problem of suggesting k relevant data sources with respect to a SPARQL query. We propose a summarization method which models the RDF graph of linked data sources and query graphs as sets of feature paths (star, sink and chain paths) and an effective algorithm to extract these feature paths for data sources and query graphs. To obtain candidate data sources we propose a time and space efficient search algorithm based on locality sensitive hashing. We perform a large-scale experiment on real world linked datasets which shows that our algorithm outperforms existing baselines.

7.4. Analyzing and Reasoning on Heterogeneous Semantic Graphs

7.4.1. *SPARQL Function*

Participant: Olivier Corby.

We wrote a SHACL interpreter with the LDScript language. Within the SPARQL Function LDScript [56] language we introduced new datatypes for JSON and XML DOM. We have written a technical documentation for the whole language: <http://ns.inria.fr/sparql-extension>.

7.4.2. *Ontology alignment approach based on Embedded Space*

Participants: Molka Dhouib, Catherine Faron Zucker, Andrea Tettamanzi.

In the framework of a collaborative project with Silex France company aiming to model the social network of service providers and companies, as a preliminary step, we developed last year a dedicated vocabulary of competences and fields of activities to semantically annotate B2B service offers. This year, we proposed a new ontology alignment approach based on a set of rules exploiting the embedded space and measuring clusters of labels to discover the relationship between concepts. We tested our system on the OAEI conference complex alignment benchmark track and then applied it to aligning ontologies in a real-world case study of Silex company. The experimental results show that the combination of word embedding and the radius measure make it possible to determine, with good accuracy, not only equivalence relations, but also hierarchical relations between concepts. This work has been presented at the 15th International Conference, SEMANTiCS 2019 [35].

7.4.3. *Argument Mining and Argumentation Theory*

Participants: Elena Cabrio, Shohreh Haddadan, Tobias Mayer, Milagro Teruel, Laura Alonso Alemany, Johanna Frau.

We have proposed an Argument Mining approach to political debates [23]. We have addressed this task in an empirical manner by annotating 39 political debates from the last 50 years of US presidential campaigns, creating a new corpus of 29k argument components, labeled as premises and claims. We then proposed two tasks: (1) identifying the argumentative components in such debates, and (2) classifying them as premises and claims. We showed that feature-rich SVM learners and Neural Network architectures outperform standard baselines in Argument Mining over such complex data. We released the new corpus USElecDeb60To16 and the accompanying software under free licenses to the research community. As a result of these findings, we have also realized the DISPUTool system [22]. The results of this research have been published at ACL 2019 and IJCAI 2019.

We have contributed to the definition of the ACTA tool, aiming at applying argument mining to clinical text, given the importance of argument-based decision making in medicine [26]. ACTA is a tool for automating the argumentative analysis of clinical trials. The tool is designed to support doctors and clinicians in identifying the document(s) of interest about a certain disease, and in analyzing the main argumentative content and PICO elements. The results of this research have been published at IJCAI 2019.

Finally, together with Laura Alonso Alemany (Univ. Cordoba), Johanna Frau (Univ. Cordoba) and Milagro Teruel (Univ. Cordoba), we evaluated different attention mechanisms applied over a state-of-the-art architecture for sequence labeling [18]. Argument mining is a rising area of Natural Language Processing (NLP) concerned with the automatic recognition and interpretation of argument components and their relations. Neural models are by now mature technologies to be exploited for automating the argument mining tasks, despite the issue of data sparseness. This could ease much of the manual effort involved in these tasks, taking into account heterogeneous types of texts and topics. They assessed the impact of different flavors of attention in the task of argument component detection over two datasets: essays and legal domain. They showed that attention not models the problem better but also supports interpretability. The results of this research have been published at FLAIRS 2019.

7.4.4. *Mining and Reasoning on Legal Documents*

Participants: Serena Villata, Cristian Cardellino, Milagro Teruel, Laura Alonso Alemany, Guido Governatori, Leendert Van Der Torre, Beishui Liao, Nir Oren.

Together with Cristian Cardellino (Univ. Cordoba), Santiago Marro (Univ. Cordoba), Milagro Teruel (Univ. Cordoba) and Laura Alonso Alemany (Univ. Cordoba), we have adapted the semi-supervised deep learning architecture known as Convolutional Ladder Networks, from the domain of computer vision, and explored how well it works for a semi-supervised Named Entity Recognition and Classification task with legal data. The idea of exploring a semi-supervised technique is to assess the impact of large amounts of unsupervised data (cheap to obtain) in specific tasks that have little annotated data, in order to develop robust models that are less prone to overfitting. In order to achieve this, first we checked the impact on a task that is easier to measure. We presented some preliminary results, however, the experiments carried out showed some interesting insights that foster further research in the topic. The results of this research have been published at FLAIRS 2019 [9].

Together with some colleagues from Data61 Queensland (Australia) and Antonino Rotolo (University of Bologna), Serena Villata proposed a framework for modelling legislative deliberation in the form of dialogues. Roughly, in legislative dialogues coalitions can dynamically change and propose rule-based theories associated with different utility functions, depending on the legislative theory the coalitions are trying to determine. The results of this research have been published at ICAIL 2019 [21].

Finally, together with Nir Oren (Univ. Aberdeen), Leendert van der Torre (Univ. Luxembourg) and Beishui Liao (Univ. Zhejiang), we defined, using hierarchical abstract normative systems (HANS), three kinds of prioritized normative reasoning approaches called Greedy, Reduction and Optimization. Then, after formulating an argumentation theory for a HANS, we showed that for a totally ordered HANS, Greedy and Reduction can be represented in argumentation by applying the weakest link and the last link principles, respectively, and Optimization can be represented by introducing additional defeats capturing the idea that for each argument that contains a norm not belonging to the maximal obeyable set then this argument should be rejected. The results of this research have been published on the Journal of Logic and Computation [3].

7.4.5. *Natural Language Processing of Song Lyrics*

Participants: Michael Fell, Elena Cabrio, Fabien Gandon, Alain Giboin.

We progressed our work in the WASABI ANR project in two directions. First, we tackled the problem of summarizing song lyrics. Given the peculiar structure of songs, applying generic text summarization methods to lyrics can lead to the generation of highly redundant and incoherent text. We thus proposed to enhance state-of-the-art text summarization approaches with a method inspired by audio thumbnailing. We showed how these summaries that take into account the audio nature of the lyrics outperform the generic methods according to both an automatic evaluation and human judgments. The work resulted in an RANLP publication [17]. Second, we investigated the task of detecting swear words and other potential harmful content in lyrics. The Parental Advisory Label (PAL) is a warning label that is placed on audio recordings in recognition of profanity or inappropriate references, with the intention of alerting parents of material potentially unsuitable for children.

Since 2015, digital providers such as iTunes, Spotify, Amazon Music and Deezer also follow PAL guidelines and tag such tracks as explicit.

Nowadays, such labelling is carried out mainly manually on voluntary basis, with the drawbacks of being time consuming and therefore costly, error prone and partly a subjective task. Therefore, we compared automated methods ranging from dictionary-based lookup to state-of-the-art deep neural networks to automatically detect explicit contents in English lyrics. We showed that more complex models perform only slightly better on this task, and relying on a qualitative analysis of the data, we discussed the inherent hardness and subjectivity of the task. The work was published at the RANLP conference [16]. We are currently modelling emotion in song lyrics, with the focus on the hierarchical and sequential structure of these texts, in which lines make up segments which make up the full lyric. And later parts may be perceived differently in light of the emotion previous parts have caused.

7.4.6. *RDF Mining*

Participants: Thu Huong Nguyen, Andrea Tettamanzi.

In collaboration with our former PhD student Tran Duc Minh, Claudia d’Amato of the University of Bari, and Nguyen Thanh Binh of the Danang University, we made a comparison of rule evaluation metrics for EDMAR, our evolutionary approach to discover multi-relational rules from ontological knowledge bases exploiting the services of an OWL reasoner [36].

In the framework of Nguyen Thu Huong’s thesis, we have proposed a grammar-based evolutionary method to mine RDF datasets for OWL class disjointness axioms [31], [30].

7.4.7. *Machine Learning for Operations Research*

Participant: Andrea Tettamanzi.

Together with Alberto Ceselli and Saverio Basso of the University of Milan we used machine learning techniques to understand good decompositions of linear programming problems [1].

7.4.8. *Image recognition with Semantic Data*

Participants: Anna Bobasheva, Fabien Gandon, François Raygagne, Frédéric Precioso.

The objective of the MonaLIA 2.0 project is to exploit the crossover between the Deep Learning methods of image analysis and knowledge-based representation and reasoning and its application to the semantic indexing of annotated works and images in JocondeLab dataset. The goal is to identify automated or semi-automated tasks to improve the annotation and information retrieval. This project was an 11-month contract with Ministry of Culture plus 6-month internship.

- Training dataset preparation
 - Developed SPARQL query to extract the subsets of images to train the multi-label Deep Learning classifiers for a given set of categories
 - Developed Python scripts to filter and balance training images and Joconde specific data loader
 - Identified categories that are not linked by Garnier Thesaurus but visually related and extended the Joconde metadata with the new RDF triples (e.g. category "Rider" is linked to categories "Horse" and "Human being")
 - Researched effects of various image transformations on the object detection performance (resizing, cropping, padding, scaling)
 - For the underrepresented categories (bicycle, airplane, cat, etc.) downloaded the images from the external sources such as Kaggles’ "Painter by Number", the Behance Artistic Media Set, and Cleveland Museum of Art. This has been done with the internship of François Raygagne.
- Building Deep Learning model
 - Adapted the pre-trained VGG16 and Inception v3 PyTorch implementations for multi-label classification of the artwork images
 - Tuned models hyperparameters
 - Experimented with scaling the multi-labeled for 10, 20, 40 classes
 - Experimented with binary classifiers for a single category
- Classification results consumption
 - Studied the possible dependencies between knowledge graph metrics and classification performance (average precision of object detection)
 - Extended the Joconde metadata with prediction scores produced by the classifiers
 - Included the scores into category search queries to filter and order the results to produce more relevant results

Results were presented at atelier Culture - Inria, on december 2nd, Institut national d’histoire de l’art in Paris.

7.4.9. Hospitalization Prediction

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

HealthPredict is a project conducted in collaboration with the Département d'Enseignement de Recherche en Médecine Générale (DERMG) at Université Côte d'Azur and the SynchroNext company. It aims at providing a digital health solution for the early management of patients through consultation with their general practitioner and health care circuit. Concretely, it is a predictive Artificial Intelligence interface that allows us to cross the data of symptoms, diagnosis and medical treatments of the population in real time to predict the hospitalization of a patient. We propose and evaluate different ways to enrich the features extracted from electronic medical records with ontological resources before turning them into vectors used by Machine Learning algorithms to predict hospitalization. We reported and discussed the results of our first experiments on the database PRIMEGE PACA at EGC 2019 [38] and ESWC 2019 [19]. We propose a semi-supervised approach based on DBpedia to extract medical subjects from EMRs and evaluate the impact of augmenting the features used to represent EMRs with these subjects in the task of predicting hospitalization. Our results will be presented at SAC 2020 [61]. We designed an interface to assist in the decision-making process of general practitioners that allows them to identify in patients the first signs that lead to hospitalization and medical problems to be treated as a priority. It has been presented at [55].

7.4.10. Learning Analytics and Adaptive learning

Participants: Oscar Rodríguez Rocha, Catherine Faron Zucker.

We developed semantic queries to analyse the student activity data available in the Educlever knowledge graph and the SIDES knowledge graph, showing the added value of Semantic Web modelling enabling ontology-based reasoning. The results of our analysis of the SIDES knowledge graph have been presented at the 2019 French workshop on AI and Health [39].

The faculties of medicine, all grouped together under the auspices of the *Conférence des doyens*, are collectively proposing to upgrade the SIDES solution to an innovative solution called Intelligent Health Education System 3.0 (SIDES 3.0). As part of this community-based approach, the coordination of the project will be carried out by the *Université Numérique Thématique (UNT) en Santé et Sport*, the *GIP UNESS.fr*. This structure offers an ideal national positioning for support and coordination of training centers (UFR) and also offers long-term financial sustainability.

In particular, Inria through the Wimmics research team focuses on the recommendation of existing questions to the students according to their profile. For this, research activities are performed to classify the questions present in the platform by difficulty levels according to the Bloom's revised taxonomy, considering the information contained in text of the question. Also, research activities have focused to predict the probability of the outcomes of the students to questions considering previous answers stored in the SIDES graph.

With the ultimate goal of recommending resources adapted to the student's profile and context, we developed an approach to predict the success of students when answering training or test questions by learning a student model from the SIDES knowledge graph. To learn a user model from the SIDES knowledge graph, we combine state-of-the-art features with node embeddings. Our first results will be presented at SAC 2020.

The level of complexity and specificity of the learning objective associated with a question may be a key criterion to integrate in the recommendation process. For this purpose, we developed an approach to classify the questions of the SIDES platform according to the reference Bloom's taxonomy, by extracting the level of complexity and specificity of their learning objectives from their textual descriptions with semantic rules.

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. PREMISSE Collaborative Project

Participants: Molka Dhoub, Catherine Faron Zucker, Andrea Tettamanzi.

Partner: SILEX France.

This collaborative project with the SILEX France company started in march 2017, funded by the ANRT (CIFRE PhD). SILEX France is developing a B2B platform where service providers and consumers upload their service offers or requests in free natural language; the platform is intended to recommend service providers to the applicant, which are likely to fit his/her service request. The aim of this project is to develop a solution to link together service providers and consumers.

8.1.2. *HealthPredict Collaborative Project*

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

Partner: Synchronext.

This collaborative project with the Synchronext company started in april 2017, funded by the ANRT (CIFRE PhD). Synchronext is a startup aiming at developing Semantic Web business solutions. The aim of this project is to design a digital health solution for the early management of patients through consultations with their general practitioner and health care circuit. The goal is to develop a predictive Artificial Intelligence interface that allows to cross the data of symptoms, diagnosis and medical treatments of the population in real time to predict the hospitalization of a patient.

8.1.3. *Joint Lab EduMICS*

Participants: Olivier Corby, Catherine Faron Zucker, Géraud Fokou Pelap, Fabien Gandon, Alain Giboin.

Partner: Educlever.

EduMICS (Educative Models Interactions Communities with Semantics) is a joint laboratory (LabCom) between the Wimmics team and the Educlever company that ended in early 2019. The aim of EduMICS was to develop research and technologies with the ultimate goal to adapt educational progressions and pedagogical resource recommendation to learner profiles.

8.1.4. *Curiosity Collaborative Project*

Participants: Catherine Faron Zucker, Oscar Rodríguez Rocha.

Partner: TeachOnmars.

This collaborative project with the TeachOnmars company started in October 2019. TeachOnMars is developing a platform for mobile learning. The aim of this project is to develop an approach for automatically indexing and semantically annotating heterogeneous pedagogical resources from different sources to build up a knowledge graph enabling to compute training paths, that correspond to the learner's needs and learning objectives.

8.2. Bilateral Grants with Industry

Accenture gifts (June 2017 - January 2022): Wimmics has received two gifts from Accenture. Together with additional funds from another project these gifts have been used to fund the Engineer position and then the PhD Grant (June 2017 - January 2022) of Nicholas Halliwell on a topic agreed with Accenture: "interpretable and explainable predictions"

9. Partnerships and Cooperations

9.1. Regional Initiatives

- Nhan Le Thanh is responsible of project Idex Jedi MIRE, Université Côte d'Azur (2017-2020)
- IADB UCA Project *Integration and Learning on Biomedical Data* ⁵, is a project funded by UCA JEDI Labex (Université Côte d'Azur). The goal of the project is to leverage medical prognosis and decision making in the clinical domain with big data analysis techniques, Natural Language Processing and Machine Learning. The partners are: I3S, Wimmics, CHU Nice, BCL (Bases, Corpus, Language) Laboratory.

⁵*Intégration et Apprentissage sur les Données Biomédicales*

9.2. National Initiatives

9.2.1. PIA GDN ANSWER

Participants: Fabien Gandon, Hai Huang, Vorakit Vorakitphan, Serena Villata, Elena Cabrio.

ANSWER stands for Advanced aNd Secured Web Experience and seaRch ⁶. It is a GDN project (Grands Défis du Numérique) from the PIA program (Programme d'Investissements d'Avenir) on Big Data. The project is between four Inria research teams and the Qwant company.

The aim of the ANSWER project is to develop the new version of the Qwant ⁷ search engine by introducing radical innovations in terms of search criteria as well as indexed content and users' privacy.

The purpose is to strengthen everyone's confidence in the search engine and increase the effectiveness of Web search. Building trust in the search engine is based on innovations in (1) Security: computer security, privacy; (2) Completeness: completeness and heterogeneity of (re)sources; and (3) Neutrality: analysis, extraction, indexing, and classification of data.

Increasing the effectiveness of Web-based research relies on innovations related to (1) Relevance: variety and value of content taken into account, measurement of emotions carried by query results; (2) Interaction with the user: adaptation of the interfaces to the types of research; and (3) Performance: perceived relevance of results and response time.

The proposed innovations include:

- Design and develop models and tools for the detection of emotions in query results:
 - Ontology, thesaurus, linguistic resources
 - Metrics, indicators, classification of emotions
- Design and develop new crawling algorithms:
 - Dynamic crawling strategies
 - Crawlers and indexes for linked open data
- Ensure respect for privacy:
 - Detection of Internet tracking
 - Preventive display of tracing techniques
 - Certified security of automatic adaptation of ads to keywords entered by the user

9.2.2. DGA CONFIRMA

Participants: Elena Cabrio, Serena Villata.

The theme of this new project with DGA is counter argumentation against fake news. Its duration is 2018-2020.

9.2.3. Ministry of Culture: MonaLIA 2.0

Participants: Anna Bobasheva, François Raygagne, Fabien Gandon, Frédéric Precioso.

⁶<https://project.inria.fr/answer/>

⁷<http://www.qwant.com>

The objective of the MonaLIA 2 project is to exploit the crossover of the automatic learning methods particularly applied to image analysis and knowledge-based representation and reasoning, in particular for the semantic indexing of annotated works and images in JocondeLab. The goal is to identify automated or semi-automatable tasks to improve the annotation. This project follows the preliminary project MonaLIA 1 which established the state of the art in order to evaluate the potential and the combination of learning (notably deep learning) and the semantization of annotations on the case of JocondeLab. In the project MonaLIA 2 we now want to go beyond the preliminary study and to design and build a prototype and the methods assisting the creation, the improvement and the maintenance of the metadata of the image database in order to assist the actors of the cultural world in their daily tasks. The preliminary study identified several possible coupling points between deep learning from non-necessarily structured data and reasoning from structured data. This project proposes to select the most promising of them to carry out a proof of concept combining these methods by focusing on the assistance to the annotation and curation tasks of the metadata of a real base to improve the contents, the course and exploitation thereafter.

9.2.4. ANR WASABI

Participants: Michel Buffa, Elena Cabrio, Catherine Faron Zucker.

The ANR project WASABI started in January 2017 with IRCAM, Deezer, Radio France and the SME Parisson, consists in building a 2 million songs knowledge base of commercial popular music (rock, pop, etc.) Its originality is the joint use of audio-based music information extraction algorithms, song lyrics analysis algorithms (natural language processing), and the use of the Semantic Web. Web Audio technologies will then explore these bases of musical knowledge by providing innovative applications for composers, musicologists, music schools and sound engineers, music broadcasters and journalists. This project is in its mid-execution and gave birth to many publications in international conferences as well as some mainstream coverage (i.e for “la fête de la Science”). Michel Buffa, national coordinator of this project, presented the project to “Journées Sciences et Musique” in October 2019 in Rennes, and animated a Master Class during the Sophia Summit 2019 event in November 2019. Participation in the ANR OpenMiage project aimed at offering online Bachelor and Master degrees.

Industrial transfer of some of the results of the WASABI project (partnership with AmpedStudio.com/Amp Track company) for integration of our software into theirs), SATT PACA.

Web site: <http://wasabihome.i3s.unice.fr>

9.2.5. ANR SIDES 3.0

Participants: Catherine Faron Zucker, Olivier Corby, Fabien Gandon, Alain Giboin, Andrea Tettamanzi.

Partners: Université Grenoble Alpes, Inria, Ecole Normale Supérieure de Lyon, Viseo, Theia.

SIDES 3.0 is an ANR project (2017-2020) which started in fall 2017. It is led by Université Grenoble Alpes (UGA) and its general objective is to introduce semantics within the existing SIDES educational platform⁸ for medicine students, in order to provide them with added value educational services.

Web site: <https://www.uness.fr/anr/projets/dune/sides3.0>

9.2.6. ANR D2KAB

Participants: Olivier Corby, Catherine Faron Zucker, Franck Michel.

Partners: LIRMM, INRA, IRD, ACTA

D2KAB is an ANR project which started in June 2019, led by the LIRMM laboratory (UMR 5506). Its general objective is to create a framework to turn agronomy and biodiversity data into knowledge - semantically described, interoperable, actionable, open- and investigate scientific methods and tools to exploit this knowledge for applications in science and agriculture.

Web site: <http://www.d2kab.org>

⁸<http://side-sante.org/>

9.2.7. *Smart Enseigno*

Participant: Catherine Faron Zucker.

Partner: Educlever, Ludotic, Cabrilog, IFE

As a follow-up of the EduMICS project, the Smart Enseigno project started in September 2019, led by Educlever. It is funded by the Ministry of National Education (MEN), within the Programme des Investissements d’Avenir (PIA2), action Partenariat d’innovation Intelligence artificielle(PI-IA)⁹ ¹⁰. This project aims at developing resources and intelligent services within the Educlever platform for secondary school mathematics education.

9.2.8. *DBpedia.fr*

Participants: Elmahdi Korfed, Fabien Gandon.

The 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>

9.2.9. *Convention between Inria and the Ministry of Culture*

Participant: Fabien Gandon.

We supervise the research convention with the Ministry of Culture to foster research and development at the crossroad of culture and digital sciences. This convention signed between Inria and the Ministry of Culture provides a framework to support projects at the cross-road of the cultural domain and the digital sciences.

9.2.10. *Qwant-Inria Joint Laboratory*

Participant: Fabien Gandon.

We supervise the Qwant-Inria Joint Laboratory where joint teams are created and funded to contribute to the search engine research and development. The motto of the joint lab is Smart Search and Privacy with five research directions:

- Crawling, Indexing, Searching
- Execution platform, privacy by design, security, ethics
- Maps and navigation
- Augmented interaction, connected objects, chatbots, personal assistants
- Education technologies (EdTech)

We released the final, but confidential, report of the Qwant-Culture short-term project. This project aimed at identifying possibilities of exploiting the Qwant search engine to improve the search for information in the digital cultural resources of the French Ministry of Culture. Some possibilities have been selected to be the subject of research actions in the context a long-term project.

9.2.11. *GDRI Zoomathia*

Participants: Catherine Faron Zucker, Franck Michel, Andrea Tettamanzi.

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

⁹<https://eduscol.education.fr/pid29713/appels-a-projets-numeriques-des-investissements-d-avenir.html>

¹⁰<https://primabord.eduscol.education.fr/P2IA>

As a continuation of the work initiated with the *Muséum National d'Histoire Naturelle* (MNHN) during the last three years, the TAXREF-LD linked data dataset, that we produced jointly with the MNHN, now appears in the Linked Open Data cloud ¹¹ and is published on AgroPortal ¹². Relatedly, we have reflected on modelling principles for biodiversity Linked Data [63].

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

9.3. European Initiatives

9.3.1. FP7 & H2020 Projects

- AI4EU : In January 2019, the AI4EU consortium was established to build the first European Artificial Intelligence On-Demand Platform and Ecosystem with the support of the European Commission under the H2020 programme. We participate to the design of an ontology of AI resources. We have set up a prototype of Web server with a SPARQL endpoint to demonstrate the ontology and RDF metadata. Web site: <https://www.ai4eu.eu>

9.3.2. Collaborations in European Programs, Except FP7 & H2020

MIREL Project

Program: RISE

Project acronym: MIREL

Project title: MIning and REasoning with Legal texts

Duration: January 2016 - December 2019

Coordinator: University of Luxembourg

Other partners: 16 members from 11 countries ¹³.

Abstract: project that defines a formal framework and develops 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, checking compliance, and supporting decision .

CREEP EIT Project

Program: KIC EIT Digital 2018

Project acronym: CREEP

Project title: Cyberbullying Effects Prevention

Duration: January 2018 - December 2019

Coordinator: Fondazione Bruno Kessler

Other partners: University of Trento, Fondazione Bruno Kessler, ExpertSystem, NeuroNation

Abstract: CREEP (Cyberbullying Effects Prevention) aims at identifying and preventing the possible negative impacts of cyberbullying on young people. It seeks to realize advanced technologies for the early detection of cyberbullying phenomena through the monitoring of social media and the communication of preventive advices and personalized recommendations tailored to teenagers' needs through a virtual coaching system (chatbot).

¹¹<http://lod-cloud.net/>

¹²<http://agroportal.lirmm.fr/ontologies/TAXREF-LD/>

¹³<http://www.mirelproject.eu/members.html>

9.4. International Research Visitors

- Laura Alonso Alemany, Professor, Cordoba University, Argentina
- Luigi Asprino, PhD, Research Assistant, Institute of Cognitive Sciences and Technologies, Roma, Italy
- Cristian Cardelino, PhD student, Cordoba University, Argentina
- Alberto Ceselli, Professor, University of Milano, Italy
- Andrei Ciortea, Postdoctoral researcher, University St. Gallen, Switzerland
- Johanna Frau, PhD student, Cordoba University, Argentina
- Marco Guerini, Researcher, Fondazione Bruno Kessler, Trento, Italy
- Phan Hieu Ho, PhD student, Danang Polytech, Vietnam
- Dario Malchiodi, Associate Professor, University of Milano, Italy
- Enrico Mensa, PhD Student, University of Torino, Italy
- Than Tuan Nguyen, Ph. D. student, Université Hanoi, Vietnam
- Debora Nozza, PhD student, University of Milano, Italy
- Johan Pauwels, Research Assistant, Queen Mary University of London
- Mark Sandler, Professor, Queen Mary University of London
- Milagro Teruel, PhD student, Cordoba University, Argentina

9.4.1. Visits to International Teams

9.4.1.1. Research Stays Abroad

- Fabien Gandon visited Stanford, USA from July to August 2019. In the context of the project MIREL he worked on the problem of SHACL-based validation of ontologies.

10. Dissemination

10.1. Promoting Scientific Activities

10.1.1. Scientific Events: Organisation

10.1.1.1. General Chair, Scientific Chair

Elena Cabrio was Conference Handbook Chair of ACL 2019 (Association of Computational Linguistics conference). Florence (Italy), July 2019.

Catherine Faron Zucker was co-chair of the AFIA scientific day on Education and Training on Artificial Intelligence (EFIA), Paris, 10/02/2019.

Fabien Gandon was general chair of ISWC the International Semantic Web Conference, October, 2019.

Serena Villata was Handbook Chair of the 2019 Conference on Empirical Methods in Natural Language Processing (EMNLP- 2019).

10.1.1.2. Member of the Organizing Committees

Michel Buffa was co-organizer of the W3C Workshop on Web Games, 27-28 June 2019; Redmond, WA, USA.

Fabien Gandon was co-organizer of the Joint Day Inria Ministry of Culture 02/12/2019.

10.1.2. Scientific Events: Selection

10.1.2.1. Chair of Conference Program Committees

Nhan Le Thanh:

Program chair of 13th International Conference on Computing and Communication Technologies (RIVF). 20-22 March 2019, Danang, Vietnam.

10.1.2.2. Member of the Conference Program Committees

Michel Buffa:

WebAudio conference 2019

W3C Workshop on Web Games, 27-28 June 2019; Redmond, WA, USA

Elena Cabrio:

Association for Computational Linguistics conference (ACL 2019), EMNLP2019, the Extended Semantic Web Conference (ESWC 2019), the International Semantic Web Conference, the AAAI Conference on Artificial Intelligence (AAAI-19).

Olivier Corby:

Digital Health, Ingénierie des Connaissances, ICCS, IJCAI, ISWC, KCAP, Quweda, SBBB, TheWebConf, WUM.

Jérôme Delobelle:

AAAI, IJCAI 2019 ⇒ Distinguished Program Committee member, Rencontres des Jeunes Chercheurs en Intelligence Artificielle (RJCIA), AAMAS.

Catherine Faron Zucker:

TheWebConf, IJCAI (Int. Joint Conference on Artificial Intelligence), ESWC (European Semantic Web Conference), ISWC (Int. Semantic Web Conference), Semantics, ICCS (Int. Conference on Conceptual Structures), IC (Ingénierie des Connaissances), EGC (Extraction et Gestion des Connaissances), EIAH (Environnements Informatiques pour l'Apprentissage Humain).

Fabien Gandon reviewed for: IJCAI, EGC, WebSci.

Oscar Rodríguez Rocha:

SAC 2020 - ACM Symposium on Applied Computing 2020 - The Semantic Web and Applications (SWA), AAAI 2020 - The 34th AAAI Conference on Artificial Intelligence, IJCAI, Semantics, IEEE-RIVF International Conference on Computing and Communication Technologies, KEOD International Conference on Knowledge Engineering and Ontology Development, KSE International Conference on Knowledge and Systems Engineering.

Andrea Tettamanzi:

AAAI-19, ACM 2020 (SWA Track), EGC 2020, EKAW 2020, PPSN 2020, TheWebConf 2020, and Web Intelligence 2020 conferences. He was Senior PC Member of IJCAI.

Serena Villata:

IJCAI, EMNLP, AAAI, AAMAS, JURIX, ICAIL.

10.1.3. Journal

10.1.3.1. Member of the Editorial Boards

Catherine Faron Zucker:

Revue d'Intelligence Artificielle, Guest editor of the Semantic Web journal for a special issue devoted to extended versions of the best papers of EKAW 2018.

Serena Villata is among the authors of two editorial activities:

- Livio Robaldo, Serena Villata, Adam Wyner, Matthias Grabmair: Introduction for artificial intelligence and law: special issue "Natural Language Processing for Legal Texts". *Artif. Intell. Law* 27(2): 113-115 (2019) [4],
- Qingliang Chen, Paolo Torroni, Serena Villata: Principles and practice of multi-agent systems. *Knowledge Eng. Review* 34: e3 (2019) [2].

10.1.3.2. Reviewer - Reviewing Activities

Elena Cabrio:

Journal Argument and Computation.

Andrea Tettamanzi has served as a referee for the journals: Fuzzy Sets and Systems, Semantic Web Journal, Transactions on Evolutionary Computation.

Serena Villata:

Journal of Logic and Computation, Argument & Computation, Artificial Intelligence.

10.1.4. Invited Talks

Michel Buffa:

Programmable Audio Workshop, "WebAudio applications developed during the WASABI ANR Project", December 4, 2019 — GRAME-CNCM, Lyon (France)

Master Class "Wasabi Project : Make Music Accessible To Everybody", Sophia Summit, 19th November 2019, Sophia Antipolis, France.

Elena Cabrio:

An introduction to Computational Linguistics. University of Bologna (Italy). May 2019.

Olivier Corby:

Graph Data on the Web: extend the pivot, don't reinvent the wheel, W3C workshop on RDF and Property Graph, Berlin, March 5th.

SPARQL Template & Function, workshop at EDF, Orsay, May 21st.

Introduction au Web sémantique, Datathon workshop of "archives nationales", Paris, november 29th.

Jérôme Delobelle:

"Comment utiliser l'argumentation pour lutter contre les fausses informations?", GraphiK team (Inria (Sophia Antipolis Méditerranée center), LIRMM (University of Montpellier and CNRS) and INRA), November 21st.

Catherine Faron Zucker:

Invited talk at the workshop of the MODAL project, Rennes, 2019/07/11: Injecting Domain Knowledge in Electronic Medical Records to Improve Hospitalization Prediction

Fabien Gandon:

Web Science 2019 keynote, The Web We Mix - benevolent AIs for a resilient web, Boston, USA, June,

RIVF 2019 keynote, Web of Data and Semantic Web: Linking Data and Their Schemas around the World, Da Nang Vietnam, March.

Andrea Tettamanzi:

Seminar, "Towards an Evolutionary Epistemology of Ontology Learning" at University of Danang, Vietnam, on March 19, 2019.

Conference on Unsupervised Learning at Amadeus, Sophia Antipolis, May 17, 2019.

Conference on Unsupervised Learning at Amadeus, Sophia Antipolis, October 25, 2019.

Serena Villata:

International Conference on Legal Data Mining, Machine Learning and Visualisation organized by HEC in March 2019 in Paris.

10.1.5. Leadership within the Scientific Community

Fabien Gandon is:

- member of IW3C2 steering committee for The Web Conference (WWW series) until May 2019.
- member of SWSA steering committee for the ISWC conference (as general chair of ISWC 2019).
- member of ESWC conference steering committee until October 2019.
- member of Web Science Trust Network.

10.1.6. Scientific Expertise

Michel Buffa:

Member of the W3C WebAudio working group

Academic Representative of Université Côte d'Azur to the W3C (AC Rep)

Elena Cabrio:

Reviewer of the proposals of the Vienna Science and Technology Fund (WWTF) in 2019.

Reviewer of the projects "soutien aux contrats doctoraux" of the Grand Est Région (France) in 2019.

Member of the evaluation committee assigning the AILC Master Thesis Award (the Italian association for Computational Linguistics) in 2019.

Catherine Faron Zucker:

scientific referent of the Inria Learning Lab,

member of the ANR scientific evaluation committee "Artificial Intelligence" (CE23),

reviewer of project proposals for the MSH Paris-Saclay.

10.1.7. Research Administration

Michel Buffa:

Member of the scientific council of the GRAME laboratory (Lyon)

Director of the Miage de Nice Sophia-Antipolis, composed of Licence, Master 1 and four Master 2 degrees. About 350 students (<http://miage.unice.fr>)

Olivier Corby is member of the Scientific and Pedagogical committee of DS4H Graduate School "Digital Systems for Humans" at Université Côte d'Azur. He is member of the scientific committee of Academy 1 RISE (Network, Information, Digital Society) at UCA. He is member of the PostDoc selection committee at Inria Sophia Antipolis.

Catherine Faron Zucker:

- General Treasurer of the French Society for Artificial Intelligence (AFIA).
- member of the steering committee of the AFIA college on Knowledge Engineering.
- member of the evaluation committee of Inria.
- member of the CPRH 27 commission at Université Côte d'Azur.
- coordinator of the Web option of the 5th year of Polytech Nice Sophia engineering school.
- pedagogical responsible of continuous training for the computer science department of Polytech Nice Sophia Antipolis.

Fabien Gandon is:

- Vice-head of science for Inria Sophia Antipolis - Méditerranée (Délégué Scientifique Adjoint, DSA)
- Advisory Committee representative of Inria at the World-Wide Web Consortium (W3C)
- Director of the joint research Laboratory Qwant-Inria
- Representative of Inria in the Web Science Trust Network
- Leader of the research convention with the French Ministry of Culture-Inria

Alain Giboin was member of the scientific committee of the IDEX Jedi Academy 5 "Homme, Idées et Milieux".

Serena Villata:

Since January 2019, Management Committee Member for France for the EU project COST Action CA17132 European network for argumentation and public policy analysis, nominated by the Ministère de l'Enseignement Supérieur, de la Recherche et de l'Innovation

10.2. Teaching - Supervision - Juries

10.2.1. Teaching

DUT: Andrea Tettamanzi, Data Mining, 16 h ETD, L2, UCA, France.

Licence: Michel Buffa, JavaScript, 40h, L3 Miage, UNS, France.

Licence: Elena Cabrio, Introduction to the Web, 40 hours, (L2MASS), UNS, France.

Licence: Elena Cabrio, Internship supervision, 27 hours, (L3MIAGE), UNS, France.

Licence: Elena Cabrio, Web, 36 hours, (L3 MIAGE), UNS, France.

Licence: Elena Cabrio, Object Oriented Programming, 14 hours (L3 MIAGE), UNS, France.

Licence: Elena Cabrio, Software Engineering, 20 hours, (L3 MIAGE), UNS, France.

Licence: Andrea Tettamanzi, Advanced Web Programming (client side), 39h , L2, UNS, France.

Licence: Andrea Tettamanzi, Web, 30h, L3, UNS, France.

Master: Michel Buffa, Web technologies front and back end, 40h, M1, UNS, France.

Master: Michel Buffa, Server Side JavaScript and modern front-end frameworks, 60h, M2 Miage NTDP and MBDS, UNS, France.

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

Master: Elena Cabrio, Computational Linguistics, 30 hours, (Lettres), UNS, France.

Master: Elena Cabrio, Natural Language Processing for AI, 24 hours, (M1 INFO), UNS, France.

Master and Licence: Elena Cabrio, Responsible of the intership programme, 40 hours, (L3 and M2 MIAGE), UNS, France.

Master: Elena Cabrio, Project supervision, Polytech project "Applied Math", 5 hours, UNS, France.

Master: Olivier Corby, Semantic Web, 20h, Polytech Nice, UNS, France.

Master: Catherine Faron Zucker, Web languages, 48h, M1, PNS UNS.

Master: Catherine Faron Zucker, Semantic Web technologies (EN), 48h, M2 Informatique, PNS, UNS.

Master: Catherine Faron Zucker, Knowledge Engineering (EN), 28h, M2 Informatique, PNS, UNS.

Master: Catherine Faron Zucker, Semantic Web technologies (EN), 30h, M1 Data Science, UNS.

Master: Catherine Faron Zucker, XML technologies, 16h, M2 IMAFA, PNS, UNS.

Master: Catherine Faron Zucker, Projects and Internship tutoring, 32h, M2, PNS, UNS.

Master: Fabien Gandon, Integrating Semantic Web technologies in Data Science developments, 56 h, M2, DSTI, France.

Master: Alain Giboin, Human-Computer-Interaction Design and Evaluation, 21h, M2, UNS, France.

Master: Alain Giboin, Adaptation of User Interfaces, 4h, M2, UNS, France.

Master: Alain Giboin, Task and Activity Analysis for HCI design and evaluation, 16h, M2 Sociology and Ergonomics of Digital Technologies, UNS, France.

Master: Alain Giboin, Digital Strategy (formerly: Economics and ICT) : Ergonomics, 16h, M2 Economics and ICT, ISEM, UNS, France.

Master: Oscar Rodríguez Rocha, Web of Data, 15h, M2, Polytech Nice, UNS, France.

Master: Oscar Rodríguez Rocha, Knowledge Engineering, 10h, M2, Polytech Nice, UNS, France.

Master: Oscar Rodríguez Rocha, Web Languages, 15h, M1, Polytech Nice, UNS, France.

Master: Andrea Tettamanzi, Logic for AI, 30 h ETD, M1, UNS, France.

Master: Andrea Tettamanzi, Web, 30 h ETD, M1, UNS, France.

Master: Andrea Tettamanzi, Agent-Based Modeling, 30 h ETD, M2, UNS, France.

E-learning

Mooc: Michel Buffa, "JavaScript Intro" published first in Juin 2017 on the EDx platform (MIT/Harvard), still active and updated regularly.

Mooc: Michel Buffa, "HTML5 Coding Essentials and Best Practices"

Mooc: Michel Buffa, "HTML5 Apps and Games", also on EDx, are still active and updated regularly.

More than 700.000 registered users since 2015 for these MOOCS.

Mooc: Fabien Gandon, Olivier Corby & Catherine Faron Zucker, Web of Data and Semantic Web (FR), 7 weeks, <http://www.france-universite-numerique.fr/>, Inria, France Université Numérique, Education for Adults, 3815 learners registered for 2019.

Mooc: Fabien Gandon, Olivier Corby & Catherine Faron Zucker, Introduction to a Web of Linked Data (EN), 4 weeks, <http://www.france-universite-numerique.fr/>, Inria, France Université Numérique, Education for Adults, 1226 learners registered for 2019.

Mooc: Fabien Gandon, Olivier Corby & Catherine Faron Zucker, Web of Data (EN), 4 weeks, <https://www.coursera.org/>, Coursera, Education for Adults, 1037 learners registered.

10.2.2. Supervision

PhD in progress: **Molka Dhouib**, *Modelling and supporting a B2B social network of service providers and consumers*, UCA, Catherine Faron Zucker, Andrea Tettamanzi.

PhD in progress: **Ahmed El Amine Djebri**, *Uncertainty in Linked Data*, UCA, Andrea Tettamanzi, Fabien Gandon.

PhD in progress: **Antonia Ettore**, *Artificial Intelligence for Education and Training: Knowledge Representation and Reasoning for the development of intelligent services in pedagogical environments*, UCA, Catherine Faron Zucker, Franck Michel.

PhD in progress: **Michael Fell**, *Natural Language Processing of Song Lyrics*, UCA, Co-supervision Elena Cabrio & Fabien Gandon.

PhD in progress: **Raphaël Gazzotti**, *Modelling Electronic Medical Records and Predicting Hospitalization*, UCA, Catherine Faron Zucker, Fabien Gandon.

PhD in progress: **Nicholas Halliwell**, *Explainable and Interpretable Prediction*, UCA, Fabien Gandon, Serena Villata.

PhD in progress: **Tobias Mayer**, *Argument Mining for Clinical Trials*, UNS, Johan Montagnat (CNRS, I3S), Serena Villata and Céline Poudat (UNS).

PhD in progress: **Thu Huong Nguyen**, *Mining the Semantic Web for OWL Axioms*, Andrea Tettamanzi, UNS.

PhD in progress: **Mahamadou Toure**, *Models and architectures for restricted and local mobile access to the Data Web*, UCA, Fabien Gandon, Moussa Lo (UGB, Senegal).

PhD in progress: **Vorakit Vorakitphan**, *Argumentation and Emotions Emotion Detection with Adaptive Sentiment Analysis*, Elena Cabrio, Serena Villata, UCA.

Internship

Master internship: **ElMahdi Ammari**, GUI builder for WebAudio plugins (WebComponents) developed as part of the WASABI project. Integration into the FAUST IDE.

Master internship: **Antonia Ettorre**, *Modelling and publishing machine-processable curated biodiversity data*, UCA, Franck Michel, Catherine Faron Zucker.

Bachelor internship: **Matthis Lequiniou**, *Applying and comparing state-of-the-art algorithms to predict student's success on the SIDES knowledge graph*, UCA, Catherine Faron Zucker, Oscar Rodríguez Rocha.

Master internship: **Zineb Rahhali**, Machine learning to associate songs with presets of instruments and audio effects encoded in WebAudio.

Master internship: **Yun Tian**, *LinkedDataViz - Visualisation de données sur les co-publications scientifiques à partir de l'application HAL RDF*, Olivier Corby & Marco Winckler (I3S).

Master internship: **Maroua Tikat**, Development of ontologies to describe the WASABI corpus

10.2.3. Juries

Michel Buffa:

Reviewer of Pasquale LISENA PhD : "Recommandation musicale basée sur la connaissance : modèles, algorithmes et recherche exploratoire", defended October 11th, 2019, EURECOM – Sophia Antipolis

Elena Cabrio:

Reviewer and member of the PhD committee of Marco Rovera, University of Turin (Italy), July 2019.

Member of the PhD committee of Yaroslav Nechaev, University of Trento (Italy), April 2019.

Catherine Faron Zucker:

- reviewer of Cassia Trojahn's HDR, entitled *Towards ontology matching maturity: contributions to complex, holistic and foundational ontology matching*, defended on December 12 at Université de Toulouse;
- reviewer of Justine Reynaud's PhD thesis, entitled *Découverte de définitions dans le web des données*, defended on December 10 at Université de Lorraine;
- reviewer of Alexis Lebis' PhD thesis, entitled *Capitaliser les processus d'analyse de traces d'apprentissage : modélisation ontologique & assistance à la réutilisation*, defended on May 22 at Sorbonne Universités;
- reviewer of Tanguy Raynaud's PhD thesis, entitled *Génération de Questions à Choix Multiples Thématiques à Partir de Bases de Connaissances*, defended on February 28 at Université Jean Monnet;
- reviewer of Ademar Crotti Junior's PhD thesis, entitled *A Jigsaw Puzzle Metaphor for Representing Linked Data Mappings*, defended on February 25 at University of Dublin, Ireland;
- external member of the monitoring committee of Stella Zevio's PhD thesis at Université Paris Nord;
- external member of the monitoring committee of Francesco Bariatti's PhD thesis at Université de Rennes;
- external member of the monitoring committee of Pauline Folz's PhD thesis at Université de Rennes.

Fabien Gandon:

- Reviewer HDR Fatiha Sais, entitled *Knowledge Graph Refinement: Link Detection, Link Invalidation, Key Discovery and Data Enrichment* 20/06/2019
- Member jury HDR Clément Jonquet, *Ontology Repository and Ontology-based Services*, 26/05/2019

Andrea Tettamanzi was reviewer of the HDR thesis of Nathalie Hernandez, *La centralité des ontologies, du Web Sémantique des utilisateurs au Web Sémantique des objets*, Université de Toulouse 2, December 13, 2019.

10.3. Popularization

10.3.1. Education

Artificial Intelligence training course for high school teachers (Inria Sophia Antipolis) - “Qu’est-ce que l’IA ?” by Jérôme Delobelle.

10.3.2. Interventions

Science Festival (“Fête de la Science”) 2019, presentation of the WASABI project by Michel Buffa during “Journées Science et Musique” organized by IRISA in Rennes, October 2019.

10.3.3. Internal action

Presentation of Artificial Intelligence to college students by Jérôme Delobelle during their week-long visit to Inria Sophia Antipolis.

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Articles in International Peer-Reviewed Journals

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- [7] P. ARSLAN, M. CORAZZA, E. CABRIO, S. VILLATA. *Overwhelmed by Negative Emotions? Maybe You Are Being Cyber-bullied!*, in "SAC 2019 - The 34th ACM/SIGAPP Symposium On Applied Computing", Limassol, Cyprus, April 2019 [DOI : 10.1145/3297280.3297573], <https://hal.archives-ouvertes.fr/hal-02020829>

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- [8] S. BIENZ, A. CIORTEA, S. MAYER, F. GANDON, O. CORBY. *Escaping the Streetlight Effect: Semantic Hypermedia Search Enhances Autonomous Behavior in the Web of Things*, in "IoT 2019 - 9th International Conference on the Internet of Things", Bilbao, Spain, October 2019 [DOI : 10.1145/1122445.1122456], <https://hal.inria.fr/hal-02289497>
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- [11] M. CORAZZA, S. MENINI, E. CABRIO, S. TONELLI, S. VILLATA. *Cross-Platform Evaluation for Italian Hate Speech Detection*, in "CLiC-it 2019 - 6th Annual Conference of the Italian Association for Computational Linguistics", Bari, Italy, November 2019, <https://hal.archives-ouvertes.fr/hal-02381152>
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