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Activity Report 2019

Project-Team SEMAGRAMME

Semantic Analysis of Natural Language

IN COLLABORATION WITH: Laboratoire lorrain de recherche en informatique et ses applications (LORIA)

RESEARCH CENTER
Nancy - Grand Est

THEME
Language, Speech and Audio

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Project-Team SEMAGRAMME

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- A7.2. - Logic in Computer Science
- A9.4. - Natural language processing

Other Research Topics and Application Domains:

- B9.6.8. - Linguistics

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2. Overall Objectives

2.1. Scientific Context

Computational linguistics is a discipline at the intersection of computer science and linguistics. On the theoretical side, it aims to provide computational models of the human language faculty. On the applied side, it is concerned with natural language processing and its practical applications.

From a structural point of view, linguistics is traditionally organized into the following sub-fields:

- Phonology, the study of language abstract sound systems.
- Morphology, the study of word structure.
- Syntax, the study of language structure, i.e., the way words combine into grammatical phrases and sentences.
- Semantics, the study of meaning at the levels of words, phrases, and sentences.
- Pragmatics, the study of the ways in which the meaning of an utterance is affected by its context.

Computational linguistics is concerned by all these fields. Consequently, various computational models, whose application domains range from phonology to pragmatics, have been developed. Among these, logic-based models play an important part, especially at the “highest” levels.

At the level of syntax, generative grammars may be seen as basic inference systems, while categorial grammars are based on substructural logics specified by Gentzen sequent calculi. Finally, model-theoretic grammars amount to sets of logical constraints to be satisfied.

At the level of semantics, the most common approaches derive from Montague grammars, which are based on the simply typed λ -calculus and Church’s simple theory of types. In addition, various logics (modal, hybrid, intensional, higher-order...) are used to express logical semantic representations.

At the level of pragmatics, the situation is less clear. The word *pragmatics* has been introduced by Morristo designate the branch of philosophy of language that studies, besides linguistic signs, their relation to their users and the possible contexts of use. The definition of pragmatics was not quite precise, and, for a long time, several authors have considered (and some authors are still considering) pragmatics as the wastebasket of syntax and semantics. Nevertheless, as far as discourse processing is concerned (which includes pragmatic problems such as pronominal anaphora resolution), logic-based approaches have also been successful. In particular, Kamp’s Discourse Representation Theory gave rise to sophisticated ‘dynamic’ logics. The situation, however, is less satisfactory than it is at the semantic level. On the one hand, we are facing a kind of logical “tower of Babel”. The various pragmatic logic-based models that have been developed, while sharing underlying mathematical concepts, differ in several respects and are too often based on *ad hoc* features. As a consequence, they are difficult to compare and appear more as competitors than as collaborative theories that could be integrated. On the other hand, several phenomena related to discourse dynamics (e.g., context updating, presupposition projection and accommodation, contextual reference resolution...) are still lacking deep logical explanations. We strongly believe, however, that this situation can be improved by applying to pragmatics the same approach Montague applied to semantics, using the standard tools of mathematical logic.

Accordingly:

The overall objective of the Sémagramme project is to design and develop new unifying logic-based models, methods, and tools for the semantic analysis of natural language utterances and discourses. This includes the logical modeling of pragmatic phenomena related to discourse dynamics. Typically, these models and methods will be based on standard logical concepts (stemming from formal language theory, mathematical logic, and type theory), which should make them easy to integrate.

The project is organized along three research directions (i.e., *syntax-semantics interface, discourse dynamics, and common basic resources*), which interact as explained below.

2.2. Syntax-Semantics Interface

The Sémagramme project intends to focus on the semantics of natural languages (in a wider sense than usual, including some pragmatics). Nevertheless, the semantic construction process is syntactically guided, that is, the constructions of logical representations of meaning are based on the analysis of the syntactic structures. We do not want, however, to commit ourselves to such or such specific theory of syntax. Consequently, our approach should be based on an abstract generic model of the syntax-semantic interface.

Here, an important idea of Montague comes into play, namely, the “homomorphism requirement”: semantics must appear as a homomorphic image of syntax. While this idea is almost a truism in the context of mathematical logic, it remains challenged in the context of natural languages. Nevertheless, Montague’s idea has been quite fruitful, especially in the field of categorial grammars, where van Benthem showed how syntax and semantics could be connected using the Curry-Howard isomorphism. This correspondence is the keystone of the syntax-semantics interface of modern type-logical grammars. It also motivated the definition of our own Abstract Categorial Grammars [37].

Technically, an Abstract Categorial Grammar simply consists of a (linear) homomorphism between two higher-order signatures. Extensive studies have shown that this simple model allows several grammatical formalisms to be expressed, providing them with a syntax-semantics interface for free [39],[3].

We intend to carry on with the development of the Abstract Categorial Grammar framework. At the foundational level, we will define and study possible type theoretic extensions of the formalism, in order to increase its expressive power and its flexibility. At the implementation level, we will continue the development of an Abstract Categorial Grammar support system.

As said above, considering the syntax-semantics interface as the starting point of our investigations allows us not to be committed to some specific syntactic theory. The Montagovian syntax-semantics interface, however, cannot be considered to be universal. In particular, it does not seem to be well adapted to dependency and model-theoretic grammars. Consequently, in order to be as generic as possible, we intend to explore alternative models of the syntax-semantics interface. In particular, we will explore relational models where several distinct semantic representations can correspond to the same syntactic structure.

2.3. Discourse Dynamics

It is well known that the interpretation of a discourse is a dynamic process. Take a sentence occurring in a discourse. On the one hand, it must be interpreted according to its context. On the other hand, its interpretation affects this context, and must therefore result in an updating of the current context. For this reason, discourse interpretation is traditionally considered to belong to pragmatics. The cut between pragmatics and semantics, however, is not that clear.

As we mentioned above, we intend to apply to some aspects of pragmatics (mainly, discourse dynamics) the same methodological tools Montague applied to semantics. The challenge here is to obtain a completely compositional theory of discourse interpretation, by respecting Montague’s homomorphism requirement. We think that this is possible by using techniques coming from programming language theory, in particular, continuation semantics, and the related theories of functional control operators.

We have indeed successfully applied such techniques in order to model the way quantifiers in natural languages may dynamically extend their scope [38]. We intend to tackle, in a similar way, other dynamic phenomena (typically, anaphora and referential expressions, presupposition, modal subordination...).

What characterizes these different dynamic phenomena is that their interpretations need information to be retrieved from a current context. This raises the question of the modeling of the context itself. At a foundational level, we have to answer questions such as the following. What is the nature of the information to be stored in the context? What are the processes that allow implicit information to be inferred from the context? What are the primitives that allow a context to be updated? How does the structure of the discourse and the discourse relations affect the structure of the context? These questions also raise implementation issues. What are the appropriate datatypes? How can we keep the complexity of the inference algorithms sufficiently low?

2.4. Common Basic Resources

Even if our research primarily focuses on semantics and pragmatics, we nevertheless need syntax. More precisely, we need syntactic trees to start with. We consequently need grammars, lexicons, and parsing algorithms to produce such trees. During the last years, we have developed the notion of interaction grammar [32] and graph rewriting [1], [2] as models of natural language syntax. This includes the development of grammars for French [33], together with morpho-syntactic lexicons. We intend to continue this line of research and development. In particular, we want to increase the coverage of our grammars for French, and provide our parsers with more robust algorithms.

Further primary resources are needed in order to put at work a computational semantic analysis of utterances and discourses. As we want our approach to be as compositional as possible, we must develop lexicons annotated with semantic information. This opens the quite wide research area of lexical semantics.

Finally, when dealing with logical representations of utterance interpretations, the need for inference facilities is ubiquitous. Inference is needed in the course of the interpretation process, but also to exploit the result of the interpretation. Indeed, an advantage of using formal logic for semantic representations is the possibility of using logical inference to derive new information. From a computational point of view, however, logical inference may be highly complex. Consequently, we need to investigate which logical fragments can be used efficiently for natural language oriented inference.

3. Research Program

3.1. Overview

The research program of Sémagramme aims to develop models based on well-established mathematics. We seek two main advantages from this approach. On the one hand, by relying on mature theories, we have at our disposal sets of mathematical tools that we can use to study our models. On the other hand, developing various models on a common mathematical background will make them easier to integrate, and will ease the search for unifying principles.

The main mathematical domains on which we rely are formal language theory, symbolic logic, and type theory.

3.2. Formal Language Theory

Formal language theory studies the purely syntactic and combinatorial aspects of languages, seen as sets of strings (or possibly trees or graphs). Formal language theory has been especially fruitful for the development of parsing algorithms for context-free languages. We use it, in a similar way, to develop parsing algorithms for formalisms that go beyond context-freeness. Language theory also appears to be very useful in formally studying the expressive power and the complexity of the models we develop.

3.3. Symbolic Logic

Symbolic logic (and, more particularly, proof-theory) is concerned with the study of the expressive and deductive power of formal systems. In a rule-based approach to computational linguistics, the use of symbolic logic is ubiquitous. As we previously said, at the level of syntax, several kinds of grammars (generative, categorial...) may be seen as basic deductive systems. At the level of semantics, the meaning of an utterance is captured by computing (intermediate) semantic representations that are expressed as logical forms. Finally, using symbolic logics allows one to formalize notions of inference and entailment that are needed at the level of pragmatics.

3.4. Type Theory and Typed λ -Calculus

Among the various possible logics that may be used, Church's simply typed λ -calculus and simple theory of types (a.k.a. higher-order logic) play a central part. On the one hand, Montague semantics is based on the simply typed λ -calculus, and so is our syntax-semantics interface model. On the other hand, as shown by Gallin, the target logic used by Montague for expressing meanings (i.e., his intensional logic) is essentially a variant of higher-order logic featuring three atomic types (the third atomic type standing for the set of possible worlds).

4. Application Domains

4.1. Deep Semantic Analysis

Our applicative domains concern natural language processing applications that rely on a deep semantic analysis. For instance, one may cite the following ones:

- textual entailment and inference,
- dialogue systems,
- semantic-oriented query systems,
- content analysis of unstructured documents,
- text transformation and automatic summarization,
- (semi) automatic knowledge acquisition.

4.2. Text Transformation

Text transformation is an application domain featuring two important sub-fields of computational linguistics:

- parsing, from surface form to abstract representation,
- generation, from abstract representation to surface form.

Text simplification or automatic summarization belong to that domain.

We aim at using the framework of Abstract Categorical Grammars we develop to this end. It is indeed a reversible framework that allows both parsing and generation. Its underlying mathematical structure of λ -calculus makes it fit with our type-theoretic approach to discourse dynamics modeling.

5. New Software and Platforms

5.1. ACGtk

Abstract Categorical Grammar Development Toolkit

KEYWORDS: Natural language processing - NLP - Syntactic analysis - Semantics

SCIENTIFIC DESCRIPTION: Abstract Categorical Grammars (ACG) are a grammatical formalism in which grammars are based on typed lambda-calculus. A grammar generates two languages: the abstract language (the language of parse structures), and the object language (the language of the surface forms, e.g., strings, or higher-order logical formulas), which is the realization of the abstract language.

ACGtk provides two software tools to develop and to use ACGs: *acgc*, which is a grammar compiler, and *acg*, which is an interpreter of a command language that allows one, in particular, to parse and realize terms.

FUNCTIONAL DESCRIPTION: ACGtk provides softwares for developing and using Abstract Categorical Grammars (ACG).

RELEASE FUNCTIONAL DESCRIPTION: This version removes the dependency to obsolete packages. It also provides a better handling of the command line interface.

NEWS OF THE YEAR: The new version removes dependencies to obsolete libraries. It improves the command line interface and prepares the integration of new functionalities and optimizations.

- Participants: Philippe de Groote, Jiri Marsik, Sylvain Pogodalla and Sylvain Salvati
- Contact: Sylvain Pogodalla
- Publications: [A syntax-semantics interface for Tree-Adjoining Grammars through Abstract Categorical Grammars](#) - [ACGTK: un outil de développement et de test pour les grammaires catégorielles abstraites](#) - [Discourse Modeling with Abstract Categorical Grammars](#) - [On the expressive power of Abstract Categorical Grammars: Representing context-free formalisms](#) - [Towards abstract categorical grammars](#)
- URL: <http://acg.loria.fr/>

5.2. Dep2pict

KEYWORDS: Syntactic analysis - Semantics

FUNCTIONAL DESCRIPTION: Dep2pict is a program for drawing graphical representation of dependency structures of natural language sentences. Dep2pict takes into account the modified format mixing surface and deep syntactic information used in deep-sequoia.

- Contact: Bruno Guillaume
- URL: <http://dep2pict.loria.fr/>

5.3. Grew

Graph Rewriting

KEYWORDS: Semantics - Syntactic analysis - Natural language processing - Graph rewriting

FUNCTIONAL DESCRIPTION: Grew is a Graph Rewriting tool dedicated to applications in NLP. Grew takes into account confluent and non-confluent graph rewriting and it includes several mechanisms that help to use graph rewriting in the context of NLP applications (built-in notion of feature structures, parametrization of rules with lexical information).

NEWS OF THE YEAR: In 2019, the Grew software was enriched with a new syntax for edges (it is now possible to use feature structures as edge labels).

The Grew-match tool (<http://match.grew.fr>) is an online service available where a user can query different corpora with graph matching requests. All UD corpora (157 in 90 different languages in v2.5) are available and data from several other projects can also be queried. In the last 12 months (December 2018 to November 2019), 32,465 requests were received on the Grew-match server. The number of requests has increased in the last months (7,948 in November 2019).

An experiment was conducted to test the usage of the matching part of Grew on larger graphs. In the internship of Axel Didier, we experiment graph query on the French lexical network, RL-Fr.

- Participants: Bruno Guillaume, Guy Perrier and Guillaume Bonfante
- Contact: Bruno Guillaume
- Publications: [Application de la réécriture de graphes au traitement automatique des langues](#) - [Application of Graph Rewriting to Natural Language Processing](#)
- URL: <http://grew.fr/>

5.4. ZombiLingo

KEYWORDS: Syntactic analysis - Natural language processing - Lexical resource - Collaborative science

FUNCTIONAL DESCRIPTION: ZombiLingo is a prototype of a GWAP (Game With A Purpose) where gamers have to give linguistic information about the syntax of natural language sentences, currently in French, and later to other languages.

NEWS OF THE YEAR: Karën Fort and Bruno Guillaume proposed a new version of ZombiLingo this year. It is named ZombiLudik (<https://zombiludik.org>) and the main difference is that the linguistic data used are now based on the Universal Dependencies (UD) framework. Due to the recent success of the UD project, this format is now used for data in 90 different languages and we hope to find new collaborations to work on a similar games for some foreign languages. A first demonstration version was built on English data (<https://en.zombiludik.org>). Karën Fort and Bruno Guillaume presented the English version of the game in June during the NIEUW consortium meeting in London.

- Authors: Bruno Guillaume, Karën Fort, Nicolas Lefebvre and Valentin Stern
- Contact: Karën Fort
- URL: <http://zombilingo.org/>

6. New Results

6.1. Syntax-Semantics Interface

Participants: Philippe de Groote, Sylvain Pogodalla, William Babonnaud.

6.1.1. Abstract Categorical Grammars

We have worked on implementing parsing optimization to the Abstract Categorical Grammar tool kit. These optimizations are based on Datalog program rewriting techniques, in particular a general version of Magic Sets [27], [36]. These optimizations rely on the tree isomorphism between derivation trees resulting from parsing with a given abstract categorical grammar, and proofs of facts in a corresponding Datalog program. Because magic rewriting breaks the isomorphism, a transformation of proofs back to derivation trees has been proposed.

6.1.2. Lexical Semantics

The lexicon model underlying Montague semantics is an enumerative model that would assign a meaning to each atomic expression. This model does not exhibit any interesting structure. In particular, polysemy problems are considered as homonymy phenomena: a word has as many lexical entries as it has senses, and the semantic relations that might exist between the different meanings of a same word are ignored. To overcome these problems, models of generative lexicons have been proposed in the literature. Implementing these generative models in the realm of the typed λ -calculus necessitates a calculus with notions of subtyping and type coercion. In this context, we have investigated several ways of expressing coercion using record types, and intersection types. In addition, William Babonnaud has shown how the structure of a generative lexicon may be formalized in type theory, using the categorical notion of a topos [10].

6.2. Discourse Dynamics

Participants: Maxime Amblard, Clément Beysson, Maria Boritchev, Philippe de Groote, Bruno Guillaume, Pierre Ludmann, Michel Musiol.

6.2.1. Dynamic Logic

We have enriched our type-theoretic dynamic logic in several directions in order to take into account more dynamic phenomena. In particular, we have continued to study the dynamic properties of determiners in order to systematically capture their semantics by defining an appropriate notion of dynamic generalized quantifier. To this end, Clément Beysson has studied several issues raised by the modeling of plural determiners, which necessitates to introduce plural discourse referents that can be formalized as second-order bound variables.

6.2.2. Dialogue Modeling

Maxime Amblard and Maria Boritchev have developed a dynamic model of dialogue. We have focused on the relation between question and answers and on building a resource based on settlers of Catan game records (the DiNG corpus).

We presented in [12] research on a compositional treatment of questions in a neo-Davidsonian event semantics style. [28] presented a dynamic neo-Davidsonian compositional treatment of declarative sentences. Starting from complex formal examples, we enriched Champollion's framework with ways of handling phenomena specific to question-answer pair representation. Maria Boritchev gave two presentations on these issues [16], [21].

In [9], we presented a taxonomy of questions and answers based on real-life data extracted from spontaneous dialogue corpora. This classification allowed us to build a fine-grained annotation scheme, which we applied to several languages: English, French, Italian and Chinese. In [13], we presented an annotation scheme for classifying the content and discourse contribution of question-answer pairs. We proposed detailed guidelines for using the scheme and applied them to dialogues in English, Spanish, and Dutch. Finally, we have reported on initial machine learning experiments for automatic annotation.

In another direction, Maxime Amblard has started a common work with Chloé Braud on Formal and Statistical Modelling of dialogue. To this end, we have started with Chuyuan Li to design a dialogue model to structure the different necessary linguistic informations for interaction. This model will be implemented in a tool that finely manages interaction through formal and learning strategies.

6.2.3. Pathological Discourse Modelling

Michel Musiol has obtained a full-time delegation in the Semagramme team. This proximity makes it possible to set up a more active collaboration on the issue of pathological discourse modeling. He has worked on the development of the possibility of testing his conjectures on the cognitive and psychopathological profile of the interlocutors, in addition to information provided by the model of ruptures and incongruities in pathological discourse. This methodological system makes it possible to discuss, or even evaluate, the heuristic potential of the computational models developed on the basis of empirical facts.

As part of the work carried out in the SLAM project, Maxime Amblard, Michel Musiol and Manuel Rebuschi (*Archives Henri-Poincaré, Université de Lorraine*) continue to work on modelling interactions with schizophrenic patients. We published an article about the corpus [20]. We are writing a book on these issues, in particular, we wrote a long introduction [19]. Maxime Amblard and Michel Musiol were awarded by an Inria Exploratory Action on this issues ODiM. This year we recruited the project's collaborators. In addition, we started the constitution of a new resource.

6.3. Common Basic Resources

Participants: Maxime Amblard, Clément Beysson, Philippe de Groote, Bruno Guillaume, Guy Perrier, Sylvain Pogodalla, Karën Fort.

6.3.1. Corpus Annotation

The Universal Dependencies project (UD) aims at building a syntactic dependency scheme which allows for similar analyses for several different languages. Bruno Guillaume and Guy Perrier are active in the UD community, and participate to the development and the improvement of the French data in this international initiative. Bruno Guillaume converted a new French treebank into UD: the French Question Bank (FQB), developed by Djamé Seddah and Marie Candito [35]. With the conversion system described in [2], the corpus UD_French-FQB was introduced in [version 2.4](#) of UD in May 2019.

Bruno Guillaume, Marie-Catherine de Marneffe (Ohio State University, Columbus, Ohio, USA) and Guy Perrier improved the consistency of two French corpora annotated with the UD scheme [6]. They improved the annotations of the two French corpora to render them closer to the UD scheme, and evaluated the changes done to the corpora in terms of closeness to the UD scheme as well as of internal corpus consistency.

Bruno Guillaume and Guy Perrier developed and popularized the use of the **GREW** tool for various language applications and more particularly the pattern matching module **Grew-match** [22], [26], [17].

SUD is an annotation scheme for syntactic dependency treebanks, that is almost isomorphic to UD (Universal Dependencies). Contrary to UD, it is based on syntactic criteria (favoring functional heads) and the relations are defined on distributional and functional bases. In [14], Kim Gerdes (Sorbonne nouvelle, Paris 3), Bruno Guillaume, Sylvain Kahane (*Université Paris Nanterre*) and Guy Perrier recalled and specified the general principles underlying SUD, presented the updated set of SUD relations, discussed the central question of Multiword Expressions, and introduced an orthogonal layer of deep-syntactic features converted from the deep-syntactic part of the UD scheme.

6.3.2. *FR-FraCas*

Maxime Amblard, Clement Beysson, Philippe de Groote, Bruno Guillaume, Sylvain Pogodalla and Karën Fort carried on the development of *FR-FraCas*, a French version of the *FraCas* test suite [31] which is an inference test suite, in English, for evaluating the inferential competence of different NLP systems and semantic theories. There currently exists a multilingual version of the resource for Farsi, German, Greek, and Mandarin. Sémagramme completed the first translation into French of the test suite. The latter has been publicly released¹. We also ran an experiment in order to test both the translation and the logical semantics underlying the problems of the test suite. The experiment was run with 18 French native speakers. Such an experiment provides a way of checking the hypotheses made by formal semanticists against the actual semantic capacity of speakers (in the present case, French speakers), and allows us to compare the results we obtained with the ones of similar experiments that have been conducted for other languages [30], [29].

7. Bilateral Contracts and Grants with Industry

7.1. Industry Partner

As a follow-up to a Cifre PhD thesis [34] on the use of Abstract Categorical Grammars in an industrial context, the team worked on a common road-map with the Yseop company and proposed common master internships as a first step towards formalizing the partnership.

After a master internship supervised by Bruno Guillaume, a discussion opened on the use of Abstract Categorical Grammars in the industrial context. C&S - Communication and Systems - has tool specifications that need to be verified, which can be achieved through semantic representation. A Cifre PhD thesis is currently being prepared for early 2020.

8. Partnerships and Cooperations

8.1. Regional Initiatives

CPER LCHN

Langues, Connaissances et Humanités Numériques (Languages, Knowledge and Digital Humanities)

Duration: 2015 - 2020 Coordinator: Bruno Guillaume

Other partners: Université de Lorraine, Région Grand-Est, France

Participants: Maxime Amblard, Karën Fort, Bruno Guillaume

¹<https://gitlab.inria.fr/semagramme-public-projects/resources/french-fracas>

Abstract: This initiative is an interdisciplinary project which involves several laboratories in the Université de Lorraine. It aims to strengthen the University de Lorraine University in the areas of management and access to digital content. A huge part of the project concerns researches on language. The initiative combines national and regional funding which mainly supports equipment purchase. It proposes to set up scientific experimentation platforms to strengthen cooperation between Lorraine's partners thus enabling Lorraine to acquire significant visibility through national platforms for the dissemination of resources. Most of the online tools built in the team (<https://zombiludik.org>, <http://match.grew.fr> for instance) are available through virtual machines funded by the CPER.

8.2. National Initiatives

ODiM

Outils informatisés d'aide au Diagnostic des Maladies mentales

2019 - 2022

Coordinator: Maxime Amblard

Participants: Maxime Amblard, Vincent-Thomas Barrouillet, Samuel Buchel, Amandine Lecomte, Chuyuan Li, Michel Musiol

Abstract:

ODiM is an interdisciplinary project, at the interface of psychiatry-psychopathology, linguistics, formal semantics and digital sciences. It aims to replace the paradigm of Language and Thought Disorders (LTD) as used in the Mental Health sector with a semantic-formal and cognitive model of Discourse Disorders (DD). These disorders are translated into pathognomonic signs, making them complementary diagnostic tools as well as screening for vulnerable people before the psychosis's trigger. The project has three main components.

The work is based on real data from interviews with patients with schizophrenia. A data collection phase in partner hospitals and with a control group, consisting of interviews and neuro-cognitive tests, is therefore necessary.

The data collection will allow the development of the theoretical model, both in psycholinguistic and semantic formalization for the identification of diagnostic signs. The success of such a project requires the extension of the analysis methodology in order to increase the model's ability to identify sequences with symptomatic discontinuities.

If the general objective of the project is to propose a methodological framework for defining and understanding diagnostic clues associated with psychosis, we also wish to equip these approaches by developing software to automatically identify these clues, both in terms of discourse and language behaviour.

8.3. European Initiatives

8.3.1. Collaborations in European Programs, Except FP7 & H2020

EnetCollect

European Network for Combining Language Learning with Crowdsourcing Techniques

2015- 2025

Coordinator: Lionel Nicolas and Verena Lyding (Chair & Grant Holder)

Participants: Karën Fort, Bruno Guillaume

Abstract:

Karën Fort and Bruno Guillaume participate in the EnetCollect² COST action. EnetCollect aims at performing the groundwork to set into motion a Research and Innovation trend combining the well-established domain of Language Learning with recent and successful crowdsourcing approaches.

- Karën Fort co-organized with Rodrigo Agerri (Univ. of the Basque Country) the first Hackathon (named Crowdfest) in January in Brussels,
- Karën Fort and Bruno Guillaume participated in the 3rd Annual Action meeting in Lisbon in March,
- Karën Fort participated to a Workgroup meeting in Malta in November.

Karën Fort participates in the COST action NexusLinguarum³. The main aim of this action is to promote synergies across Europe between linguists, computer scientists, terminologists, and other stakeholders in industry and society, in order to investigate and extend the area of linguistic data science.

8.4. International Initiatives

8.4.1. Participation in other International Programs

Common work and a common workshop was held in Gothenburg with the Centre for Linguistic Theory and Studies in Probability (CLASP, University of Gothenburg, Sweden), especially with Robin Cooper, Ellen Breitholtz and Chris Howes on the topic of dialogical reasoning in patients with schizophrenia and formal approaches to (in)coherence and dynamics in dialogue. The visit was supported by the French Institute in Sweden (*Programme Galan*).

9. Dissemination

9.1. Promoting Scientific Activities

9.1.1. Scientific Events: Organisation

9.1.1.1. Member of the Organizing Committees

- Karën Fort co-organized of the first enetCollect (European Network for Combining Language Learning with Crowdsourcing Techniques) hackathon

9.1.2. Scientific Events: Selection

9.1.2.1. Chair of Conference Program Committees

- Philippe de Groote: Chair of the **16th Meeting on the Mathematics of Language** [24].
- Sylvain Pogodalla: co-chair of **FG 2019 23rd Conference on Formal Grammar** [23].

9.1.2.2. Member of the Conference Program Committees

- Philippe de Groote: Senior PC member of: **IJCAI 2019**, the 28th International Joint Conference on Artificial Intelligence; PC member of: **SCiL 2020**, the third meeting of the Society for Computation in Linguistics; **WOLLIC 2019**, the 26th Workshop on Logic, Language, Information and Computation; **IWCS 2019**, the 13th International Conference on Computational Semantics ; **FG'19**, the 24th Conference on Formal Grammar; **SPE 11**, the 11th Semantics and Philosophy in Europe Colloquium.

9.1.2.3. Reviewer

- Maxime Amblard: **13th International Conference on Computational Semantics (IWCS 2019)**, **IJCAI 2019**, **TALN 2019**, **JPC2019**.
- Karën Fort: **ACL 2019**, **NAACL 2019**, **TALN 2019**, **CJC-Praxiling 2019**. *La fabrique de la participation culturelle. Plateformes numériques et enjeux démocratiques*

²<https://enetcollect.eurac.edu/>

³<https://www.cost.eu/actions/CA18209>

- Sylvain Pogodalla: **13th International Conference on Computational Semantics (IWCS 2019), Logic and Engineering of Natural Language Semantics 16 (LENLS16).**

9.1.3. Journal

9.1.3.1. Member of the Editorial Boards

- Maxime Amblard: Member of the editorial board of the journal *Traitement Automatique des Langues*, in charge of the hard copy editorial process,
- Philippe de Groote: area editor of the *FoLLI-LNCS series*.
- Sylvain Pogodalla: Member of the editorial board of the journal *Traitement Automatique des Langues*, in charge of the *Résumés de thèses* section.

9.1.3.2. Reviewer - Reviewing Activities

- Maxime Amblard: **Logic and Algorithms in Computational Linguistics, Springer series Studies in Computational Intelligence (SCI)**
- Philippe de Groote: **Journal of Language, Logic and Information; Journal of Logic and Computation; Logical Methods in Computer Science.**
- Sylvain Pogodalla: **Journal of Language, Logic and Information.**

9.1.4. Invited Talks

- Karën Fort:
 - *La production participative (crowdsourcing) : miroir grossissant sur l'annotation manuelle.* Inria Almanach. Paris, France. October 11th 2019
 - *Productions participatives de corpus annotés : des modèles encore incertains.* Colloque Jeunes Chercheurs PRAXILING 2019
 - with Denis Maurel. *Regards croisés sur la linguistique informatique.* Colloque Décrire une langue : objectifs et méthodes. Sorbonne Université, Paris, France. September 13th 2019
- Michel Musiol:
 - *Improving the investigation of conversational discontinuities using the support of eye-tracking methods.* Workshop on Incoherence of Dialogue, University of Göteborg, 2019, october 9-10th
 - *Approche différentielle des registres communicationnels de l'interlocuteur schizophrène dans l'entretien clinique,* Faculté de Médecine and Centre Hospitalo-Universitaire of Tizi Ouzou, Algeria, June 13th.
- Bruno Guillaume:
 - *Rigor Mortis* EnetCollect 3rd Annual Action meeting in Lisbon, March 14th. The game Rigor Mortis (<http://rigor-mortis.org>) is a crowdsourcing projet when users have to find Multi-Word expression.

9.1.5. Leadership within the Scientific Community

- Maxime Amblard: Management Committee of the OLKI project (*Lorraine Université d'Excellence* project - PIA), co-leader of the workpackage 2 on NLP activities.
- Karën Fort:
 - Management Committee member of the COST Action CA16105 "European Network for Combining Language Learning with Crowdsourcing Techniques" (http://www.cost.eu/COST_Actions/ca/CA16105).
 - Management Committee Substitute member of the COST Action CA18209 "European network for Web-centred linguistic data science" (http://www.cost.eu/COST_Actions/ca/CA18209).

- in charge with G. Wisniewski of axis 2 of GDR LIFT (*Linguistique informatique, formelle et de terrain*) : *Linguistique et évaluation des systèmes de traitement automatique des langues*. Kick off meeting at the end of Nov., Orléans, France, co-organized (with A. Millour, SU) a working group on variations in GDR LIFT
- Philippe de Groote: president of SIGMOL, *Association for Mathematics of Language, a Special Interest Group of the Association for Computational Linguistics*; member of the LACL steering committee.
- Bruno Guillaume: Management Committee Substitute member of the COST Action CA16105 "European Network for Combining Language Learning with Crowdsourcing Techniques" (http://www.cost.eu/COST_Actions/ca/CA16105).
- Sylvain Pogodalla: member of the LACL steering committee; member of the Formal Grammar standing committee.

9.1.6. Scientific Expertise

- Philippe de Groote: member of the scientific council of the AREN e-FRAN project, *ARgumentation Et Numérique*.
- Sylvain Pogodalla: expert for the Research Executive Agency (REA) of the EU.

9.1.7. Research Administration

- Maxime Amblard:
 - Member of *conseil scientifique* of *Université de Lorraine*
 - Standing invitee at the *pôle scientifique AM2I* of *Université de Lorraine*
 - Member of the *Sénat Académique* of *Université de Lorraine*
 - Member of the progress commission of *Université de Lorraine*
 - Member of the administration council of the *Institut des sciences du digital, management et cognition*
 - Member of the board of the *Maison des sciences de l'homme*, MSH-Lorraine
 - Head of the master in Natural Language Processing (master 1 and 2)
- Philippe de Groote:
 - Member of the *bureau du comité des projets d'Inria Nancy – Grand Est*.
 - Member of the scientific council of the LIRMM, *Laboratoire d'Informatique, de Robotique et de Microélectronique de Montpellier*
- Bruno Guillaume:
 - Head of the Loria department NLPKD (Natural Language Processing and Knowledge Discovery).
 - Leader of the CPER 2015-2020 project *Langues, Connaissances et Humanités Numériques* (Languages, Knowledge and Digital Humanities) in which ten laboratories of *Université de Lorraine* participate.
 - Member of the Comipers (committee for PhD and Post-doctoral selection).
- Michel Musiol:
 - Member of the McF selection committee 1231/4381 (section 16), *Université de Reims Champagne-Ardenne*
 - Member of the McF selection committee 739 (section 16), *Aix-Marseille Université*
- Sylvain Pogodalla:
 - Elected member of the *comité de centre d'Inria Nancy – Grand Est*,

- in charge of the *commission IES (information et édition scientifique du centre d’Inria Nancy – Grand Est)*.

9.2. Teaching - Supervision - Juries

9.2.1. Teaching

Licence:

- Maxime Amblard, NLP Introduction, 4h, L1, Université de Lorraine, France
- Maxime Amblard, Linguistic engineering, 20h, L3, Université de Lorraine, France
- Maria Boritchev, Formalisms and reasoning representations , 20h, L3, Université de Lorraine, France
- Maria Boritchev, Algorithmic 1, 22h, L1, Université de Lorraine, France

Master:

- Maxime Amblard, Python Programming (english), 30h, M1 NLP, Université de Lorraine, France.
- Maxime Amblard, Methods for NLP (english), 36h, M1 NLP, Université de Lorraine, France.
- Maxime Amblard, Formalisms (english), 24h, M2 NLP, Université de Lorraine, France.
- Maxime Amblard, Discourse and Dialogue (english), 18h, M2 NLP, Université de Lorraine, France.
- Philippe de Groote, Formal Logic, 22h, M1 NLP, Université de Lorraine, France.
- Philippe de Groote, Formal languages, 22h, M1 NLP, Université de Lorraine, France.
- Philippe de Groote, Computational Semantics, 18h, M2 NLP, Université de Lorraine, France.
- Philippe de Groote, Computational structures and logics for natural language modeling, 18h, M2 NLP, Université Paris Diderot – Paris 7, France.
- Bruno Guillaume, Written Corpora TAL (english), 30h, M1 NLP, Université de Lorraine, France.

9.2.2. Supervision

PhD defended:

- Timothée Bernard, *Approches formelles de l’analyse du discours : relations discursives et verbes d’attitude propositionnelle*, September 1st 2019

PhD in progress:

- William Babonnaud, *Lexical semantics, compositionality and type coercion*, since September 2018, Philippe de Groote.
- Clement Beysson, *Dynamic generalized quantifiers for discourse analysis*, since September 2015, Philippe de Groote and Bruno Guillaume.
- Maria Boritchev, *Dialogue Dynamics Modeling in the Simple Theory of Types*, since September 2017, Maxime Amblard and Philippe de Groote.
- Pierre Ludmann, *Dynamic construction of discursive structures*, since September 2017, Philippe de Groote and Sylvain Pogodalla.
- Chuyuan Li, *Formal and statistical modeling of dialogue*, since October 2019, Maxime Amblard and Chloé Braud.
- Vincent-Thomas Barrouillet, *Towards an automated formalization of logical deviations of pathological discourse from schizophrenic patients*, since October 2019, Maxime Amblard and Michel Musiol.

Samuel Buchel, *Linguistic, semantic and cognitive modelling of dialogical incongruities and discontinuities in the interaction with the schizophrenic patients*, since December 2019, Maxime Amblard and Michel Musiol.

9.2.3. *Juries*

- Karën Fort was member of the jury PhD thesis of:
 - Claire Wolfarth, Université Grenoble Alpes. December 9th.
 - Arne Skjærholt, Oslo University. First opponent. December 4th.
 - Ivan Garrido Marquez, Université Paris 13. February 8th.
- Michel Musiol
 - Yann Auxemery, Université de Lorraine, October 15th
 - Aurore Morel, Université de Lyon 1 Claude Bernard, December 20th

9.3. Popularization

9.3.1. *Internal or external Inria responsibilities*

Maxime Amblard is the vice head of editorial board of Interstices.info

9.3.2. *Articles and contents*

- Karën Fort: 3 articles in volume 140 of *Culture et Recherche* (Journal of the Ministry of Culture):
 - Ouvrir le dédale des données des recherches myriadisées (with Lisa Chupin, Université Paris-Descartes)
 - Les jeux ayant un but : des sciences participatives ? (with Bruno Guillaume)
 - Sciences participatives et diversité linguistique : retours d'expériences (with Alice Millour, Sorbonne Université)

9.3.3. *Interventions*

Maxime Amblard was an organizer of the *Forum des Sciences Cognitives* in Nancy

Maxime Amblard organized a Diabolo Science presentation with Marie Duflot-Kremer for PintOf-Science

Maxime Amblard gave a presentation for high school students in the laboratory

Karën Fort: ethics and citizen science class at the Museum national d'histoire naturelle (3h)

9.3.4. *Creation of media or tools for science outreach*

Maxime Amblard was the leader of the project Happy Family Cards Game, which aimed to develop such a game for promoting computer science as a scientific field. 20 000 copies have been printed and are currently being distributed. The project was presented at the Fête de la Science panel in Paris.

Maxime Amblard designed an unplugged activity on syntactic parsing (about rabbits and carrots), [25].

Karën Fort: participation in the Sorbonne Université portal for citizen science with ZombiLUDik and Recettes (with A. Millour) : <https://www.science-ensemble.org/>

10. Bibliography

Major publications by the team in recent years

- [1] G. BONFANTE, B. GUILLAUME. *Non-size increasing Graph Rewriting for Natural Language Processing*, in "Mathematical Structures in Computer Science", 2018, vol. 28, n^o 08, pp. 1451–1484 [DOI : 10.1017/S0960129518000178], <https://hal.inria.fr/hal-00921038>

- [2] G. BONFANTE, B. GUILLAUME, G. PERRIER. *Application of Graph Rewriting to Natural Language Processing*, Logic, Linguistics and Computer Science Set, ISTE Wiley, 2018, vol. 1, 272 p. , <https://hal.inria.fr/hal-01814386>
- [3] S. POGODALLA. *A syntax-semantics interface for Tree-Adjoining Grammars through Abstract Categorical Grammars*, in "Journal of Language Modelling", 2017, vol. 5, n^o 3, pp. 527–605 [DOI : 10.15398/JLM.V5I3.193], <https://hal.inria.fr/hal-01242154>
- [4] P. DE GROOTE, M. KANAZAWA. *A Note on Intensionalization*, in "Journal of Logic, Language and Information", 2013, vol. 22, n^o 2, pp. 173-194 [DOI : 10.1007/s10849-013-9173-9], <https://hal.inria.fr/hal-00909207>

Publications of the year

Doctoral Dissertations and Habilitation Theses

- [5] T. BERNARD. *Formal approaches to discourse analysis : Discourse relations and attitude verbs*, Université Sorbonne Paris Cité, January 2019, <https://hal.inria.fr/tel-02150106>

Articles in International Peer-Reviewed Journals

- [6] B. GUILLAUME, M.-C. DE MARNEFFE, G. PERRIER. *Conversion et améliorations de corpus du français annotés en Universal Dependencies*, in "Traitement Automatique des Langues", 2019, vol. 60, n^o 2, pp. 71-95, <https://hal.inria.fr/hal-02267418>

Invited Conferences

- [7] K. FORT. *La production participative (crowdsourcing) : miroir grossissant sur l'annotation manuelle*, in "Séminaire de l'équipe Inria ALMANACH", Paris, France, October 2019, <https://hal.inria.fr/hal-02418852>
- [8] K. FORT. *Productions participatives de corpus annotés : des modèles encore incertains*, in "Colloque Jeunes Chercheurs PRAXILING", Montpellier, France, November 2019, <https://hal.inria.fr/hal-02418826>

International Conferences with Proceedings

- [9] M. AMBLARD, M. BORITCHEV, M. CARLETTI, L. DIEUDONAT, Y. TSAI. *A Taxonomy of Real-Life Questions and Answers in Dialogue*, in "SemDial 2019 - LondonLogue - 23rd Workshop on the semantics and pragmatics of dialogue", London, United Kingdom, September 2019, <https://hal.inria.fr/hal-02269609>
- [10] W. BABONNAUD. *A Topos-Based Approach to Building Language Ontologies*, in "Formal Grammar. 24th International Conference, FG 2019", Riga, Latvia, R. BERNARDI, G. KOBELE, S. POGODALLA (editors), Lecture notes in Computer Science, July 2019, vol. 11668, pp. 18-34 [DOI : 10.1007/978-3-662-59648-7_2], <https://hal.inria.fr/hal-02418029>
- [11] T. BERNARD. *Negation in event semantics with actual and nonactual events*, in "ConSOLE 2018 - 26th Conference of the Student Organization of Linguistics in Europe", London, United Kingdom, 2019, pp. 350-366, <https://hal.inria.fr/hal-01931273>
- [12] M. BORITCHEV, M. AMBLARD. *A compositional view of questions*, in "WiNLP - Widening NLP - ACL Workshop", Florence, Italy, July 2019, <https://hal.inria.fr/hal-02269603>

- [13] M.-A. CRUZ-BLANDÓN, G. MINNEMA, A. NOURBAKHS, M. BORITCHEV, M. AMBLARD. *Toward Dialogue Modeling: A Semantic Annotation Scheme for Questions and Answers*, in "LAW XIII 2019 - The 13th Linguistic Annotation Workshop", Florence, Italy, August 2019, <https://arxiv.org/abs/1908.09921> , <https://hal.inria.fr/hal-02269613>
- [14] K. GERDES, B. GUILLAUME, S. KAHANE, G. PERRIER. *Improving Surface-syntactic Universal Dependencies (SUD): surface-syntactic relations and deep syntactic features*, in "TLT 2019 - 18th International Workshop on Treebanks and Linguistic Theories", Paris, France, August 2019, <https://hal.inria.fr/hal-02266003>
- [15] P. MULLER, C. BRAUD, M. MOREY. *ToNy: Contextual embeddings for accurate multilingual discourse segmentation of full documents*, in "Proceedings of the Workshop on Discourse Relation Parsing and Treebanking 2019", Minneapolis, United States, Proceedings of the Workshop on Discourse Relation Parsing and Treebanking 2019, Association for Computational Linguistics, June 2019, pp. 115-124 [DOI : 10.18653/v1/W19-2715], <https://hal.archives-ouvertes.fr/hal-02374091>

Conferences without Proceedings

- [16] M. BORITCHEV. *Thé, café et licornes – Traitement de la structure conversationnelle dans la théorie dynamique des types*, in "EJCIM 2019 - École Jeunes Chercheurs et Chercheuses en Informatique Mathématique", Marseille, France, March 2019, <https://hal.inria.fr/hal-02071515>
- [17] B. GUILLAUME. *Graph Matching for Corpora Exploration*, in "JLC 2019 - 10èmes Journées Internationales de la Linguistique de corpus", Grenoble, France, November 2019, <https://hal.inria.fr/hal-02267475>
- [18] D. MAUREL, K. FORT. *Regards croisés sur la linguistique informatique*, in "Colloque Décrire une Langue : Objectifs et Méthodes. Université de la Sorbonne", Paris, France, September 2019, <https://hal.archives-ouvertes.fr/hal-02290423>

Scientific Books (or Scientific Book chapters)

- [19] M. AMBLARD, M. MUSIOL, M. REBUSCHI. *Discourse coherence - From psychology to linguistics and back again*, in "(In)coherence of discourse - Formal and Conceptual issues of Language", M. AMBLARD, M. MUSIOL, M. REBUSCHI (editors), Springer, 2019, Language, Cognition and Mind, forthcoming, <https://hal.inria.fr/hal-02269640>
- [20] M. AMBLARD, M. REBUSCHI, M. MUSIOL. *Corpus et pathologie mentale : particularités dans la constitution et l'analyse d'une ressource*, in "Les corpus en sciences humaines et sociales", M. REBUSCHI, C. BENZITOUN (editors), Presses Universitaires de Nancy, 2019, forthcoming, <https://hal.inria.fr/hal-02269622>
- [21] M. BORITCHEV, M. AMBLARD. *Picturing Questions and Answers - a formal approach to SLAM*, in "(In)coherence of discourse - Formal and Conceptual issues of Language", M. AMBLARD, M. MUSIOL, M. REBUSCHI (editors), (In)coherence of discourse Formal and Conceptual issues of Language, Springer, 2019, Language, Cognition and Mind, forthcoming, <https://hal.inria.fr/hal-02269631>
- [22] B. GUILLAUME, G. PERRIER. *Leçons de l'annotation linguistique en dépendances de corpus écrits du français*, in "Les corpus en sciences humaines et sociales", Presses Universitaires de Nancy, 2019, forthcoming, <https://hal.inria.fr/hal-02267428>

Books or Proceedings Editing

- [23] R. BERNARDI, G. KOBELE, S. POGODALLA (editors). *Formal Grammar : 24th International Conference, FG 2019, Riga, Latvia, August 11, 2019, Proceedings*, Lecture Notes in Computer Science, Springer, Riga, Latvia, 2019, vol. 11668 [DOI : 10.1007/978-3-662-59648-7], <https://hal.inria.fr/hal-02267405>
- [24] P. DE GROOTE, F. DREWES, G. PENN (editors). *Proceedings of the 16th Meeting on the Mathematics of Language*, Association for Computational Linguistics, Toronto, Canada, 2019, <https://hal.inria.fr/hal-02268054>

Other Publications

- [25] M. AMBLARD. *Les lapins magiciens*, December 2019, working paper or preprint, <https://hal.inria.fr/hal-02414345>
- [26] G. PERRIER, B. GUILLAUME. *GREW, a tool for annotating corpora and exploiting annotated corpora*, November 2019, 73 p., Journées scientifiques "Linguistique informatique, formelle de terrain", Poster, <https://hal.inria.fr/hal-02388693>

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- [33] G. PERRIER. *A French Interaction Grammar*, in "International Conference on Recent Advances in Natural Language Processing - RANLP 2007", Borovets, Bulgarie, G. ANGELOVA, K. BONTCHEVA, R. MITKOV, N. NICOLOV, K. SIMOV (editors), INCOMA Ltd, Shoumen, Bulgaria, 2007, pp. 463-467, <http://hal.inria.fr/inria-00184108/en/>
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- [36] J. D. ULLMAN. *Principles of Database and Knowledge-Base Systems: Volume II: The New Technologies*, W. H. Freeman & Co., New York, NY, USA, 1990
- [37] P. DE GROOTE. *Towards abstract categorial grammars*, in "Association for Computational Linguistics, 39th Annual Meeting and 10th Conference of the European Chapter", Toulouse, France, Association for Computational Linguistics, July 2001, pp. 148-155, Colloque avec actes et comité de lecture. internationale, <http://hal.inria.fr/inria-00100529/en>
- [38] P. DE GROOTE. *Towards a Montagovian Account of Dynamics*, in "16th Semantics and Linguistic Theory conference - SALT2006", Tokyo, Japan, M. GIBSON, J. HOWELL (editors), 2006, <https://journals.linguisticsociety.org/proceedings/index.php/SALT/article/view/2952/0>
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