D5.1

First report on dissemination & upscaling support activities

Grant Agreement nº:	690974
Project Acronym:	MIREL
Project Title:	MIning and REasoning with Legal texts
Website:	http://www.mirelproject.eu/
Contractual delivery date:	31/12/2016
Actual delivery date:	18/01/2017
Contributing WP	All work packages
Dissemination level:	Public
Deliverable leader:	UNS
Contributors:	UNS

Document History

Version	Date	Author	Partner	Description
0.1	28/12/2016	Guillermo Simari	UNS	Initial draft
1.0	19/1/2017	Guillermo Simari	UNS	Final Version

Contributors

Partner	Name	Role	Contribution
UNS	Guillermo Simari	Editor	Author of the deliverable
UL	Livio Robaldo	Reviewer	Author of revisions

Disclaimer: The information in this document is provided "as is", and no guarantee or warranty is given that the information is fit for any particular purpose. MIREL consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law.

Table of Contents

Executive Summary

This document contains a report that covers progress in dissemination activities performed by the members of the project over the first year. Several publications in journals and conferences were published; these documents are listed and commented in the first subsection. In addition, as it is described below in detail, two workshops were organized, and a tutorial and a course were given.

1 Dissemination activities

This section presents all publications that have been produced in the context of MIREL. Links with respect to the other work packages are highlighted.

1.1 Publications

Publications have been grouped with respect to the work package they concern. Links with respect to the other work packages are highlighted.

1.1.1 WP1: Conceptual and formal frameworks for mining and reasoning on legal texts

- *Sequence Semantics for Normative Agents (Guido Governatori, Francesco Olivieri, Erica Calardo, Antonino Rotolo, Matteo Cristani), In Principles and Practice of Multi-Agent Systems conference agent-based modeling programming (PRIMA 2016), 2016.*

  Abstract: a novel framework for the representation of goals and other mental-like attitudes in terms of degree of expected outcomes, where an outcome is an order of possible alternatives is presented in this work. The sequences of alternatives are modeled by a non-classical (substructural) operator; a modal logic based axiomatization of the intuition proposed in such frameworks, and some variants (in particular for the notion of social intention, intentions that are compliant with norms) is proposed. Given that the outcome operator is substructural, first a novel sequence semantics (a generalization of possible world semantics) to model the outcome operator is introduced, and then it is proven that the axiomatization is sound and complete with respect to the new semantics.

  The work is connected with WP3, in that the refinements oft he sequence semantics for the $\otimes$-logic affect the kind of reasoning schema on legal norms.

- *Sequence semantics for norms and obligations (Francesco Olivieri Erica Calardo Antonino Rotolo Guido Governatori), In The 13th International Conference on Deontic Logic and Normative Systems (DEON2016), 2016.*

  Abstract: while Input/Output approach mainly works by imposing some constraints on the

manipulation of conditional norms, the Gentzen style sequent system (called $\otimes$-logic) uses $\otimes$-chains to express the logical structures (norms) that generate actual obligations and permissions. $\otimes$ is a special operator for modeling chains of obligations and compensatory obligations. In this paper, the authors complete their previous works on the model-theoretic semantics (called *sequence semantics*) for the –logic. They extend sequence semantics and split the treatment of $\otimes$-chains and obligations, they added $\otimes$-sequences to express ordering among explicit permissions, and they systematically studied several options for the axiomatisation of the operators of the logic.

The work is connected with WP2, in that it refines the role of agents' mental attitute interplay with norms, which could lead to a better ontological representation of norms.

- *A Framework to Reason about the Legal Compliance of Security Standards (Andra Giurgiu, Gabriele Lenzini, Cesare Bartolini, Livio Robaldo), In Proceedings of the 10th International Workshop on Juris-informatics (JURISIN 2016), 2016.*

Abstract: Achieving compliance with legal regulations is no easy task. Normally, laws state general requirements but do not provide clear parameters to determine when such requirements are met. On a different level, industrial standards and best practices define specific objectives that can be certified using auditing procedures from qualified bodies. Implementing a standard does not per se guarantee legal compliance, with the rare exception when the standard is also endorsed by the law itself. Nevertheless, standards and laws in the same domain may have overlaps and correlations, so adopting the former may provide an argument to demonstrate that adequate measures were taken to achieve legal compliance. This work introduces a framework that, using state-of-the-art Natural Language Semantics techniques, helps process legal documents and standards to build a knowledge base to store their logic representations, and the correlations between them. The knowledge base will help legal experts assess what requirements of the law are met by the standard and, consequently, recognize what requirements still need to be implemented to fill the remaining gaps. An application of the framework is exemplified by comparing a provision of the European General Data Protection Regulation (GDPR) against the ISO/IEC 27001:2013 standard.

This paper is connected with WP2. It is part of a new research project DAPRECO that has been retained for funding by the Luxembourg National Research Fund (https://www.fnr.lu) and that it will start on the 1st of February 2017. The paper describes the project and addresses conceptual representational issues related to the GDPR. The project will produce a knowledge base that can be used by NLP systems to monitor and keep track of legal interpretations of the several GDPR provisions, as well as those related to the linking between the GDPR and the ISO standards.

- *Interpretation Across Legal Systems (Antonino Rotolo Guido Governatori Alessandra Malerba), In Proceedings of the 29th International Conference on Legal Knowledge and Information Systems (JURIX 2016), 2016.*

Abstract: this paper extends the formal framework previously developed by the authors in order to model interpretative arguments in deontic defeasible reasoning applied in legal interpretation. The framework is extended in order to model reasoning across legal systems. In particular, it is proposed a logical system that encompasses the various interpretative interactions occurring between legal systems in the context of private international law. This is done by introducing meta-rules to reason with interpretive canons, in order to explore the feasibility of formal methods for arguing with canons of interpretation coming from different legal systems, once they have accessed domestic legal systems in private international law disputes. In so doing, the authors defined a logic-based conceptual framework that could encompass the occurring interpretive interactions, without neglecting the existing, broader normative background each legal system is nowadays part of.

The publication is connected with WP3, in that it enlarges the application of the defeasible deontic reasoning framework under a broader perspective concerning legal interpretations.

- *The rationale behind the concept of goal (Francesco Olivieri Simone Scannapieco Antonino Rotolo Matteo Cristani Guido Governatori), In TPLP 16(3): 296-324, 2016.*

    Abstract: the paper proposes a fresh look at the concept of goal and advances that motivational attitudes like desire, goal and intention are just facets of the broader notion of (acceptable) outcome. The authors propose to encode the preferences of an agent as sequences of "alternative acceptable outcomes". It is studied how the agent's beliefs and norms can be used to filter the mental attitudes out of the sequences of alternative acceptable outcomes. Finally, such intuitions are formalized in a novel Modal Defeasible Logic and it is proven that the resulting formalisation is computationally feasible.

    This publication is related to WP2 and WP3. On the one hand, it refines the role of agents' mental attitute interplay with norms, which could lead to a better ontological representation of norms. On the other hand, it enhance the range of possible reasoning schema on Modal Defeasible Logic.

- *Quantification in Some Non-normal Modal Logics (Antonino Rotolo Erica Calardo), In Journal of Philosophical Logic, online first, 2016.*

    Abstract: it is well-known that normal deontic logics, paradigmatically Standard Deontic Logic (SDL), are problematic. Research on quantification in non-normal modal logics (and on deontic logics) has been neglected and mainly focused on frames with constant domains of individuals, which ensures to keel FOL untouched. This assumption has been relaxed in in this paper, which offers a new formal model which offer the most general semantic treatment for quantified non-normal modal logic.
    This publication is related to WP2 in that quantification in deontic logic is not currently encompassed in legal ontologies, thus the work can serve as a basis to extend the expressivity of existing legal ontologies in that sense.

- *Lógica modal (Clara Smith), In Capitulo 3, Logic for Informatics, the Editorial of the University of La Plata (EUNLP), Argentina, 2016.*

  Abstract: this chapter carefully explores the subject of Modal Logic, its syntax and semantics, and Deontic Logic. It also includes the application of Modal Logic to formalize Multi-agent Systems. The chapter focuses on the study of the linguistic expressions that qualify the validity conditions of the deontic propositions.

  This publication is circumscribed within WP1, as it reviews current literature.

- *Cumulative Aggregation (Xavier Parent Leendert van der Torre Diego Agustin Ambrossio), in proc. of the Workshop on 'MIning and REasoning with Legal texts' collocated at the 29th International Conference on Legal Knowledge and Information Systems., 2016*

  Abstract: In this paper, the authors study cumulative aggregation in Input/Output logic framework. Cumulative aggretation allows from any two conditional obligations to derive a third combined obligation representing the cumulative deontic meaning of the first two. The authors propose FC systems consisting of cumulative aggregation together with factual detachment, and give a representation result for FC systems, as well as for FA systems consisting of simple aggregation together with factual detachment. FC and FA systems are related to each other and to Input/Output logic axioms.

  This publication is connected to WP3, in that it opens new possible reasoning schema in Input/Output logic for factual detachment.

1.1.2   WP2: Norm mining

- *Eunomos, a legal document and knowledge management system for the Web to provide relevant, reliable and up-to-date information on the Law (Luigi Di Caro, Llio Humphreys, Livio Robaldo, Piercarlo Rossi, Leendert van der Torre, Guido Boella), In Artificial Intelligence and Law, to appear, 2016.*

  Abstract: this paper describes the Eunomos software, an advanced legal document and knowledge management system, based on legislative XML and ontologies. The challenges of legal research in an increasingly complex, multi-level and multi-lingual world is described and how the Eunomos software helps users cut through the information overload to get the legal information they need in an organized and structured way and keep track of the state of the relevant law on any given topic. Using NLP tools to semi-automate the lower-skill tasks makes this ambitious project a realistic commercial prospect as it helps keep costs down while at the same time allowing greater coverage. The core system from workflow and technical perspectives and discuss applications of the system for various user groups is also described.

This publication is connected with WP5, in that a commercial version of Eunomos, called MenslegiS, is patented and distributed by the partner Nomotika S.R.L.

- *Textual Inference with Tree-structured LSTMs (Luigi Di Caro, Livio Robaldo, Guido Boella, Kolawole J. Adebayo), In Proceedings of the 28th Benelux conference on Artificial Intelligence., 2016.*

  Abstract: Textual Inference is a research trend in Natural Language Processing (NLP) that has recently received a lot of attention by the scientific community. Textual Entailment (TE) is a specific task in Textual Inference that aims at determining whether a hypothesis is entailed by a text. Usually tackled by machine learning techniques employing features which represent similarity between texts, the recent availability of more training data presupposes that Neural Networks that are able to learn latent feature from data for generalized prediction could be employed. This approach employs the Child-Sum Tree-LSTM for solving the challenging problem of textual entailment. Our approach is simple and able to generalize well without excessive parameter optimization. Evaluation performed on SNLI, SICK and other TE datasets shows the competitiveness of our approach.

  This publication is connected with WP5, in that similarity among legal texts can help existing commercial systems to identify, given a certain legal document, similar legal documents that need to be also analyzed and connected to it (manually or semi-automatically).

- *Text Segmentation With Topic Modeling And Entity Coherence (Luigi Di Caro, Adebayo John Kolawole, Guido Boella), In Proceedings of the 16th International Conference on Hybrid Intelligent Systems (HIS2016), 2016.*

  Abstract: this work describes a system that uses entity and topic coherence for improved Text Segmentation (TS) accuracy. First, Linear Dirichlet Allocation (LDA) algorithm was used to obtain topics for sentences in the document. Then performed entity mapping across a window to discover the transition of entities within sentences was performed using the information obtained to support our LDA-based boundary detection for proper boundary adjustment. The significance of the entity coherence approach, as well as the superiority of the algorithm over existing works, is analyzed.

  This publication is circumscribed within WP2; text segmentation can help the identification of paragraphs and segments in legal texts which can in turn help the extraction of other relevant information via further NLP techniques.

- *Neural Reasoning For Legal Text Understanding (Guido Boella, Adebayo John Kolawole, Luigi Di Caro), In Proceedings of the 29th International Conference on Legal Knowledge and Information Systems (JURIX2016), 2016.*

  Abstract: this paper investigates the application of text similarity techniques to detect

automatically the transposition of European Union (EU) directives into the national law. Currently, the European Commission (EC) resorts to time consuming, and expensive manual methods, e.g., conformity checking studies and legal analysis for identifying national transposition measures. Both, lexical and semantic similarity techniques are used, supplementing them with knowledge from EuroVoc to identify transpositions. Then, the approach is evaluated by comparing the results with the correlation tables (gold standard). The results indicate that both similarity techniques proved to be effective in detecting transpositions. Such systems could be used to identify the transposed provisions by both EC and legal professionals.

This publication is circumscribed within WP2; text segmentation can help the identification of paragraphs and segments in legal texts which can in turn help the extraction of other relevant information via further NLP techniques.

- *A Text Similarity Approach for Automated Transposition Detection of European Union Directives (Luigi Di Caro, Rohan Nanda, Guido Boella), In Proceedings of the 29th International Conference on Legal Knowledge and Information Systems (JURIX2016), 2016.*

  Abstract: this work introduces a domain-specific Question Answering system, deviating from approaching this problem as a Textual Entailment task. A Memory Network-based Question Answering system was implemented which tests a Machine's understanding of legal texts and identifies whether an answer to a question is correct or wrong, given some background knowledge. In addition, a corpus of real USA MBE Bar exams for this task was prepared.

  This work is connected with WP5. The work is part of the research activity of the PhD student Rohan Nanda, who is closely working with the partner APIS EOOD. An H2020 project[1] centered on these research results will be submitted by the partners APIS and UNITO, as well as by other entities which do not participate in MIREL.

- *Laying bare EuroVoc by means of Latent Dirichlet Allocation (Giovanni Siragusa and Luigi Di Caro), in proc. of the Workshop on 'MIning and REasoning with Legal texts' collocated at the 29th International Conference on Legal Knowledge and Information Systems., 2016*

  Abstract: EuroVoc is a 23-languages thesaurus that covers the activity of the European Union. It contains more than 6000 descriptor terms that are organized in a 8-levels hierarchy. The main advantage of EuroVoc consists in the assignment of a set of descriptors to documents, which can be used to perform documentary search, document management and cross-language alignment. Unfortunately, descriptor terms are not in mutual exclusion with each others, sharing contextual similarities that may lead to skewed data, especially in document classi_cation. This paper presents a corpus analysis via Latent Dirichlet Allocation in order to

---

[1]   http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/ict-14-2016-2017.html

study whether and how EuroVoc descriptors capture documents' true content. In particular, the authors compared extracted topics with descriptors through a number of proposed measured on a bipartite graph.

This publication is connected to WP5, in that the procedures developed therein can be integrated within existing industrial systems to classify new documents.

- *An approach to information retrieval and question answering in the legal domain (Luigi Di Caro, Guido Boella, Adebayo John Kolawole, Cesare Bartolini), In Proceedings of the 10th International Workshop on Juris-informatics (JURISIN 2016), 2016.*

  Abstract: this paper contains a report of the authors' participation at COLIEE 2016 Information Retrieval (IR) and Legal Question Answering (LQA) tasks. The solution proposed for the IR part employs the use of a simple but effective Machine Learning (ML) procedure. The Question Answering solution answers "YES" or "NO" to a question, i.e., "YES" if the question is entailed by a text and 'NO' otherwise. With recent exploit of Multi-layered Neural Network systems at language modeling tasks, a Deep Learning approach is introduced that uses an adaptive variant of the Long-Short Term Memory (LSTM), i.e. the Child Sum Tree LSTM (CST-LSTM) algorithm that was modified to suit the intended purpose. Additionally, this approach was benchmarked by handcrafting features for two popular ML algorithms, i.e., the Support Vector Machine (SVM) and the Random Forest (RF) algorithms. Even though some features were used that have performed well from similar works, also some semantic features were introduced for performance improvement. The results from these two algorithms were used as the baseline for our CST-LSTM algorithm. All evaluation was done on the COLIEE 2015 training and test sets. The overall result confirms the competitiveness of the approach.

  This publication is connected with WP3, in that question-answering systems are a form of possible reasoning investigated in the work package.

- *Combining Input/Output logic and Reification for representing real-world obligations (Livio Robaldo, Llio Humphreys, Xin Sun, Loredana Cupi, Cristiana Santos, Robert Muthuri), In Proceedings of the Ninth International Workshop on Juris-informatics (JURISIN 2015), 2015.*

  Abstract: this work presents a proposal of a new approach to formalizing real-world obligations that may be found in existing legislation. Specifically, real-world obligations are formalized by combining insights of two logical frameworks: Input/Output logic, belonging to the literature in deontic logic and normative reasoning, and the Reification-based approach of Jerry R. Hobbs, from the literature in Natural Language Semantics. This aim at filling the gap between the current logical formalizations of legal text, mostly propositional, and the richness of Natural Language Semantics.

  The work is connected with WP3, in that the fine-grained logical representations devised therein can lead to more powerful reasoning systems for compliance-checking.

- *Reified Input/Output logic - a position paper (Livio Robaldo, Xin Sun), In Proceedings of Workshop on Artificial Intelligence for Justice (AI4J), collocated at the 22nd European Conference on Artificial Intelligence (ECAI 2016), The Hague, The Netherlands., 2016.*

Abstract: a new approach to formalizing obligations and permissions from existing legislation is proposed; specifically, two frameworks are combined: Input/Output logic and Hobbs's logic. The former is a well-known framework for normative reasoning. The latter is a neo-Davidsonian wide-coverage first order logic for Natural Language Semantics. The Input/Output logic is wrapped around Hobbs's logic, to fill the gap between current logical formalizations of legal text, mostly propositional, and the richness of Natural Language Semantics.

The work is connected with WP3; it is an improved version of the paper "Combining Input/Output logic and Reification for representing real-world obligations" described above and a position paper of a journal version currently submitted to the Journal of Logic and Computation.

1.1.3 WP3: Reasoning on norms

- *An approach to Decision Making based on Dynamic Argumentation Systems (Luciano H. Tamargo, Alejandro J. García, Marcelo L. Errecalde, Guillermo R. Simari, Edgardo Ferretti), In Artificial Intelligence, to appear, 2016.*

Abstract: in this paper, a formalism for single-agent decision making based on Dynamic Argumentation Frameworks is introduced with the aim of being used to justify a choice using information on the current situation the agent is involved. Taking advantage of the inference mechanism of the argumentation formalism it is possible to consider preference relations and conflicts among the available alternatives for that reasoning. With this formalization, given a particular set of evidence, the justified conclusions supported by warranted arguments will be used by the agent's decision rules to determine which alternatives will be selected. An algorithm that implements a choice function based on our formalization is presented completing this presentation introducing formal results that relate the proposed framework with approaches of classical decision theory.

The publication is related to WP5, in that the algorithm developed therein can be integrated within existing systems for the legal domain.

- *A Framework for Easing the Development of Applications Embedding Answer Set Programming (Stefano Germano, Jessica Zangari, Marco Anastasio, Francesco Calimeri, Simona Perri, Davide Fuscà), In Proc. of the 18th International Symposium on Principles and Practice of Declarative Programming (PPDP '16), 2016.*

Abstract: the use of Answer Set Programming (ASP) in various real-world domains to develop industrial-level and enterprise applications haves made clear the need for proper development tools and interoperability mechanisms for easing interaction and integration with external

systems in the widest range of real-world scenarios, including mobile applications and educational contexts. In such context, this work presents a framework for integrating the KRR capabilities of ASP into generic applications. The use of the framework is shown by illustrating proper specializations for some relevant ASP systems over different platforms, including the mobile setting. Furthermore, the potential of the framework for educational purposes is illustrated using the development of several ASP-based applications.

The publication is connected with WP5, in that the system presented could be used to provide existing services in legal informatics.

- *An Empirical Comparison of Argumentation Formalisms (Zhe Yu, Kang Xu, Beishui Liao), in proc. of the Workshop on 'MIning and REasoning with Legal texts' collocated at the 29th International Conference on Legal Knowledge and Information Systems., 2016*

Abstract: One of the aims of argumentation formalisms is to bridge the gap between human reasoning and computer-based reasoning. Several argumentation formalisms have recently been proposed for this purpose, including ABA, ASPIC+ and ASPIC-, and different designed decisions have been implemented in different systems. In the current paper we focus on one particular design decision (that of *restricted rebut* versus *unrestricted rebut*). We present empirical results on which of these principles are most likely to be accepted by human users.

This publication is circumscribed within WP3; the innovative reasoning schema needs to be investigated further and implemented in a real system.

- *On Revision of Partially Specified Convex Probabilistic Belief Bases (Gavin Rens, Thomas Meyer, Giovanni Casini), In European Conference on Artificial Intelligence (ECAI2016), 2016.*

Abstract: a method for an agent to revise its incomplete probabilistic beliefs when a new piece of propositional information is observed is proposed here. An agent's beliefs are represented by a set of probabilistic formulae, referred to as a belief base. The method involves determining a representative set of "boundary" probability distributions consistent with the current belief base, revising each of these probability distributions and then translating the revised information into a new belief base. A version of Lewis Imaging technique as the revision operation is used and the correctness of the approach is proved. An analysis of the approach is done against six rationality postulates. The expressivity of the belief bases under consideration is rather restricted but has some applications. The methods of belief base revision employing the notion of optimum entropy and point out some of the benefits and difficulties of those methods are analyzed; both, the boundary distribution method and the optimum entropy methods are reasonable, yet yield different results.

This publication is circumscribed within WP3; the innovative reasoning schema needs to be investigated further and implemented in a real system.

- *Prioritized Norms and Defaults in Formal Argumentation (Beishui Liao, Nir Oren, Leendert van der Torre, Serena Villata), In Proceedings of the 13th International Conference on Deontic Logic and Normative Systems (DEON2016), 2016.*

Abstract: deontic logic sentences define what an agent ought to do when faced with a set of norms. These norms may come into conflict; therefore, a priority ordering them is necessary to resolve these conflicts. Dung's seminal paper raises the still open challenge to use formal argumentation to represent non-monotonic logics, highlighting its value to exchange, communicate and resolve possibly conflicting viewpoints in distributed scenarios. In this paper, a formal framework to study various properties of prioritized non-monotonic reasoning in formal argumentation, in line with this idea, is introduced. More precisely, it is shown how a version of prioritized default logic and Brewka-Eiter's construction in answer set programming can be obtained in argumentation via the weakest and last link principles. It is also shown how to represent Hansen's recent construction for prioritized normative reasoning by adding arguments using weak contraposition via permissive norms, and their relationship to Caminada's "hang yourself" arguments.

This publication is circumscribed within WP3; the innovative reasoning schema needs to be investigated further and implemented in a real system.

- *Norm Creation in Proposition Control Games (Xin Sun, Livio Robaldo), In Proceedings of the Chinese Conference on Logic and Argumentation (CLAR2016), 2016.*

Abstract: this paper investigates how to create norms in games. Norms are considered as deontic statements used to describe prescriptions made by certain randomized signals of which the usage is to guide agents' behavior. Such randomized signals are implemented from correlated equilibria in games. The proposal follows the offline norm creation approach. Agents' compliance and computational tractability have been identified as interesting problems to cope with in the offline norm creation approach. Here, four types of norms are studied: utilitarian norms, egalitarian norms, Nash product norms and opportunity-balanced norms. It is shown that in our framework all four types of norms can be created in polynomial time and all rational agents will comply with those norms.

This publication is circumscribed within WP3; the innovative reasoning schema needs to be investigated further and implemented in a real system.

1.1.4 WP4: Case Studies and Evaluation

- *Semantic Business Process Regulatory Compliance Checking using LegalRuleML (Mustafa Hashmi, Ho-Pun Lam, Serena Villata, Guido Governatori, Monica Palmirani), In Proceedings of the 20th International Conference on Knowledge Engineering and Knowledge Management (EKAW2016), 2016.*

  Abstract: Legal documents are the source of norms, guidelines, and rules that often feed into different applications; to encourage the development and deployment of various applications, it is important to have a sufficiently expressive conceptual framework such that various heterogeneous aspects of norms can be modeled and reasoned with. This work investigates how to exploit Semantic Web technologies and languages, such as LegalRuleML, to model a legal document, showing how the semantic annotations can be used to empower a business process (regulatory) compliance system and discuss the challenges of adapting a semantic approach to legal domain. The presented approach is evaluated over two versions of the technical document "Australian Telecommunications Consumer Protections Code".

  This publication is circumscribed within WP4, and more precisely with use case 2 about technical documents.

- *Combining NLP Approaches for Rule Extraction from Legal Documents (Mauro Dragoni, Serena Villata, Williams Rizzi, and Guido Governatori), in proc. of the Workshop on 'MIning and REasoning with Legal texts' collocated at the 29th International Conference on Legal Knowledge and Information Systems., 2016*

  Abstract: Legal texts express conditions in natural language describing what is permitted, forbidden or mandatory in the context they regulate. Despite the numerous approaches tackling the problem of moving from a natural language legal text to the respective set of machine-readable conditions, results are still unsatisfiable and it remains a major open challenge. This paper proposes a preliminary approach which combines different Natural Language Processing techniques towards the extraction of rules from legal documents. More precisely, the linguistic information provided by WordNet is combined together with a syntax-based extraction of rules from legal texts, and a logic-based extraction of dependencies between chunks of such texts. Such a combined approach leads to a powerful solution towards the extraction of machine-readable rules from legal documents. We evaluate the proposed approach over the Australian "Telecommunications consumer protections code".

  This publication is circumscribed within WP5, in that the developed system could be integrated within existing industrial systems for legal informatics.

- *Legal Tech Start-ups: State of the Art and Trends (Sabrina Praduroux, Valeria de Paiva, and Luigi di Caro), in proc. of the Workshop on 'MIning and REasoning with Legal texts' collocated at the 29th International Conference on Legal Knowledge and Information Systems., 2016*

Abstract: this paper surveys the legal tech market, classifying and analyzing a number of legal start-ups, particularly the ones in Silicon Valley, where the first author was based for her graduate summer project with the second author. This kind of survey of the state of the art is inherently incomplete, very tied-up to where and when it is done, and frankly biased towards the interests of the authors. However, if read paying attention to these caveats, this survey can be very useful to practitioners, interested in uncovering the landscapes of the market.

This publication is connected to WP5, in that it surveys the panorama of the legal start-ups in the United States.

1.2 Events
The following events have been organized in the context of MIREL.

1.2.1 COURSE "Deontic modality: Linguistic and Logical Perspectives on Oughts and Ends"

The course took place on the 15-26^h November 2016 in Bolzano (Italy). It was collocated at the 28th European Summer School in Logic, Language and Information (ESSLLI 2016). The organizers of the workshop were: Leon Van Der Torre (UL), Cleo Condoravdi (STANFORD).

The aim of the course was to enable dialogue between practitioners of logical and linguistic approaches to deontic modality. The semantics of conditional ought broadly construed, including normative, teleological, bouletic, deliberative and advice modals was examined. The basic issues raised by modalities and the principal linguistic and logical approaches to them, highlighting their conceptual similarities and differences were presented.

1.2.2 TUTORIAL "Mining and Reasoning with Legal documents (MIREL)"

The tutorial took place at The Hague (The Netherlands) on the 29th of August 2016. It was collocated at the 22nd European Conference on Artificial Intelligence (ECAI2016). The organizers of the tutorial were: Antonino Rotolo (UNIBO), Livio Robaldo (UL), Guido Governatori (Data61)

This tutorial offered an outline of three topics in the area of Artificial Intelligence and Law: (a) Conceptual and computational frameworks for legal interpretation and reasoning with legal texts; (b) Natural Language Semantics (NLS) and Natural Language Processing for the legal domain; (c) Modeling legal compliance. It was presented the different ways in which the advancement of AI techniques in this area can pave the way for operative reasoning models supporting legal drafting and the harmonization of legislative and judicial practice across EU legal systems and jurisdictions.

1.2.3 Workshop on Legal Knowledge and the Semantic Web (LK&SW-2016)

The workshop took place on the 19th November 2016 in Bologna (Italy). It was collocated at the 20th International Conference on Knowledge Engineering and Knowledge Management.

The organizers of the workshop were: Monica Palmirani (UNIBO), Leon van der Torre (UL), Pompeu Casanovas (Univ. of Barcelona)

The LK&SW-2016 workshop aimed to discuss the challenges that the legal domain poses to the Semantic Web research, and how Semantic Web technologies and formalisms can contribute to addressing these open issues. This way, the use of legal knowledge for addressing Semantic Web research questions and, vice versa, to use Semantic Web technologies as reasoning tools to be implemented in the legal domain is advanced.

The workshop's papers were structured in two sessions as described below:

Session I: Legal Knowledge Modelization and Methods

- Patterns for Representing Legal Procedural Knowledge, presented by Aldo Gangemi (ISTC-CNR, University Paris 13) as an invited talk.

- MeLOn: a Methodology for Bulding Legal Ontology, Monica Palmirani, University of Bologna, CIRSFID

- An Architecture for Establishing Legal Semantic Workflows in the Context of Integrated Law Enforcement, Pompeu Casanovas, Autonomous University of Barcelona – IDT, and Deakin University, Melbourne, Australia

Session II (split in two parts): Legal Semantic Web

- The project DAPRECO (DAta Protection REgulation COmpliance), Livio Robaldo, University of Luxembourg.

- Topic Maps in the International Law – pilot project with the UN Convention on the Law of the Sea, Dirk Fleischer, Kiel Marine Science

- From Words to Images Through Legal Visualization, Arianna Rossi, University of Bologna, LAST-JD PhD Programme.

- Non-ontological Legal Resources Reuse and Reengineering, Cristiana Santos, University of Luxembourg, LAST-JD PhD

- ContrattiPubblici.org, a Semantic Knowledge Graph on Public Procurement Information, Giuseppe Futia, Nexa Center for Internet & Society, Politecnico di Torino (DAUIN).

1.2.4 MIREL 2016 - Workshop on 'MIning and REasoning with Legal texts

The workshop took place on the 14th December 2016 in Nice (France). It was collocated at JURIX 2016 – 29th Int. Conf. on Legal Knowledge and Information Systems. The organizers of the workshop

were: Livio Robaldo (UL), Guido Governatori (NICTA), Grigoris Antoniou (HUD), and Luigi Di Caro (UNITO).

The workshop fostered scientific discussions aimed at considering relations between approaches based on language technologies applied to the legal domain (representing legal knowledge) and those based on legal reasoning (using the legal knowledge to build specialized services and applications).

Adam Wyner was an invited speaker of the workshop. His talk "Comments on Translating Legal Texts into Formal Representations." presented his past research concerning the translation of legal texts into logical representations on which enable reasoning.

The following papers where accepted and presented at the workshop:

- Mauro Dragoni, Serena Villata, Williams Rizzi and Guido Governatori, Combining NLP Approaches for Rule Extraction from Legal Documents.

- Zhe Yu, Kang Xu and Beishui Liao, An empirical comparison of argumentation formalisms.

- Giovanni Siragusa and Luigi Di Caro, Laying bare EuroVoc by means of Latent Dirichlet Allocation.

- Marcello Ceci, Firas Al Khalil, Leona O'Brien and Tom Butler, Requirements for an Intermediate Language Bridging Legal Text and Rules.

- Agustin Ambrossio, Xavier Parent and Leon van der Torre, Cumulative Aggregation.

- Sabrina Praduroux, Valeria De Paiva and Luigi Di Caro, Legal Tech Start-ups: State of the Art and Trends.