



HYPERMODELEX



European Research Council
Established by the European Commission



Co-funded by
the European Union

LegalXML Methodology supporting DRL

Prof. Monica Palmirani –
University of Bologna
CIRSFID-ALMA AI – Italy
Paris, 7 Nov 2024



CRACKING THE CODE

RULEMAKING FOR HUMANS AND MACHINES



digital.nsw

Digital Transformation Policy Design System Get Involved Blog

Rules as Code – NSW Joins the Worldwide Movement to Make Better Rules



Digital-ready policies



European Commission

Law as Code

Digital-ready policies: Components and enabler



1. User-centric processes ready for automation



2. Alignment with digital policies



3. Once-only principle and reuse of data



4. Evolving ICT landscape



5. Innovation & Digital technologies



6. Digital-ready drafting



Enabler:
Multidisciplinary teams

eLegal evolution

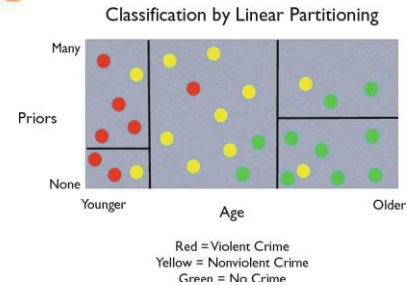


EUR-Lex

at4am



EU Open Data Portal

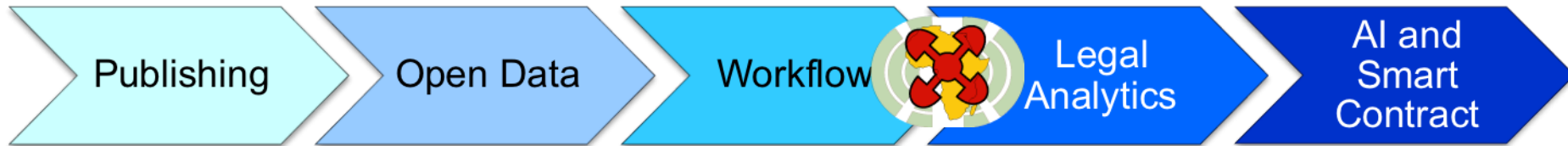


```
pragma solidity ^0.4.17;

contract SimpleStorage {
    uint storedData;

    function set(uint x) public {
        storedData = x;
    }

    function get() public view returns (uint) {
        return storedData;
    }
}
```



1990s

2000s

2010s

2020s

2030s

AI and Law

Logic programming – symbolic AI

Semantic Web e Knowledge representation

ML, Classification, clustering, NLP, predict

Legal data analytics

Blockchain & Smart Contract

AI and Legislation Domain: critical analysis

- Law is **not only rules** (e.g., principles and values).
- Norms have been adapted according to the **evolution of the society – dynamic model**
- **‘artificial languages’** (e.g., programming language) is a subset of natural language (Chomsky 2006)
- Norms sometime are intentionally **vague** for implementing flexibility and interpretations (hermeneutic)
- **Prediction** based on the past should be mitigated to the new events (computational legalism)
- Predictions influence decision-makers and future human behaviour (Hildebrandt 2021)
- **Autonomy** and transparency are pillars of normativity (Günther 2021)
- The **right of disobey** as moment of creativity of new norms

Some concrete risks

1. Crystallization of the legislation using code that frustrate the «flexibility of the legislative text»
2. Apply «quantitative science» to «qualitative discipline» like the law
3. Implement only the «view» of ONE Government perspective
4. Transfer the «Executive Power» INSIDE of the «Legislative Power»
5. Case-law should be included in the analysis

For «technical» norms (e.g., labor law, tax law, school law, building regulation) is applicable with caution

Generative AI and Risks

Lawyer apologizes for fake court citations from ChatGPT

By [Ramishah Maruf](#), CNN

Updated 3:28 PM EDT, Sun May 28, 2023

US judge orders lawyers to sign AI pledge, warning 'they make stuff up'

By [Jacqueline Thomsen](#) ✓

May 31, 2023 8:56 PM GMT+2 · Updated 10 hours ago

[Home](#) / [News](#) / [Technology](#) / [Artificial Intelligence](#) / [EU Commission issues internal guidelines on ChatGPT, generative AI](#)

EU Commission issues internal guidelines on ChatGPT, generative AI

By [Luca Bertuzzi](#) | [EURACTIV.com](#) © Est. 4min

📅 31 mag 2023

Critical issues in legal domain

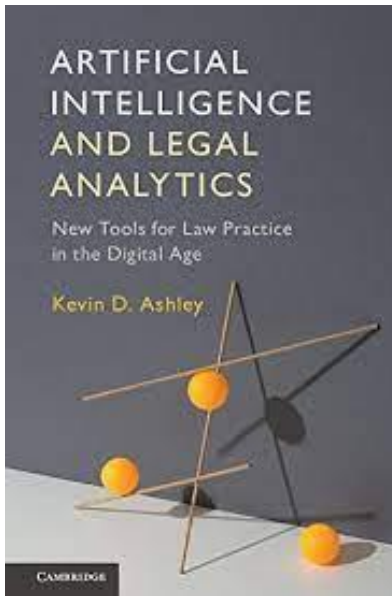
Structure: LLM works at **sentence level/document level** and this approach is not capable to understand the structure (e.g., sequence of articles)

Context: LLM loses the **context** (e.g., jurisdiction, temporal parameters)

Innovation: LLM depends to the **past data series** (e.g., new brilliant solution has no historical series)

Reference: ML does not consider the **normative and juridical citations**. The normative references evolve over time (e.g., art. 3 is not the same forever)

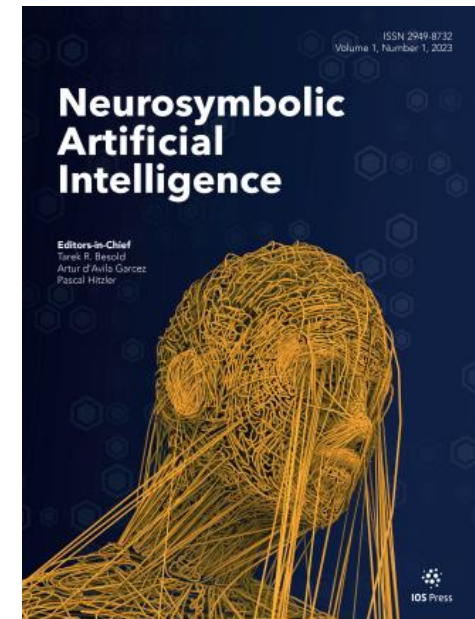
Time: the LLM is **timeless** and the legislation is integrated in the legal system



Klaus Günther

From Normative to Smart Orders?

Abstract: The increasing penetration of new digital technologies, especially artificial intelligence, into almost all areas of society's life has led to the emergence of smart orders. These are orders that are designed to minimize or eliminate deviations from their norms through intelligent design and algorithmic operations. The article explains some examples of smart orders and shows that, at least in principle, a distinction can be made between algorithmically optimized, norm addressee-oriented prevention and addressee-substituting pre-emption of deviant behavior by digital technologies. The focus of the article is then on the question of whether and, if so, in what sense smart orders are still normative orders at all. In the course of the analysis, it becomes apparent that while legal orders and other normative orders pursue the goal of effective enforcement of their norms, they do not pursue the ideal of complete non-deviance. It becomes clear that one of the essential aspects of normative orders is that they are addressed to persons who must embrace them as autonomous and, at the



Transparency: Black box risk in Legal Norms Modelling

EasyChair Terms of Service

The EasyChair Terms of Service have changed as part of EasyChair compliance with the GDPR providing a number of new services since the introduction of the previous version of the Terms of Service. To continue using EasyChair you must agree to our new Terms of Service as shown below.

You must agree to our Terms of Service to continue using the Service.

You can download these Terms of Service by clicking on "Download". To agree to these terms, tick the box below and click on "Continue". If you disagree with these Terms, click [here to log out](#).

I agree to these Terms of Service

Continue

EasyChair Terms of Service

Thank you for choosing EasyChair!

1. TERMS AND CONDITIONS OF SERVICE

1.1 EasyChair Ltd ("we" or "us" or "EasyChair Ltd"), via its online web service EasyChair ("EasyChair" or "EasyChair Web Site") <https://www.easychair.org> provides services that allow users:

- a) to manage document submission, reviewing, publishing, program generation, content management, registration, user management, email management and monitoring, and accounting for conferences, workshops, journals, books, special issues and any other events or publications;
- b) to publish papers, articles, preprints, slides, presentations, videos, teaching material, programs of events, calls for papers and volumes and collections thereof.

(the "services").

WE ASK THAT YOU READ THESE TERMS AND CONDITIONS OF SERVICE (THESE "TERMS") CAREFULLY BEFORE USING THE SERVICE SINCE THEY DEFINE YOUR ACCEPTANCE OF THESE TERMS WITHOUT MODIFICATION. IF YOU DO NOT AGREE TO THESE TERMS, DO NOT USE THE SERVICE.

1.2 If you use the Service on behalf of a company, organisation, or other entity, then:

- a) "you" includes you and that entity, and
- b) you represent and warrant that the entity is authorised to bind the entity to these terms, and that you agree to these terms on the entity's behalf.

1.3 We reserve the right to update the Service at any time at our discretion with or without notice to you. Such updates are designed to improve, enhance and further develop the Service and may take the form of bug fixes, enhanced functions, new modules, or other forms. You agree to use the Service as updated and we will deliver these to you as part of your use of the Service.

1.4 Additional terms may apply to some of our services. For example, if you use our conference registration module, additional terms apply to your use of this module. All of these are referred to herein as the "Additional Terms". You agree to use the Additional Terms only if there is no contradiction between what the Additional Terms say and what these terms say, then the Additional Terms shall take precedence in relation to that element of the Service.

2.1 We grant you a non-transferable, non-exclusive, non-commercial, royalty-free licence and license to use the Service. It does not include the right for you (or any third party) to copy, adapt, modify, re-sell, or otherwise use EasyChair Ltd product, service, or data or the EasyChair Web Site. If you are unclear about whether your use is acceptable under these terms, please contact us. The contact information will be available on the contact page of the EasyChair Web Site.

2.2 Your use of the Service does not create a partnership, joint venture or agency relationship or similar relationship between you and us.

2.3 You are expressly prohibited and shall not be allowed to third party to reproduce, redistribute, duplicate, copy, or to decompile, disassemble, modify, sell, trade or re-sell the Service (including the EasyChair Web Site) for any purpose, unless you have been specifically permitted to do so in a separate agreement with EasyChair Ltd.

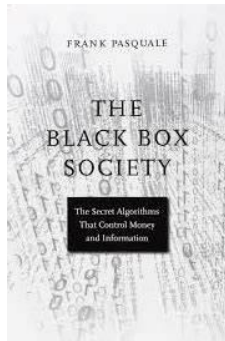
2.4 No competitors or future competitors of EasyChair Ltd are permitted access to the Service and EasyChair Ltd reserves the right to suspend or terminate any account created or used by any person employed by or acting on behalf of any such competitor.

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3. YOUR USE OF THE SERVICE

3.1 You represent that you are of legal age to form a binding contract and are not prevented from accessing or receiving the Service under any applicable jurisdiction.

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What are your rights in respect of your personal data?

Your right of data access

8.1. You are entitled to receive a copy of your personal data that is in our possession (your right of data access).

Your right to erasure and rectification

8.2 You may request the deletion of personal data or the correction of inaccurate personal data (your right to erasure and rectification). Please note that we may keep certain information concerning you, as required by law, or when we have a legal basis to do so (e.g., our legitimate interest to keep the platform safe and secure for other users).

Your right to object to processing

8.3 You have the right to object at any time (i) to the processing of your personal data for the purpose of direct marketing, or (ii) to the processing of your personal data for other purposes on grounds relating to your particular situation (your right to object to processing). Please note that in the latter case, this right only applies if the processing of your personal data is based on our legitimate interest.

Your right to restriction to processing

8.4 You have the right to restrict the processing of your personal data (your right to restriction of processing). Please note that this only applies if (i) you contested the accuracy of your personal data and we are verifying the accuracy of the personal data; (ii) you exercised your right to object and we are still considering, as foreseen by the applicable law, whether our legitimate grounds to process your personal data in that case override your interests, rights and freedoms; or (iii) your personal data has been processed by us in an unlawful way but you either oppose the erasure of the personal data or want us to keep your personal data in order to establish, exercise or defend a legal claim.

Lawyer-readable



Legal norms modelling without explicability

Human-readable



“White box” approach in AI

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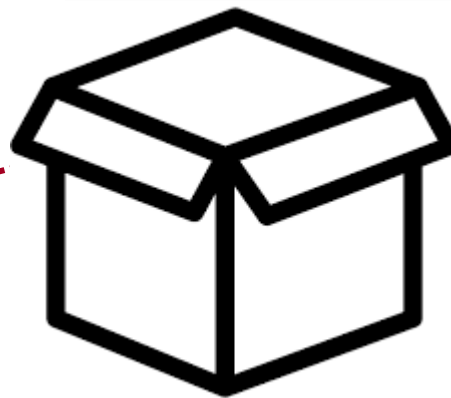


AKOMA NTOSO

Architecture for Knowledge-Oriented Management of African Normative Texts using Open Standards and Ontologies

OASIS LegalXML

LegalRuleML



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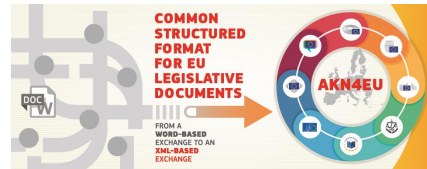
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Lawyer-readable

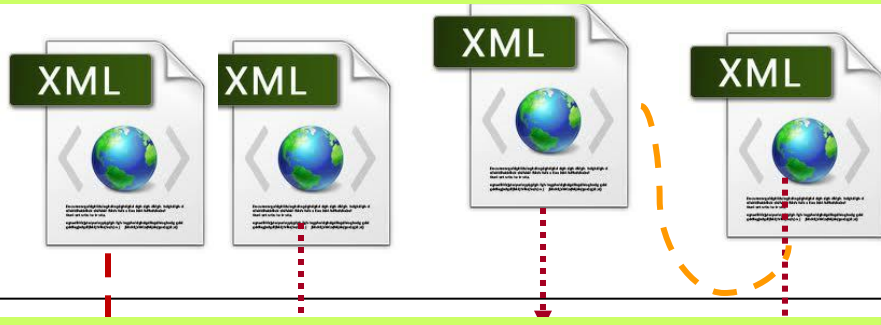
Machine-readable

Human-readable

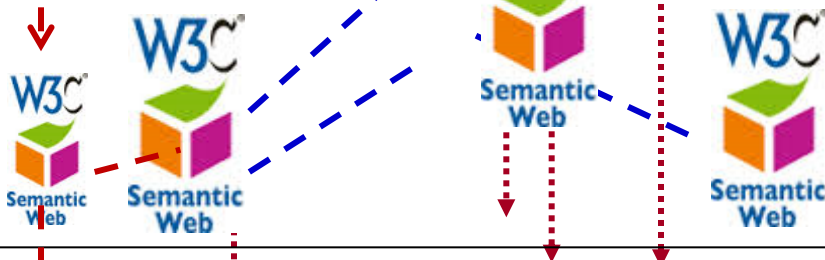


Legal Knowledge Modelling – Law as Code

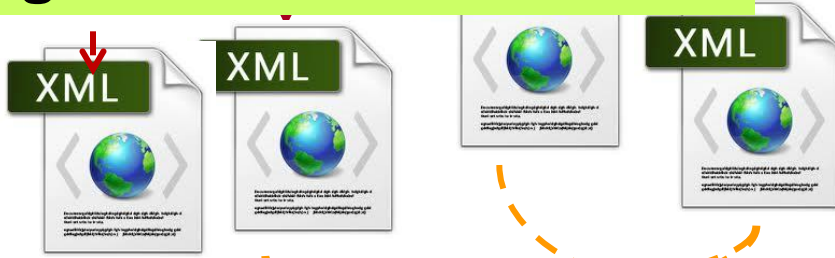
Legal document in XML - context



Legal Ontology – semantic level



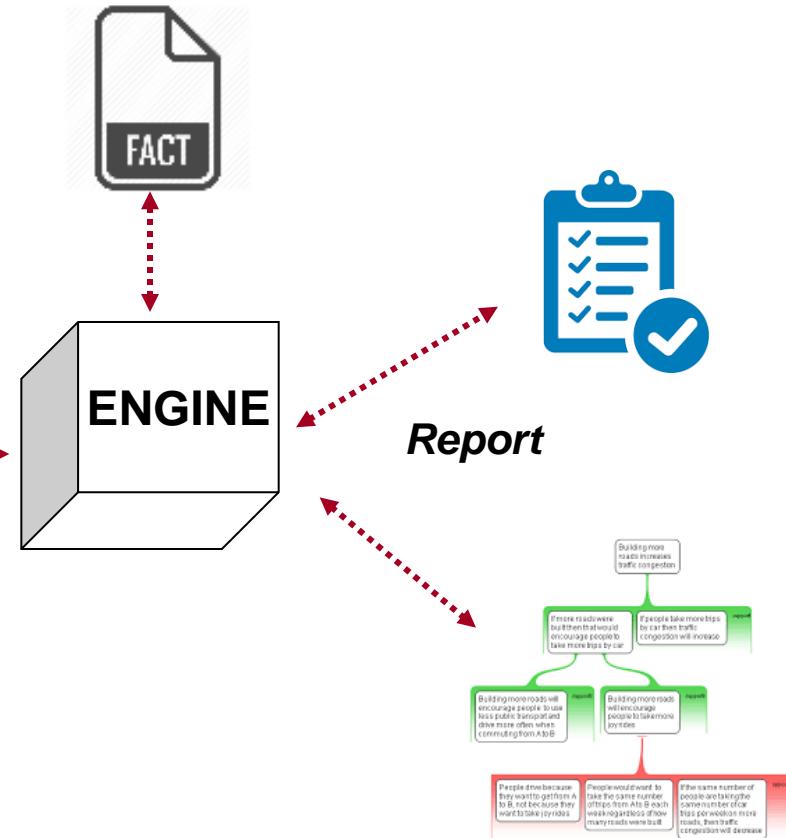
Logic Rules – deontic level



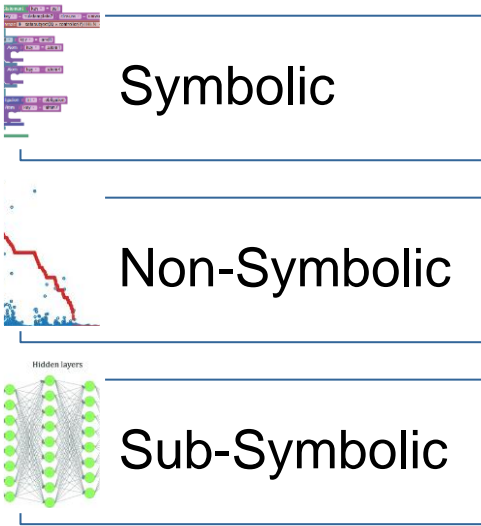
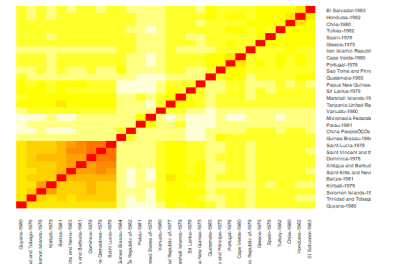
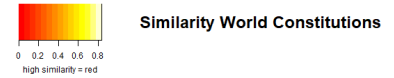
Argumentation/Justification

POLICY

eGOV Services




Hybrid AI for Legal Domain



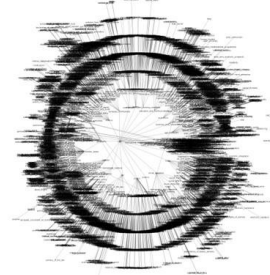
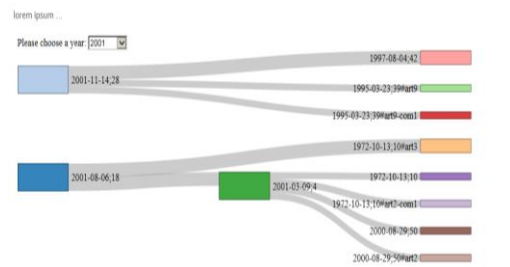
- AI
- Smart Contract

- Regression
- Data Science

- LegalXML



- KG
- Legal Ontology



Framework

Visualization/ Portals/Editor

Services of AI (support during drafting, classification, clustering, aggregation, correlation) - LLM

Workflow management

Advanced Ontology and Rule-base system

Extraction of the Legal Knowledge using AI/LLM

ELI/ECLI



AKOMA NTOSO – XML

Theory of law/Explicability

Akoma Ntoso is a methodology

Guidelines for the mark-up of UN normative, parliamentary and judicial documents

Google Custom Search



Part 1

Technical Specifications V 1.0



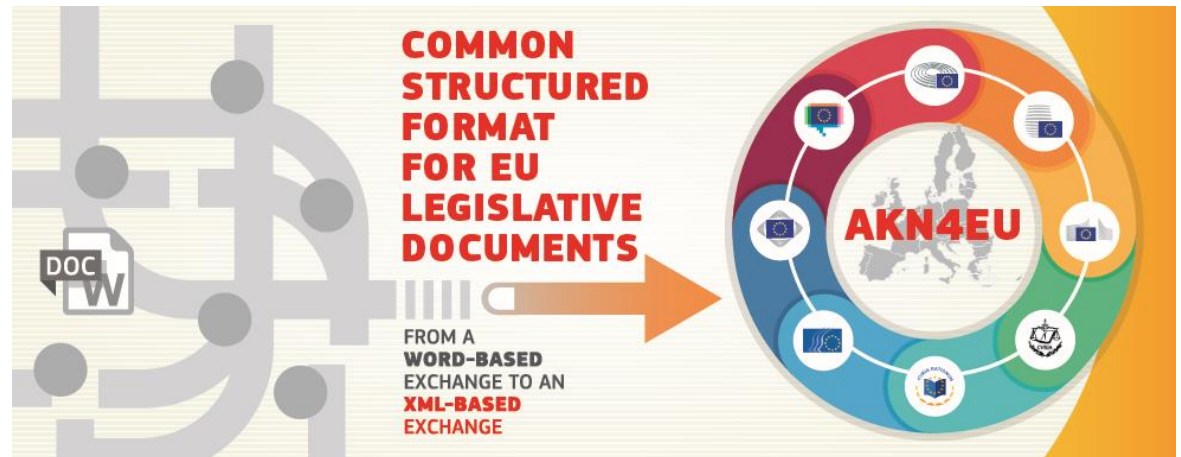
Part 2

Document Modelling V 1.0



Modelling of GA Resolutions

The United Nations System
Document Ontology 



Presidenza del Consiglio dei Ministri

Docs Piano Triennale IA Avanzamento digitale Dati ITA

Seguici su 

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**Pubblicata la Circolare n. 2/2019
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giuridica"**



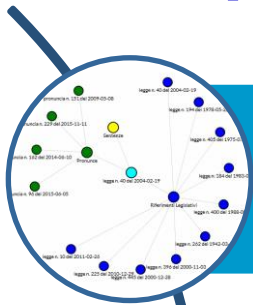
AI for Legislative drafting

Study on 'Drafting legislation in the era of AI and digitisation' with EU Commission – Directorate General Informatics Unit B2 – Solutions for Legislation, Policy & HR

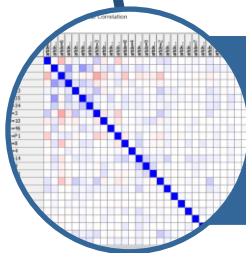


Legal Drafting in the Era of Artificial Intelligence and Digitisation

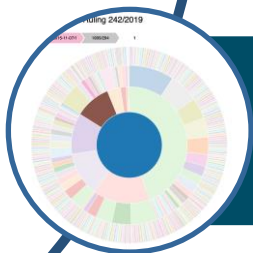
■ 4 use-cases



Legal Drafting supported by AI system for improving quality, effectiveness, efficacy, semantic annotation (e.g., Law as Platform)



Decision support System/AI for making better the legislative process and anticipating needs of the society (e.g., same-sex marriage, end of live, etc.)



Legal System data analytics for understanding the legislative hidden knowledge (e.g., patterns, frequent errors)

<https://cirsfid.gitlab.io/derograph/>

Analysis of the Derogations in EU Legislation using Network Analysis

This is a visualization map for AKN derogations of the EU legislation from 2010 to 2020

Eurovocs:

Select a Eurovoc

Places

Select a Place

Duration:

22/03/2015

01/04/2022

Conditions:

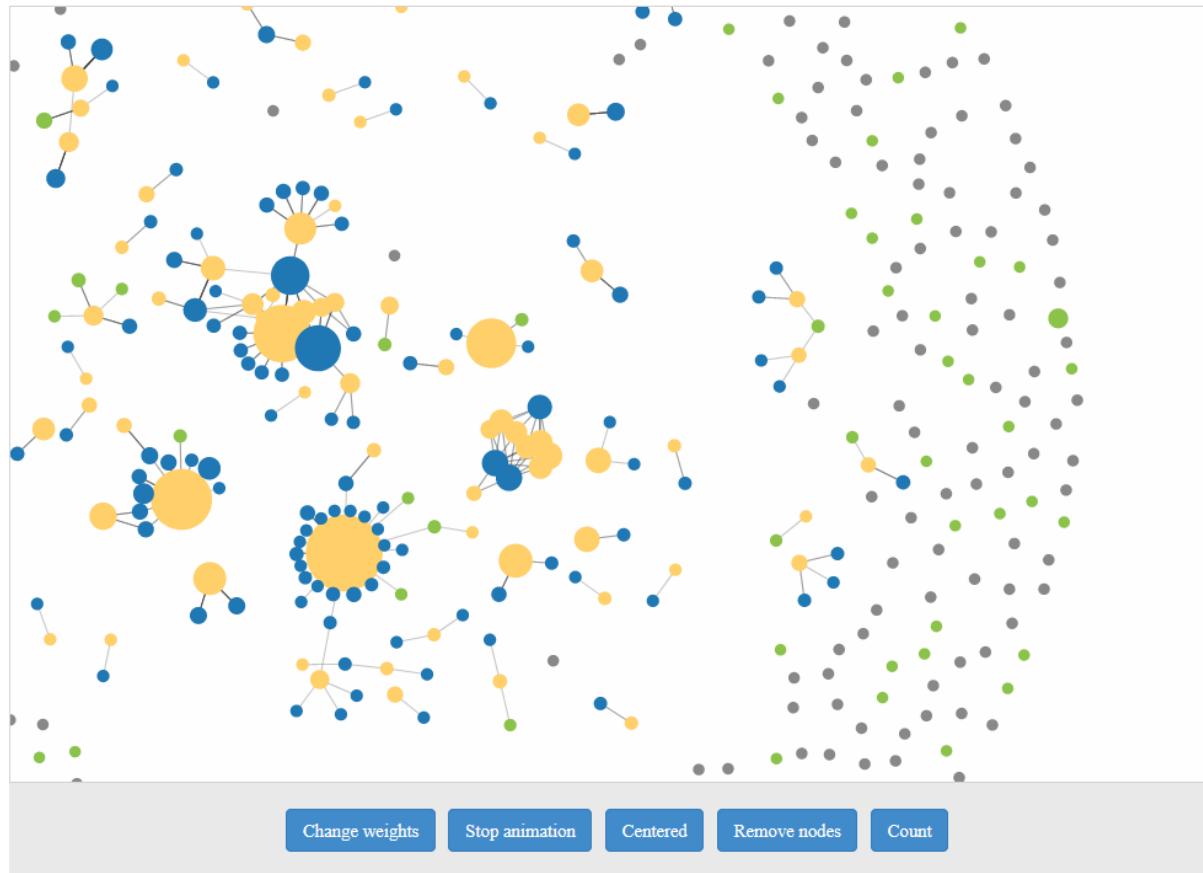
Select a Condition

Domains:

Select a Domain

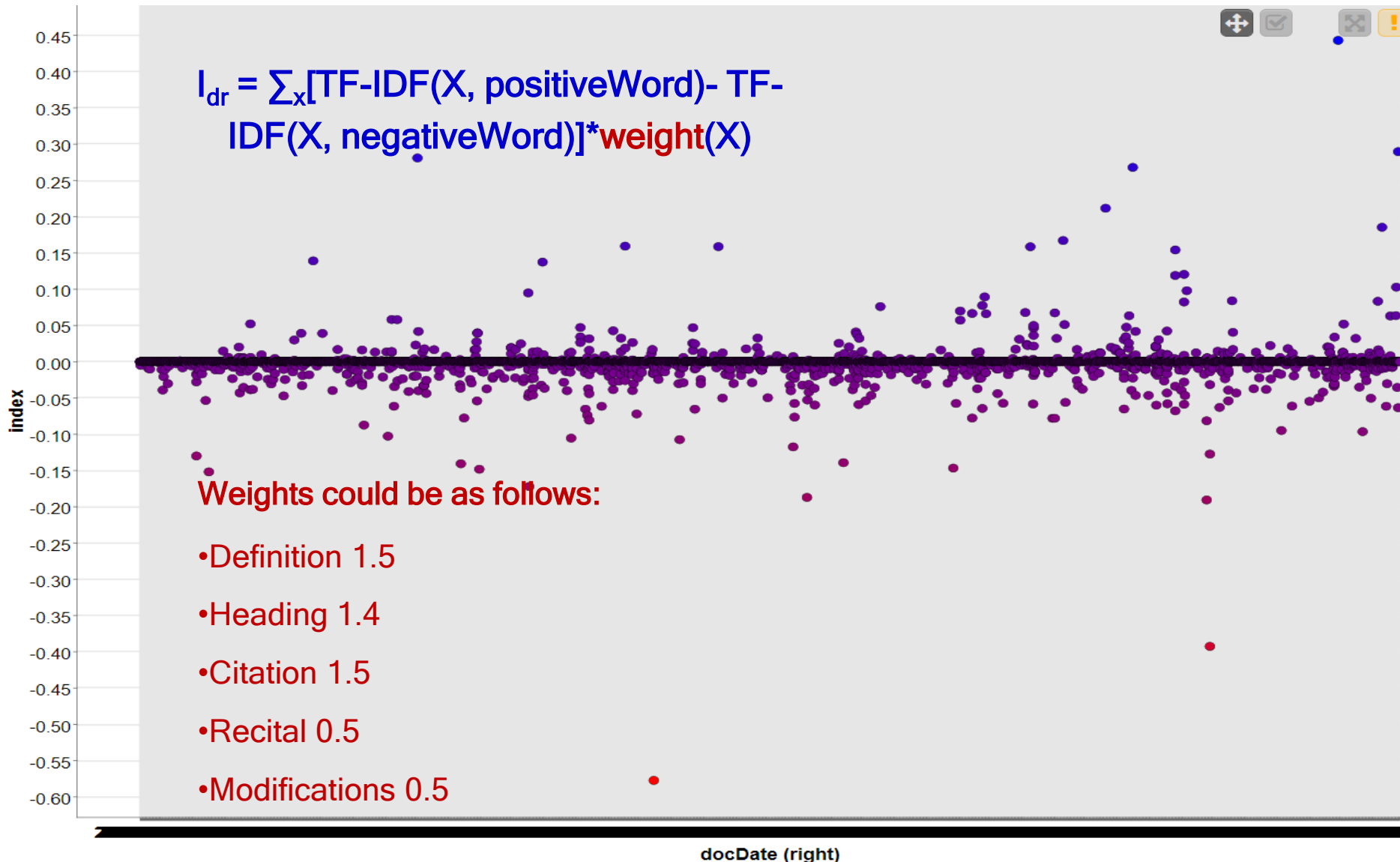
Match all filters (narrow results)

Update



$$w = k * (\#ActiveDerogations + \#ReflexiveDerogations + \#PassiveDerogations)$$

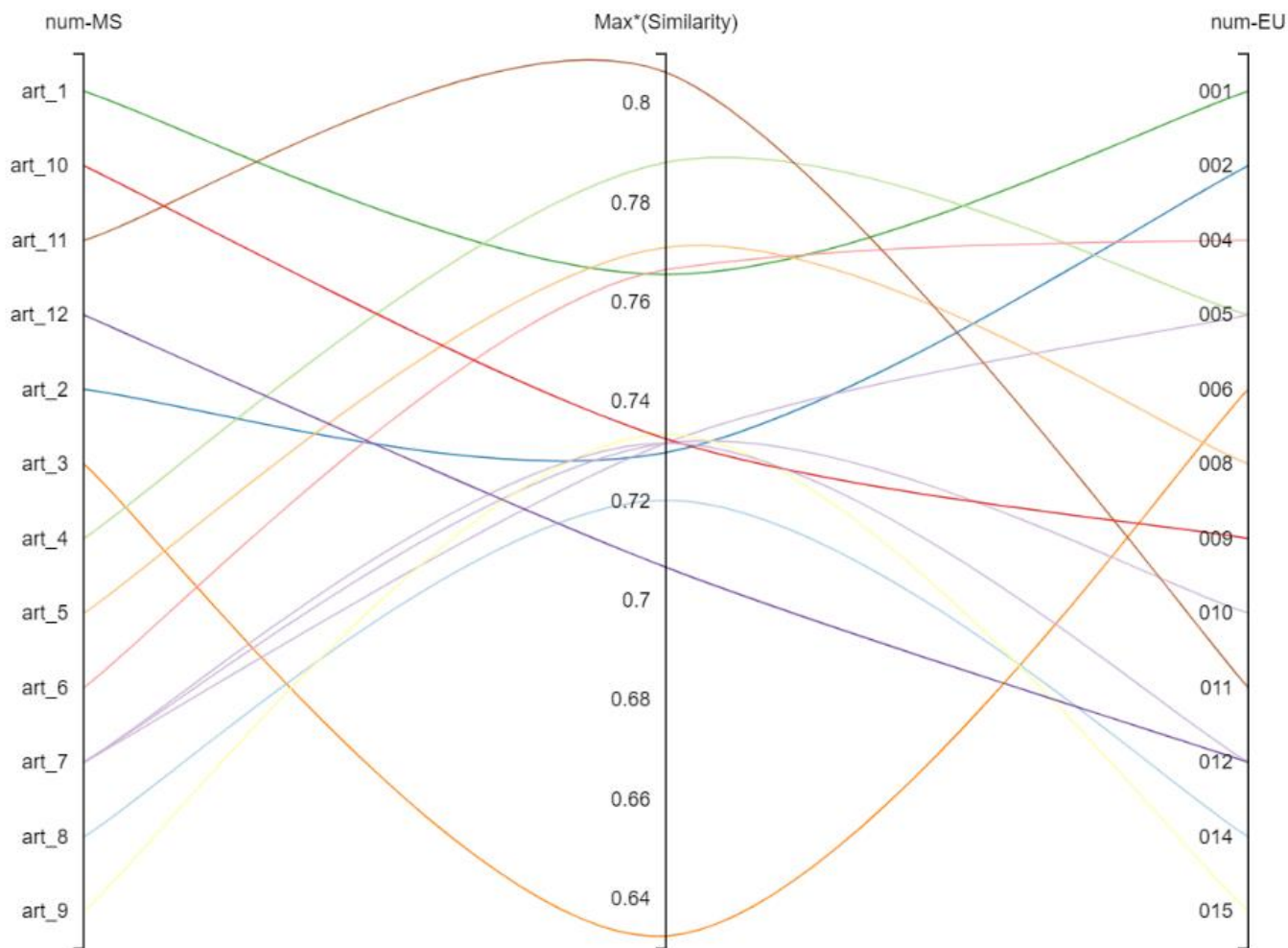
Digital-ready index in the EU legislation – TF-IDF at article level



Study on "Drafting legislation in the era of AI and digitisation"

Similarity between Italian implementation of Directive and the EU Directive

2-gram distance



Monitoring and Measuring the Policy



AKOMA NTO

Architecture for Knowledge-Oriented Management of African Normative Texts using Open Standards and Ontologies

Testo

Informazioni sul documento

Procedimento

Sintesi del documento

Salvare nei "miei elementi"

Link aggiornato

Link permanente

Scaricare la nota

Segui questo documento

Indice

Nascondi le versioni consolidate

12/08/2022

01/11/2019

Atto giuridico

CHAPTER IX
REVIEW

Article 29
Reports and review

1. Within 36 months of the date of entry into force of the delegated act adopted by the Commission pursuant to Article 4(9), the Commission shall, after consulting ESMA, submit a report on the effectiveness, efficiency and proportionality of the obligations laid down in this Regulation to the European Parliament, to the Council and to the Commission, together with any appropriate proposals. That report shall include, in particular, an overview of similar reporting obligations laid down in third countries taking into account work at international level. It shall also focus on the reporting of any relevant transactions not included in the scope of this Regulation, taking into account any significant developments in market practices, as well as on the possible impact on the level of transparency of securities financing operations.

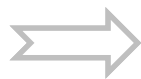
For the purposes of the report referred to in the first subparagraph, ESMA shall, within 24 months of the date of entry into force of the delegated act adopted by the Commission pursuant to Article 4(9), and every three years thereafter, or more frequently where significant developments in market practices arise, submit a report to the European Parliament, to the Council and to the Commission on the efficiency of the reporting, taking into account the appropriateness of single-side reporting, in particular in terms of reporting coverage and quality as well as reduction of reports to trade repositories, and on significant developments in market practices with a focus on transactions having an equivalent objective or effect to an SFTR.

2. Following completion of, and taking into account, work at international level, the report referred to in paragraph 1 shall also identify material risks related to the use of SFTRs by credit institutions and listed companies and analyse the appropriateness of providing for additional disclosure by those entities in their periodical reports.

Obbligations

LegalRuleML

Legal Text



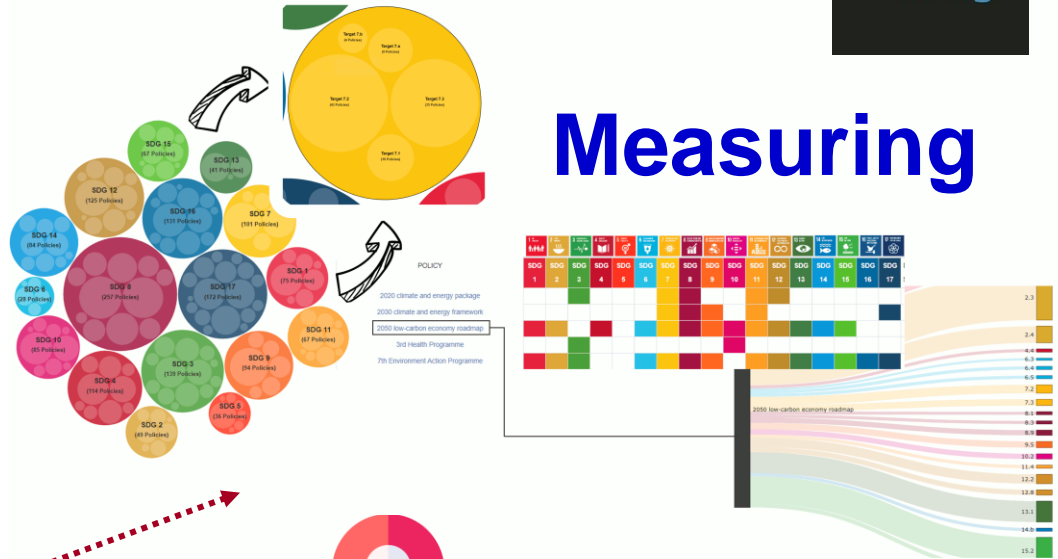
Machine-readable metadata



Monitoring



Measuring



Integration

LegalRuleML – business logic of the Norms (using legal ontologies)

NTT DATA

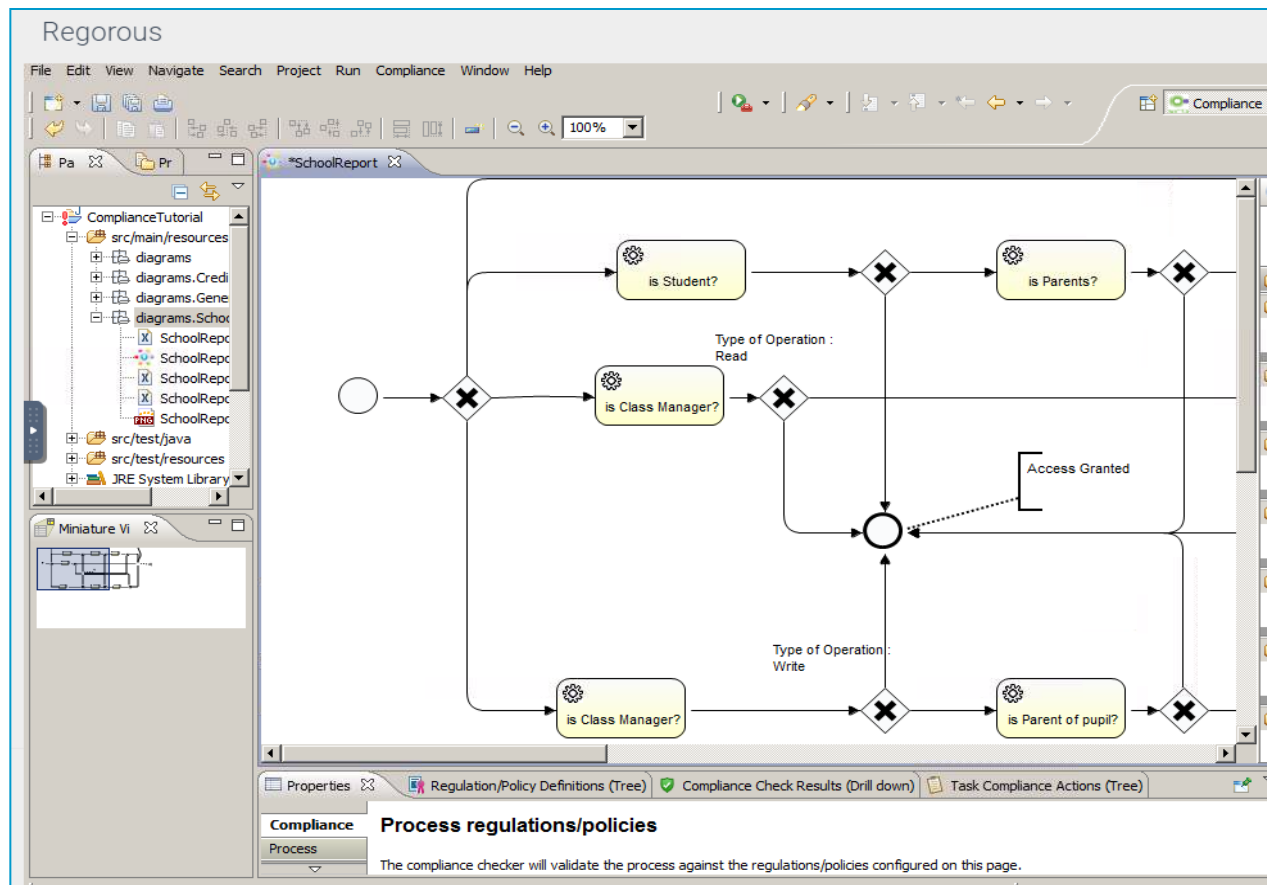
The screenshot displays a web-based interface for editing legal documents and their corresponding LegalRuleML. The browser address bar shows the URL `sinatra.cirsfd.unibo.it/c4eu-dashboard/#/rawe`. The interface is divided into several sections:

- Document editor:** Shows the text of a legal document. The **Preface** section includes the document title "REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL" and the date "27 April 2016". The **Body** section contains **Article 8**, which discusses conditions for child's consent in relation to information society services. A paragraph states: "Where point (a) of Article 6(1) applies, in relation to the offer of **Tern** information society services directly to a **Tern** child, the **Tern** processing of the personal data of a child shall be lawful where the child is **Tern** at least 16 years old. Where the child is below the age of 16 years, such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child."
- LegalRuleML preview:** Shows a visual representation of the document's logic. It features a **Prescriptive** rule structure:
 - Rule:** A container for the logic.
 - If:** A conditional block containing:
 - And:** A logical connector for multiple conditions.
 - Atom:** A block containing a **Rel** (relation) `atLeast16YearsOld` and a **Var** (variable) `X`.
 - Atom:** A block containing a **Rel** (relation) `informationSocietyService` and a **Var** (variable) `Y`.
 - Then:** A block containing:
 - Atom:** A block containing a **Rel** (relation) `lawfulConsentSigned`, a **Var** (variable) `X`, and another **Var** (variable) `Y`.

At the bottom of the interface, there are buttons for **Edit metadata**, **Delete**, and **Store**. The status bar at the bottom left shows the path `act > en`.

Use of BPMN for connecting the Norms with the eGOV services

NTT DATA



Conclusions

- DRL is a **great occasions** for improving the quality of law and services
- DRL includes some **risks** that should be mitigated with a strong methodology of theory of law
- LLM/ML includes some **weaknesses** that should be mitigated with a Hybrid AI approach
- DRL without **semantic/ontology** could create problems of legal meaning and frustrating the legal interpretation/autonomy of judge
- Transparency, **explicability** and accountability are crucial (e.g., democratic principles)
- Legitimacy and **Rule of Law** should be included *by-design* in the DRL projects

**thank you
for your attention**

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