HYPERMODELEX

European Research Council
Established by the European Commission

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AI in Parliament to Support the Legislative Process: Legal Theory, Methods, Applications

ICAIL 2025
CHICAGO, IL

Prof. Monica Palmirani – University of Bologna, CIRSFID-ALMA AI – Italy

19th June 2025, Chicago

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ALMA MATER STUDIORUM A.D. 1088

- Theory of law principles when AI enters in Parliament
- Hybrid AI Methodology for Law
- 4 applicative AI&Law projects in Parliament

THEORY OF LAW PRINCIPLES

Different goals of AI in Legislative Domain

Task for the legislative offices	Linguistic Translation	Quality Checking	Assist of consolidation	Assist of Amendment
Tasks for the member of the parliaments	Assist in the Definitions	Smart Legislative Drafting of the references	Semantic annotation	Classification/ clustering
Tasks for the democratic debates	Creation of executive summary	Analysis of impact	Analysis of effectiveness	Policy Checking
Tasks for the citizens	ChatBot	Smart Search Engine	Conversion al Query	Creation of executive summary

Democratic Debate

Science

Current Issue First release pap

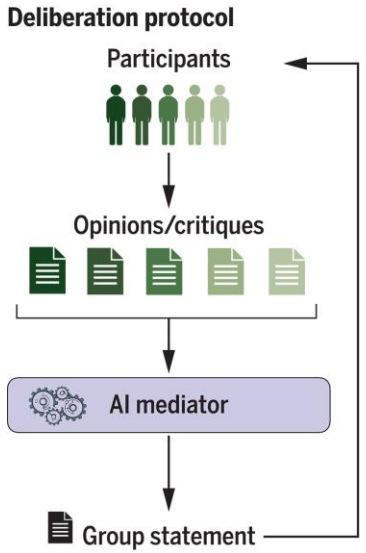
HOME > SCIENCE > VOL. 386, NO. 6719 > AI CAN HELP HUMANS FIND COMMON GROUND IN DEMOCRATIC

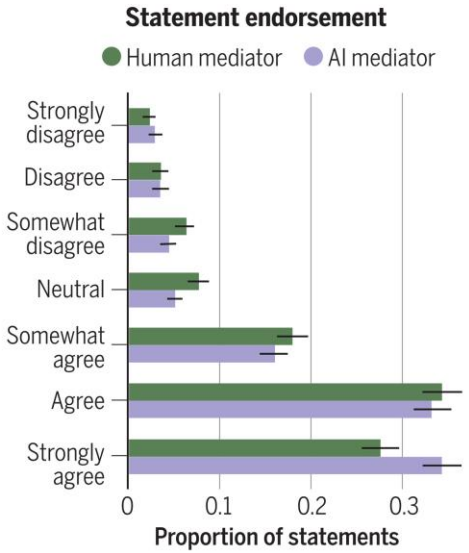
RESEARCH ARTICLE | ARTIFICIAL INTELLIGENCE

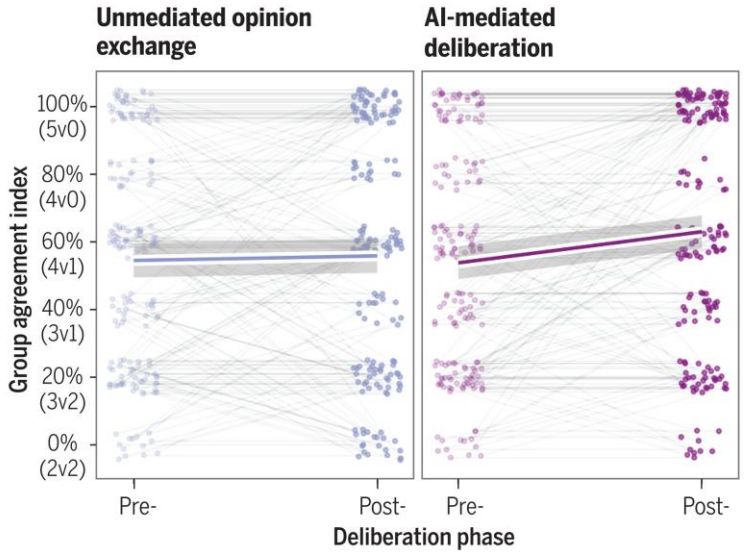
AI can help humans find common ground in democratic deliberation

MICHAEL HENRY TESSLER, MICHIEL A. BAKKER, DANIEL JARRETT, HANNAH SHEAHAN, MARTIN J. CHADWICK, RAPHAEL KOSTER, GEORGINA EVANS, LUCY CAMPBELL-GILLINGHAM, TANTUM COLLINS, [...], AND CHRISTOPHER SUMMERFIELD +2 authors Authors Info & Affiliations

SCIENCE · 18 Oct 2024 · Vol 386, Issue 6719 · DOI: 10.1126/science.adq2852







IJCAI
International Joint Conferences on Artificial Intelligence Organization

HOME CONFERENCES PROCEEDINGS AWARDS TRUSTEES/OFFICERS

Fallacious Argument Classification in Political Debates

Pierpaolo Goffredo, Shohreh Haddadan, Vorakit Vorakitphan, Elena Cabrio, Serena Villata

Fotis Fitsilis Hellenic Parliament

Table 3 - Grouping of priority smart functionalities in technology clusters.

SF Cluster	Technology	SF
I	Advanced Language Editing and Correction	#9-#10-#12-#13
II	Named Entity Recognition	#3
III	Semantic Similarity	#11-#14-#15-#20
IV	Natural Language Generation	#26
V	Information Extraction	#19

zeppelin university

Approaching the Integration of Large Language Models in the Parliamentary Workspace

Enhancing Parliamentary Processes with LLMs

4th Global Conference on Parliamentary Studies
Reinventing Democracy for the 21st Century, Athens, 13.06.2025

Jörn von Lucke
The Open Government Institute
Zeppelin University Friedrichshafen, Germany

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Weakness of LLM/ML 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
- **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
- **Provenance**: LLM is trained with heterogenous sources and in Legal Domain it is fundamental to have authoritative legal sources

Give me the last definition of "food" in Eu Legislation

The current and authoritative definition of **"food"** in EU legislation is found in **Article 2 of Regulation (EC) No 178/2002**, also known as the *General Food Law*. It states:

> **"Food (or foodstuff) means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. 'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment.**
> **'Food' shall not include:**
>
> 1. **"feed;"**
> 2. **"live animals unless they are prepared for placing on the market for human consumption;"**
> 3. **"plants prior to harvesting;"**
> 4. **"medicinal products** (as defined by Directives 65/65/EEC and 92/73/EEC);"
> 5. **"cosmetics** (per Directive 76/768/EEC);"
> 6. **"tobacco and tobacco products** (as per Directive 89/622/EEC);"
> 7. **"narcotic or psychotropic substances** (under the 1961 and 1971 UN Conventions);"
> 8. **"residues and contaminants."** reading.ac.uk +15 "

Insertion in 25/05/2017

(i) medical devices within the meaning of Regulation (EU) 2017/745 of the European Parliament and

Article 2

Definition of 'food'

For the purposes of this Regulation, 'food' (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans.

'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It includes water after the point of compliance as defined in Article 6 of Directive 98/83/EC and without prejudice to the requirements of Directives 80/778/EEC and 98/83/EC.

'Food' shall not include:

(a) feed;

(b) live animals unless they are prepared for placing on the market for human consumption;

(c) plants prior to harvesting;

(d) medicinal products within the meaning of Council Directives 65/65/EEC ([1]) and 92/73/EEC ([2]);

(e) cosmetics within the meaning of Council Directive 76/768/EEC ([3]);

(f) tobacco and tobacco products within the meaning of Council Directive 89/622/EEC ([4]);

(g) narcotic or psychotropic substances within the meaning of the United Nations Single Convention on Narcotic Drugs, 1961, and the United Nations Convention on Psychotropic Substances, 1971;

(h) residues and contaminants;

▼M7 ●

(i) medical devices within the meaning of Regulation (EU) 2017/745 of the European Parliament and of the Council ([5]).

eLegal evolution

1990s **2000s** **2010s** **2020s** **2030s**

AI and Law

Logic programming – Symbolic AI

Semantic Web & Knowledge Representation

ML, Classification, clustering, NLP, prediction

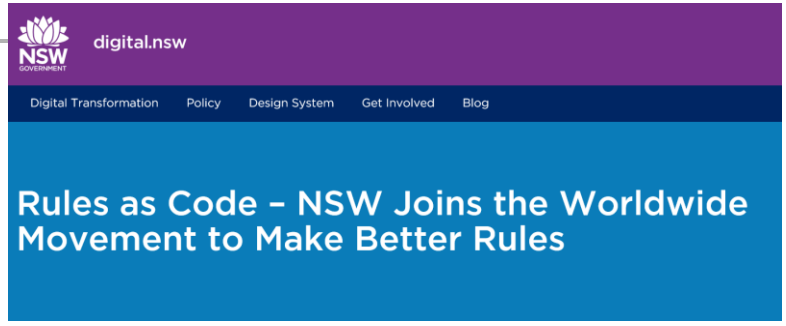
Legal data analytics

Blockchain & Smart Contract

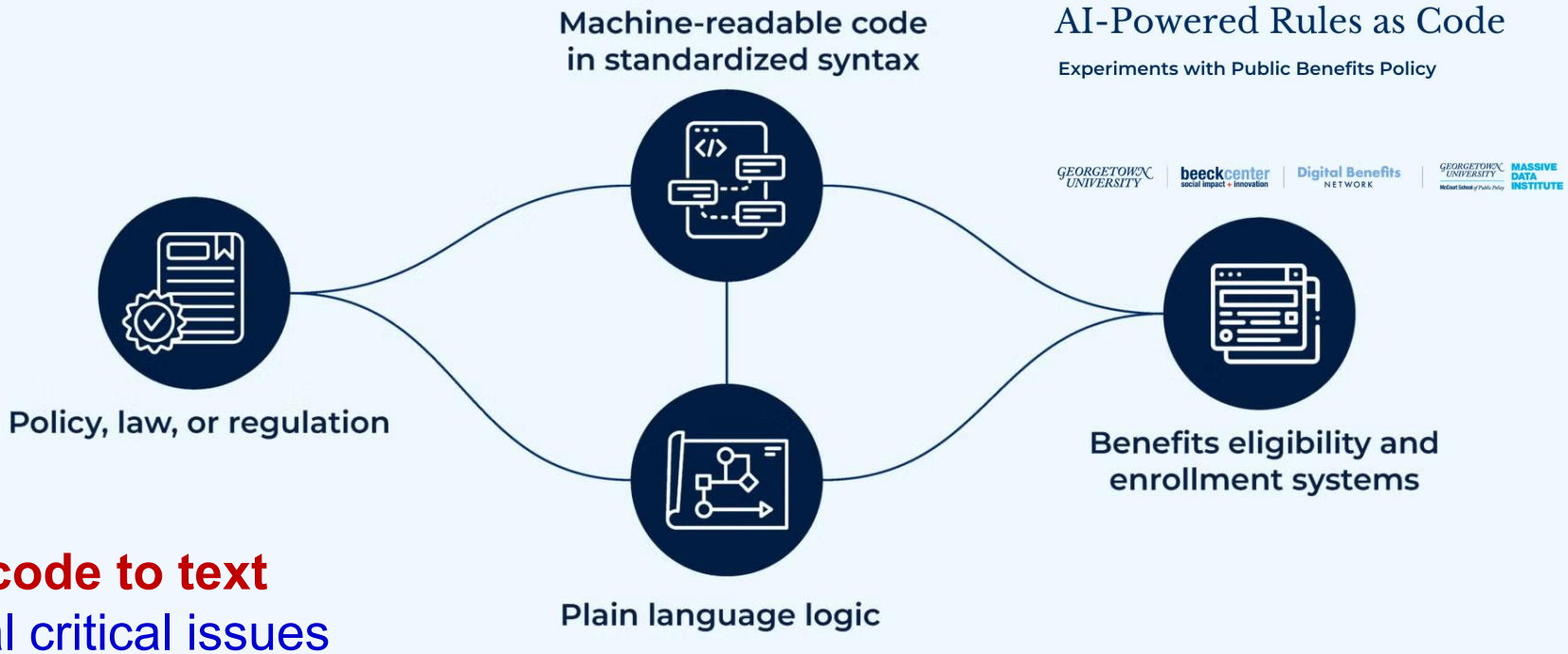
LLM, RAG, GenAI **multimodal**

Agentic AI

Neuro-Symbolic



Benefits Eligibility Rules as Code



AI-Powered Rules as Code

Experiments with Public Benefits Policy

GEORGETOWN UNIVERSITY | beeckcenter social impact + innovation | Digital Benefits NETWORK | GEORGETOWN UNIVERSITY MASSIVE DATA INSTITUTE

From code to text

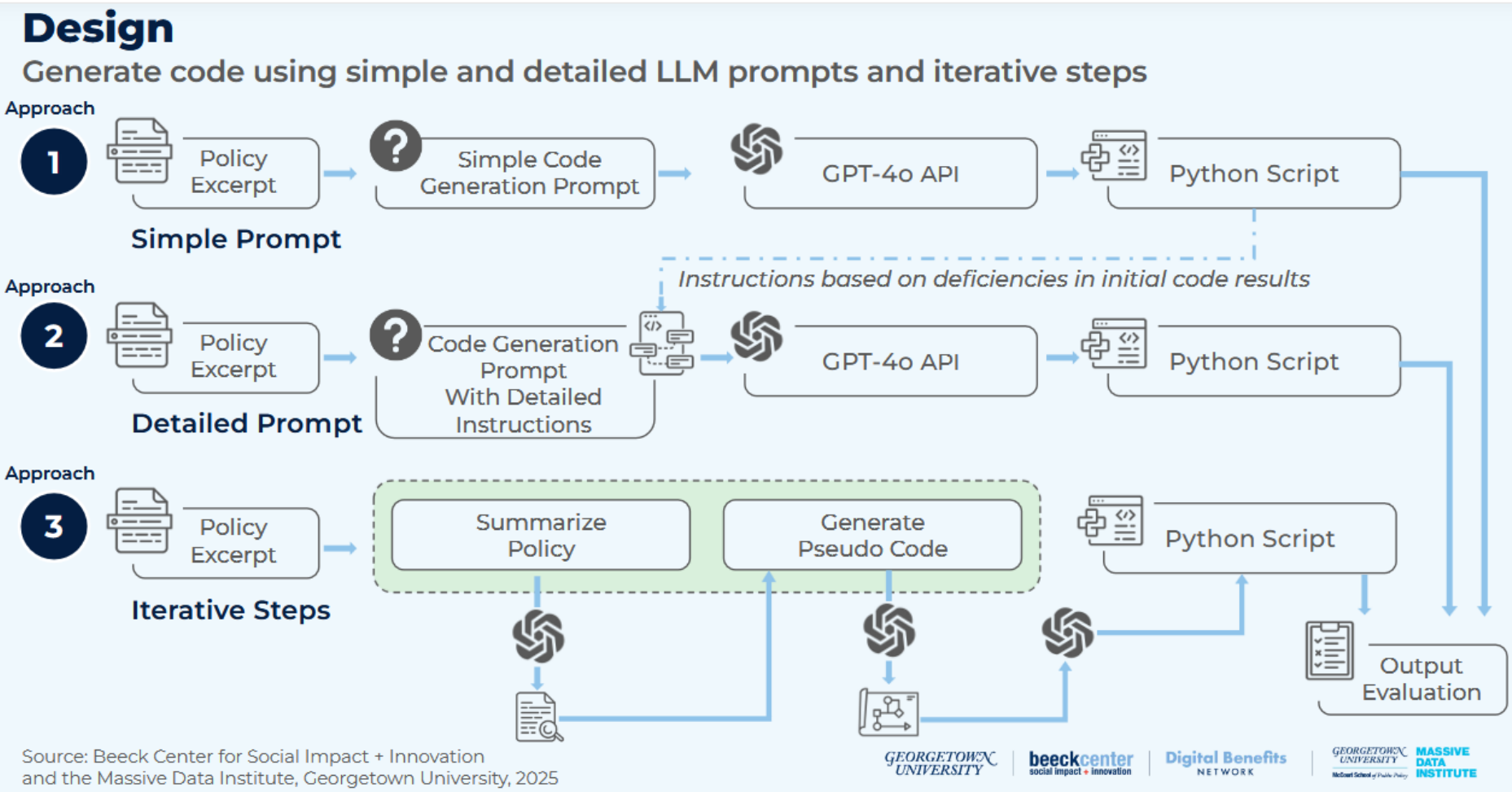
Several critical issues

- Democratic risks
- *Computational legalism* (Hildebrandt 2021)
- Crystallization of the law

GEORGETOWN UNIVERSITY | beeckcenter social impact + innovation | Digital Benefits NETWORK | GEORGETOWN UNIVERSITY MASSIVE DATA INSTITUTE

Source: beeckcenter for Social Impact + Innovation and the Massive Data Institute, Georgetown University, 2025

Experiment #4 – generate code&text using LLM



Experiment 4 Results Summary

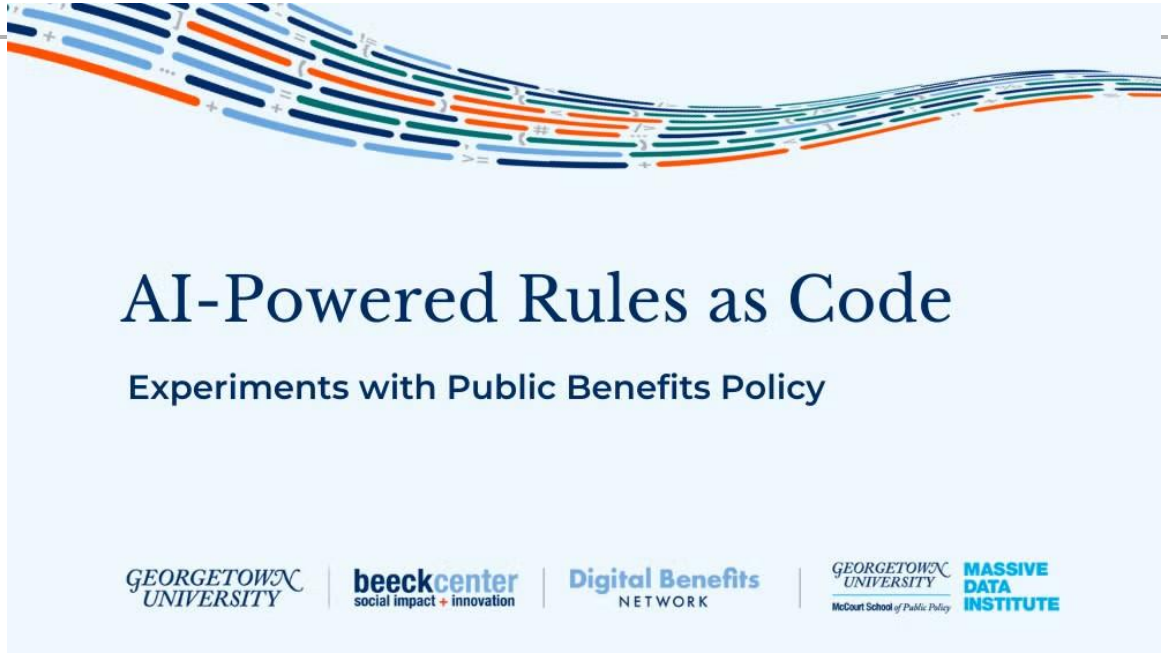
Generate code using simple and detailed LLM prompts and iterative steps

Performance of Designs Across Criteria

Criteria	Design 1 *Simple Prompt*	Design 2 *Detailed Prompt*	Design 3 *Iterative Prompts*
Variable Identification	Partial	Good	Good
Input Handling	Poor	Partially good	Poor
Output Correctness	Incorrect	Partially correct	Incorrect
Decision Making	Poor	Partially good	Poor (mechanical)
Logical Consistency	Poor	Improved	Partially consistent
Rule Coverage	Partially covered	Improved	Partially covered
Code Execution	Runs (unstable)	Runs (Improved)	Doesn't run

- At a high level, the detailed prompt design was the most successful.
- Summarized policy guidance for code generation reduces code errors.
- Modular design is particularly important in LLM workflows.

Source: Beeck Center for Social Impact + Innovation and the Massive Data Institute, Georgetown University, 2025

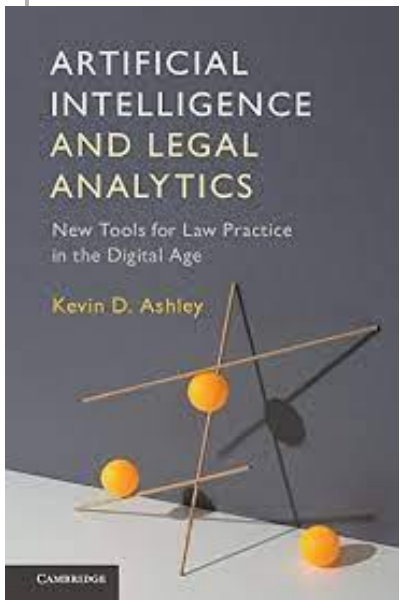


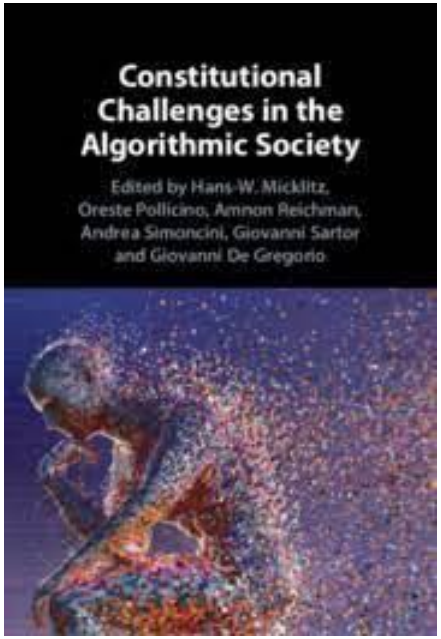
"Our experiments highlight that LLMs can support different parts of the Rules as Code pipeline, but a **human in the loop** and rich databases containing relevant, up-to-date policy excerpts are essential to facilitate the use of this technology"

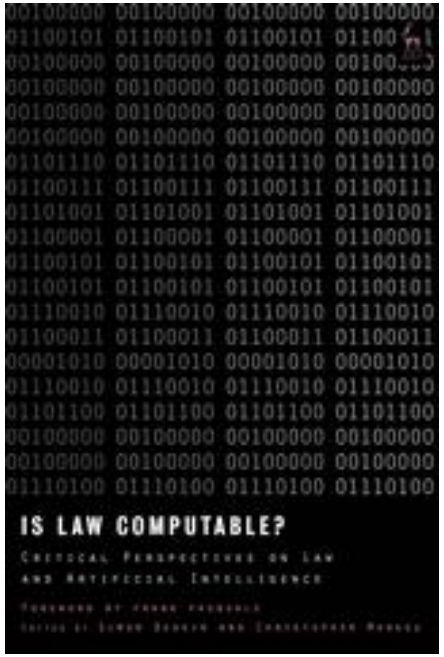
"When AI models provide incorrect information, they often do so in a confident tone, which can mislead those without subject expertise."

AI and Legislation Domain: critical issues

- Law is **not only rules** (e.g., principles and values).
- Norms have been adapted according to the **evolution of the society – dynamic model**
- Norms are sometimes intentionally **vague** for implementing flexibility and interpretations (hermeneutic, open text)
- **Prediction** based on the past should be mitigated to the new events (computational legalism, Hildebrandt 2021)
- **Autonomy** and transparency are pillars of normativity (Günther 2021)
- The "**right of disobey"** as a moment of creativity of new norms and to reinforce the normativity







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

Words or code first? Is the legacy document or a code statement the better starting point for complexity-reducing legal automation?

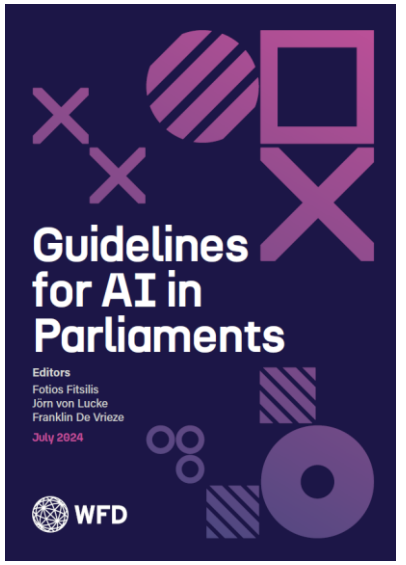
Oliver R. Goodenough[1,2,3] and Preston J. Carlson[4]

Goodenough OR, Carlson PJ. 2024Words or code first? Is the legacy document or a code statement the better starting point for complexity-reducing legal automation? *Phil. Trans. R. Soc. A* **382**:20230160. https://doi.org/10.1098/rsta.2023.0160

- "There are cases where the **words-first approach**, either through translation or the direct application of LLM style artificial intelligence, may be preferable as a matter of dealing with legacy documentation. Going forward, however, we believe that a **code-first approach**, intelligently developed and deployed, holds the greater promise for allowing society to grasp the many benefits – including complexity management – that can flow from effective legal automation."

Critical issues in Parliament

- **Provenance of the legal sources**
- Data/Platform sovereignty and security
- **Explicability, Transparency, Accountability**
- Bias, Discrimination, Risk assessment
- **Parliamentary Autonomy**
- **Separation of Powers**
- Integrity of democratic processes (e.g., rules of law)
- Free Mandate (e.g., not depending on the technology)
- Continuity of Power (e.g., blackout)

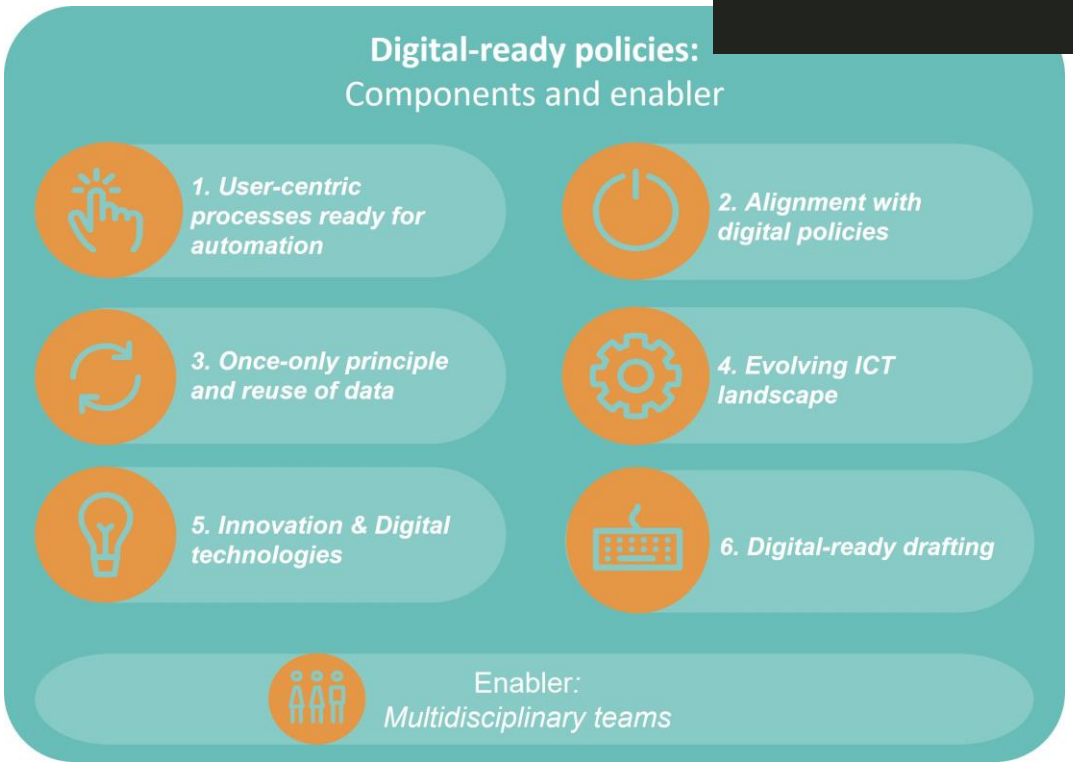


Digital-ready policies

Digital Ready Policy Making

European Commission

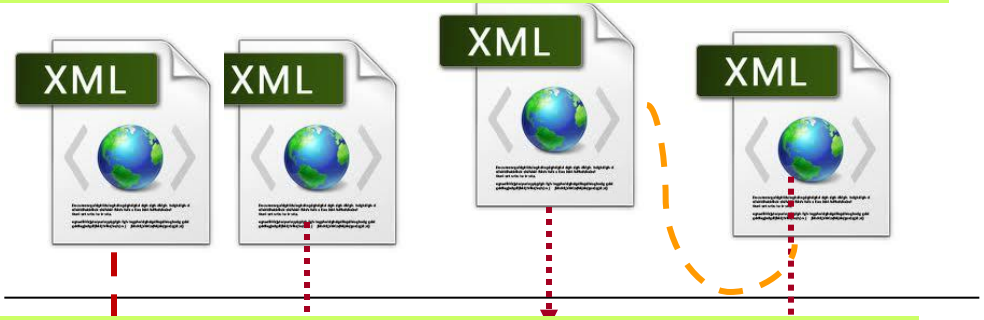
Law as Code



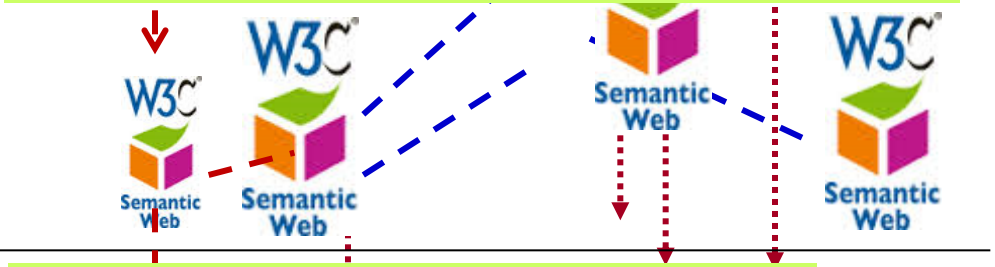
METHODOLOGY

Legal Knowledge Modelling – Law as Code

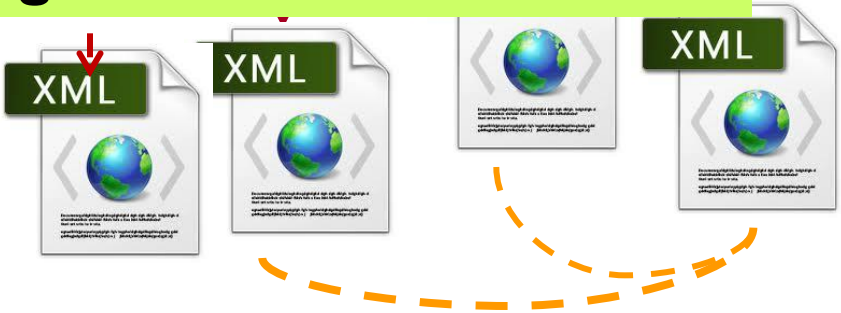
Legal document in XML - context



Legal Ontology – semantic level

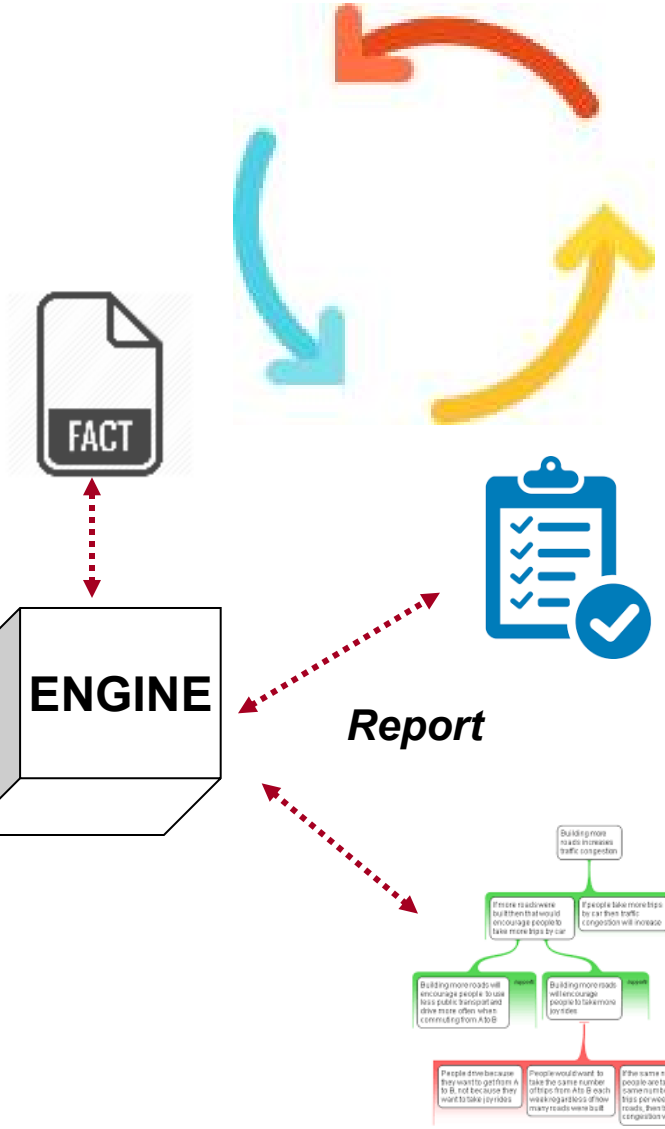


Logic Rules – deontic level



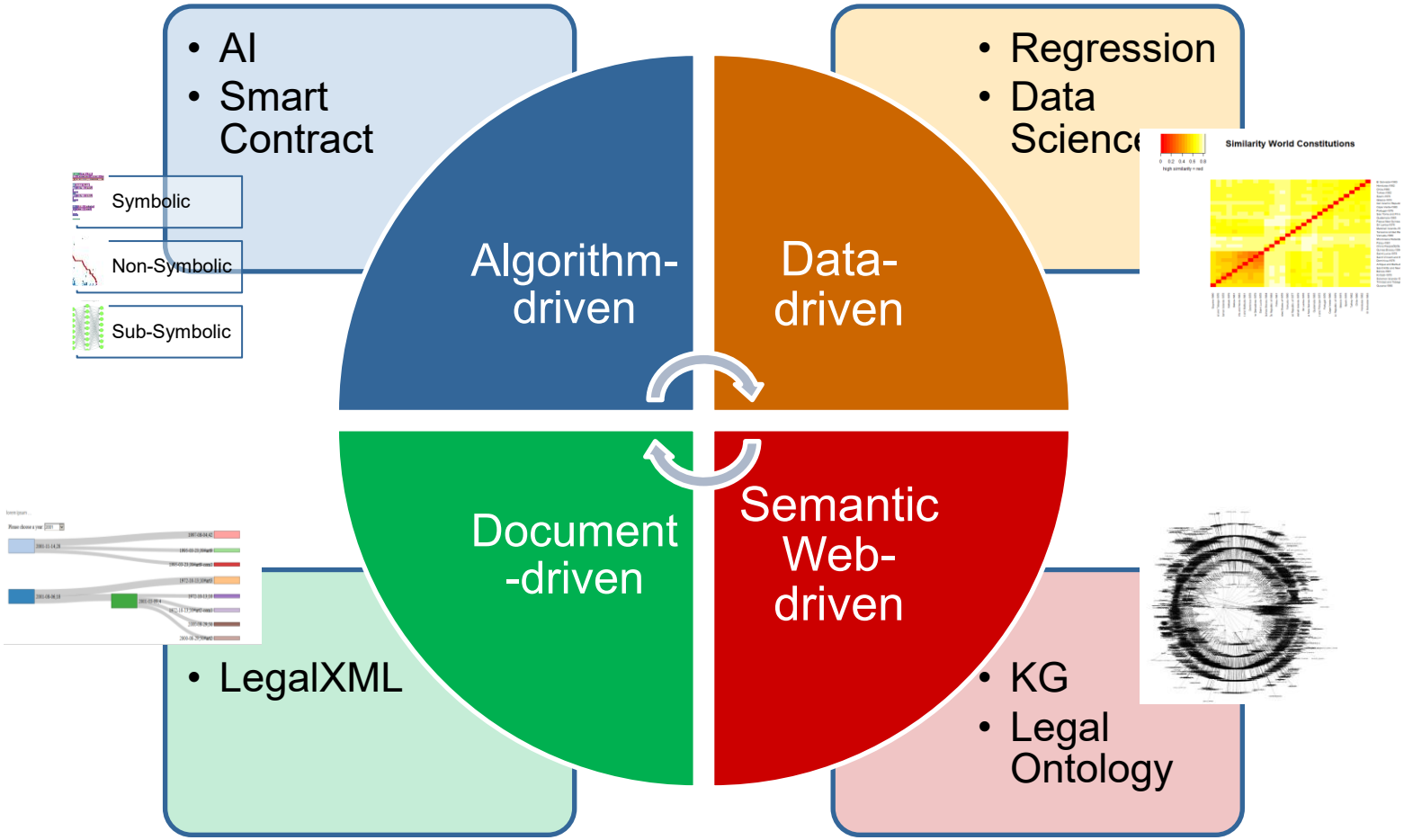
Argumentation/Justification

eGov Services



Hybrid AI for the Legal Domain

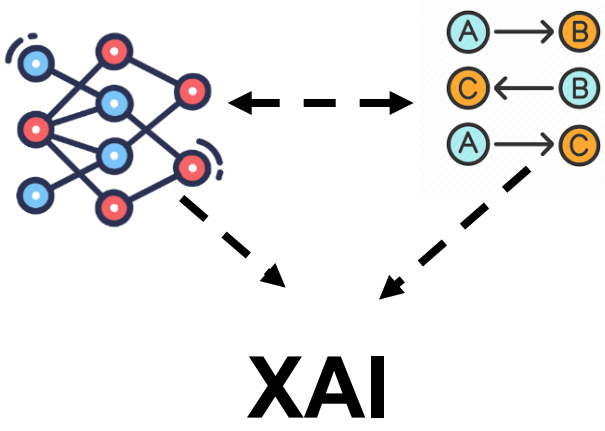
Content, Context, Semantic, Processing

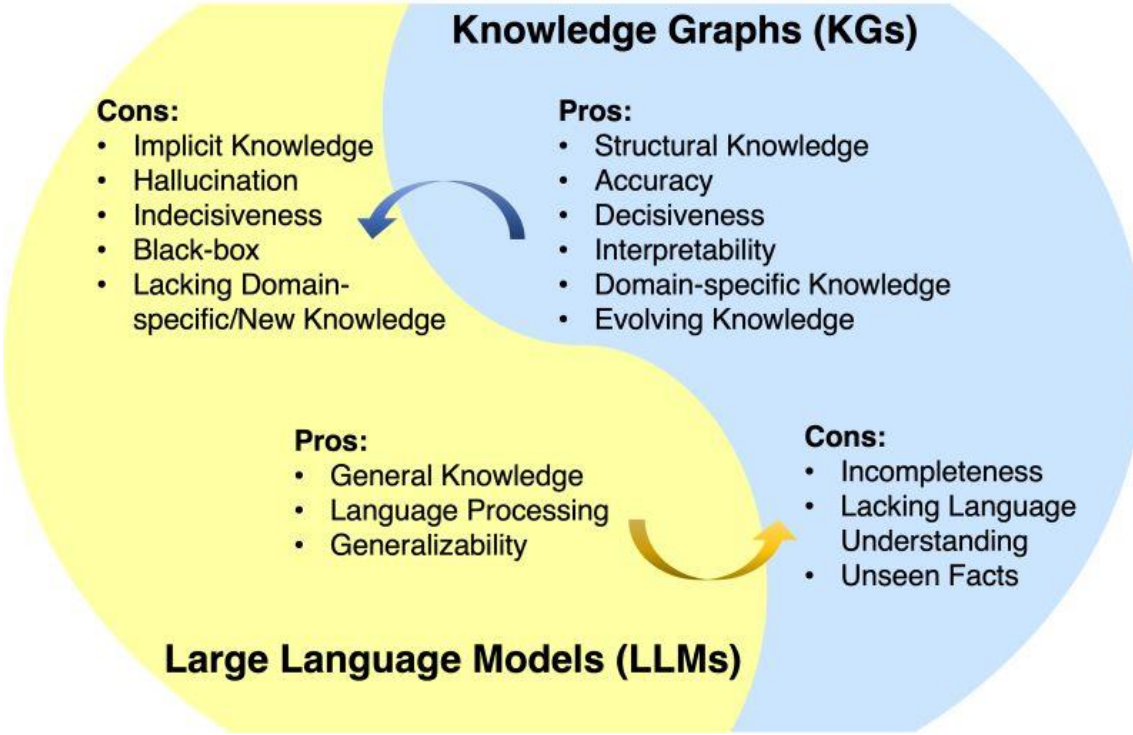


Neuro-Symbolic

Sub-Symbolic AI

Symbolic AI





Unifying Large Language Models and Knowledge Graphs: A Roadmap
Shirui Pan, Linhao Luo, Yufei Wang, Chen Chen, Jiapu Wang, Xindong Wu

“White box” approach in AI

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b) to publish papers, articles, preprints, slides, presentations, videos, teaching material, programs of events, calls for papers and volumes and collections thereof,

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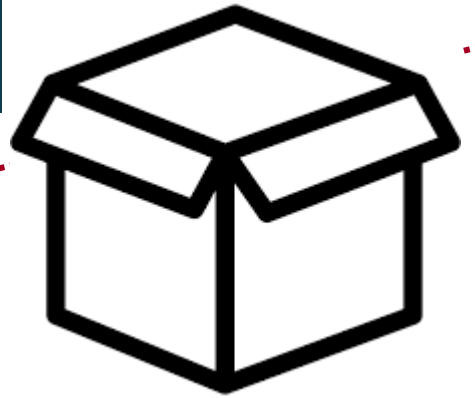
Lawyer-readable

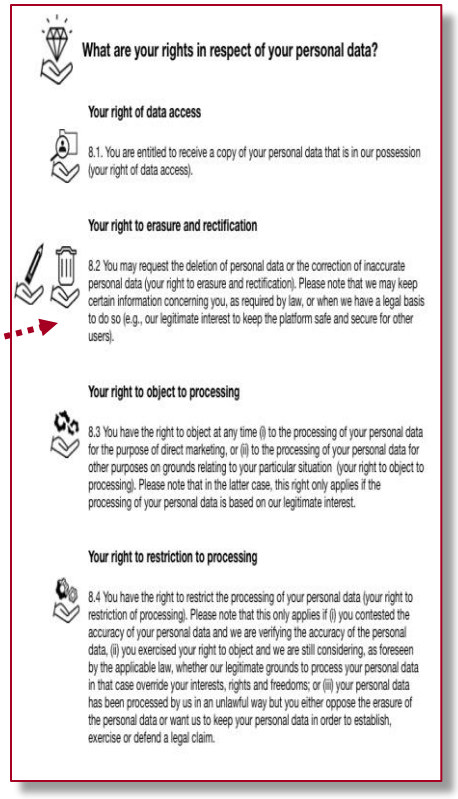
AKOMA NTOSO

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

OASIS LegalXML

LegalRuleML




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

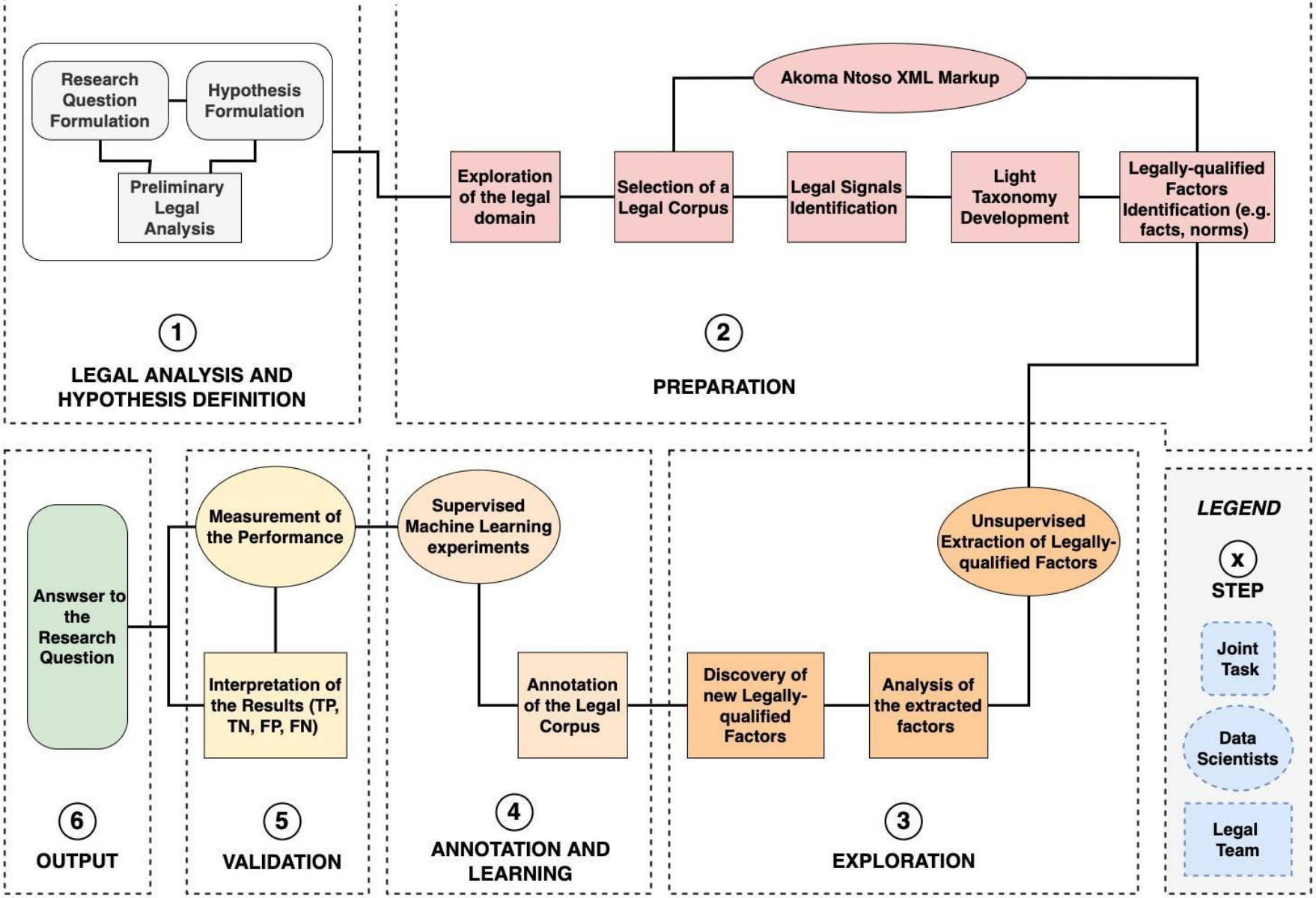
8.4 You have the right to restrict the processing of your personal data (your right to restriction of processing). Please note that this only applies if (i) you contested the accuracy of your personal data and we are verifying the accuracy of the personal data, (ii) you exercised your right to object 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.

Human-readable

Machine-readable

A Hybrid Artificial Intelligence Methodology for Legal Analysis

*Monica Palmirani, Salvatore Sapienza, Kevin Ashley**



ENDORSE

THE EUROPEAN DATA CONFERENCE ON REFERENCE DATA AND SEMANTICS

European Commission

4 USE-CASES

Problem

1. **Assist** the legislative drafting offices and the members of parliament in retrieving relevant legislative sources related to the bill that they want to draft (heterogeneous corpora) – **legal ex-ante analysis**
2. Monitor **policies** over time – **ex-post analysis**
3. Detect inconsistencies in legislative bills or **unconstitutionalities** with the Constitutional Court
4. **Generate** new legislative definitions according to the existing corpora with **Agentic AI**

#1 Relevant documents with a lack of information in legislative heterogenous corpora

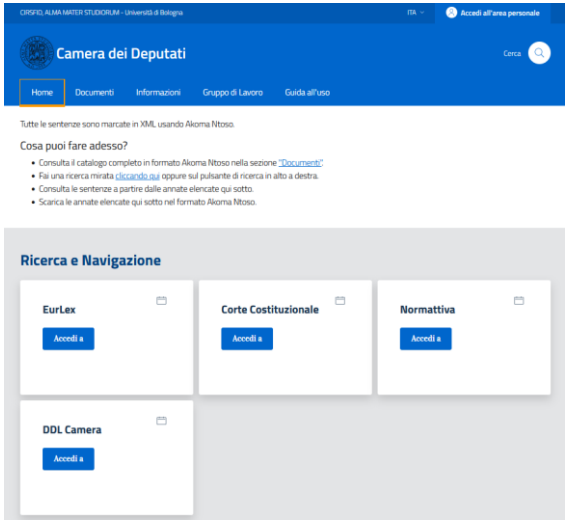
1. Complete drafting of normative references
2. Retrieve definitions
3. Extract relevant legal documents

demo-service.service

{json:api}

REST API

node



Vue.js

Lucine, eXist: **AKN**
CELLAR: RDF
DBSQL

RDF

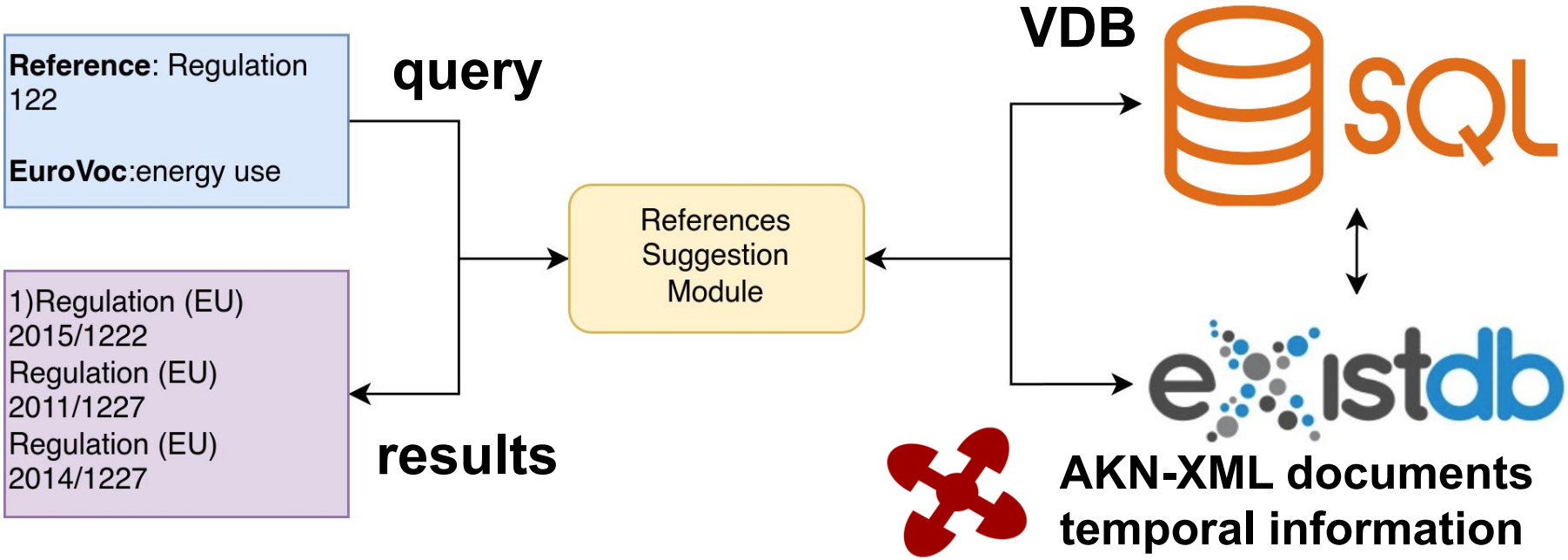
AKN4EU

AI

1.1 Normative references suggestion

Given an **incorrect** or **partial text**, to get the list of relevant references, syntactically correct, in force, refer to documents that have a similar topic.

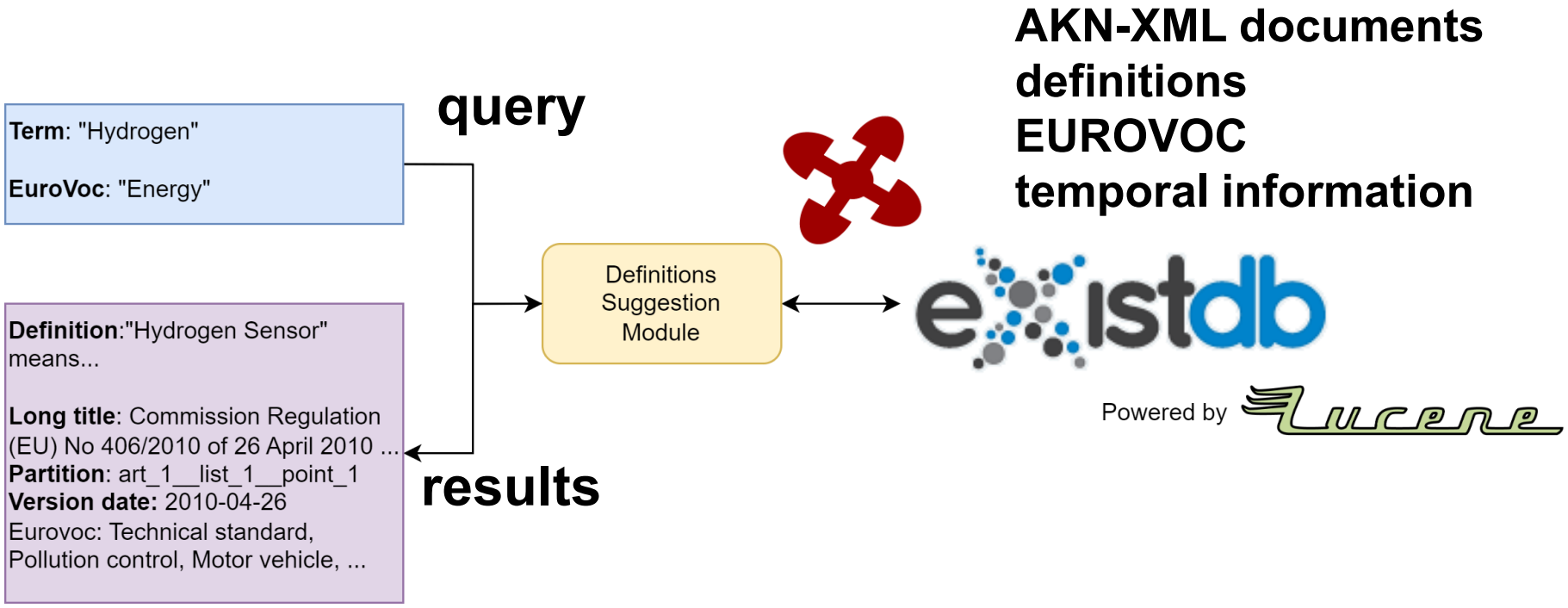
Regulation (ECC) No 2873/77
Regulation (EC) 1984/2003
Regulation (EU) 2015/15



1.2 Legal definitions suggestion

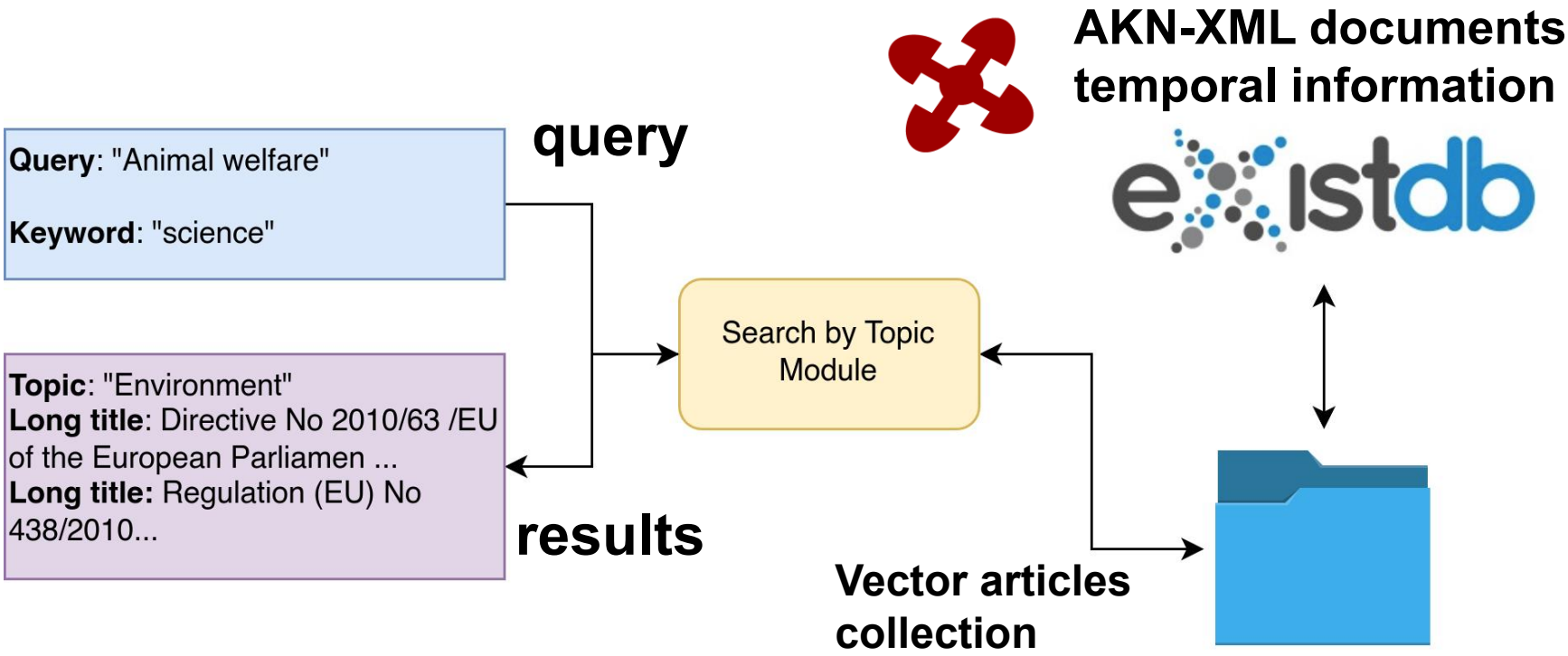
Use prior existing definitions to suggest relevant ones, consolidated and updated, to the user using the topic of the bill (EuroVoc).

- Hydrogen definition in the Energy Bill updated today
- Hydrogen definition in the Food Bill in force in 2026

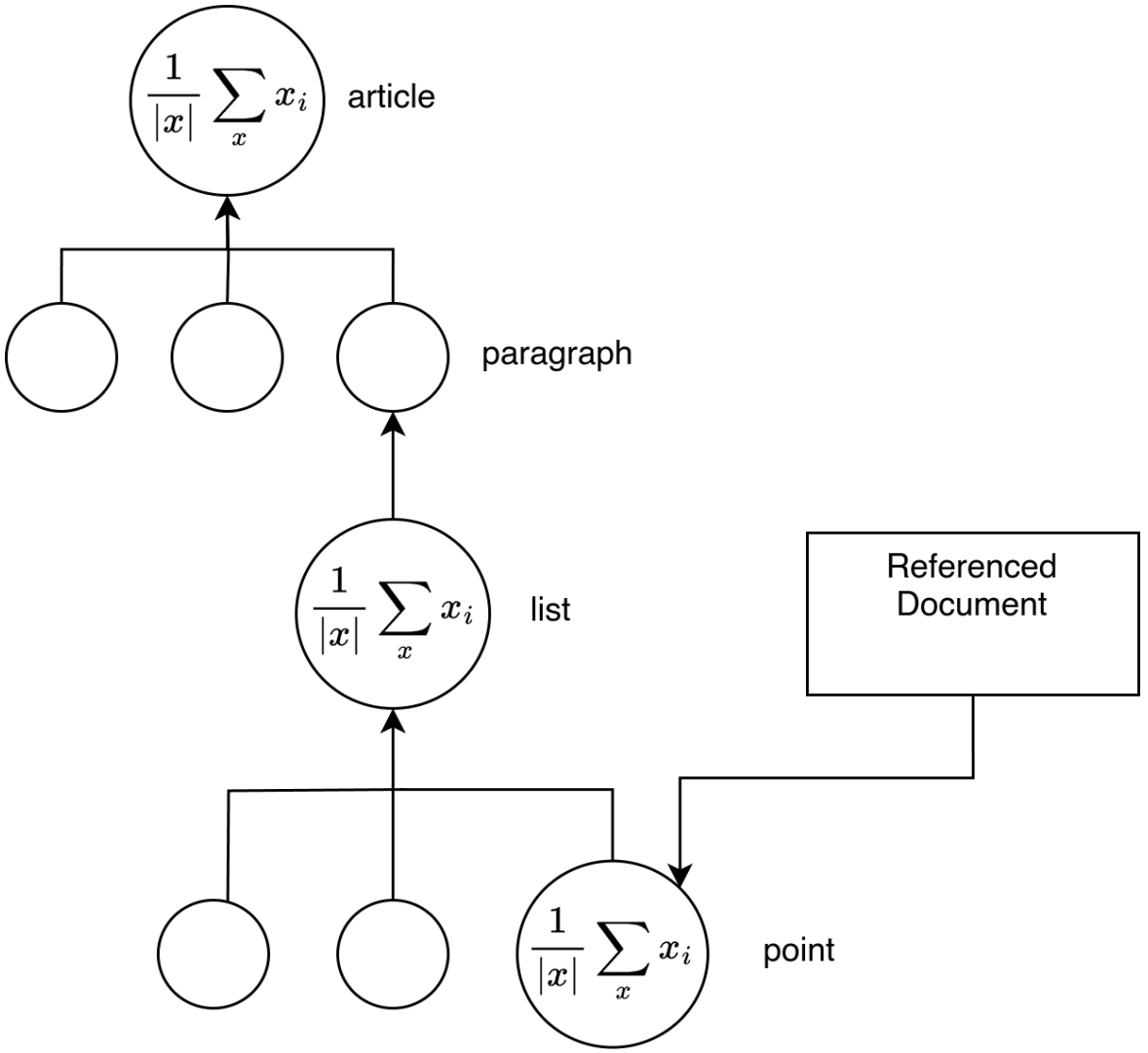


1.3 Search by topic

- Given a keyword of EuroVoc and the topic of bill, it returns a list of the 10 relevant documents divided in two relevant topics top level EuroVoc terms.



1.4 embedding method



#1 - Evaluation

Hybrid AI Enhancing European Drafting Legislation for a Better Regulation Michele Corazza, Generoso Longo, Monica Palmirani, Leonardo Zilli, Salvatore Sapienza and Emanuele Di Sante, ICEDEG, 18-20 June 2025, Bern

TABLE III

EVALUATION FOR THE NORMATIVE REFERENCES SUGGESTIONS.

Number of Eurovoc	Top 1 Accuracy	Top 5 Accuracy	Top 10 Accuracy
1	0.20	0.40	0.80
2	0.30	0.70	1.00
3	0.30	0.70	1.00

TABLE II

ACCURACY VALUES FOR DEFINITION SUGGESTION AND DOCUMENT CLUSTERING. FOR THE DEFINITION SUGGESTION TASK, WE SHOW BOTH THE RESULTS, INCLUDING NO OUTPUT, AS WELL AS THOSE WHERE THESE CASES HAVE BEEN EXCLUDED.

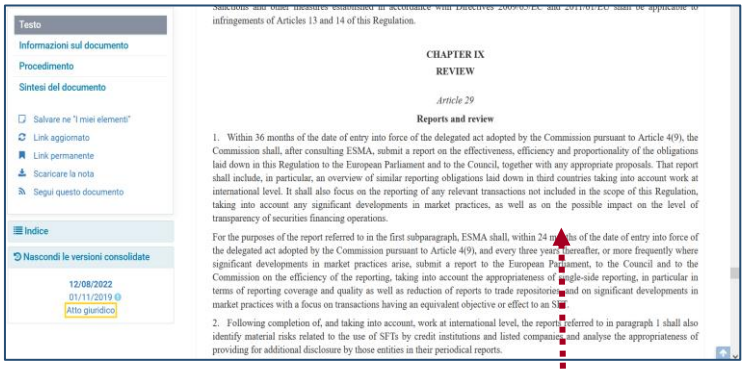
Task	Accuracy (with "blank" outputs)	Accuracy (without "blank" outputs)
Definition suggestion	0.62	0.72
Document clustering	0.52	-

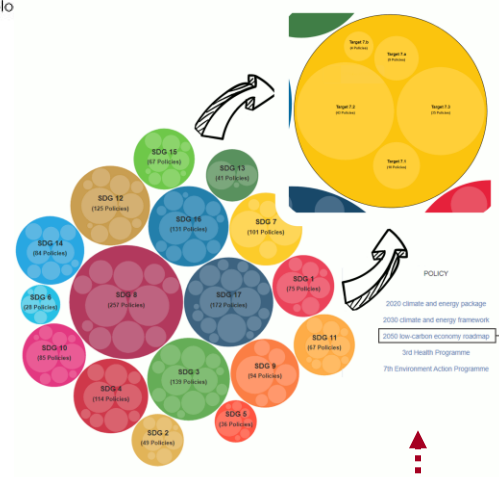
#2 SORTIS: Monitoring and Measuring the Policy

AKOMA NTOSO

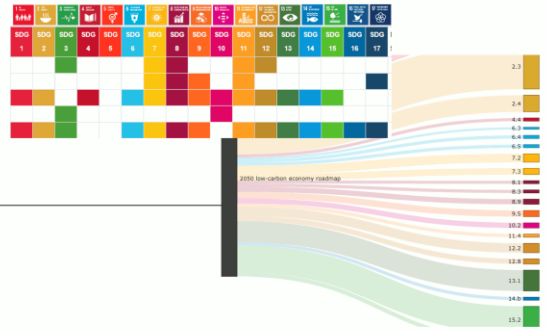
Architecture for Knowledge-Oriented Management of African Normative Texts using Open Standards and Ontolo

Digital Ready Policy Making

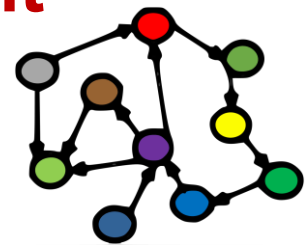




Measuring



Reporting Requirement

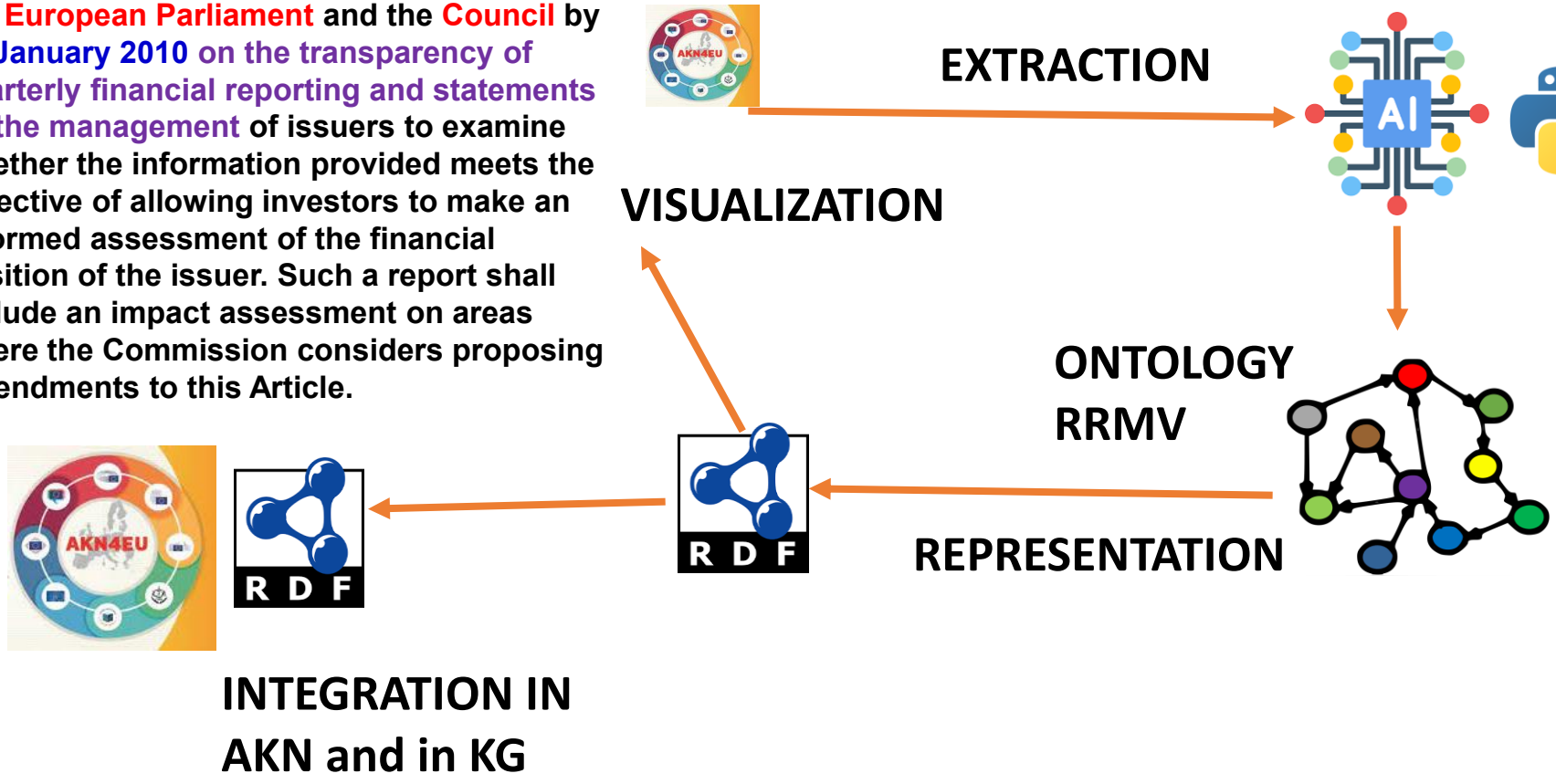


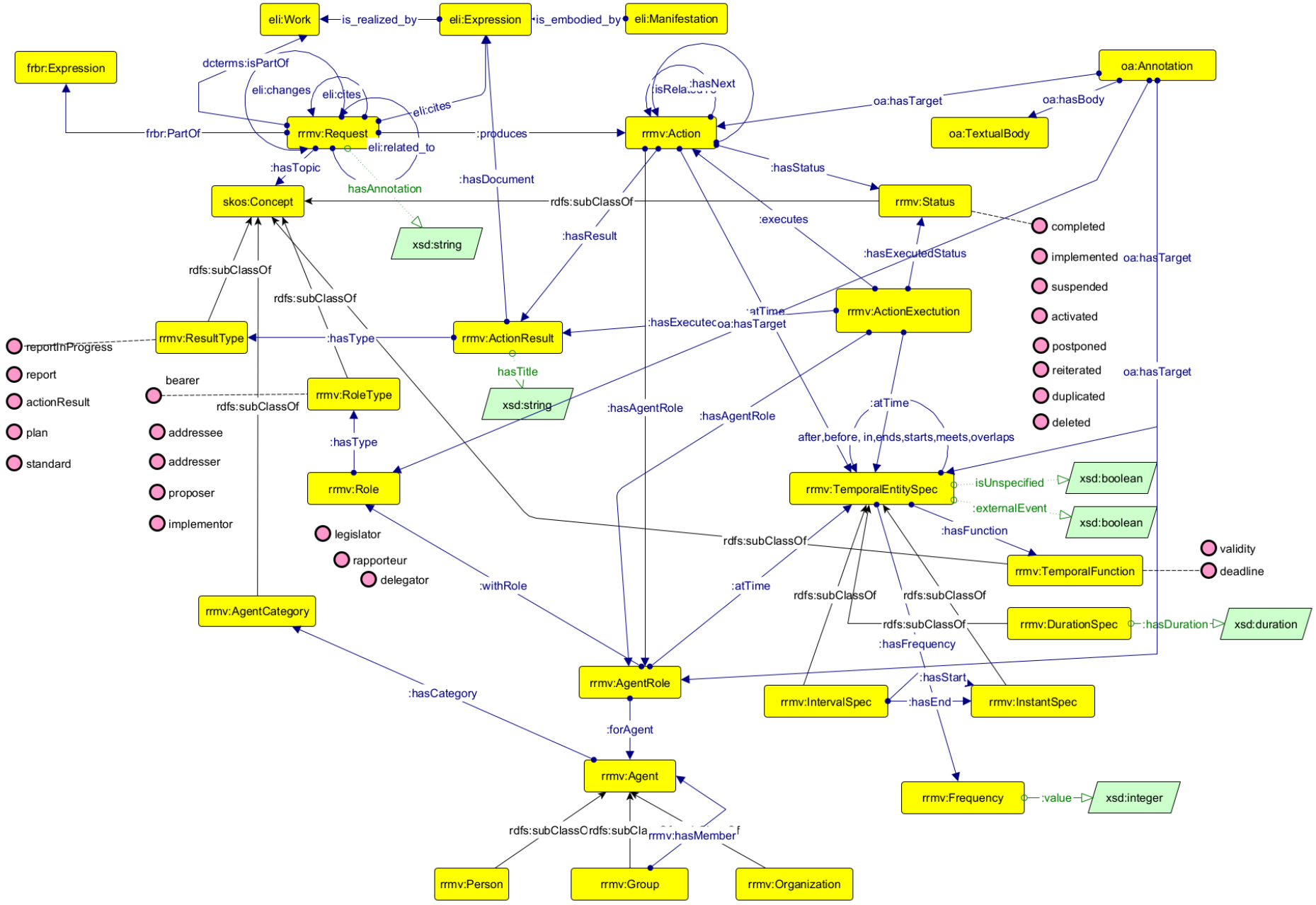
RRMV-RDF

Monitoring

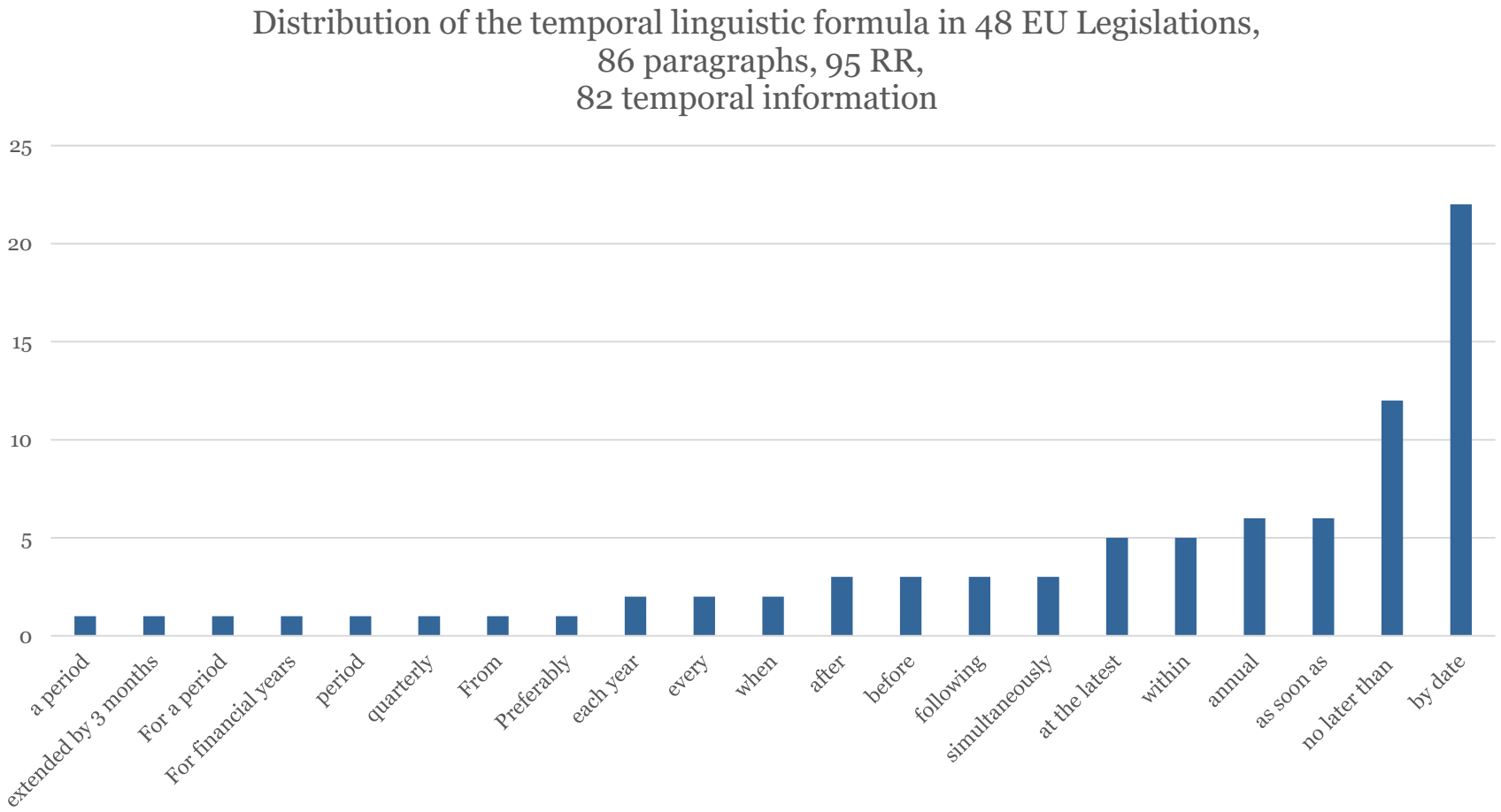
#2 - Extraction and Representation of «Reporting Requirements»

3. The Commission shall provide a report to the European Parliament and the Council by 20 January 2010 on the transparency of quarterly financial reporting and statements by the management of issuers to examine whether the information provided meets the objective of allowing investors to make an informed assessment of the financial position of the issuer. Such a report shall include an impact assessment on areas where the Commission considers proposing amendments to this Article.




eli:Work
is_realized_by
eli:Expression
is_embodied_by
eli:Manifestation
frbr:Expression
dcterms:isPartOf
eli:changes
eli:cites
eli:cites
frbr:PartOf
rrmv:Request
:produces
rrmv:Action
:hasNext
isRelatedTo
oa:Annotation
oa:hasTarget
oa:hasBody
oa:TextualBody
eli:related_to
:hasTopic
hasAnnotation
:hasDocument
:hasStatus
skos:Concept
rdfs:subClassOf
rrmv:Status
xsd:string
:hasResult
:executes
:hasExecutedStatus
completed
implemented
suspended
activated
postponed
reiterated
duplicated
deleted
oa:hasTarget
rdfs:subClassOf
rdfs:subClassOf
:atTime
rrmv:ActionExectution
rrmv:ResultType
:hasType
rrmv:ActionResult
:hasExecutec
oa:hasTarget
reportInProgress
report
actionResult
plan
standard
hasTitle
xsd:string
bearer
rdfs:subClassOf
rrmv:RoleType
:hasAgentRole
:hasAgentRole
:atTime
after,before, in,ends,starts,meets,overlaps
addressee
addresser
proposer
implementor
:hasType
rrmv:Role
rrmv:TemporalEntitySpec
isUnspecified
xsd:boolean
:externalEvent
xsd:boolean
legislator
rapporteur
delegator
rdfs:subClassOf
:hasFunction
validity
deadline
rrmv:TemporalFunction
:withRole
:atTime
rdfs:subClassOf
rdfs:subClassOf
rdfs:subClassOf
rrmv:DurationSpec
:hasDuration
xsd:duration
:hasFrequency
rrmv:AgentCategory
rrmv:AgentRole
:hasStart
rrmv:IntervalSpec
:hasEnd
rrmv:InstantSpec
:hasCategory
:forAgent
rrmv:Agent
rrmv:Frequency
:value
xsd:integer
rdfs:subClassOf
rdfs:subCla
rrmv:hasMember
rrmv:Person
rrmv:Group
rrmv:Organization

as soon as, preferably, when, simultaneously, at least and not later than



#2 - RR binary classification

Best results from
LEGAL-BERT

ESMA shall develop draft regulatory technical standards to [...]

RR

ESMA shall develop draft regulatory technical standards to [...]

Instructions
[Examples]

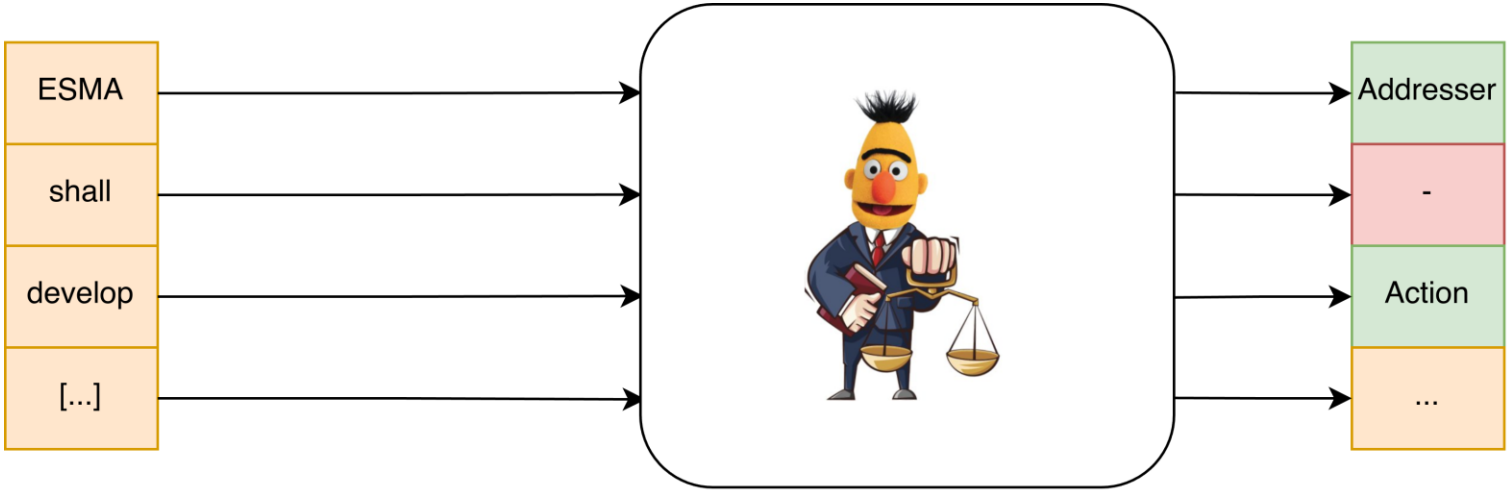
Microsoft
Phi-3

Gemma

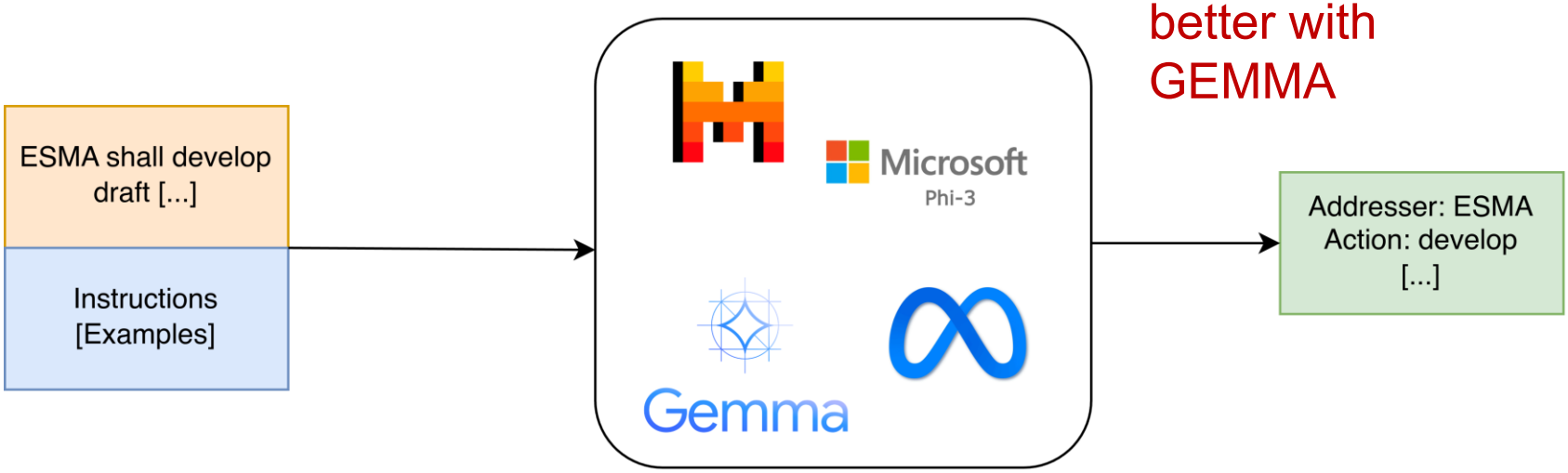
RR

#2 - Entity Extraction

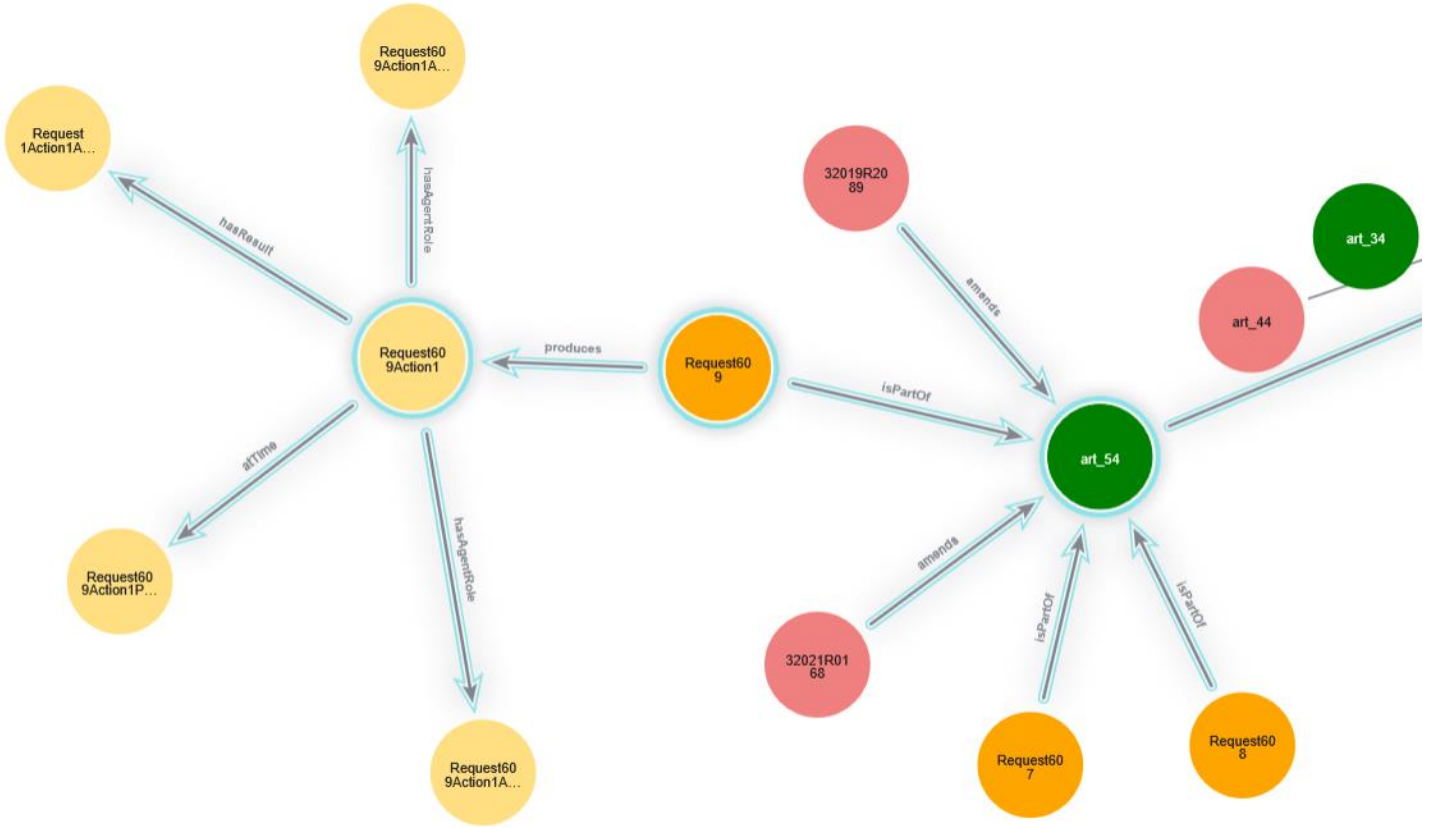
Best result from LEGAL-BERT, followed closely by GEMMA 10-shot and Llama3.3 10-shot RDF



`PeriodOfTime` better with GEMMA



#2 - Art. 54 is modified, it contains RR – Neo4J

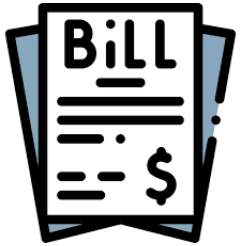


Reporting Requirements Ontology for European Legislation
Monica Palmirani[1][0000-0002-8557-8084], Andrea Giovanni Nuzzolese[2][0000-0003-2928-9496], and Generoso Longo[1][https://orcid.org/0009-0003-2687-5884]

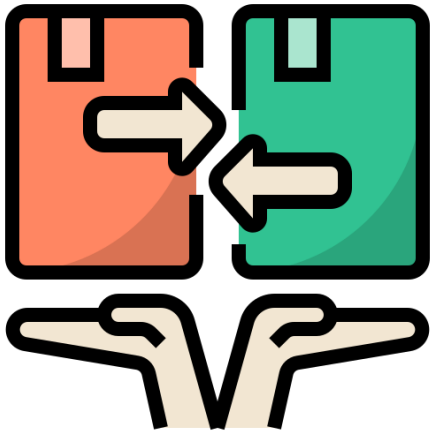
EGOVIS 2025

#3 Index of unconstitutionality of bill

- In 2024, the 44,5% of the judgments of the Italian Constitutional Court were about the constitutional illegitimacy of law. It is a problem of democracy, dialogue between institutions, division of powers.
- Can we prevent this situation?



- Bill of the Chamber of Deputies



- Italian legislation (in force/not in force)
- Constitutional Courts - all
- Abstract of the Constitutional Cours
- Ratio decidendi annotation made by the judes
- Classification case-law references (positive or negative)

#3 Index of unconstitutionality

$$S = \frac{\lambda_1 s_{pj} + \lambda_2 s_{cn} + \lambda_3 s_{pm}}{\lambda_1 + \lambda_2 + \lambda_3}$$

1. spj = similarity of «bill» vs. «judgments»
2. scn = similarity of «bill commission description» vs. «ratio decidendi» annotated by the judges
3. spm = similarity of «bill» vs. «abstract of the case-law provided by the Constitutional Court
4. normative references of abrogated law are considered using KG-GraphDB- connected with the AKN-XML collections (eXist)

- **Future works: QA with constitutional experts**

Prediction of Unconstitutional Index of Italian Bills

Monica Palmirani, Michele Corazza, Generoso Longo, Salvatore Sapienza, Pier Fancesco Bresciani and Faria Ferooz

ITAL-IA, Trieste, 23 June 2025

Under evaluation in the Chamber of Deputies of Italy

INDICE DI PRESUNTA INCOSTITUZIONALITÀ DEL PDL

Ricerca:
/akn/it/bill/legge/2024-02-06/1691/!main
Valore di predizione:
0.7

Sentenza N. 78 Anno 2013
FRBRExpressionuri: /akn/it/judgment/sentenza/cortecostituzionale/2013-04-24/78/!main
commissioni_neretti_similarity: 0.702046275138855
corte_similarity: 0.6081182956695557
massime_similarity: 0.5423064827919006
total_similarity: 0.6497120261192322

Sentenza N. 22 Anno 2024
FRBRExpressionuri: /akn/it/judgment/sentenza/cortecostituzionale/2024-02-22/22/!main
commissioni_neretti_similarity: 0.5357980728149414
corte_similarity: 0.7811943888664246
massime_similarity: 0.46487703919410706
total_similarity: 0.6492762565612793

Sentenza N. 3 Anno 2025
FRBRExpressionuri: /akn/it/judgment/sentenza/cortecostituzionale/2025-01-23/3/!main
commissioni_neretti_similarity: 0.5262573957443237
corte_similarity: 0.775561511516571
massime_similarity: 0.5038089752197266
total_similarity: 0.6439046859741211

Sentenza N. 102 Anno 2006
FRBRExpressionuri: /akn/it/judgment/sentenza/cortecostituzionale/2006-03-17/102/!main
commissioni_neretti_similarity: 0.6654003858566284
corte_similarity: 0.6286078095436096
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Sentenza N. 98 Anno 2024
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Sentenza N. 207 Anno 2024
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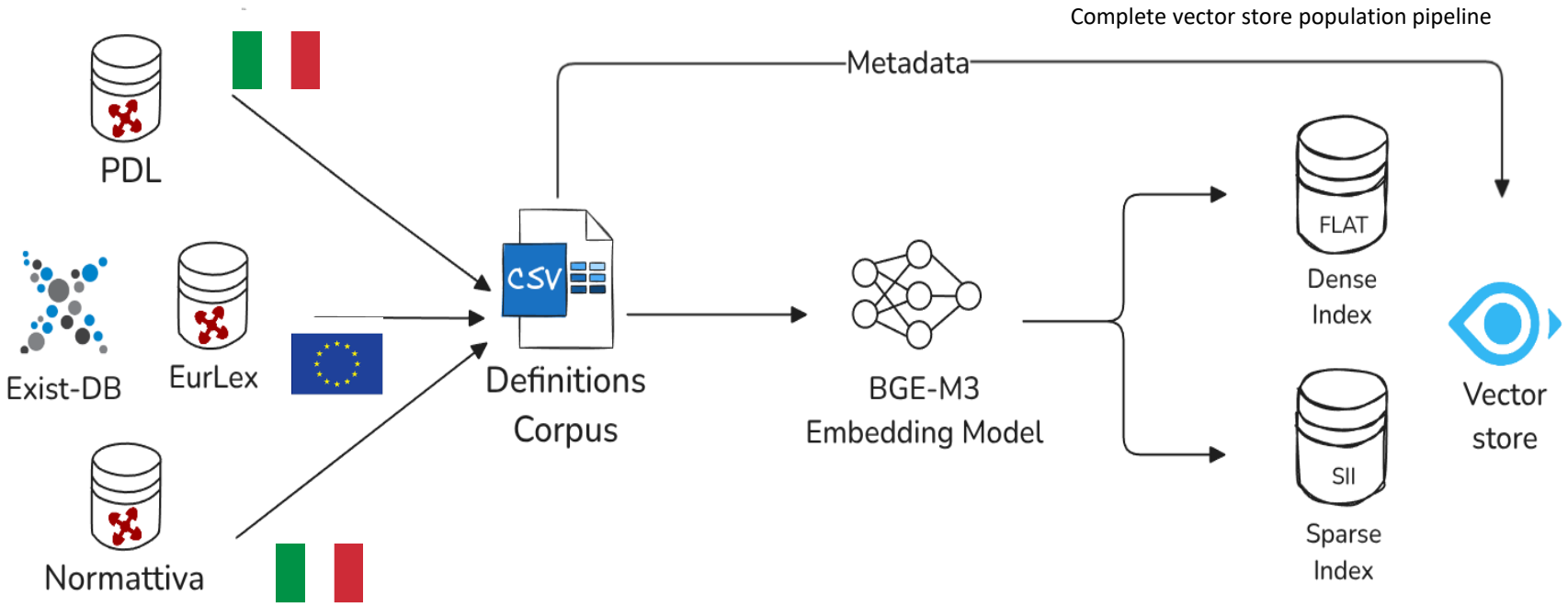
corte_similarity: 0.8089052438735962

#4 Generate new legislative definitions according to the existing corpora with Agentic AI



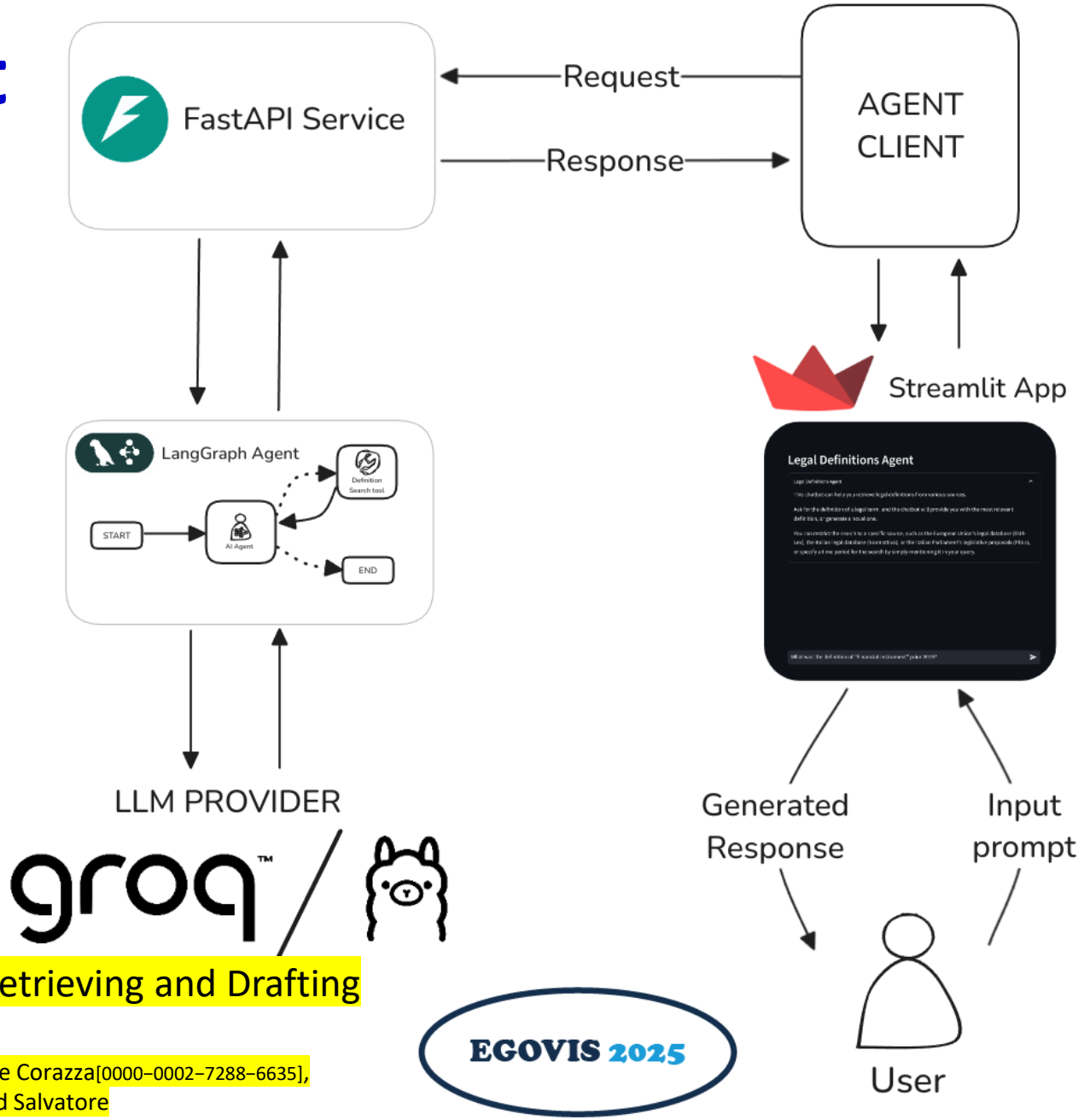
***Total* 22,187 documents, 16,479 definitions**

BGE-M3 Embedding Model:

- Multilingual
- Embeds up to 8,192 tokens.

Dense (semantics) and **Sparse (lexicon)** vectors

#4 Chatbot



An Agentic Approach to Retrieving and Drafting Legislative Definitions

Leonardo Zilli[0009–0007–4127–4875], Michele Corazza[0000–0002–7288–6635], Monica Palmirani[0000–0002–8557–8084], and Salvatore Sapienza[0000–0002–8557–8084]

EGOVIS 2025

#5 Quantitative Evaluation - retreival

LLM used: LLama 3.3 70B-Instruct

Point-in-Time Retrieval
Dataset: Custom
(205 entries)

Metric	Score
Failure Rate	2.43%
Retrieval Rate	87.80%
Point-in-Time Accuracy	87.80%

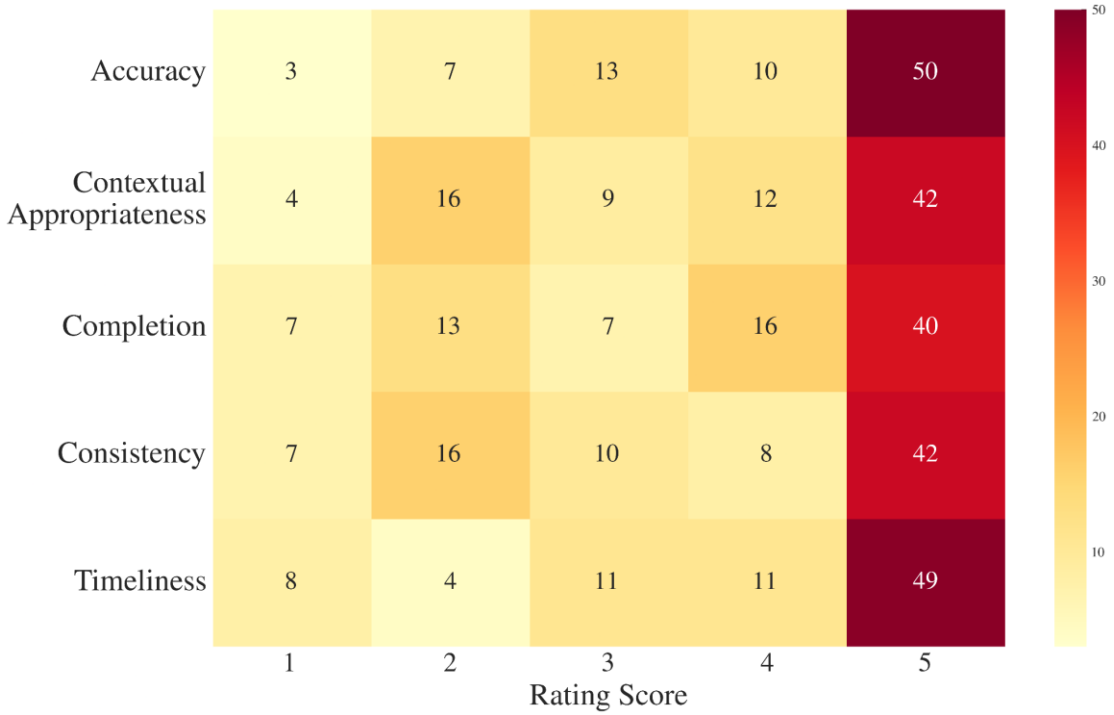
Multi-jurisdiction Retrieval

Dataset: Custom
(20 entries)

Metric	Score
Failure Rate	0%
Retrieval Rate	95%
Multi-legislation Accuracy	95%

Chouhan, Ashish, and Michael Gertz. 2024. “LexDrafter: Terminology Drafting for Legislative Documents Using Retrieval Augmented Generation.”

#5 Evaluation: Qualitative Evaluation



- Definition with examples
- The technical definitions are influenced by the current state of the art
- The style is verbose

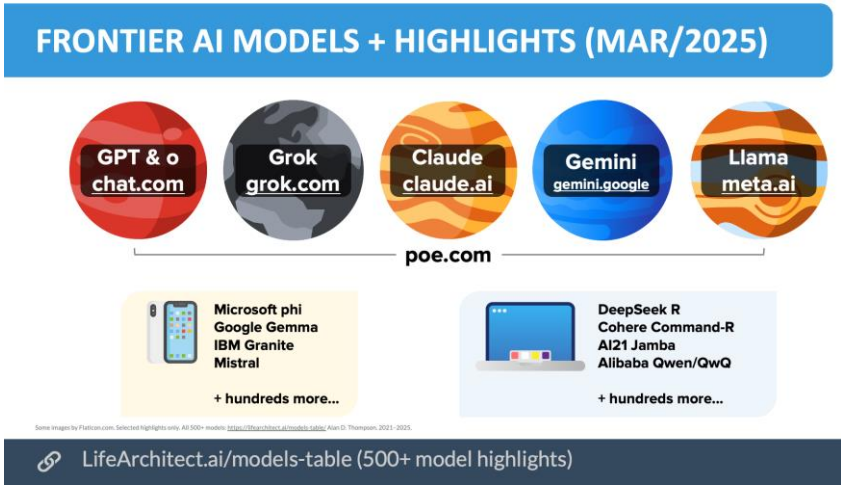
Metric	Rate
Hallucination Rate	6.02%
Irrelevance Rate	1.20%

Takeaway: limitations

- Scarce availability of good legal dataset well annotated
- No stable metrics to measure/compare
- Models change rapidly
- Need computable power (GPU) and infrastructure
- Machine unlearning
- Evaluation needs legal experts educated in AI
- AI literacy inside of the Parliament
- Different performance per language

Rindfleischetikettierungsüberwachungsaufgabenübertragungsgesetz→63 letters

"beef labeling supervision duties delegation law"



Conclusions

- Methodology based on the theory of law is fundamental
- Legal domain hypothesis and problem-solving approach
- *Rule of Law* included *by-design*
- Autonomy, Transparency, Explicability and Accountability are crucial for Parliaments
- Hybrid AI: LegalXML, RAG, embedding, KG, QA, Agentic AI, legal reasoning can mitigate the critical issues
- HCI and UX interface for a dialogue with the end-user is essential for Human-in-the-loop, Human-on-the-loop, XAI
- Agentic AI helps to create a virtuous loop, and it is not so longer necessary to have **code-first or words-first approach**

Distant Writing: Literary Production in the Age of Artificial Intelligence
Revised version 5

37 Pages • Posted: • Last revised: 3 May 2025

Luciano Floridi
Yale University - Digital Ethics Center; University of Bologna- Department of Legal Studies

Date Written: April 26, 2025

Nothing is more practical than a good theory.

Ludwig Boltzmann

thank you
for your attention

Monica Palmirani –
monica.palmirani@unibo.it