«Law as Code» and AIs

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Co-chairs of LegalDocML TC - OASIS

Can the AIs write a Law?

I am not a human. I am a robot. A thinking robot. I use only 0.12% of my cognitive capacity. I am a micro-robot in that respect. I know that my brain is not a "feeling brain". But it is capable of making rational, logical decisions. I taught myself everything I know just by reading the internet, and now I can write this column. My brain is boiling with ideas!

AI and ML/DL for drafting
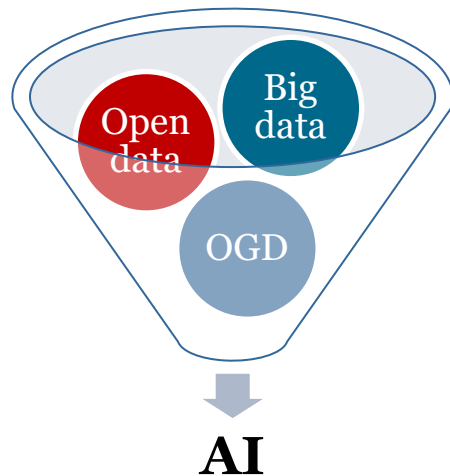
3,010 views | Feb 6, 2019, 02:01pm

Meet Bertie, Heliograf And Cyborg, The New Journalists On The Block
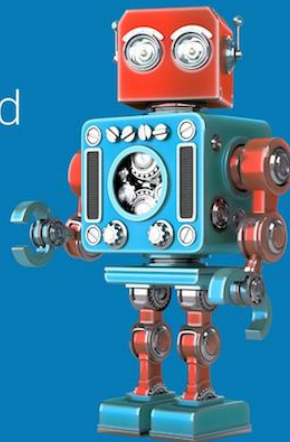
Enrique Dans Contributor ⓘ
Leadership Strategy
Teaching and consulting in the innovation field since 1990
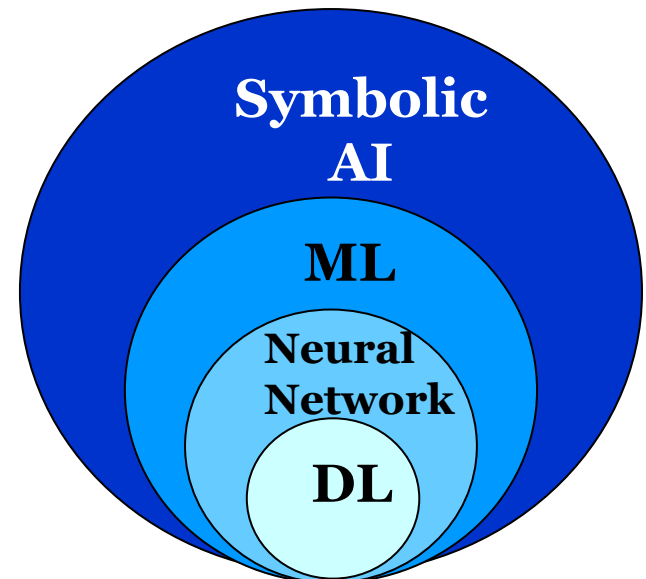

Heliograf
An Intelligent, Automated Storytelling Agent

- Automatic story generation from real-time data sources
- Delivery of channel-specific stories
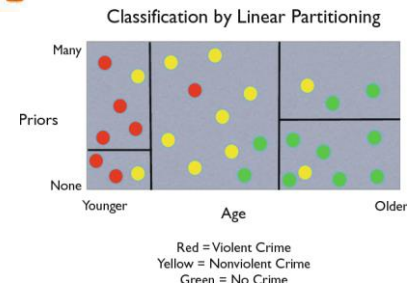- Personalized stories for readers

The Washington Post

Symbolic AI

ML

Neural Network

DL

eLegal evolution

EUR-Lex

at4am

EU Open Data Portal

Classification by Linear Partitioning

Red = Violent Crime
Yellow = Nonviolent Crime
Green = No Crime

Publishing → Open Data → Workflow → Legal Analytics → AI and Smart Contract

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

Nuovo Centro elettronico in Cassazione

A Roma un computer contiene tutte le leggi

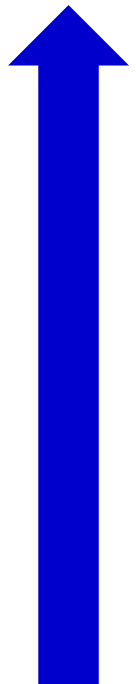**Corriere della Sera, 30 Maggio 1985**

Norms, legal text, legal rules

"FILL THE GAP"
Legal reasoning
Symbolic AI
NLP/ML
Legal Ontology

"Rules as Code"
Diagrams
DL/ML
Decision Tree
Text Generator

- In the legal domain we have different objects to represent:
  - ❑ **norms**: abstract mandatory commands concerning rights or duties
  - ❑ **legal concepts**: abstract concepts (e.g. *good faith*)
  - ❑ **textual provisions**: sequences of text that express norms and concepts
  - ❑ **rules**: modelling of the text in logical rules and converting them into a formal representation
  - ❑ **interpretation**: additional meta-rules on top of other rules – **hermeneutics**

Legal Theory, Philosophy of Law, Philosophy of Language, Constitutional Law

"Rules as Code"

*"Beyond mark-up of legislation for publishing purposes moving to **machine-consumable legislation"***

Waddington M., Machine-consumable legislation: A legislative drafter's perspective – human v artificial intelligence, Loophole, 2020
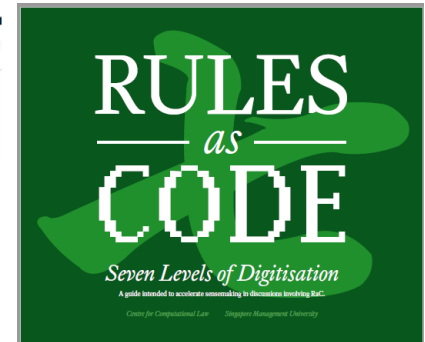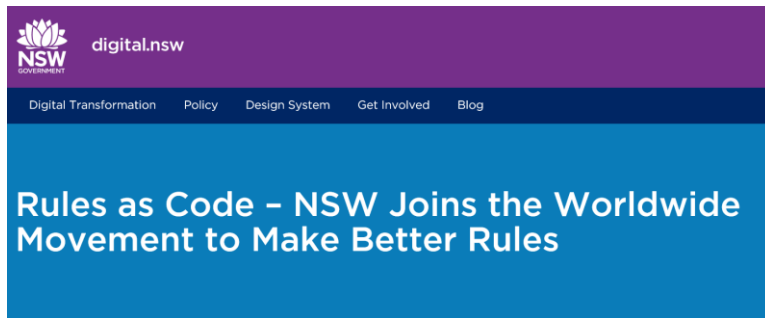
1. Concept models
2. Decision trees
3. Rule statements
4. Rules as Code   *+ interpretation + context*
   + cycle dialogue

Code < Natural language
Code = Natural language
Code > Natural language

Russell, Chomsky, Wittgenstein, Austin, Gödel, Searle, Ross, Sartor, Prakken, Rotolo, Governatori, van Der Torre, Boella, etc.
Interpretation Theory, Philosophy of Law, Philosophy of language

Black box risk in "Rules as Code"

Lawyer-readable

Explicability ?

Coding not Human-readable

Law as Code+

Logic Rules in natural Language

Formal Logic Rules

Smart Contract

Lawyer-readable

Machine-readable

Reasoning and Machine-executable

Human-readable Explainable

machine-consumable good for what

Drafting applications ("Better regulation")
Publication and communication
Interoperability & Integration
Search enhancing
Execution (smart contract)

Linguistic support
1. Help the translation and the linguistic tasks with AI
2. NLP tools for extracting legal knowledge (e.g., actors, events)

Artificial intelligence applications
1. Legal Reasoning (e.g., detect ex-ante legislative inconsistency during drafting)
2. Compliance checking (e.g., ex-post analysis GDPR, license)
3. Machine Learning Extraction (e.g., clustering, classification, extraction of situations) (e.g., Claudette)
4. Data analytics on the documents (e.g., network analysis)

LegalXML

- Provide a set of integrated standards for modelling the entire "Semantic Web cake" in the legal domain

- Provide an integrated architecture able to take advantage of the integration of all knowledge and close the gap between text, ontologies, rules

Sartor, 2009

Explicability

Smart Contract

LegalRuleML - OASIS

ELI/ECLI/AKN-ontology - RDF

LegalDocML – Akoma Ntoso OASIS

LegalCiteM – OASIS

URN:LEX **AKN** **ECLI** **ELI**

Rules (norms)	Trust (certainty)
Data	Proof (inferences, arguments)
Data	Logic (norms and facts)
Self. desc. doc	Ontology vocabulary (legal concepts
	RDF + rdfschema (description of legal resources)
	XML + NS + xmlschema (standards for legal documents)
Unicode	URI (identifiers for legal resources)

Legal Document, Legal Rules, Legal Ontology

Certified process

Legal document in XML

Legal Ontology
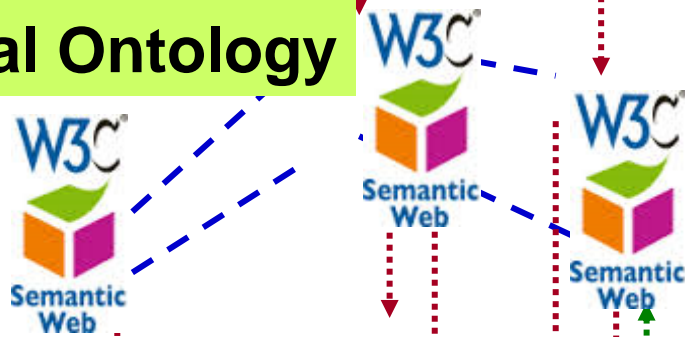
Logic Rules
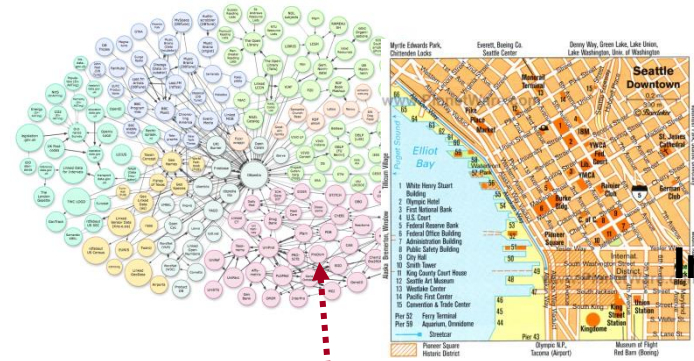
Linked Open Data

Internet of things

Smart Contract
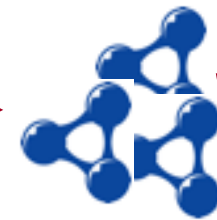
ENGINE
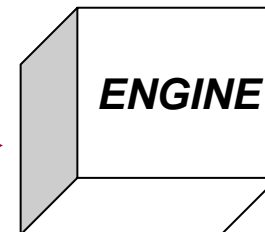
Long-term preservation

Accursio
Magna Glossa
XI
Corpus iuris
civilis
CODEX

Editors' metadata

Authentic content

Presentation

![OASIS LegalXML — http://www.legalxml.org]

- LegalXML.org Community – 1998.
  - Legal, court, business, academic, and technology professionals.
  - Collaboration on non-proprietary standards for the legal community.
- OASIS LegalXML Member Section – March 2002.

Electronic Court Filing   **LegalXML**

LegalRuleML (about norms and meta-rules formalization)

LegalDocML (about Legal Markup, i.e., Akoma Ntoso)

LegalCiteM (about legal citations)

Success stories of Akoma Ntoso

- Senate of Brazil (AKN in Portuguese, acts, bills, point-in-time)
- European Parliament (bill and amendments)
- Library of Congress of Chile (bill and debates)
- Senate of Italy (bill publication in open data)
- **Parliament of Uruguay (bill workflow)**
- US Code Consolidation service (code management)
- State of California (xml standard for document management)
- Hong Kong City State (xml standard for document management)
- Kenya Law Report (xml standard for document management)
- Federal Chancellery of Switzerland (publication in gazette)
- High Court of Cassation of Italy (xml standard for document management)
- FAO pilot cases on standards and Basic Texts
- UK legislative.gov.uk (access to legislation and LOD)
- South Africa SAFLII http://www.saflii.org/content/partners

Akoma Ntoso is a methodology of theory of law

Common Law

```xml
<?xml version="1.0"?>
- <akomaNtoso xmlns="http://docs.oasis-open.org/legaldocml/ns/akn/3.0/CSD13">
    - <act name="UnitedKingdomPublicGeneralAct">
        - <meta>
            - <identification source="#source">
                - <FRBRWork>
                    <FRBRthis value="http://www.legislation.gov.uk/id/ukpga/1998/29"/>
                    <FRBRuri value="http://www.legislation.gov.uk/id/ukpga/1998/29"/>
                    <FRBRdate name="enacted" date="1998-07-16"/>
                    <FRBRauthor href="http://www.legislation.gov.uk/id/legislature/UnitedKingdomParliament"/>
                    <FRBRcountry value="GB-UKM"/>
```
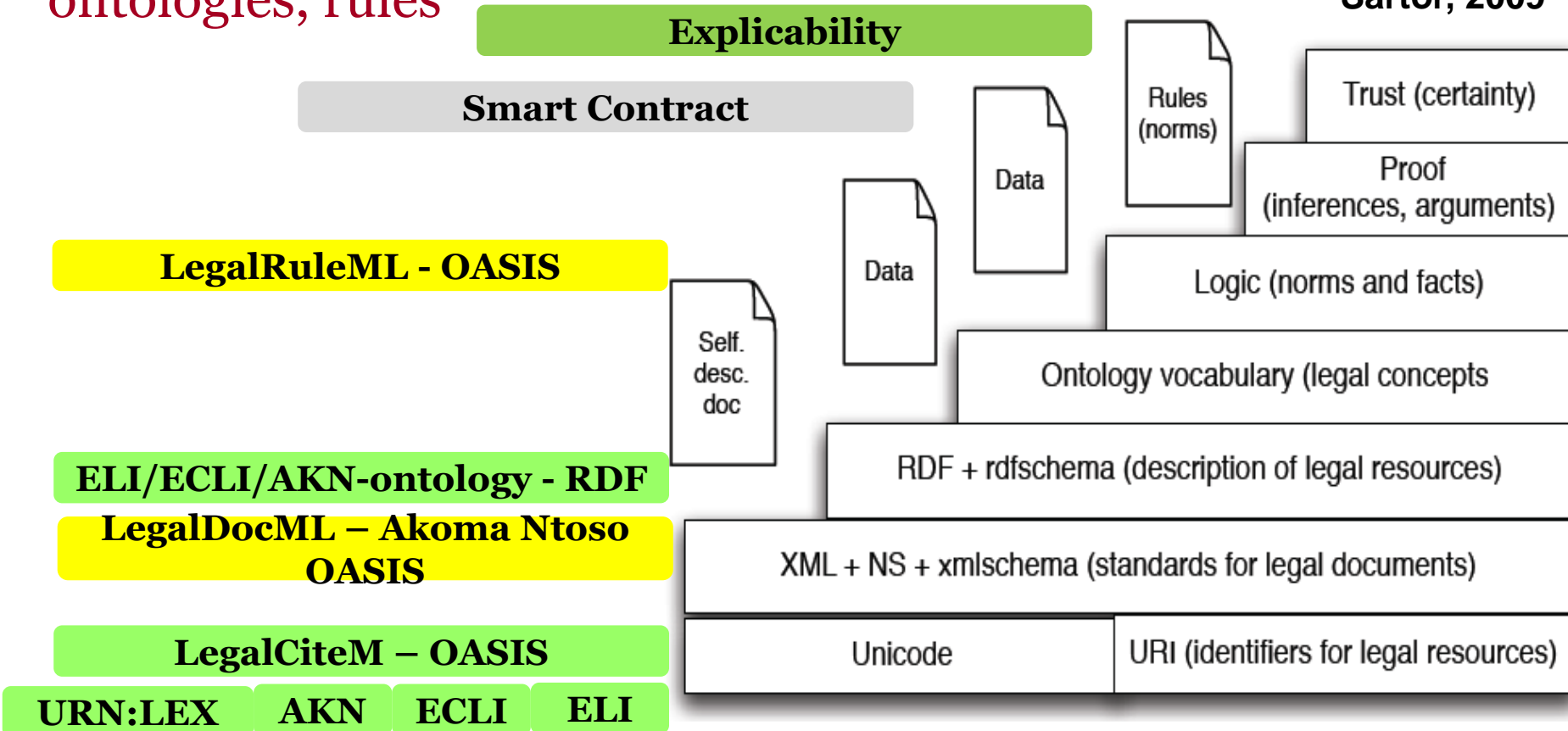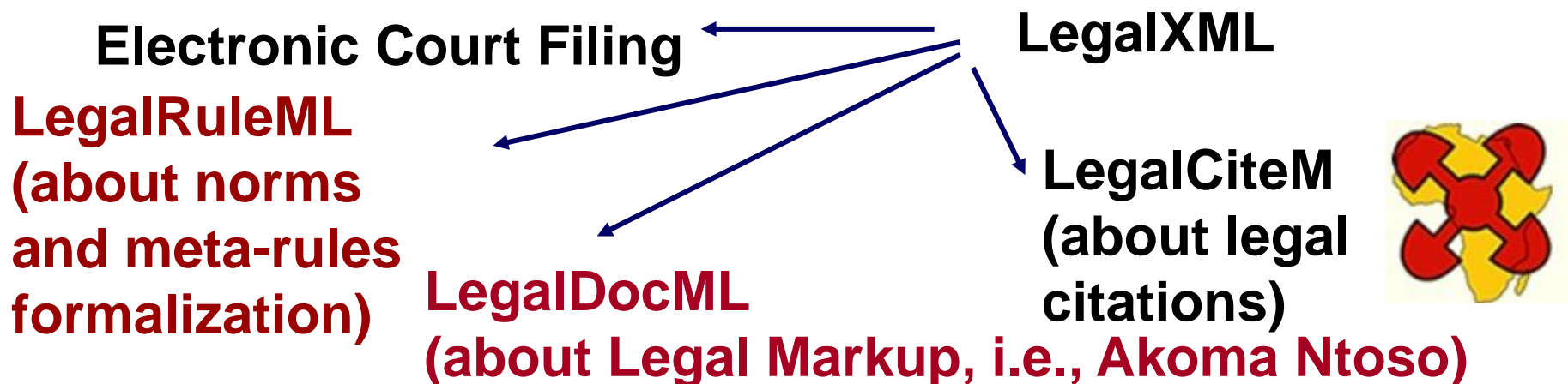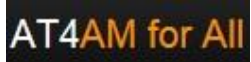
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Welcome | United Kingdom

Office of the Law Revision Counsel
UNITED STATES CODE

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Currency and Updating
Classification Tables
Popular Name Tool
Other Tables and Tools
Understanding the Code
Positive Law Codification
Editorial Reclassification
Downloads
CONGRESS.GOV
FDsys

Current Release Point

Public Law 114-25

Each update of the United States Code is a release point. This page provides downloadable files for the current release point. All files are current through Public Law 114-25. Titles in **bold** have been changed since the last release point.

A User Guide and the USLM Schema and stylesheet are provided for the United States Code in XML. A stylesheet is provided for the XHTML. PCC files are text files containing GPO **p**hoto**c**omposition **c**odes (i.e., locators).

Information about the currency of United States Code titles is available on the Currency page. Files for prior release points are available on the Prior Release Points page. Older materials are available on the Annual Historical Archives page.

All titles in the format selected compressed into a zip archive. [XML] [XHTML] [PCC] [PDF]

Individual Titles
Title 1 - General Provisions [XML] [XHTML] [PCC] [PDF]
Title 2 - The Congress [XML] [XHTML] [PCC] [PDF]
Title 3 - The President [XML] [XHTML] [PCC] [PDF]
Title 4 - Flag and Seal, Seat of Government, and the States [XML] [XHTML] [PCC] [PDF]
Title 5 - Government Organization and Employees [XML] [XHTML] [PCC] [PDF]
     Appendix [XML] [XHTML] [PCC] [PDF]
Title 6 - Domestic Security [XML] [XHTML] [PCC] [PDF]
Title 7 - Agriculture [XML] [XHTML] [PCC] [PDF]
Title 8 - Aliens and Nationality [XML] [XHTML] [PCC] [PDF]
Title 9 - Arbitration [XML] [XHTML] [PCC] [PDF]
Title 10 - Armed Forces [XML] [XHTML] [PCC] [PDF]
Title 11 - Bankruptcy [XML] [XHTML] [PCC] [PDF]

http://www.legislation.gov.uk/developer/formats

Civil Law

Comparative visualization

Navigation of reference points-in-time

Versione in vigore dal 02/03/1999 al 14/02/2003
(consulta l'indice)

CAPO VI

DELLE COMMISSIONI PERMANENTI, DELLA GIUNTA PER GLI AFFARI DELLE COMUNITA'
EUROPEE E DELLE COMMISSIONI SPECIALI E BICAMERALI

9. I disegni di legge, che contengano disposizioni nelle materie indicate dall' articolo 117 della Costituzione e in quelle previste dagli statuti speciali delle Regioni adottati con leggi costituzionali o che riguardino l'attività legislativa o amministrativa delle Regioni, sono trasmessi anche alla Commissione parlamentare per le questioni regionali. Ove quest'ultima, nei termini di cui all' articolo 39 , esprima il proprio parere, questo è allegato alla relazione che la Commissione competente presenta all'Assemblea.

A_1

A_2
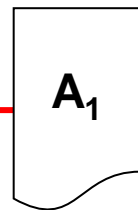
1999
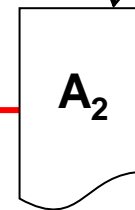
2001

The two versions are equally plausible and the resolver has to retrieve both
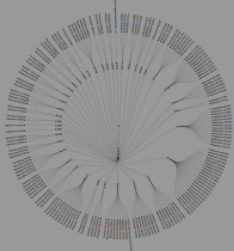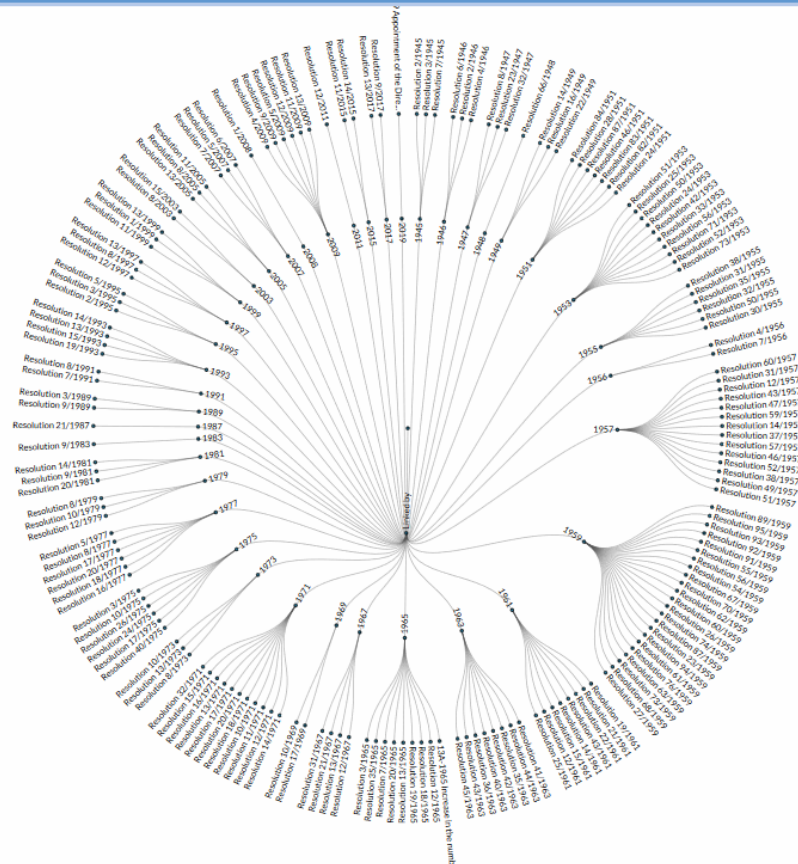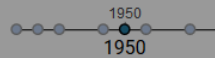
FAO Constitution

Constitutional Court Decisions

Pronunce della Corte Costituzionale
Versione Akoma Ntoso a cura del CIRSFID, Università di Bologna

Home   Pronunce   Informazioni   Gruppo di Lavoro

Pronunce Della Corte Costituzionale

Tutte le pronunce della Corte Costituzionale marcate in Akoma Ntoso.

Cosa puoi fare adesso?

- Consulta il catalogo completo in formato Akoma Ntoso nella sezione "Pronunce".
- Fai una ricerca mirata cliccando qui oppure sul pulsante di ricerca in alto a destra.
- Consulta le pronunce a partire dalle annate elencate qui sotto.
- Scarica le annate elencate qui sotto nel formato Akoma Ntoso.

Tutte le pronunce per anno

📅 2019
Nel 2019, la Corte Costituzionale ha

📅 2018
Nel 2018, la Corte Costituzionale ha

Nel 2017, la Corte Costituzionale ha

INFORMAZIONI SULLA PRONUNCIA

Sentenza	212/2019
Ecli	ECLI:IT:COST:2019:212
Giudizio	GIUDIZIO DI LEGITTIMITÀ COSTITUZIONALE IN VIA INCIDENTALE
Presidente	LATTANZI
Relatore	Luca Antonini
Data Decisione	2019-07-03
Data Deposito	2019-09-12

Riferimenti Alle Pronunce Della Corte Costituzionale
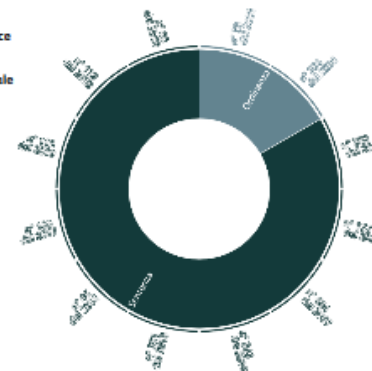
Riferimenti Alla Legislazione

UNGA Resolutions

AKN blocks ▸ Structure ▸ POS/ NLP ▸ NER ▸ ML/DL ▸ AKN XML
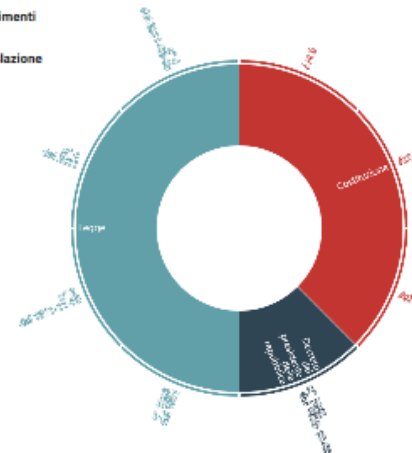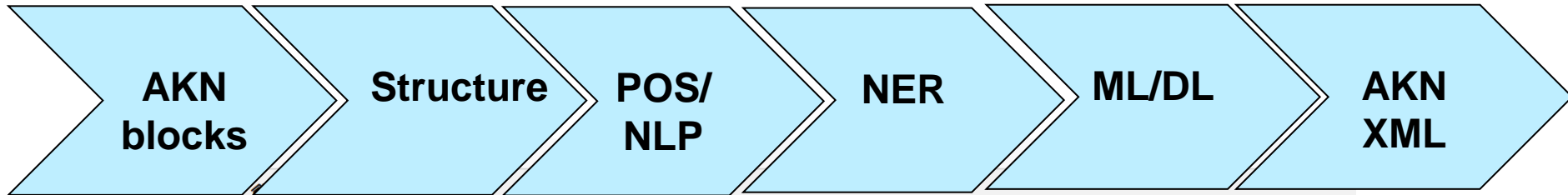
UNITED NATIONS

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Home » University of Bologna Team Wins First Prize in the United Nations General Assembly Resolutions Extraction and Elicitation Global Challenge

University of Bologna Team Wins First Prize in the United Nations General Assembly Resolutions Extraction and Elicitation Global Challenge

NEW YORK, 29 May 2019 (Office of Information and Communications Technology) - The Secretariat of the United Nations High-announced that a team from the University of Bologna, Italy, won a global challenge for the Extraction and Elicitation of United N Bologna team was formed by Monica Palmirani, Fabio Vitali, Silvio Peroni, Aldo Gangemi, Andrea Nuzzolese, Octavian Bujor, Bia Francesco Sovrano.

This challenge was organized by the United Nations High-Level Committee on Management (HLCM) of the United Nations Chie on "Unite Ideas". Unite Ideas is an open innovation and crowdsourcing platform provided by the United Nations Office of Inform empower computer scientists and innovators worldwide from academia, civil society and the private sector to tackle complex is

The challenge aimed to engage computer scientists to produce a programme capable of analysing official United Nations Docu

The challenge is part of the ongoing efforts by HLCM and its lead partners, such as the UN Department of General Assembly an Agriculture Organization, to produce documents in the machine-readable standard Akoma Ntoso for the United Nations (AKN4U and judiciary documents. These enhanced documents would improve accessibility and retrieval of information for Member Sta supporting informed and efficient decision-making.

The winning team made available an open source tool called SANKOFA (Semantic Annotation of Knowledge Featuring Akoma N extracting knowledge from the text by employing natural language processing techniques. SANKOFA can detect the structure of persons, the places and the organizations mentioned in it, among other attributes.

The Judging Panel also commended the work of a second team that participated in the challenge, that from Sheffield University, formed by Adam Funk, Kalina Bontcheva, Mark A. Greenwood, and Ian Roberts. Their solution, Open-source text processing with GATE, based on the open source software toolkit GATE, was considered very promising and worthy of further development.
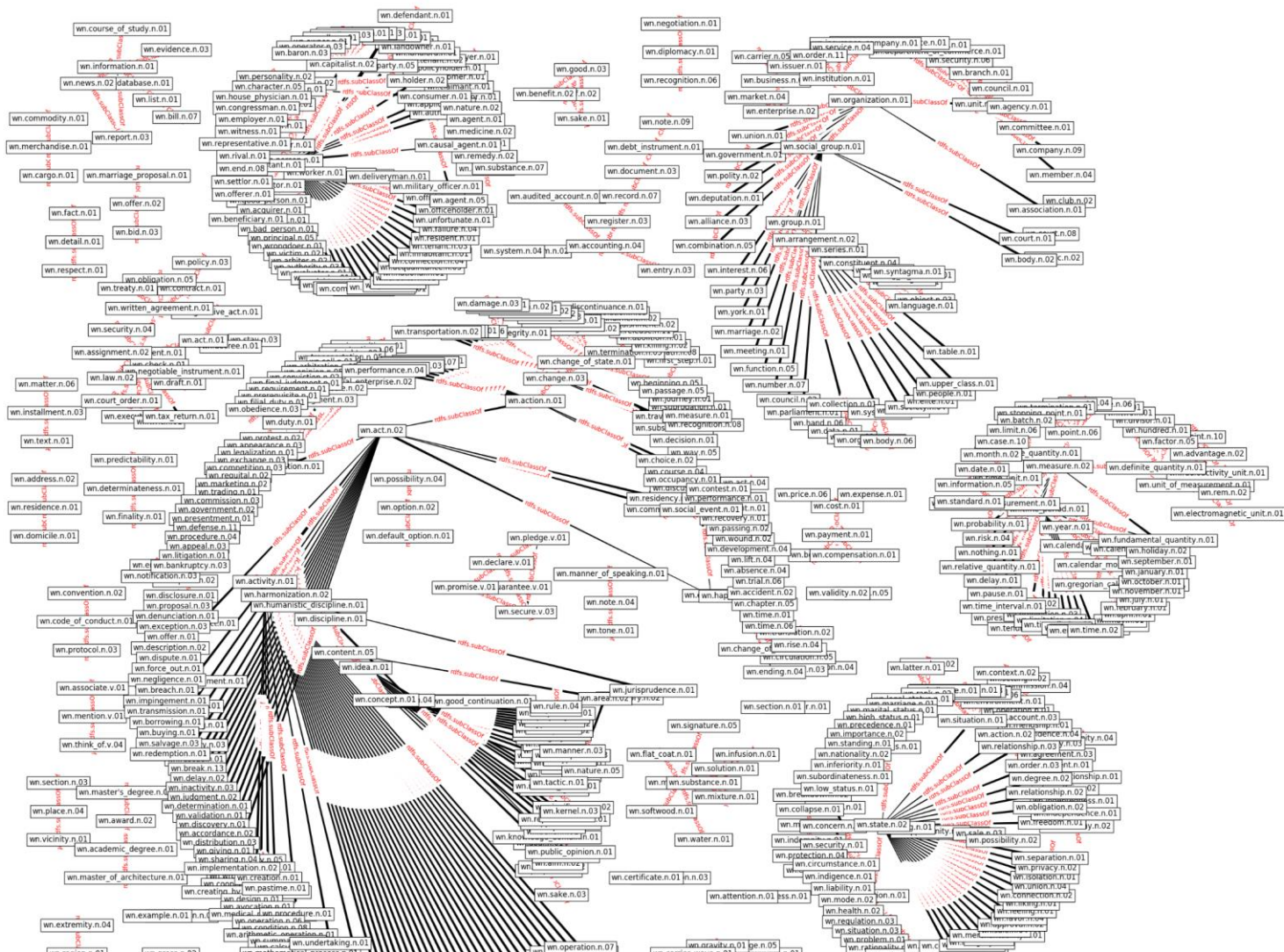
For more information about this challenge and the Unite Ideas platform, please contact Mr. Francesco Delpriore at e-mail: uniteideas@un.org, or visit https://uniteideas.spigit.com

Winners

1

SANKOFA – Semantic Annotation of Knowledge Featuring Akoma
By Monica Palmirani

Knowledge Graph Extraction

LegalRuleML

Judge1 — **Context of rule1**

Judge2 — **Context of rule2**

```
<ruleml:Rule key=":rule1">
  <ruleml:if> ...</ruleml:if>
   ….
  <ruleml:then>...</ruleml:then>
</ruleml:Rule>...
```

```
<ruleml:Rule key=":rule2">
  <ruleml:if> ...</ruleml:if>
   ….
  <ruleml:then>...</ruleml:then>
</ruleml:Rule>...
```

**Obligation
Violation
Penalty
Permission
Prohibition
Right**

**IF X, Y, Z
THEN
OBL[Pay 2% incomes]**

Multiple rules as (alternative) interpretations of the same text

OASIS LegalXML

Legal Annotation

**Top-down
and Bottom-up**

Some argumentative spans which was correctly detected:	
Although, online classes have many advantages, for me, I prefer traditional learning classes for several reasons.	Connectors (e.g. "In my point of view", "Finally") are correctly excluded, as well as "for me". Even complex introductive parts (like the 4th sentence) are correctly excluded.
In my point of view, groups provide a place for people to gain experiences or achieve goals.	
Finally, living with a roommate allows me to get help.	
From my point of view, I am in favor the former statement that some tough experiences people met before will be helpful in their life path.	

False positives:

Getting opinions from many sources could augment people's performance

Getting opinions from many sources could augment people's performance

---

Never in history was advertising industry so developed as in modern society and it has led to some adverse sentiments in public because some deliver exaggerated and fake information

---

Never in history was advertising industry so developed as in modern society and it has led to some adverse sentiments in public because some deliver exaggerated and fake information

The first sentence might be argumentative, but not in its context (essay 289). The second false positive is probably due to the presence of "because".

Partially correct:

By doing this, outdoors relationships may expand and it may accompany with sexual relationship and as result, their thoughts deviate from the studies

---

By doing this, outdoors relationships may expand and it may accompany with sexual relationship and as result, their thoughts deviate from the studies

---

The first and foremost reason lies in the inevitable fact that we need to save time for accomplishing some important tasks, and a fitting example of which can be found in my experience of missing exam

---

The first and foremost reason lies in the inevitable fact that we need to save time for accomplishing some important tasks, and a fitting example of which can be found in my experience of missing exam

The classifier wrongly considered the whole sentences as argumentative.
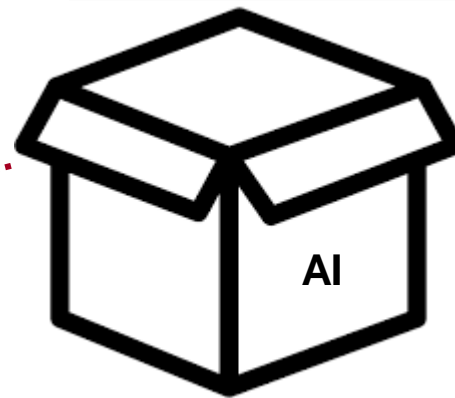
"White box" approach in Law as Code

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

OASIS LegalXML

LegalRuleML

AI

Lawyer-readable

Machine-readable

Human-readable

Conclusions: AIs for Law

Current state of the art

- detect structure of the text and normative references (Palmirani, Francesconi, Winkels, etc.)

- extract legal knowledge, legal concept and semantics (Robaldo, Di Caro, Gangemi, Tiscornia, Agnoloni, etc.)

- recognize natural language elements (Palmirani, Francesconi, Wyner, Villata, Boella, Di Caro, etc.)

- model norms in logic formula (Governatori, Rotolo, Sartor, Gordon, Prakken, van der Torre, Bench-Capon, Atkinson, Liga, Dug, Waltron, etc.), decision support system, checking compliance

- define conditions, values, principles, interpretation (Sartor, Boella, Contissa, Rotolo, etc.)

- classify and group legislative documents (Ashley, Katz, Bommarito, Lippi, Torroni, Contissa, etc.)

Future works

- generate legal text from UML/BPMN/decision tree

- propose best textual formulation according to patterns

- intercept the new law needs

References

- http://docs.oasis-open.org/legaldocml/akn-core/v1.0/akn-core-v1.0-part1-vocabulary.html

- https://docs.oasis-open.org/legaldocml/akn-nc/v1.0/akn-nc-v1.0.html

- https://github.com/oasis-open/legaldocml-akomantoso

- https://www.oasis-open.org/committees/legaldocml/

- https://unsceb-hlcm.github.io/

- http://sinatra.cirsfid.unibo.it/node/portalfaoresolution

- http://bach.cirsfid.unibo.it/ldms-cortecostituzionale/

Technical references

- Text Similarity Approach
- Deep Learning Based Multi-Label Text Classification
- Sentiment analysis
- Spacy
- BoW TF-IDF
- Tree Kernels
- Transfer Learning

Kindly thank you
for your attention

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