«Law as Code» and AIs

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Can the AIs write a Law?

A robot wrote this entire article. Are you scared yet, human?

**GPT-3**

We asked GPT-3, OpenAI's powerful new language generator, to write an essay for us from scratch. The assignment? To convince us robots come in peace

*For more about GPT-3 and how this essay was written and edited, please read our editor’s note below*

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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

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

Symbolic AI
ML
Neural Network
DL
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*
“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

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
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)
- 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**

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**LegalXML**

**LegalRuleML - OASIS**

**ELI/ECLI/AKN-ontology - RDF**

**LegalDocML – Akoma Ntoso OASIS**

**LegalCiteM – OASIS**

**URN:LEX AKN ECLI ELI**
Legal Document, Legal Rules, Legal Ontology

Legal document in XML

Linked Open Data

Internet of things

Certified process

Logic Rules

Semantic Web

XML

ENGINE

Smart Contract

Logic Rules

Semantic Web

XML

XML

XML

XML

XML
Accursio Magna Glossa
XI
Corpus iuris civilis
CODEX

Long-term preservation

Editors' metadata

Authentic content

Presentation
  - 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

LegalRuleML (about norms and meta-rules formalization)

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

LegalXML

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)
- 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
Che cosa è dati.senato.it

Il punto per l'accesso diretto ai dati del Senato della Repubblica. Aggiornamenti quotidiani di informazioni facilmente e liberamente utilizzabili (dati aperti), tra cui testi, protocolli, decreti, leggi, votazioni elettroniche d'Ateneo.

Una base informativa messa a disposizione in conoscenza di cosa viene proposto.

I dati sono disponibili in formato l'open.
Comparative visualization

PROYECTO DE LEY

Artículo 1°.
- Declarase, por vía interpretativa, a los efectos dispuestos por la Ley Nº 12.091, de 5 de enero de 1954 y por la Ley Nº 16.387, de 27 de abril de 1993, que las embarcaciones deportivas o de recreo, de bandera extranjera, con sus accesorios, que arriben al país navegando por sus propios medios, podrán entrar, permanecer y salir de aguas jurisdiccionales o de puertos o lugares de la República amparadas por su bandera y sin otro requisito que presentar el rol respectivo de la tripulación y la matrícula y sin cumplir con las exigencias aplicables a los buques mercantes, pudiendo ser sus propietarios y/o usuarios, personas físicas o jurídicas, nacionales o extranjeras, radicadas o no en el país.

Artículo 6°. (Condiciones)
-Las prestaciones se otorgarán a los hogares cuyos ingresos por todo concepto, exceptuándose las asignaciones familiares, jubilaciones y pensiones por invalidez y vejez, al mes de marzo de 2005, que no superen los $ 1.300 (mil trescientos pesos uruguayos) promedio por persona y presenten carencias críticas en sus condiciones de vida. A efectos de calificar tales carencias se considerarán la composición familiar, las condiciones de habitabilidad de la vivienda, su equipamiento y demás condiciones que establezca la reglamentación de la presente ley.

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Artículo 6°. (Condiciones)
-Las prestaciones se otorgarán a los hogares cuyos ingresos por todo concepto al mes de marzo de 2005, no superen los $ 1.300 (mil trescientos pesos uruguayos) promedios por persona, y presenten carencias críticas en sus condiciones de vida. Nota 1

A efectos de calificar tales carencias se considerarán la composición familiar, las condiciones de habitabilidad de la vivienda y su equipamiento.
Navigation of reference points in-time

The two versions are equally plausible and the resolver has to retrieve both
Constitutional Court Decisions

Pronunces of the Constitutional Court

All pronouncements of the Constitutional Court marked in Akoma Ntoso.

What can you do now?
- Consult the complete Akoma Ntoso catalog in the section "Pronunce".
- Make a search by clicking here or by using the search button on the right.
- Consult the pronouncements starting from the years listed below.
- Download the listed years in the Akoma Ntoso format.

All pronouncements by year

- In 2019, the Constitutional Court has
- In 2018, the Constitutional Court has
- In 2017, the Constitutional Court has
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 Level Committee on Management (HLCM) of the United Nations Chief of Staff, under the United Nations Chief of Staff, has announced a global challenge for the Extraction and Elicitation of United Nations General Assembly Resolutions. The challenge was organized by the United Nations High-Level Committee on Management (HLCM) and its lead partners, such as the UN Department of General Assembly and Conference Management.

The challenge is part of the ongoing efforts by HLCM to improve the use of information and communications technology (ICT) in the United Nations. The challenge aimed to engage computer scientists to produce a programme capable of automatically extracting information from the resolutions and other documents.

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The winning team made available an open source tool called SANKOFA (Semantic Annotation of Knowledge Featuring Akoma Ntoso). The tool uses natural language processing techniques to extract knowledge from the text. The tool also supports the extraction of information for Member States, supporting informed and efficient decision-making.

The judging panel also commended the work of a second team that participated in the challenge, under the leadership of A. 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 Delprioire at e-mail: unitedideas@un.org or visit https://unitedideas.spigrt.com

SANKOFA – Semantic Annotation of Knowledge featuring Akoma Ntoso
By Monica Palmirani
Knowledge Graph Extraction
Multiple rules as (alternative) interpretations of the same text

**Rule 1**

**Context of rule1**

**Rule 2**

**Context of rule2**

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

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

**Obligation**

**Violation**

**Penalty**

**Permission**

**Prohibition**

**Right**
LEGAL ANNOTATION

http://sinatra.cirsfid.unibo.it/rawe-legregsw/

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. |
| 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. |

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.

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

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

- 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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