A Smart Legal Order for the Digital Era: A Hybrid AI and Dialogic Model

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Abstract

The emerging trend of using AI, big data, and smart contracts in the legislative process opens relevant research questions in the theory of law, constitutional law, and the philosophy of law. How to preserve the open texture of the law when it is codified? How to guarantee the legitimacy of the lawmaking process in the digital document flow? How to preserve the autonomy of the decision-maker if the law is automated using AI? At the same time, however, we cannot ignore the undeniable benefits the emerging technologies afford in enhancing the quality of legislation, improving the enforceability of the rule of law, checking the compliance of applications, and working toward a better society. This paper presents a possible solution (Law as Platform, or HyperModeLex) for defining a theoretical legal framework (Smart Legal Order) that takes into account the benefits of the emerging AI technologies in a good balance with the computational-law paradigm and the theory of law. In the digital society we need machine-computable law to use legal knowledge mixed with other important artefacts of the infosphere (e.g., apps, the Web, sensors). In meantime we do not want to lose the control of autonomy (the human-in-command) in a sector as important as the legislative system. This research intends to use the Hybrid AI approach where different techniques could contribute to mitigating weaknesses of each specific method (data-driven vs. code-driven). Additionally, the human-computer interaction methodology could help toward designing a dialogic model for making sure the overall legislative process is transparent and explicable.

Keywords: Legal Theory – AI – Legislation – Legal Design – Legal Language.

1. Introduction

During the COVID-19 emergency we were confronted with a flood of regulations enacted by many governments to manage the pandemic, often followed by a sequence of amendments as the situation would evolve. (In Italy, the government and Parliament approved approximately 871[1] regulations with different

[1] https://www.openpolis.it/coronavirus-lelenco-completo-degli-atti/, accessed in May 2022.

hierarchical levels; the EU institutions issued 77 legislative documents[2], the government of New Zealand[3] started «Using Rules as Code during COVID-19»)[4].

Four urgent needs were singled out as particularly pressing in the pandemic:

1) to manage the digital legislative norms (especially under emergency status) in light of democratic and constitutional principles, with particular attention to legitimacy, transparency, accessibility, accountability, timing, and autonomy;

2) to have digital modelling of norms capable of quickly interacting with the digital society, the institutions, and IT systems (e.g., IoT fitness tokens, the digital health system, apps for contract tracing), even without the intermediation of human beings;

3) to enforce executable legal norms in a computable way and to check compliance with these norms with the support of automatic decision-making systems; and

4) to measure the effectiveness of norms in order to react and rapidly change direction depending on how society might evolve.

There is much need to create legislative norms in a computable way to support the digital transformation, the data society, and the fourth industrial revolution (Floridi 2014), but the problem is to create a legal theory framework capable of preserving the legitimacy of computable law as a source of law and not as another form for representing the law.

Over the last two decades the legal informatics community, using multidisciplinary methodologies, have come up with solutions to for addressing three of the aforementioned needs, with the Semantic Web framework (Casanovas 2016), Open Government Data (Casanovas 2017, Francesconi 2018), ans thre Free Access to Law Movement[5] (Greenleaf 2011). Also, the Official Gazettes have moved to digital format[6], with a deep transformation of the paradigm for legal sources. The LegalXML community developed different XML standards (e.g., Akoma Ntoso, AKN4UN, AKN4EU) for structuring legal texts, as well as metadata legal models (e.g., RDF models for the legal domain, like ELI), legal rule modelling languages (e.g., LegalRuleML, Palmirani 2011), URI naming conventions that are persistent over time (e.g., ELI/ECLI, Opijnen 2017), and legal reasoning literature and AI and Law. Machine learning and legal analytics extract legal knowledge and predictive models, and legal design proposes new patterns for smart visualization. The LegalXML approach ranges from the official legal text approved by government institutions (e.g., Parliament, government) to formal modellization using XML, logic programming, and functional coding.

[2] https://eur-lex.europa.eu/content/news/Covid19.html
[3] https://serviceinnovationlab.github.io/projects/legislation-as-code/
[4] https://oecd-opsi.org/using-rules-as-code-during-covid-19/
[5] https://www.nyulawglobal.org/globalex/Legal_Information_Institutes1.html
[6] https://op.europa.eu/en/web/forum_official_gazettes/home

The MIT Computational Law Development Goals[7] is a July 2020 initiative that aims to find new methods for making the law human-centred, measurable, computable, and machine-readable on the Semantic Web approach, as well as interoperable, this thanks to international data models and standards. In some cases, the legal drafting activity is enhanced by the mentioned technologies with the aim of supporting the lawmaking process and fostering the paperless creation, consolidation, publication, and dissemination of law, as well as access to legal sources, using the Web or apps. Additionally, there is a large community of legal drafters investigating how to improve the process using the RegTech tool in a pragmatic way (International Association of Legislation 2019 Seoul Conference proceedings, Micheler 2019).

In 2018, the New Zealand government started a project called «Rules as Code»[8], and in 2020 it proposed OECD-OPSI (Cracking the code: Rulemaking for Humans and Machines[9]) to codify a new approach: the idea is to use coding methodology (e.g., UML, flow charts, pseudo-coding) to create a macro-schema of law, legally binding, that as output produces a legal text in natural language. It is a sort of a reverse-engineering approach compared to the dominant method, and it is backed by legal theory, where digitalization is done from the legal text expressed in natural language to the formal-logic representation. The Stanford CodeX lab[10] and the Australian and Canadian governments[11] are working in this new direction by also using programming languages (e.g., Java, Python, C++, etc.). The intuition is very fascinating, but it is affected by a certain preconception, stemming from a technocratic culture, according to which it is deemed possible to transform everything in formulas and algorithmic computations.

2. Smart Legal Order

This approach is raising several critical issues: it does not seem to take into account the last 30 years of research in legal theory and in AI and Law. As noted in a previous study[12], there are some important questions that need to be addressed:

[7] https://law.mit.edu/pub/computationallawdevelopmentgoals/release/1

[8] https://joinup.ec.europa.eu/collection/better-legislation-smoother-implementation/discussion/better-rules-and-rules-code-references-australia-nz-mainly; https://www.digital.govt.nz/blog/what-is-better-rules/

[9] https://www.oecd.org/innovation/cracking-the-code-3afe6ba5-en.htm

[10] https://law.stanford.edu/projects/computational-linguistics-and-effective-legal-drafting/

[11] Making Laws in a Post-Modern World: Are You Ready – CIAJ Legislative Drafting Conference https://ial-online.org/legislative-drafting-conference-making-laws-in-a-post-modern-world-are-you-ready-ottawa-september-2020/

[12] Palmirani, M., *Artificial intelligence and LegalXML standards to support the transposition and implementation of the Acquis*, Conference Proceedings Slovenian Legal Conference

i) Ontological meaning of the law. The law is not made up only of formal rules: it also includes parts that can hardly be reduced to static formulas like principles, values, and constitutive rules (Raz 1972; Hansson 2007). Even if several scholars have offered solutions (Sartor 2010; Maranhão 2021), it is difficult to crystallize in a static formalization some of the dynamic elements of the concept of law (e.g., proportionality).

ii) Open texture of the law. Fixing norms into a monolithic code makes it difficult to flexibly adapt norms to an evolving society, as instead is possible through the open texture of the law (Hart 1961; Bix 1995).

iii) The role of legal language. Artificial programming languages are a subset of natural language (Chomsky 2006), so we need to take this limit into account and to evaluate different approaches (Fillmore 2009) based on semantic patterns rather than only on syntax, while also considering the different roles (e.g., constitutive and autopoietic) of legal language (Brownsword 2011; Reichman 2021; Teubner 1988; Searle 1995).

iv) The contradictory nature of norms. Norms can be made intentionally contradictory in order to achieve a balance between different institutions, levels of regulation (e.g., national and European), and powers (e.g., legislative and executive). Additionally, ambiguity is often not a drafting error but a legislative instrument of political negotiation between different interests.

v) Alterations induced by prediction. Prediction is based on the past, so its ability to influence decision-makers and future human behaviour is limited (Hildebrandt 2021). In addition, prediction works only if the phenomenon follows the same trend without divergence. The pandemic events have been creating unexpected behaviours in society, ones that cannot be predicted on the basis of past information.

vi) Autonomy. The automatic execution of norms raises problems for the autonomy of the agent, who may not be able to comply. Without transparency and engagement, it is difficult to form an independent opinion. Furthermore, without an interior consciousness norms over time, the rule could lose its main characteristic, namely, its normativity, turning into self-execution action without any voluntary participation by the individual (Forst 2021). In fact, the artificial intelligence community often holds up the principle of *trustworthiness*[13] in algorithms, which implies that we don't have to know all the details of complex computable solutions (e.g., deep neural networks have millions of parameters and nodes). At the same time, the ability to form an independent opinion also

«United in Practice», Editors Katja Božič, Gordana Lalič, Anamarija Patricija Masten, Ljubljana, 2022.

[13] European Commission, *White Paper: On Artificial Intelligence – A European Approach to Excellence and Trust*, COM(2020) 65 final, Brussels, 19.2.2020.

rests on the principle of the *explicability* of the logic of the algorithm and the auditability of the dataset (Hamon 2020).

vii) The creative role of disobedience. It stands to reason that disobedience with norms, under conditions of justice and generality, could also bring some benefits. Critical thinking indubitably stimulates innovation in the law (e.g., IPR infringement created the Creative Commons), making it possible to update the law in keeping with the evolution of society (e.g., end-of-life law) and creating new rights (e.g., same sex-marriage).

Some scholars (Hildebrandt 2020; Oster 2021; Barraclough 2021; Deakin 2020) underscore the impossibility of reducing the law to computable code or data, highlighting the risk of a new *computational legalism* (Diver 2020) that could crystallize the rules of law into unmodifiable code, severely undermining some important «[c]onstitutional principles, such as legality, accountability, transparency and other expressions of the checks and balances of the rule of law that are core to constitutional democracies». So-called Hybrid AI is a new direction in AI research where *human-in-the-loop*, *human-on-the-loop*, and *human-in-command* principles[14] are combined with different complementary disciplines (law, philosophy, ethics), using symbolic and sub-symbolic AI techniques integrated with Semantic Web research in order to add context and meanings to the purely *data-driven* or *code-driven* methodology. Hybrid AI is a very promising approach, especially in the legal domain, where context, values, and concepts are fundamental to correctly applying AI (Fratrič 2021). The European Commission has recently provided a roadmap for *digital-ready legislation*[15] on an interdisciplinary approach, and has taken up the project of «Drafting legislation in the era of artificial intelligence and digitisation» (workshop 2019; Palmirani 2022)[16].

The EU Commission Directorate-General for Informatics is conducting with the University of Bologna a study on «Drafting Legislation in the Era of Artificial Intelligence and Digitisation» that includes three pilot cases using AI techniques applied to support the legal drafting units. In this study we propose a third way – Hybrid AI for Law – with a legal and technical model for developing computable informatics legal systems that are compliant by design (or legal protection by design, as Hildebrandt has termed it) with the theory of law, understood in the autopoietic role of creating new frameworks that have never been seen before. Legal formalism and logic-positivism (reductionism and textualism), used for decades, have proved inadequate as an approach to the coding of law that is resilient to the passage of time. It is necessary to maintain

[14] High-Level Expert Group on AI presented Ethics Guidelines for Trustworthy Artificial Intelligence, 2019.

[15] https://joinup.ec.europa.eu/collection/better-legislation-smoother-implementation/digital-ready-policymaking

[16] https://ial-online.org/wp-content/uploads/2019/07/Invitation-EN.pdf

flexibility if a solution is to be applicable to different jurisdictions, contexts, and historical periods, and able to adapt to a changing society. On the opposite end of the spectrum we find radical legal hermeneutics and subjectivism, and this kind of approach is equally unsuited to the Web of Data (Filtz 2021).

Additionally, we need to consider the Goodhart and Campbell laws and Hildebrandt's consideration that any excess of predictive AI automatically introduces modifications in people's behaviour depending on the predictions made (Hennessy 2021)[17]. Since the issue is crucial, we need to fight the non-skeptical and simplistic technocratic approach, which generates a great risk for our democratic legal system. The point is stressed by Oster (2021): «That leaves one question open: how does the digitalization of law – the drafting, interpretation and/or enforcement of the law by digital agents – affect the epistemology of law, that is, the theory of knowledge of the law?». We are creating a solid theoretical framework for models under the banner of Law *as* Code (as distinguished from Law *is* Code) or, better yet, Law as Platform[18], an approach we are pursuing without market connotations (a.k.a. the digitalization of law in machine-consumable format like coding or smart contracts). The framework aims to define a Smart Legal Order compatible with constitutional law (legitimacy, legality, flexibility, enforceability), the theory of law (hermeneutics and interpretation), and democratic systems (the separation of powers) by relying on different disciplines, including the philosophy of law, legal informatics, and computational linguistics, thus fostering a plurality of perspectives for modelling a new vision that is necessary to tackle this Digital Era.

3. Dialogical Approach between Law and Code

It is possible to define, under some conditions, a robust theoretical and empirical legal-techno-linguistic framework to equally define in an official and authoritative manner the legal norms formalized in machine-consumable form (e.g., XML, logic formula) with the same legal value as the natural-language text that for centuries has been the main medium and embodiment of the legal system (Raz 1970; Alchourrón 1971; van der Weide 2010). This framework based on the dialogical approach and on the Smart Legal Order works like an ecosystem.

[17] Manheim D., S. Garrabrant, *Categorizing Variants of Goodhart's Law*, http://arxiv.org/abs/1803.04585.

[18] See also the project started on 2017 https://raap.d61.io/api/v0/swagger-ui/ funded by the Australian Federal Government and coordinated by Guido Governatori.

Equal attention needs to be devoted to the following:

i) evaluating the ex-ante and ex-post regulatory impact assessment using measurement indicators, so as to simplify and coordinate the legislative agenda (so-called better regulation, Sartor 2022);

ii) tracking the legitimacy of the digital legislative process for creating norms because the institutions should be valid and legitimate in each step (MacCormick 2007), especially if some actions are automatically carried out by algorithms;

iii) checking the compliance of implementations and rapidly updating legal corpora over time in order to accurately connect text, rules, and code;

iv) refashioning norms in order to adequately respond to normal life processes and update the legal system; and

v) communicating with citizens, companies, institutions, and public sector bodies in a transparent manner and making the legal-tech scenario trustworthy by avoiding the black-box effect, to this end using simplification principles and legal design visualization without undermining transparency and accountability.

It is evident that there is an urgent need for legal and ethical norms machine-*consumable*, and not simply machine-*readable*, in such a way as to save time, promptly react to changes, correctly apply regulations, enable machine-to-machine dialogue with digital artefacts (e.g., IoT, smart cities, transportation), analyse the results, and make quick decisions to grow the economy and protect the social community. If a theoretically sound Law as Code framework is defined and adopted by parliaments, deliberative bodies, government institutions, and public administrative entities, we can save a significant amount of time in implementing norms, reducing errors to a reasonable percentage, monitoring the effects of the legal norms, correcting unsuccessful norms, and developing an integrated ecosystem with digital infosphere entities interacting with robots, multi-agent systems, AI, blockchain, and smart contracts. Additionally, AI systems can also support the legislative lawmaking process in the creation phase and produce better regulation by avoiding mistakes and inconsistency. This approach saves money for companies, reduces lawsuits and litigation costs, and makes for more effective compliance and respect for the rule of law.

Most legal systems are affected by some fragmentation of legal sources (e.g., international, European, national, regional, and authority levels), with issues relating to their overproduction (e.g., secondary/subsidiary law) and the reshaping of sovereignty (e.g., Brexit), all the while having to deal with the pressing demands of liquid democracy and the hyperconnected society (Floridi 2011, 2013b). On the one hand, there is a risk that other, more nimble forms of legal sources could arise (e.g., BitTech Law); on the other hand, different forms for regulating society are being put into practice (e.g., distributed rules, smart contracts), with detrimental effects on the role of government institutions if they

are not designed well. This is a complex and trailblazing project that requires a long-term commitment to create a new legal theory for the e-legal system and an accompanying technical framework. This is an urgent task in the current digital and knowledge society. Otherwise, simplistic solutions will arise, often promoted by big tech or by private companies chipping away at the pillars of democracy, the rule of law, and institutional authority.

4. State of the Art of Computable Law and Its Limits

Current research in Rules as Code (see Cracking the Code) in part avoids integrating legal theory, interpretation theory, legal linguistics, and semiotics into the picture (Bench-Capon 1992, 2012; Hildebrandt 2018, 2020; Verheij 2020, Oster 2021). It is true that in common law systems it is easier to canonize the legal language into formulas, but in civil law systems (Nazarenko 2018) this is a challenge, and in both systems constitutional norms are open rules, a feature that enables them to be resilient to cultural and social evolution and to be sufficiently flexible in case-by-case application and interpretation (Robaldo 2019; Ashley 2017; Greenleaf 2020). Finally, implicit rules are not included in normative texts, and different carriers of meaning, like pictures, diagrams, and videos, are emerging as media through which to communicate prescriptions (Casellas 2011; Casanovas 2016; Boella 2017; Moroni 2017, 2020; Lorini 2020). However, the idea of digitizing official legal norms and legal sources of law in a machine-consumable format and executable manner is not new.

In the last twenty years, several legal official gazettes, national archives, and parliaments have sought to manage legal sources within legal corpora with the support of technologies like databases, XML, RDF-metadata, and logic formulas. Subsequently, they also set themselves the goal of providing versions of the law updated to any given time (the so-called point-in-time mechanism). In 1995, EnAct (Arnold-Moore 1995), by the government of Tasmania, was the first system to make available a point-in-time[19] legislative database in SGML. In 1992, at Cornell Law School, the Legal Information Institute (LLI), cofounded by Peter Martin and Tom Bruce (Bruce 1994), provided a consolidated HTML United States Code for the Web[20]. The Australasian Legal Information Institute (AustLII), cofounded by Graham Greenleaf in 1995, makes accessible AI instruments like DataLex, which are grounded in rule-based legal inferencing software capable of dialoguing with the end-user (Greenleaf 2020). Eur-Lex began to consolidate European Legislation into a database in 1999 using Formex, an

[19] Point-in-time is the function that makes it possible to manage all the versions of a document over the time and not only the original document and its last version.
[20] http://www.law.cornell.edu/uscode/

SGML data standard now translated into XML (Formex v4)[21]. On 1 January 2001, Norway activated a Web service by Lovdata[22] and began to provide consolidated legislation. In 2002, France transformed the commercial service Jurifrance into a public Web portal called Legifrance[23], which includes consolidated texts in mixed format (HTML, XML, and PDF). Today, it also supports the Akoma Ntoso format. Austria launched the eLaw project (2004) and transformed its previous RIS database (1983) into a Web collection of authentic documents, thus completely dematerializing the publication of the legal Official Gazette. The Emilia-Romagna Region (Italy) started consolidating regulations in 2003 using the NormeInRete XML schema[24], and the Italian High Court of Cassation started the same mark-up in 2005 and it is now consolidating the whole set of documents. The Senate of Italy adopted the Akoma Ntoso (Vitali 2018, 2019) standard for bills, transcripts, and other kinds of documents also provided as Open Government Data. On 30 June 2009, the Senate of Brazil launched the parliamentary consolidated database (LexMLBrazil)[25] with a point-in-time function based on a customisation of the XML Akoma Ntoso schema.

The Library of Congress of Chile[26] provides up-to-date legislation using Akoma Ntoso. The UK's National Archives have progressively been transforming all UK legislation into XML, RDF, and Akoma Ntoso[27] since 2012. The Kenya Law Report[28] is now converting their database of laws into XML documents marked-up using the Akoma Ntoso standard. In 2017, the United Nations approved Akoma Ntoso as the official standard for their documentation (AKN4UN)[29], and EU institutions did a similar thing in 2018 under the AKN4EU[30] initiative. In Germany, the e-Legislation project is at an advanced stage[31], and some experiments have also been conducted in Japan (Gen 2015). The interoperability between institutions and the simplification of the lawmaking process as it moves back and forth between different bodies can be managed using XML legal standards: if the process is also tracked, we have the traceability of legal rules and accountability in the process of enacting them.

Additionally, over the last 30 years the AI and law community has developed widely shared theories and models that can manage norms, values,

[21] http://formex.publications.europa.eu/index.html
[22] http://www.lovdata.no/info/lawdata.html
[23] http://www.legifrance.gouv.fr/
[24] http://demetra.regione.emilia-romagna.it/
[25] http://projeto.lexml.gov.br/documentacao/resumo-em-ingles
[26] http://www.leychile.cl/Consulta
[27] https://www.legislation.gov.uk/projects/drafting-tool
[28] http://www.kenyalaw.org/update/index.php
[29] https://unsceb-hlcm.github.io/
[30] https://op.europa.eu/it/web/eu-vocabularies/akn4eu
[31] https://www.verwaltung-innovativ.de/DE/Gesetzgebung/Projekt_eGesetzgebung/English_Project_Description_%20eLegislation/English_Project_Description_E-legislation_node.html

principles, beliefs, interpretation, and argumentation (Sartor 2005; Prakken 2015; Rotolo, Boella 2017; van der Torre 2013). Other scholars use ML/NLP/AI non-symbolic techniques for extracting knowledge and classifying and analysing legal knowledge and legal norms starting from texts (Ashely 2017). Many members of AI and law community have developed significant logic theories and methods for modelling norms in legal formulas and have developed tools (Governatori 2019, 2020; Palmirani 2013; Boella 2017) for managing interaction between legal reasoning and legal experts.

Some research projects have undertaken significant investigations in (data-driven) Law as Data that aim to extract data from the legal text and to enhance information retrieval based on semantic and legal ontologies (Palmirani 2018, 2019, 2020; Gandon 2017; Peroni 2017). Lynx[32] aims to translate the entire legal system into a knowledge graph; ManyLaws[33] seeks to mix different legal metadata to improve searchability. What is new is the attempt to codify normative thought directly using programming languages without going through legal language. Considering overcomplicated the analysis of legal texts, the idea is to use coding directly instead of legal provisions. OpenFisca[34] sets out to codify significant fragments of the legal system using programming; Marcell[35] uses AI to improve multilingualism in legal documents (code-driven).

5. Hybrid Approach

All the previous results are isolated and not well integrated into a single overarching research vision, especially as they do not fully include the philosophy of law and legal theory or constitutional law, thus failing to create a robust legal framework for a digital legal system, one that is dynamic and diachronic over time, in multilingual perspectives, with multiple interpretations and meanings. CompuLaw[36] ERC is one of the most advanced projects to take an interdisciplinary approach including legal-techno-social aspects; however, it is focused more on logic-symbolic and non-symbolic modelling of norms integrated with AI techniques like predictive law and eJustice. Cohubicol ERC[37] (Hildebrandt 2020) is investigating the philosophical and ethical implications of computable law from the data-driven and code-driven points of view, but without including document modelling and representation in hybrid meta-level informatics systems, where symbolic and non-symbolic AI are combined to create dynamic multi-level

[32] https://lynx-project.eu/
[33] https://www.manylaws.eu/
[34] https://openfisca.org/en/
[35] https://marcell-project.eu/
[36] https://site.unibo.it/compulaw/en
[37] https://www.cohubicol.com/

and multi-agent systems. Multi-agent systems and document-oriented views make it possible to overcome the dualism between data-driven and code-driven approaches. We need to answer several research questions as follows:

Legitimacy. The data-driven approach is technically speaking ill-equipped to manage law in a persistent and legal manner and so to replace the canonical legislative methodologies. The Data model is fluid, and it could be repackaged in different ways and combined without any control including other non-authentic information that has not been validated and supervised by legal authority. The data-driven approach we make subservient to the document-driven approach because the document is a consistent and self-contained artefact, and the result of different linguistic and legal processes, including constitutional rules and lawmaking constraints that are the result of a complex democratic process. A legal document is not pure text. It is the sum of a concatenation of events that are relevant for guaranteeing the democratic political process under the separation of powers (legislative, judicial, executive). The legal document is validated at three stages: (i) legal experts in drafting the document; (ii) procedural rules in the lawmaking process; and (iii) social participation using instruments like public consultation. The legislative process is tracked and validated per se on the basis of institutionalist theory, and is made legitimate even if automated, using three main instruments: (i) technical standards, as in digital identity management (e.g., see the eIDAS Regulation and the XML SAML protocol for guaranteeing security and accountability at the normative level); (ii) certifications from third parties (e.g., as in the digital signature or in medical devices); and (iii) auditable processes at any moment (e.g., as in the privacy sector).

Flexibility. For the code-driven approach we propose a multi-agent system with a dialethic argumentation framework capable of having constant and bidirectional relationships between the computable part of the representation of norms (legal reasoning) and non-symbolic information and human intelligence (e.g., so-called hybrid intelligence). Additionally, we could use formal semantic linguistic models more focused on the semantics and on specific situations rather than on the lexicon (Fillmore 2009).

Interpretation. New technical protocols (Barabucci 2020; Athan 2014, 2015) make it possible to annotate different official alternatives that are equally valid in different contexts, temporal periods, and jurisdictions. These new techniques also make it possible to distinguish direct assertions from the *relata refero* opinions by creating a mechanism for managing different levels of shades (e.g., interpretations by judges, comments from scholars, annotations from students), with different degrees of authoritativeness. This additional annotation adds another dimension to the document by providing an interesting instrument for implementing the theory of interpretation.

Transparency. The coding of the law also creates a lack of transparency in each human that is not able to read code, highlighting a new form of digital

divide and illiteracy. This could create a diverging society, with those who are able to understand code and who are not. A very interesting approach in taking down this barrier is legal design (Hagan 2020; Moroni 2017, 2020), with the appreciation that explicit normative rules are also possible with nonlinguistic acts; this kind of approach also includes human-computer interaction techniques devoted to enabling customized explicability (Sovrano 2020, 2022; Guidotti 2018). By means of such transparency methods, laws and their sublayers become intelligible for both citizens and machines. The system should be self-explainable, giving the agent some autonomy, including the faculty to not dissent (Raz 2009).

Enforceability. Defeasible logic and argumentation theory make possible an enforceability at once computable and flexible, one that can change with antecedents that could be rebuttals and be defeated by new emerging conditions. Classic logic and functional programming (e.g., smart contracts) are under-equipped as instruments for modelling the law in any situation and at any time.

We also face some critical issues from the technical point of view, and these could significantly reinforce the previous considerations.

Paragraph vs. Structure. Machine learning (ML), supervised or unsupervised, works at paragraph level and does not take into account the document's structure. ML cannot semantically connect portions of the provisions (e.g., obligation-exception, duty-penalty).

Text vs. Context. ML often works without additional information about the context of the provision (e.g., jurisdiction, temporal parameters); this means ignoring elements that are key to the legal domain (e.g., derogations depend on certain conditionals, a clear example being *sunset* clauses)[38].

Prediction vs. Relevance. ML works mostly by applying probabilistic techniques based on a data series, and if a trend becomes widespread in the legal system, it is likely to be repeated by the statistical model even if the legislation has changed. For this reason, in the legal domain, it is also very important to consider the relevance of the legal phenomenon being analysed (e.g., new legislation). This peculiar aspect should be included in the ML model using particular techniques (e.g., assigning weights to events) that have already been adopted in some industrial sectors where recent data are more important than past data.

Internal vs. External content. ML does not consider normative and legal citations (normative cross-references) as qualified parts of a legal provision. For

[38] A sunset clause is a provision that contains an expiration time. An example is Regulation (EU) 2020/1042 defining temporary measures concerning the time limits of the citizens' initiative in view of the COVID-19 outbreak: «Article 8 Entry into force This Regulation shall enter into force on the day following that of its publication in the Official Journal of the European Union. It shall apply until 31 December 2022», https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32020R1042.

ML, a citation is just a sequence of characters. This makes it necessary to recall the portion of the text cited and inject it in the dataset.

Static vs. Dynamic. The content linked up by way of normative citations changes as the legal system changes over time (e.g., art. 3 will not be the same forever). ML cannot understand this semantic aspect, and for this reason we need to integrate each normative citation with the corresponding *point-in-time* version of the text.

6. Law as Platform for a Smart Legal Order

We propose a framework that considers the Smart Legal Order as an ecosystem and managed like a platform (see Figure 1) capable of managing the flow of the process from the legal text to program coding, and vice versa from formalization into rules to the natural language of official legal text. Principles drawn from the philosophy of law and from constitutional law need to be implemented by design. A technical security level should keep track of each step (e.g., blockchain, digital signature, trust service – Cervone 2020) and connect it with the others to certify the legal validity of the whole process (process-oriented model). In the meantime, the framework has a user-centred interface for managing a dynamic dialogue.

In managing the norms issued by legislative institutions, the framework takes six aspects into account as follows:

i) Fundamental to the process is HCI dialogue between the legal expert and serialization in XML representation. The HCI makes sure that the transformation from the text into the machine-readable format is tracked. This is not a one-shot transformation but is a dialogic process: like food processing or the manufacture of drugs, it is constantly monitored. We could use reinforcement-learning techniques to teach the legal experts what the AI has discovered, and the legal experts could train the AI, increasingly passing valuable, high-level legal knowledge about best practices.

ii) Versioning norms over the time (Palmirani 2011a) makes it easier to access consolidated law and share updated legal texts with the AI algorithms for more accurate predictive and analytics.

iii) Another relevant aspect – also in light of multi-normativity (i.e., different social orders) – is that of multilingual variants (Palmirani 2014). Several legal orders interact (e.g., EU and domestic law) and this dialogue is fundamental in detecting the interconnections, influences, and divergences, in such a way as to provide the legal expert with a complete picture of the options available.

iv) The hermeneutic methodology for interpreting legal texts needs to be kept flexible – also in view of legal pluralism (i.e., different legal orders coexisting) – and this makes it necessary to keep open different interpretive alternatives (Boella, Rotolo, Sartor). Technically, we capture the varieties while

at the same time connecting them semantically in order to convey them visually to the legal experts contextually.

v) Another component is FRBR[39] (short for Functional Requirements for Bibliographic Records), a model for digital artefacts that helps us manage the dynamicity of legal sources from the aforementioned multi-level perspectives (versions/variants/alternatives) while adhering to the Semantic Web paradigm.

vi) An enhanced formal computational linguistic model is defined to describe the characteristics of legal language and to the extent possible fill the gaps between the two.

A crucial problem is how to also provide a persistent Unique Resource Identifier for legal sources in the Web to make it possible to refer to digital objects for generations, similarly to medieval manuscripts, which stood for centuries. Can we preserve the normative characteristics of the law when it is digitalized and formalized in a neutral manner, preserving its contingent and specific implementation (e.g., using a particular programming language) or the available medium (e.g., virtual reality)? How do digital media transform the meaning of the law? And how to preserve the autonomy of the normative function of law when the law digitalized for machine-consumable purposes? What is the role of the technology in this transformation, and what effects could it have in the long term? We intend to minimize the dependency on any specific current technology and to digitize norms in canonical, interoperable, independent ways (Palmirani 2012). In the meantime, we embrace the great opportunities this approach can offer (e.g., checking compliance, rapid analysis of modifications, legal reasoning).

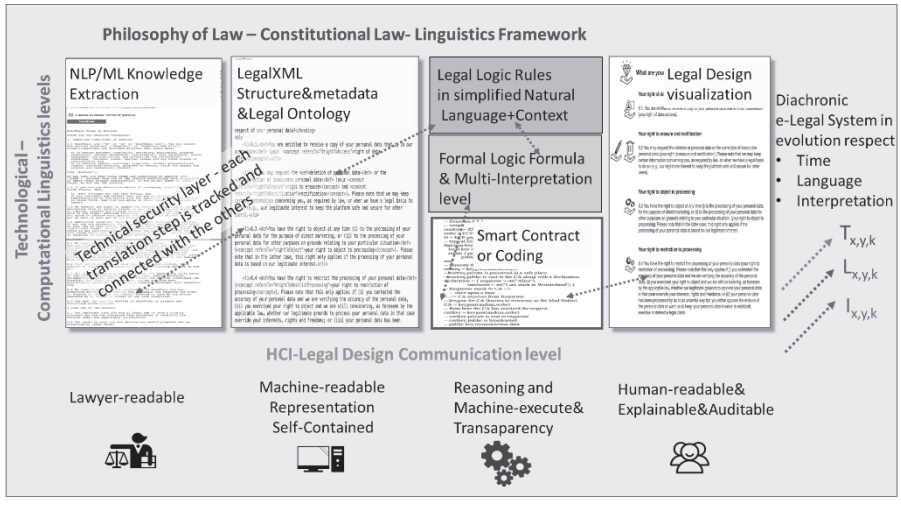

Fig. 1. «Law as Platform» Framewrok – HyperModeLex.

[39] https://www.ifla.org/publications/functional-requirements-for-bibliographic-records

This framework makes it possible to move from text to code (any kind of different formal codification, including visual codification) and from code to text with robust logic checking and an explicable human-computer interface, preserving transparency, engagement, and autonomy.

7. Some Benefits of Law as Platform

The Law as Platform framework (HyperModeLex) uses a Hybrid AI approach, and to this end the European Commission's report «Drafting Legislation in the Era of Artificial Intelligence and Digitisation» (Palmirani 2022) provides some concrete use-cases.

Detecting derogations in EU legislation (Palmirani 2022b) and present them in a navigable graph, modelling patterns for types of corrigenda (Palmirani 2021), critically comparing the similarity between directives and their Member State implementation (Palmirani 2022a), and calculating the index of adherence for a specific policy like gender balance or the digital transformation are only some examples how it is possible to combine document-management techniques, machine learning, and the semantic Web with a good dialogue between legal experts and computable law. Also a good example of this Hybird AI approach is (Sovrano 2020), where different techniques have been applied (NLP, AI, LegalXML, legal ontology) for detecting some relevant decisions in United Nations General Assembly resolutions and transforming them into machine-readable assertions that are good for making valuable queries (Peroni 2017)[40].

8. Conclusion and Future Work

We are working to move past the state of the art of the post-reductionism of the logic programming of norms (e.g., formal logic of norms), rigid textualism (e.g., text modelling), and the sceptical approach to interpretation theory that excludes the codification of values, principles, and argumentation. This makes it essential to transition to a new Smart Legal Order theory (Brownsword

[40] Here is an example of analysis from UNGA Resolution A/ES-11/L.1: «Demands that the Russian Federation immediately cease its use of force against Ukraine and to refrain from any further unlawful threat or use of force against any Member State». This sentence is qualified by the ML as a request but a further analysis of the semantics of the sub-elements we could discover, using Name-Entity Recognition techniques, the States mentioned (Russian Federation-RF, Ukraine-UA, Member State-MS). We also can detect the action using verbs («cease its use of force against», «use of force against») and compose an assertion in RDF (Resource Description Framework) format: <UNGA *demands* RF *ceaseAttack* UA AND RF *useForce* MS>).

2022) that makes it possible to reap the benefits of existing technologies, while preserving democratic principles and the high level of normativity. This poses the challenge of coding the law to build a solid constitutional-legal framework supported by legal theory and legal-informatics and computational linguistics, in such a way as to ensure that the machine-computable law produced directly by institutions is legally valid. Hybrid AI is already a reality. What is missing is the theoretical framework for adopting it natively in all lawmaking process.

We use the Hybrid AI approach to implement the following pillars:

i) *Document-oriented modelling* with close supervision by authoritative institutions that, under constitutional law, have the power to issue sources of law. Documents, connected in an intricate legal order, evolve over time using a strong model of versioning, which in turn makes it necessary to update the semantic content (e.g., the concept of European citizenship), in turn making it possible to effectively retrieve information inclusive of the semantic context.

ii) *Process-oriented* design accountability for monitoring all the steps in the lawmaking process, including the transformation from text to coding, and vice versa, in a dynamic flow. Additionally, this process-oriented approach provides information to answer questions about transparency and explicability.

iii) *Alternatives* are admissible, and they are documented through a transparent process, coupled with strong modelling for provenance, chains of assertions, conditions, and contextual information. This makes it possible to ensure the legitimacy of plural interpretations.

iv) *Legal reasoning* is defeasible depending on context, temporal parameters, and the evolution of society (Liga 2019, 2022).

v) The *dialogic human-computer interface* process is fundamental in implementing the principle of isomorphism (Bench-Capon 1992), as well as transparency and the autonomy of the different agents involved (legislator, judge, citizen).

vi) *Legal design* is the instrument we rely on to implement customized explicability in light of the different skills and abilities of the end-user (e.g., lawyer, judge, citizen, administrator).

In the future a bot could support humans in drafting law like in journalism[41], education (self-generation essays using GPT-3[42], Fitsilis 2021), or LegalTech practices (e.g., contracts, applications). Several law schools are introducing coding courses for lawyers. The Artificial Intelligence Act (AIA[43]) is a legislative proposal that includes a risk-analysis approach and a complex

[41] https://www.forbes.com/sites/enriquedans/2019/02/06/meet-bertie-heliograf-and-cyborg-the-new-journalists-on-the-block/

[42] https://www.gwern.net/GPT-3

[43] Proposal for a Regulation of the European Parliament and of the Council Laying down harmonised rules on artificial intelligence and amending certain union legislative acts (a.k.a. AIA). COM/2021/206 final https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021PC0206.

system of documentation and certification. To support our approach, we could take some elements from the AIA draft regulation concerning high-level risk systems (e.g., Chapter II):

i) Art. 10 defines a workflow for producing data and not just the release of datasets without any monitoring.

ii) Art. 12 defines the recordkeeping for the whole process (e.g., logs), and Annex IV requires appropriate documentation for the whole process of producing the automatic system, including the certification process.

iii) Art. 14 imposes HCI interfaces for enabling everyone to fully understand the coding.

iv) Art. 14 includes explicability with concrete human oversight, under the human-in-the-loop and human-in-command principles. In this legislative sector, we should also reinforce the role of the human in the loop.

v) Art. 16, on the quality management systems, can monitor the whole process to as to avoid crystallizing the automatization procedures. Additionally, Art. 19 introduces a «conformity assessment» to include «substantial modifications».

vi) Art. 61 introduces «post-market monitoring», which in our case means designing a dynamic system which is capable of evolving, and which, if need be, makes it possible to deactivate some rules, code, etc.

In conclusion, while computable law is not impossible, it does require a theoretical framework and a hybrid methodology (e.g., Hybrid AI) that includes all the techniques available in the state of the art for mitigating the risks that reliance on a single technology could introduce. We intend to natively inject principles from the theory of law in designing this hybrid ecosystem so as to preserve legal foundations. Also necessary is a bird's eye view looking at the the lawmaking process so as to track all the steps involved in supporting legitimacy. These considerations support the idea of designing an ecosystem based on Law as Platform rather than on Rules as Code, in such a way as to include all the fundamental pillars mentioned in this work. We should also be ready to detect the risks inherent in new trends, to capture opportunities, and to shift toward a new Smart Legal Order using solid theoretical scientific methodology. Otherwise, the pure-coding approach could turn into a new black box, affording no explicability to the regular end-user. This is not the first time that the law has undergone a great transformation in its theoretical foundations – witness the mediaeval era, with the Lex Mercatoria, and the codification era, with the modern democratic nation states – and now we need to design new foundations with which to face the digital era with solid ethics and democratic values. We know that technological innovation never stops, so it is our responsibility to shape the next generation of sources of law.

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