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Rethinking Global-Regulation: world's law meets artificial intelligence

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Rethinking Global Regulation

World's Law Meets Artificial Intelligence

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Abstract

This article takes a critical look at Machine Translation of legal text, especially global legislation, through the discussion of Global-Regulation, a state of the art online search engine of the world's legislation in English. Part 1 explains the rationale for an online platform such as Global-Regulation. Part 2 provides a brief account of the history of the development of machine translation, and it describes some of the limits of the use of statistical machine translation for translating legal texts. Part 3 describes Neural Machine Translation (NMT), which is a new generation of machine translation systems Finally, Parts 4 outline the "big sky" thoughts on future directions for Global-Regulation.

Keywords: machine translation, legislation, search, artificial intelligence, democracy

Introduction

The assertion that government services should be delivered as easily as ordering a pizza (Monson 2017), captures both the problem and the underlying motivation behind Global-Regulation (www.global-regulation.com). Global-Regulation is an online platform that aims to improve transparency and accessibility of global regulation by translating world's legislation to English. To do so, Global-Regulation uses Artificial Intelligence (AI) to translate the world's legislation to English and to create an automated system to identify compliance clauses and extract penalties from this legislation. This article takes a critical look at this state of the art online search engine of the world's legislation in English containing 1.6 million laws and regulations from 90 countries, machine translated from 30 languages and the Artificial Intelligence driven analytics it provides.

Part 1 explains the rationale for an online platform such as Global-Regulation. It highlights the close connection between transparency/accountability and democracy, and it highlights the role that the Internet and AI systems can play in this relationship. Part 2 provides a brief account of the history of the development of machine translation, and it describes some of the limits of the use of statistical machine translation for translating legal texts. Part 3 describes Neural Machine Translation (NMT), which is a new generation of machine translation systems also used by Global-Regulation. The advantages of using NMT as opposed to statistical machine translation are discussed. However, Part 3 also explains that nonetheless the technological advancement; human reviewers are still needed to ensure a correct

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translation of legal texts. Moreover, Part 3 discusses how Global-Regulation gather, normalize and translate data. Finally, Parts 4 and 5 outline the "big sky" thoughts on future directions for Global-Regulation. What can be done with this big data using AI? How can AI improve legal analysis? How can AI impact on legal advisors, governments and corporations dealing with the challenges of regulation? Can Global-Regulation and AI technologies be used to bridge the gap between people and laws?

1. Artificial Intelligence – Linked Democracy

Global-Regulation engage artificial intelligence in two ways: (i) employing machine translation to translate the world's legislation to English and, (ii) creating an automated system to identify compliance clauses and extract penalties from this legislation. These means are intended to foster democracy and improve regulation by enabling lessons drawing from one jurisdiction to the other. As stated by Lloyd (2017): "The internet collapses geography and expands our concept of community, yet geographic community is a cornerstone of our structures for democratic participation".

There is a strong relationship between democracy and transparency (Goltz 2017). At the same time, some argue that big data will enable citizens to be governed by a data-empowered "wise king", who would be able to produce desired economic and social outcomes almost as if with a digital magic wand. These trends bring to the front a term recently used by Microsoft's CEO Satya Nadella, of democratizing AI (Reporter 2017). By making AI available to everyone, it can move from a centralized tool, to one which can be used in fields such as healthcare, education, manufacturing, retail and more. The ultimate aim, is sharing AI's power with the masses, allowing anyone and everyone to use the AI systems they need.

Early arguments for internet democratization highlighted that internet tools have the potential to revolutionize democracy by introducing "direct two-way interaction between *citizens* and *politicians*" (Ferdinand 2000:1). In addition, systems, such as machine translation, allow people from different countries and cultures to come together and participate in the democratic debate, overcoming languages barriers (Uszkoreit et al., others 2017). Global-Regulation further increases the flow of information and transparency by allowing everyone, everywhere to access a database of the world's laws in English. In doing so, Global-Regulation does something that hadn't been done before (Global-Regulation Inc. Blog 2017) – create a search engine of the world's laws in English, the lingua franca of the internet (World Internet Statistics 2017). Other created machine translation systems to render legislations available in English, but these focus on translating from only one language to English (Kawachi et al. 2015).

Global-Regulation is the largest search engine of legislation from around the world, enabling comparative search of 1.6 million laws and regulations from 90 countries in English (Global-Regulation Inc. 2017a). Global-Regulation has employed Microsoft and Google's machine translation on a massive scale translating 750,000

laws and regulations from 30 languages into English (Goltz 2017a), and 250,000 technical standards provided by the American National Standards Institute (ANSI).[2]

The founders' vision for Global-Regulation is a "better regulation for a better world". The importance of the vision that the world's laws should be available to everyone everywhere cannot be overstated, mainly for developing economies with unique regulatory structure interested in drawing in external investment on the one hand, and making their legal system transparent to its citizens, on the other. Indeed, statistical evidence has been found of the direct relationship between the use of Information Communications Technology and good governance in developing countries (Gberevbie, Daniel et al. 2014). Making legislation transparent, accessible and searchable, especially on a comparative basis, is one of the cornerstones of democracy and a task made possible on this scale only due to recently mature technology, advances in artificial intelligence, and governments making laws available online.

Goltz and Gilmore (2018) explain that much of scholarly debate about the intersection of law AI is dominated by computer scientists rather than legal expert. Instead, they argue that legal scholar should lead research at the intersection between AI and law because: "Without philosophy and law, AI as applied to law is useless" (Goltz and Gilmore 2018: 89). To partially fill the gap highlighted by Goltz and Gilmore, the ensuing sections discuss the efficiency of machine translation technologies to translate legal texts, from a legal analysis point of view.

2. Machine Translation – Babylon of Laws

The raise of Big Data made the development of machine translation possible. In the 1990s, IBM used Canadian parliamentary transcripts, which need to be deposited both in English and French, to develop a statistical program to deduce which word in one language is the correct translation for another (Cukier and Mayer-Schoenberger 2013:31; Brown et al. 1990). Subsequently, Google further developed such statistical approach to machine translation by collecting billions of texts from the European Union's websites and documents in 65 languages (Cukier and Mayer-Schoenberger 2013:31). Therefore, the fact that in some jurisdictions the same legal documents are deposited in many languages is both the problem that triggered the need for machine translation and the solution to actually develop machine translation technologies. In fact, on the one hand, the development of machine translation was possible because legal documents are deposited in multiple languages in some jurisdiction such as in Canada and in the European Union. And on the other hand, the fact that machine translation was first created to translate legal texts highlights the need for a quick, reliable and affordable tool to translate legal documents from one language to another. This is particularly needed in part of the world where people who speak different languages live closely together and interact daily.

Today, machine translation is in continuous evolution; still, with some limitations. For example, rare and out-of-vocabulary words are problematic for conventional machine translation because these systems can only store a fixed modest-sized vocabulary (Luong et al. 2014), as well as word order between languages. For example, Maja Popović and Hermann Ney (2006) highlights that those languages which use compound words can be difficult to be translated. The authors explain that when a statistical machine translation system translates to

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[2] See <https://www.ansi.org/>

German as a target language, the system might not be able to choose the correct compound word because the components of the training data are not sufficient.

Furthermore, problems have been identified in the translation of long sentences (Ajay Anand Verma and Pushpak Bhattacharyya 2017), and in particular, it has been noted that legal texts can be more challenging for machine translation due to long and complex sentences (Sanja Seljan, Marija Brkić, and Vlasta Kučiš 2011). Yates (2006) argues that for various reasons – the translation of legal texts require the understanding of the socio-cultural context of the single words, legal languages are different from ordinary speech, and many legal concepts are peculiar to certain legal traditions and do not have specific counterparts – hence, the use of machine translation is inappropriate for law library users and researchers.

In his response to Yates', Somers (2007) criticized Yates' methodology and minimized Yate's analysis by explaining that machine translation systems are not meant to produce perfect translations. In fact, a number of studies argue that machine translation should not be used alone, but alongside with human translators. Kit and Wong (2008) undertook a comparative evaluation of machine translation from free online systems, for example Google and Babel Fish, of legal texts from some popular languages to English. They concluded that although machine translation quality is still less-than satisfactory, if properly used machine translation technologies "have been good enough to serve most of the translation demands for the purposes of information access, interchange, and assimilation" (Kit and Wong 2008:320). In other words, machine translation has the potential to increase the transparency of legal texts; however machine translation systems should not replace the human translation of legal texts. Rather, machine translation services could be used to create a first draft to be reviewed by a human translator (Mule and Johnson 2010). The process of reviewing can also be supported by automatic methods to evaluate the quality of machine translation outputs (Papineni et al. 2002; Matthew Snover et al. 2006). A combination of automatized and human translation is particularly efficient to bring down the cost of (exclusively) human translation, and to minimize inaccuracy due to (exclusively) using machine translation systems.

3. Global-Regulation and the use of Neural Machine Translation

Neural machine translation (NMT) is a new method of machine translation used by Google and Microsoft. Differently from traditional (statistical) machine translation, "which consists of many small sub-components that are tuned separately, [NMT] attempts to build and train a single, large neural network that reads a sentence and outputs a correct translation" (Bahdanau, Cho, and Bengio 2015:1). NMT has the potential to overcome some of the disadvantages of phrase-by-phrase translation systems. For example, to overcome problems related to translating long sentences, NMT encodes a sequence of words into a fixed length vector, which summarizes the entire sentence from the source language. Then, NMT decodes the vector into a sentence in the target language. This process should provide a more accurate and reliable translation of long a complex sentences (Ajay Anand Verma and Pushpak Bhattacharyya 2017). Moreover, to overcome the limit of the out-of-vocabulary words, NMT systems can emit a "pointer" for each out-of-vocabulary words in the source language. Then, when the text is translate in the target language; the pointer can be used to post-processing the out-of-vocabulary words using a dictionary or other automatized tools, if such a word was not translated in the first process (Luong et al. 2014). The fact that NMT systems can improve the translation of long and complex sentences and out-of-vocabulary words is particularly relevant for the translation of legal documents. Indeed, as seen above, legal documents are difficult to be translated exactly because they present long sentences and jargon.

Nevertheless, some limitations have been identified in the use of NMT methods. For example, NMT systems are slow to be trained, they still can present difficulties in translating rare words, and they sometimes fail to translate parts of the sentences. However, Google has developed an NMT system that in term of accuracy and reduction of mistakes surpasses all published result, as of October 2016 (Wu et al. 2016).

Considering the state of the art of machine translation, it seems unlikely that a court would accept translations produced solely through human independent tools. However, automatized systems, with the support of human reviewers, would be of great help for courts and legal non-profits that often lack enough resources for documents' translation (Jeff Hogue and Anna Hineline 2013:23).

Global-Regulation system connects to each country's official government website and uploaded the legislation to its database. If the legislation is not in English, the system uses machine translation.

The process of machine translation for laws is as follows:

1. Index the laws in the original language and track which language the law is in (in some countries laws are published in several languages)

2. Download the laws in the original language.

3. Convert laws to "plaintext" (from HTML, XML, PDFs, etc.), where plaintext means UTF-8-encoded plain text files.

4. Format the plaintext so that items like headers, footers, and extra non-legal information is removed. Attempt to normalize line endings (especially important for PDF conversions which have odd formatting issues).

5. Break the plaintext into pieces that can be handled by machine translation systems (which generally have a size limit) using logical break points such as line endings. Also translate the title of the law.

6. Convert each piece into English then stitch the English version together using the breakpoint identified in the previous step.

7. Store the translated law and the original law in the database.

8. As machine translation models for languages improve, periodically re-translate the laws and store them in the database.

Figure 1: How Global-Regulation works
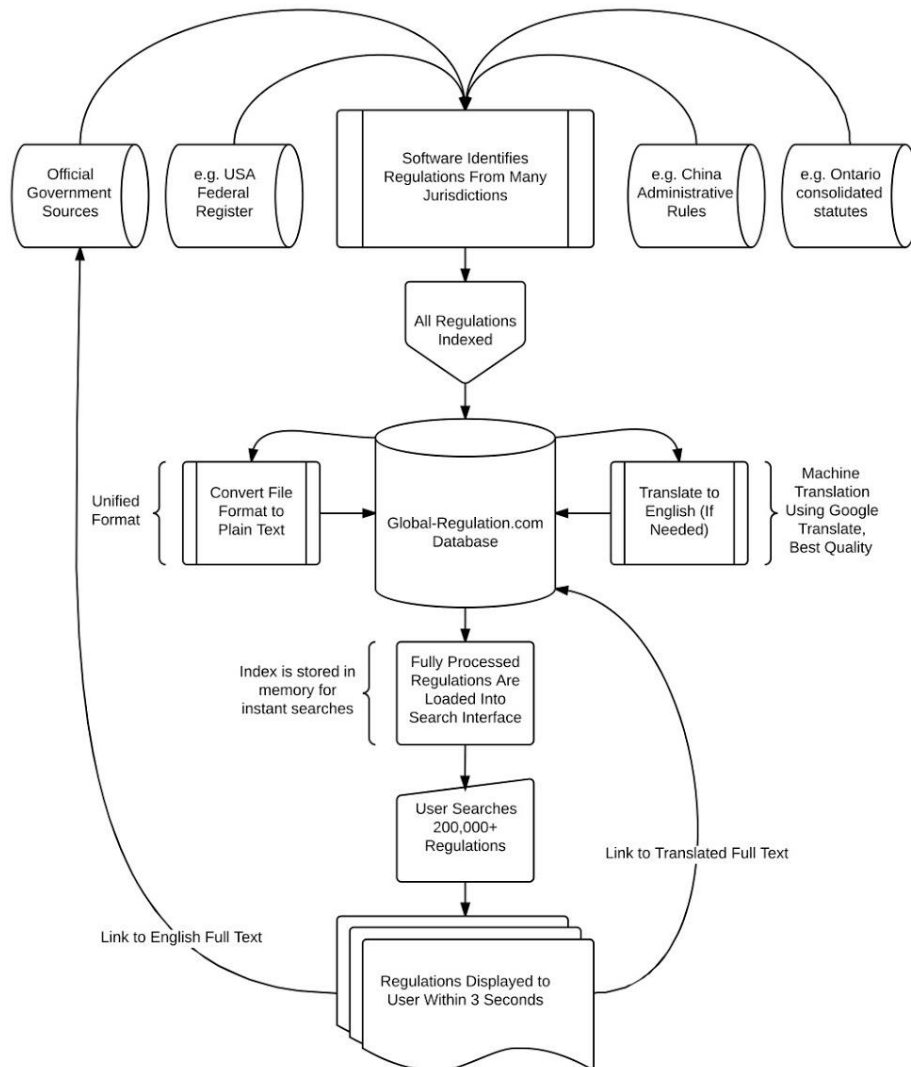
Global-Regulation system is completely software-based and there is no human evaluation of the accuracy of the translation. In other words, there cannot be expectation on the outputs of Global-Regulation to be perfect, and the system does not aim to substitute human analysis of any given law. Still, the platform allow for achieving a task otherwise impossible, researching legislations by key words (in English) from 90 countries and 30 languages – in English.

4. What's next?

Big data begs for analytics and Global-Regulation already provide some tools that enable the user to determine the complexity (Global-Regulation Inc. 2017b) of a certain field across jurisdictions, including a "heat map" and legislation changes across time; extract penalties (Goltz 2017b) clauses and amounts (Global-Regulation Inc. 2017c) in USD; and offer search ideas (Goltz 2017c) based on word-frequency cross-reference of the entire database. Global-Regulation has been referenced in numerous academic and non-academic articles, mainly for translated legislation.

As Surden (2014) explains, the use of AI for legal analysis can produce useful statistical assessments of complex data. Even though the outputs of these analyses can be less accurate then data analyzed by humans, they "can actually be sufficiently accurate for certain purposes that do not demand extremely high levels of precision and accuracy" (Surden 2014:115). In other words, AI can facilitate and enhance legal research, if accompanied by human analysis.

Combining big data - the world laws, with advanced artificial intelligence, creates fertile ground for endless opportunities in the realm of bringing the law to the people and bridging the gap between society's bricks (laws) and its citizens. Yet the main challenge going ahead is twofold: how to use the technology in a way that will be understandable, intuitive and friendly to people; and, perhaps more importantly, how to explain to users around the world, that AI technology, such as Global-Regulation, is a key to linked democracy.

Understandable, Intuitive and Friendly

Laws are complex creatures made up of multiple clauses and many times lengthy and complex text. Exploring the gist of the law, the regulatory mechanism or mechanisms embedded in the law is a tedious task requiring expertise and legal knowledge. Users accessing the law are usually interested in one of two things: (1) a specific clause in the law – this would be easy to find and read, especially by employing a simple keyword search, and (2) the 'gist' of the law – the regulatory mechanism or mechanisms that are the heart of the law.

These two components are usually divided by the type of the audience searching the law. The lay person would mostly look for a specific clause to clarify his or her legal situation in specific circumstances while the academic or the regulator would look for the regulatory mechanism embedded in the law. This will enable not only an overall understanding of the law, but also the opportunity to draw lessons from the law and 'translate' these lessons into a new law to be drafted in the academic or regulator jurisdiction.

For the lay person, finding the answer to a legal question in the legislation text, certainly across multiple jurisdictions, is like finding a needle in the haystack. This is not an easy task for the professionals as well. It is argued that with enough legal text combined with a suitable AI system that can digest questions and provide answers – the Global-Regulation database can be turned into the global lawyer of the future – receiving questions from users, for example, 'what is the punishment for unleashing a dog in public in Havana?', and providing an answer based on the relevant legislation.

By using "Text to Speech" and "Speech to Text" existing mechanisms, the user would not even need to type in her question and can just ask the question (as done on Apple's Siri) and receive an immediate reply in the users language. Hence, a German tourist visiting Cuba with his dog can be informed about the risk of setting fido free in the captial's central park by merely asking Global-Regulation for the answer, which obviously will be provided in German. The system will translate his question into English, will search the relevant law that was translated from Spanish to English and will return an answer in German.

Capturing the 'gist' of the law is more challenging. The current state of the art in Artificial Intelligence does not yet allow an algorithm to identify the regulatory mechanisms in the law. Feeding a bunch of clauses into an AI system and asking the system to determine whether these are 'command and control' or 'green light' regulation would be challenging. While Global-Regulation has succeeded in using AI to identify compliance clauses in legislation, and hence, identify the regulatory mechanism as explained above – the way is still long before an AI system could identify other, more complex, regulatory mechanisms based on the language of the law.

One option towards capturing the 'gist' of the law is trying to employ AI in creating an abstract of the law. If the automated system can produce a reasonable abstract of the legal text, which may not meet the quality of a human composing such abstract but will make sense and capture the essence of the law – this could be a big step towards making the system more understandable, intuitive and friendly.

Enhancing linked democracy

The connection between democracy, the online world and Artificial Intelligence is a complex one with multiple applications and implications. From online voting, through public consultations and the impact of social networks news algorithms, connecting democracy to the internet, especially with the immense force of AI, is a contested issue with much potential, negative and positive.

Engaging AI in the ways discussed towards offering the world laws in the user's language globally, as well as providing answers to legal questions and the abstract of the law, is a prominent pillar in the enhancement of democracy. Being interlinked with the rule of law, democracy flourishes when the requirements for transparent and accountable legal system are met. This is true not only to democracies but moreover to jurisdictions in which the rule of law is jeopardized and the regime is not a democratic one.

There are few levels of such jurisdictions and accordingly the value their people may gain from Global-Regulation. The Chinese government, for example, upload its laws to the internet and hence enable their inclusion in the database. Conversely, the database is exposing the Chinese people to foreign laws in their own language and hence allowing them to compare legislation from around the world to their own. This may have far reaching implications in the field of human rights and may lead, eventually, to a ban by the Chinese government on Global-Regulation's Chinese site (www.global-regulation.cn).

Other examples include Middle Eastern countries like Egypt or Iran that does not upload their laws online. While their citizens can use the internet and search Global-Regulation (assuming it is not blocked by the government), they and the rest of the world would not have access to

their own laws. This is the Achilles hill of Global-Regulation's system where as it can only drew on laws that are uploaded by the respected governments.

Nonetheless, within the realm of Linked Democracy, Global-Regulation can be considered as a revolutionary tool creating a modern Tower of Babylon and connecting a global village through its legal systems. The level of its adoption, in a way, is a question of perceiving legal systems – those who perceive legal systems as the main pillar of democracy, will probably adopt it enthusiastically (as already done by academics and democratic governments); those who perceive legal systems as an obstacle, will not only ignore it, but will ban it.

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