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THE EXPANSION OF ALGORITHMIC GOVERNANCE:
From Code is Law to Law is Code

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- CODE-IS-LAW
- BLOCKCHAIN
- SMART CONTRACTS
- CRYPTOCURRENCIES
- SELF-GOVERNING
- PROTOCOLS

"Code is law" is a form of regulation whereby technology is used to enforce existing rules. With the advent of Blockchain and Machine Learning, we are witnessing a new trend, whereby technology is progressively taking the upper-hand over these rules.

INTRODUCTION

We are spending increasing amounts of our lives interacting within platforms, whose user base belittle that of existing nation states. And yet, their governance is very far from the values of democratic countries. Instead, they are governed by software and algorithms that regulate our interactions. As put by Lessig, "Code is Law", a form of regulation where private actors may embed their values into technological artifacts, effectively constraining our actions. Today, code is also used by the public sector as a regulatory mechanism. This brings a variety benefits, mostly related to the ability to automate the law and to enforce rules and regulations a priori, i.e. before the fact. Yet, regulation by code also comes with important limitations and drawbacks that might create new issues related to fairness and due process. Blockchain technology comes with many newfound opportunities of turning law into code. By transposing legal or contractual provisions into a blockchain-based "smart contract" with a guarantee of execution, these rules are automatically enforced by the underlying blockchain network and will, therefore, always execute as planned, regardless of the will of the parties. This, of course, generates new problems related to the fact that no single party can affect the execution of that code. With the widespread adoption of Machine Learning, it is possible to circumvent some of the limitations of regulation by code. ML allows for the introduction of code-based rules which are inherently dynamic and adaptive, replicating some of the characteristics of traditional legal rules characterized by the flexibility and ambiguity of natural language. However, the use of ML in the context of regulation is not devoid of any drawback: data-driven decision making has shown implicit bias that discriminate minorities, and ML-driven laws may damage traditional principles such as universality and non-discrimination.

I. FROM CODE IS LAW TO LAW IS CODE

We are spending increasing amounts of our lives interacting within platforms, whose user base belittle that of existing nation states, e.g. Facebook enjoys more than 2 billion users, Youtube 1 billion, and Instagram 700 million users. And yet, their governance is very far from the values of democratic countries. Instead, they are governed by software and algorithms that regulate our interactions and online communications through obscure rules embedded in source code, and elaborated by a handful of private actors.

The digital environment opens up the doors to a new form of regulation — by private actors — which might try to impose their own values by embedding them into a technological artefact. As stated by Lessig (1999), "Code is Law": code is ultimately the architecture of the Internet, and — as such — is capable of constraining an individual's actions via technological means.

As more and more of our interactions are governed by software, we increasingly rely on technology as a means to directly enforce rules. Indeed, as opposed to traditional legal rules, which merely stipulates what people shall or shall not do, technical rules determine what people can or cannot do in the first place. This eliminate the need for any third party enforcement authority to intervene after the fact, in order to punish those who infringed the law. Software ultimately ends up stipulating what can or cannot be done in a specific online setting, more frequently than the applicable law, and possible also much more effectively.

An emblematic example of that are digital rights management (DRM) schemes, transposing the provisions of copyright law into technological measures of protection (Rosenblatt, *et al.*, 2002), and thus restricting the usage of copyrighted works (*e.g.*, by limiting the number of possible copies of a digital song that can be made). The advantage of this form of *regulation by code* is that, instead of relying on *ex-post* enforcement by third parties (*i.e.*, courts and police), rules are enforced *ex-ante*, making it very difficult for people to breach them in the first place. Besides, as opposed to traditional legal rules, which are inherently flexible and ambiguous, technical rules are highly formalized and leave little to no room for ambiguity, thereby eliminating the need for judicial arbitration.

Today, regulation by code is progressively establishing itself as a regulatory mechanism adopted not only by the private sector but also by the public sector. Governments and public administrations increasingly rely on software algorithms and technological tools in order to define code-base rules, which are automatically executed (or enforced) by the underlying technology. This is the case, for instance, of the *No Fly List* in the U.S., which relies on data mining to make predictive assessments about potential threats to national security (Citron 2007), or the use of computer algorithms to support judicial decision-making and determine jail sentences or paroles (O'Neil 2016).

Relying on technological tools and code-based rules as a means to regulate society brings about a variety benefits, mostly related to the ability to automate the law and to enforce rules and regulations *a priori, i.e.* before the fact. Yet, regulation by code also come with important drawbacks that might ultimately disrupt some of the basic tenets of law.

On the one hand, in contrast to traditional legal rules, which must be appreciated by a judge and applied on a case-by-cases basis, code-based rules are written in the rigid and formalized language of code, which does not benefit from the flexibility and ambiguity of natural language. On the other hand, the architectural implementation of online platforms ultimately depends on the specific choices of platform operators and software engineers, seeking to promote or prevent a certain type of actions. Just like any other technological artifact, code is not neutral, but inherently political: it has important societal implications, insofar as it might support certain political structures or facilitate certain actions and behaviors over others (Winner 1980).

"INDEED, AS OPPOSED TO TRADITIONAL LEGAL RULES, WHICH MERELY STIPULATES WHAT PEOPLE SHALL OR SHALL NOT DO, TECHNICAL RULES DETERMINE WHAT PEOPLE CAN OR CANNOT DO IN THE FIRST PLACE. THIS ELIMINATES THE NEED FOR ANY THIRD PARTY ENFORCEMENT AUTHORITY TO INTERVENE AFTER THE FACT, IN ORDER TO PUNISH THOSE WHO INFRINGED THE LAW."

II. NEW CHALLENGES TO LAW IS CODE: BLOCKCHAIN & MACHINE LEARNING

Blockchain technology — the technology underpinning Bitcoin — is an emergent technology that comes with many newfound opportunities of turning law into code (De Filippi & Hassan, 2016). With the advent of "smart contracts" (*i.e.* software deployed on a blockchain-based network, like Bitcoin, and executed in a distributed manner by a distributed network of peers), blockchain technology could revolutionize the way in which people coordinate themselves and engage in many economic transactions and social interactions (Tapscott & Tapscott 2016). Indeed, transposing legal or contractual provisions into a smart contract can give rise to a new set of code-based rules with a "guarantee of execution". These rules are automatically enforced by the underlying blockchain network and will, therefore, always execute as planned, regardless of the will of the parties.

A smart contract can be implemented in such a way as to make it possible for multiple parties, humans or machines, to interact with each other. These interactions are mediated by a blockchain application, controlled exclusively by set of immutable and incorruptible rules embedded in its source code. As such, smart contracts increase the applicability of *regulation by code*, by making it possible for people to formalize contractual agreements and economic transactions into a set of predetermined code-based rules, which are self-executing and self-enforcing. And to the extent that blockchain-based networks and associated smart contracts do not rely on any central server, they cannot be arbitrarily shut down by any single party—unless specifically provided for in their code. This further exacerbated the problem related to the rigidity and formality of code-based regulation, in that it becomes harder for any single party to upgrade the code or even just to affect the execution of that code.

"AS LAWS ARE INCORPORATED INTO A CODE-BASED WHOSE RULES DYNAMICALLY EVOLVES AS NEW INFORMATION IS FED INTO THE SYSTEM, IT MIGHT BECOME DIFFICULT FOR PEOPLE TO NOT ONLY UNDERSTAND, BUT ALSO QUESTION THE LEGITIMACY OF THE RULES THAT ARE AFFECTING THEIR LIVES ON A DAILY BASIS."

Machine Learning (ML) allows software to acquire knowledge from external sources and to learn or do things that it was not explicitly programmed to do. The availability of growing amounts of data ("big data"), along with the recent advances in neural networks and data mining techniques, has led to the widespread adoption of Machine Learning in several online platforms. With ML, it becomes in fact possible to circumvent some of the limitations traditionally associated with r*egulation by code*. While these platforms are still for the most part governed by a set of rigid and formalized code-based rules, ML allows for the introduction of code-based rules which are inherently dynamic and adaptive—thus replicating some of the characteristics of traditional legal rules characterized by the flexibility and ambiguity of natural language.Indeed, to the extent that they can learn from the data they collect or receive, these systems can evolve constantly refining their rules to better match the specific circumstances to which they are meant to apply.

However, the use of ML in the context of regulation is not devoid of any drawback. Data-driven decision making has already been proven to be implicitly biased, and consequently unfair (Hardt, 2014). Allegedly "neutral algorithms" systematically discriminate minority groups in their generalizations, showing results which may be catalogued, for instance, as racist or sexist (Guarino 2016).

Moreover, if implemented into law, the dynamicity of these rules could undercut notions of universality (*i.e.* "all are equal before the law") and non-discrimination. As laws are incorporated into a code-based whose rules dynamically evolves as new information is fed into the system, it might become difficult for people to not only understand, but also question the legitimacy of the rules that are affecting their lives on a daily basis. And as more and more of these rules can be customized and adapted to the profile of each individual user, the basic principles of universality and non-discrimination that characterize the current legal system might be forever lost.

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