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Law as Code

Exploring Information, Communication and Power in Legal Systems

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Abstract

This paper is an inquiry into the informational nature of legal systems to arrive at a new understanding of law-society interactions. Katharina Pistor in her book *Code of Capital* reveals how the legal 'coding' of 'capital' has deepened wealth inequality but does not offer an in-depth exploration or definition of 'legal coding'. In her critical response to 'legal singularity' as a proposed solution for making law more inclusive and accessible, Jennifer Cobbe calls for a closer look at the structural role law plays in society and how it has come to exclude, marginalise and reinforce power gaps. The paper aims to link Pistor's project with Cobbe's critical questions by exploring 'law as code' and modelling juridical communication and information flows in a legal system. For this purpose, I use two external frames — Claude Shannon's information theory and Niklas Luhmann's systems theory — to explore ways in which the legal system is exclusive, reflexive, and adaptive in the ways it interacts with society. An attempt to model information flows *within* (using Shannon) and *beyond* (using Luhmann) the boundaries of law reveals the influence of experts, their identities, and their lived experiences on both the translation and transmission of legal information. The paper is hopefully a starting point for more cross-disciplinary conversations aimed at addressing the structural issues with the way law shifts and reinforces power.

Keywords: information theory of law, social systems, exclusivity, reflexivity, adaptability

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Introduction

Background, literature, questions

Katharina Pistor's *Code of Capital* reveals how the legal coding of capital has deepened wealth inequality.[1] She argues that the protection afforded to capital allows private self-interest to flourish, but at a cost. The state's willingness to recognise and enforce privately coded capital deepens the problem of exclusion. This then leads to a trickle-up process: the benefits of the capital mostly only reach the capital-holders at the top of the wealth chain. According to Pistor, this trickle-up is a result of how assets are selected for legal coding. The coding of capital, both in its process and output, is exclusively understood by, and is accessible only to, legal professionals trying to protect the interests of the capital-holders.[2]

Pistor's critique has implications for the fast-moving debates over the relationship between law and computation. 'Legal singularity' has been offered as a solution to make law more inclusive. Benjamin Alarie, among other singularists,[3] argues that removing all uncertainty from decision-making will make law more predictable and transparent.[4] Jennifer Cobbe argues that singularists have failed to consider foundational issues arising from the structural role law plays in society.[5] In Cobbe's view, access to justice and fairness is hampered not only by the functional shortcomings of legal systems such as delay and complexity of language, but also by the way law has exacerbated pre-existing inequalities by design.[6] Problematising law as slow, costly, inefficient and complicated is therefore not enough. What really needs to be considered is how law has additionally become a tool for exploitation, exclusion, marginalisation, and the reinforcement of inequalities.[7]

While Pistor has begun laying the kind of structural critique that Cobbe calls for, she does not clarify, elaborate, or expand what is meant by 'code' or 'legal coding'. This paper will expand on 'coding' and elaborate how that can lead to a better understanding of the foundational issues with law. In that sense, the paper will argue that it is this *process* of legal coding that can help explain why law has the exclusionary social effects both Pistor and Cobbe refer to. There is a need to be more precise about 'law as code' and the role of power in that coding process. To investigate these questions, it is pertinent to explore how law interacts with society at large, an underlying assumption here being that law is separate from the 'social reality' it is constantly coding.[8] In this paper, I will use information theory to understand law-society interactions

1 Katharina Pistor, *The Code of Capital: How the Law Creates Wealth and Inequality* (Princeton University Press 2019).

2 Ibid 1-22.

3 Daniel Goldsworthy, 'Dworkin's dream: Towards a singularity of law' (2019) 44(4) Alternative Law Journal 286.

4 Benjamin Alarie, 'The Path of the Law: Toward Legal Singularity' (2016) 66(4) University of Toronto Law Journal 443, 445.

5 Jennifer Cobbe, 'Legal Singularity and Reflexivity of Law' in Simon Deakin and Christopher Markou (eds), *Is Law Computable? Critical Perspectives in Law and Artificial Intelligence* (Hart 2020) 107.

6 Ibid 112.

7 Pistor (n 1). For the role of law in deepening gender inequality, see Carol Smart, *Feminism and the Power of Law* (Routledge 1989).

8 I use 'social reality' instead of 'social realities' based on Roy Bhaskar's idea that there are many epistemologies but one reality. See Roy Bhaskar, *A Realist Theory of Science* (Routledge 2008). While I distinguish law from 'social reality', I acknowledge that law itself is a part of it, thus making the relationship between law and 'social reality' as that of coevolution/structural coupling. For the sake of convenience, it will be more straightforward to refer to law's external environment, which law codes, as the 'social reality'.

and explore how the coding process might end up reinforcing power gaps.

The existing contributions in the law and computation literature offer descriptions of law in informatic-computational terms. Mireille Hildebrandt has previously explored the question of how law can be treated *as* information.[9] Simon Deakin explains how different social phenomena are linguistically represented in text-driven legal form.[10] While both Hildebrandt and Deakin explain the nature of law as representation of information from legal evolutionary perspectives, they do not engage with the way law *receives* information from society and then *transmits* it back, thereby leading to the exclusionary effects discussed by Pistor and Cobbe.

The aim here is to fill this gap and conceptually clarify the nature of 'law as code'. By these means, Pistor's ideas will be shown to be linked with Cobbe's critical questions. The umbrella question I therefore ask is — *how does law translate/'code' information?* In exploring this question, I attempt to present the legal system as an information system that communicates both internally and externally[11] and further ask — *how does a legal system translate, transmit, retain, and communicate information? What do these translation and transmission processes entail? How does information flow within a legal communication system and where does power get locked in?*

Objectives, methodology, scope

I will address these questions using two external frames. My primary frame of exploration will be a theory that goes back to the origins of modern computation as we know it today — Claude E. Shannon's information theory (sometimes also referred to as a theory of communication), to understand how information is transmitted within the legal system.[12] Why this theory of communication in particular? Three reasons.

One, Shannon's focus on encoding and decoding of messages to enable their transmission is what makes it an apt frame to understand legal coding. Two, a Shannonian understanding of communication puts weight on the ability of the receiver to translate a message — defining 'information' as the difference between what the destination of the message knew before versus what it knows after the transmission is completed. The theory's emphasis on the receiver's ability to decode messages reveals how agents control information flows within systems, further lending an explanation to Pistor's claim that legal coding is controlled by the 'masters' of the code.[13] By these means, studying law through Shannon's lens contributes to a broader agent-based critique of the legal system, indicating that is it not in fact law as such that 'codes', but

[9] Mireille Hildebrandt, 'Law *as* Information in the Era of Data-Driven Agency' (2016) 79(1) The Modern Law Review 1.

[10] Simon Deakin, 'Juridical Ontology: The Evolution of Legal Form' (2015) 40(1) Historical Social Research 170.

[11] These enquiries are largely in line with Elena Esposito's provocation to think about 'artificial communication' instead of 'artificial intelligence'. She suggests that by examining how intelligent our algorithms are likely to be on a comparative human scale, we are asking the wrong question. A more practical/forward-looking approach would be to start examining how algorithms are likely to communicate and interact with human life. Elena Esposito, *Artificial Communication: How Algorithms Produce Social Intelligence* (The MIT Press 2022).

[12] CE Shannon, 'Mathematical Theory of Communication' (1948) 27 The Bell System Technical Journal 379.

[13] As the article will argue below, it is not just lawyers but a broad variety of experts engaging with the legal system at different stages of the transmission who constitute the 'agents'. A sole emphasis on lawyers as the 'masters' of the code by Pistor seems a bit exaggerated.

the agents within the legal system doing the encoding and decoding.[14] Three, Shannon's conceptualisation of 'noise' can be compared to silences, or vagueness or plasticity, within the legal system — features that make it 'cognitively open' in terms of systems theory. In other words, it is the indeterminacy of legal rules, or their messiness, that enables law to respond to external noise and adapt to its environment.

The choice of Shannon's theory among various other theories of communication in computer science[15] must be perceived as the beginning of a larger exploratory project. Unlike other disciplines such as economics and law that treat 'information' as a resource to be regulated,[16] theories of communication in computer science, especially Shannon's, engage with the ontology of 'information' itself.[17] I will borrow from Shannon's communication model, using its elements as analogies and disanalogies, to introduce a framework for a proposed *Information Theory of Law (ITL)*, a theory to explain, in admittingly oversimplified manner, how information flows within and outside the 'social system' of law, in the sense understood by Niklas Luhmann.[18]

In addition to Shannon, I will also borrow from Luhmann's systems theory and his ideas of code — my second external frame — to understand how law interacts externally with its environment.[19] While Shannon is purely concerned with information and how it is transmitted within a digital system from point A to point B, Luhmann looks at the way social systems interact externally with each other. Neither theory offers a full account of what Pistor focuses on—the role that agents play within these systems. In this paper, I will attempt to interlink Shannon, Luhmann and Pistor as a response to Cobbe's call for a structural critique of law.

It is perhaps important to note here what the paper does not do. First, while it introduces the theoretical, critical and exploratory elements of the project, it is not a comprehensive account of any of them. The paper is an introduction to a theoretical framework that is a work in progress, and attempts to model juridical communication within and beyond the social system

[14] The language used in the paper to discuss how 'law codes' may suggest that law has agency. However, it is clarified that it is the agents within law that control these coding processes. In that sense, there is scope for bridging the agent-based and systemic critiques of law. On the importance of distinguishing between causality, a feature of systems, and agency, a capability of human actors, see Andreas Malm, *The Progress of This Storm* (Verso 2018).

[15] Some alternate theories of communication that can possibly be used to explore communication in law are: Norbert Wiener, *Cybernetics: Or Control and Communication in the Animal and Machine* (The MIT Press 1961); 'Chaos' (*Stanford Encyclopedia of Philosophy*, 13 October 2015) <https://plato.stanford.edu/entries/chaos/> accessed 17 July 2023; 'Dynamic Epistemic Logic' (*Stanford Encyclopedia of Philosophy*, 24 June 2016) <https://plato.stanford.edu/entries/dynamic-epistemic/> accessed 17 July 2023.

[16] George J Stigler, 'The Economics of Information' (1961) 69(3) The Journal of Political Economy 213; Joseph E Stiglitz, 'Information and the change in the Paradigm in Economics' (2002) 92(3) The American Economics Review 460; Charles I Jones and Christopher Tonetti, 'Nonrivalry and the Economics of Data' (2020) 110(9) American Economic Review 2819.

[17] I use the word 'ontology' here in the sense used by Tony Lawson to point ontology's significance for social sciences in general. Tony Lawson, *The Nature of Social Reality: Issues in Social Ontology* (Routledge 2019) ch 1.

[18] Law can be understood as an 'autopoietic' social system that has its own boundaries of legal language. It communicates internally within these boundaries, a feature that makes it operationally closed. It also responds to its external environment, a feature that makes it cognitively open. Niklas Luhmann, *Law as a Social System* (Fatima Kastner and others eds, Klaus A Ziegert tr, OUP 2004).

[19] Ibid.

of law. Second, this means that an in-depth engagement with alternative, more complex theories of communication other than Shannon, though perhaps useful, remain beyond the scope of this paper. Third, while the paper uses some parts of Luhmann's concepts to extend the theoretical strands reached using Shannon, it is not a Luhmannian enquiry into the nature of law. The paper therefore steers away from an in-depth engagement with both Luhmann's critics and a prospective critique of an incomplete Luhmann's frame used to extend (rather than build) the theoretical framework proposed here.

Beyond this introduction, the paper is divided into three sections. In the next section, I will show how Shannon offers the apparatus and vocabulary to *theorise* ways in which law and society interact, revealing the role of agents in these coding processes. In the section thereafter, I will link the Shannonian model with that of Luhmann's, to *critically examine* why these translation or coding processes can never be neutral. This interlinking will further help in bridging Cobbe's inquiries with Pistor's work that show why and how the legal system locks in power gaps — through the identities and lived experiences of the agents themselves, as well as of the inherently political and unequal realities they are trying to code. In the conclusion, I will finally discuss the implications of this analysis for legal technology and chalk out future research trajectories that could benefit from *ITL*.

Terminology: 'legal system', 'law', 'code'

Before diving into the substantive elements of my explorations, let me first explain what I mean by the terms 'legal system', 'law' and 'code' throughout the paper. 'Legal system' is used as understood in systems theory. It includes everything that has to do with the law and its interaction with the society, including agents that run and are a part of that system. The theoretical conceptualisation of 'legal system' here goes beyond the strict Luhmannian conceptualisation that has been criticised for leaving humans out of the picture.[20] As demonstrated below, it is not just a social but also an information system, which is implicit in Luhmann's own reliance on cybernetics.[21]

The term 'law' can be understood as information that flows within the legal system. This is mostly in the form of text-driven but can also be in the form of code and/or data-driven language, contained in statutes, precedents, interpretation, regulations and so on. And because *ITL* deals not just with law but also with its interactions outside the legal boundaries, and the system includes agents who are both legal and non-legal experts, 'law' would include what Mariana Valverde calls the 'common knowledge' or cultural understandings of law.[22]

The term 'code' has been used in three different ways in the paper, each of them accompanied with context where necessary.[23] First is 'code' as a verb. Law is

[20] Michael King and Chris Thornhill, *Niklas Luhmann's Theory of Politics and Law* (Palgrave Macmillan 2003) 204.

[21] Michael Paetau, 'Niklas Luhmann and Cybernetics' (2013) 11 Journal of Sociocybernetics 75.

[22] Mariana Valverde, *Law's Dream of Common Knowledge* (Princeton University Press 2009).

[23] It might be important to clarify here, that 'code' is not used anywhere in this paper in the sense used by Lawrence Lessig, *Code: And Other Laws of Cyberspace* (Basic Books 1999). This paper therefore does not engage with the 'law as code' vs. 'code as law' debate that has been extensively written about in in a different context. See for example, Michael Junnemann and Udo Milkau, 'Can Code be Law?' (*Bird & Bird & DLT*, 27 July 2021) <https://www.twobirds.com/-/media/pdfs/news/articles/2021/junemann-milkau-2021-can-code-be-law-download.pdf> accessed 17 July 2023.

explained to have been 'coded'[24] through a distinct conceptualisation of the world.[25] The verb 'coded' refers to the translation process wherein the legal system takes information from outside, and puts it into juridical terms (of course through its agents) that the system can then internally process. For example, law 'codes' the computer I am writing on as 'moveable property', the substance of what I am writing as 'intellectual property', myself as a 'legal subject', my identity as 'female'.

Second is 'code' as a noun. Through the process of 'coding', which is an active deliberate process that creates meaning,[26] legal terms come to have distinctive meanings which are separate from their usages in daily life and other discourses.[27] This is what makes law a form of 'code'.[28] 'Code', used as a noun here, refers to this distinctive system of linguistic representation through which information is communicated within and outside the legal system.

Third is 'code' as an adjective. There is an ongoing debate about the plausibility and desirability of further coding of law by shifting from text-driven law to code and/or data-driven law.[29] The term 'code' in the phrase 'code-driven law', used as an adjective here, refers to digital code used in programming languages.

Law as an information system: a theoretical exploration

An introduction to Shannon's information theory

Shannon offers a mathematical definition of information as coded data which is transferred from a source to a destination.[30] He suggests that communication is a function of the receiver's ability to accurately decode and retrieve the meaning of the message.[31] The idea of digital representation implies that the content of a message should not matter to the mode of its transmission.[32] In other words, the message during its transmission would always be in the binary form of 1s and 0s, regardless of whether it contains an audio, video or text. This would essentially mean that the information can always be transmitted, regardless of what form it was originally in, once it has been digitally represented. Thus, an underlying assumption of the theory is that the message to be

[24] I use the words 'codes'/'coded'/'coding' throughout the paper as a verb that involves both the processes of 'encoding' and 'decoding', unless expressly specified for either of the two separate processes.

[25] Simon Deakin, 'Evolution for our time: a theory of legal memetics' (2002) ESRC Centre for Business Research, University of Cambridge Working Paper No 242 <https://www.cbr.cam.ac.uk/wp-content/uploads/2020/08/wp242.pdf> accessed 17 July 2023.

[26] In legal theory, this process of 'coding' could potentially be said to have an effect that goes beyond just describing or defining a social phenomenon in juridical terms. 'Speech Acts' (*Stanford Encyclopedia of Philosophy*, 24 September 2020) <https://plato.stanford.edu/entries/speech-acts/> accessed 17 July 2023.

[27] Deakin, 'Juridical Ontology: The Evolution of Legal Form' (n 10).

[28] It is important to note here that the use of 'code' in explaining 'law as a form of code' is in the same vein as the use of the term 'codes'/'coding'/'coded' as an active verb. This is different from the use of the term 'code' in the phrase 'code-driven law'.

[29] I use the word 'code' throughout the paper as a noun in context of 'code-driven law', to refer to automation within law by shifting to digital forms associated with computerisation.

[30] Shannon (n 12).

[31] O Aftab and others, 'Information Theory and the Digital Age' (2001) Final Paper, Project History, MIT 6.933 <https://web.mit.edu/6.933/www/Fall2001/Shannon2.pdf> accessed 17 July 2023.

[32] Ibid 3.

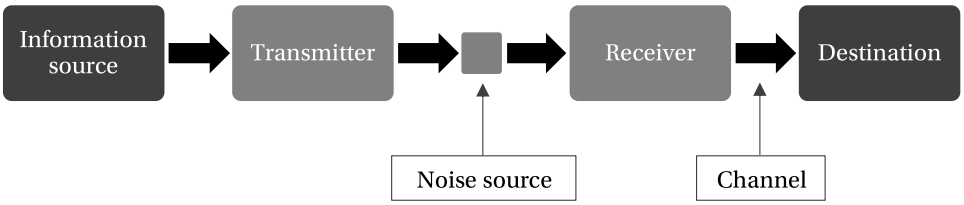

Figure 1. Shannon's Information System[33]

transmitted is distinct from its transmitter, and that the content or the meaning of that message has no effect on the way it is coded.

The transmission of a message is depicted in Figure 1. The message is generated at the information source and then transmitted via a channel through a transmitter which encodes the message in a digitally transmittable form. It is then passed onto the receiver, which decodes the message to extract its original meaning, and is then finally passed on to the destination. The rationale behind coding messages lies in minimising interference by external noise which is not supposed to be part of the message being transmitted. Digital encoding and decoding are therefore designed to solve an engineering problem and reduce the risk of errors in communication.

The application of Shannon's information theory to fields outside of computer science gave rise to a heated debate in the field in mid-1950s. 'Purists' (including Shannon himself) maintained that the scope of information theory had ballooned into something more than it was intended to be.[34] They critiqued the 'outsiders' for applying the theory to almost any form of communication, ranging from neural networks to ecological systems.[35] This debate therefore gradually restricted the scope of information theory to the field of computer science.

I understand that my attempt to engage with Shannon as a legal academic is that of an 'outsider'. However, I must clarify that I am not 'applying' Shannon's theory to law and have deliberately refrained from transplanting the technical solutions offered by Shannon for digital systems (specifically those towards reducing noise and optimising efficiency of communication) to the legal system. As I will argue below, the apparatus and skeleton of Shannon's theory still has much to offer for the understanding of communication in social systems, especially the legal system. In this light, this section may provide impetus to revive the debate about the wider significance of Shannon's model beyond its disciplinary boundaries in new light.

Mapping Shannon's elements to law

Shannon's system comprises of messages and the digital codes that contain them. To enable communication between two devices (source and destination), it is important to code messages in a language that both the transmitter and receiver understand, to increase accuracy of the transmission. Another requirement is the transmitter's and receiver's abilities to translate the message into code and vice versa, the message being completely independent of the code that contains it.

[33] Shannon (n 12) 2.

[34] O Aftab and others (n 31) 10.

[35] Ibid.

If law is a form of code and the information it contains corresponds to an aspect of social reality, it is time to think where the other elements of Shannon's system fit in this analogy. The primary six components of Shannon's information system can be applied to the concepts of law and social reality in the following ways (see Figure 2):

1. An 'information source' produces a message or a sequence of messages to be communicated to the destination. This can be compared to a coordination problem originating in society to which law could potentially provide a solution.[36] An information source in a legal system is anything that gives rise to the need to code an aspect of social reality into legal language. The information source therefore ultimately routes back to the behaviour of the subjects of law.

2. A 'transmitter' operates on the message to produce a signal for its transmission over the channel.[37] In other words, the one responsible for 'encoding' the message, to make it transmittable over a channel is the 'transmitter'. In the present context, these are agents who participate in the process of juridical encoding. This will include those responsible for stakeholder engagements, researching and drafting in legislative bodies, lobbying as activists and academics, as well as those involved in the process of establishing precedents such as clerks, lawyers, legal academics, policymakers, judges, and so on.

3. The 'channel' is the medium used to transmit the signal from the transmitter to the receiver. Channels in this sense are the institutional structures put in place to enable the law to function the way it does. These include courts, tribunals and other dispute resolution ('DR') mechanisms.

4. A 'receiver' ordinarily performs the inverse operation to that of the transmitter. It decodes the message from the signal received using a translation 'key'. The process of 'decoding' in Shannon's system is analogous to legal interpretation in courts where law is translated back to social reality and applied to different sets of facts each time. The receivers would therefore include judges and anyone who assists them in legal interpretation, including law clerks, law students, legal academics, lawyers arguing the case, legal interns assisting the litigating lawyers and so on. Furthermore, considering the wider definition of 'law' explained below in the section 'Exclusivity and "operational closure" of law', anyone who is involved in communicating the interpretations of law to the public will also count as a 'receiver'. This would therefore include experts who are not strictly 'legal', but also experts such as journalists, bloggers, interviewees on media platforms, social science experts engaging with legal debates and so on.

5. The 'destination' is what the message was initially intended for. In the present analogy, this could be compared to the endpoint of the legal system, in

[36] The term 'coordination problem' has been borrowed from Coase theorem and broadly refers to the tendency of conflicts arising in society because of limit on available resources; RH Coase, 'The Problem of Social Cost' (1960) 3 The Journal of Law and Economics 1.

[37] For example, in telephony, this operation consists merely of changing sound pressure into proportional electric current. In telegraphy, transmission is an encoding operation that produces a sequence of dots, dashes and spaces on the channel corresponding to the message; Shannon (n 12) 5.

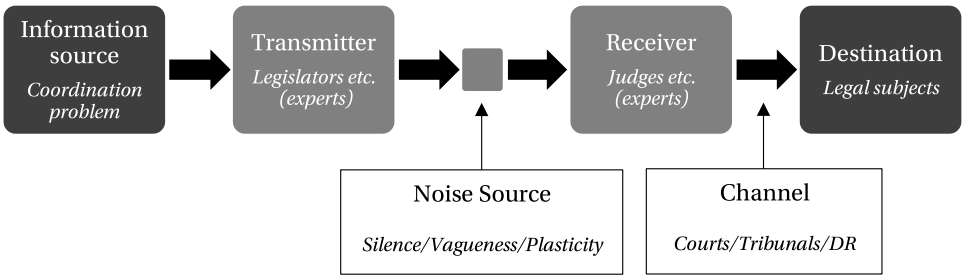

Figure 2. Law as an Information System

other words, the legal subjects to whom the legal rules are addressed.

6. 'Noise' is the information that ideally needs to be screened out by the channel for the communication to be effective. In law, this can be compared to elements of the social reality that have not been or cannot be coded yet. This will include definitions in legal statutes that are deliberately left vague to make law adaptive and flexible.

Implications of law as an information system: a critical exploration

Exclusivity and 'operational closure'[38] of law

Legislators and other legal experts help in the juridical encoding of social reality by drafting the law. Similarly, lawyers, judges and other legal experts help in decoding the law to apply it to facts, translating the code back to social reality. In practicality however, the encoding and decoding processes cannot be as cleanly segregated. For instance, judge-made law in courts will amount to 'encoding' as much as 'decoding'. The encoding and decoding processes are therefore almost always occurring simultaneously. By extension, the roles of transmitters and receivers are much more fluid than they first appear.

This means that the transmitters and receivers, or 'experts' as opposed to 'subjects' to whom the law is addressed, are more well versed with the legal code than the rest. Therefore, transmission in both Shannon's system and the legal system, excludes those who do not have the ability to encode or decode. While this exclusion serves a desirable function in Shannon's system by making the transmission secure, the effect of this exclusion within the legal system is not always desirable.

This exclusivity of law has implications both for law itself and for how it shifts power. The fact that law codes social reality suggests that it is separate from its environment. In other words, it has a boundary that excludes social reality which has not or cannot be coded into juridical form. It is important to note here that this separation between the social realm of law and the external world does not indicate that law is fictional.[39] Law ascribes ontology to society which is distinct from that of the natural or material world and it is the way law interacts with its external environment

[38] According to Luhmann, law operates exclusively within the boundaries of legal language by coding events in its environment using a binary classification that is unique to itself: legal/illegal. See Luhmann (n 18) 11.

[39] Yuval Noah Harari, *Sapiens: A Brief History of Humankind* (Vintage 2015); Joshua Fairfield, *Runaway Technology: Can Law keep Up?* (CUP 2021). While Harari conceptualises law as a 'social construct', Fairfield calls it 'fiction'.

that makes it 'closed' or 'exclusive'.[40] The boundary of legal conceptualisation or legal language separates it from brute facts, especially where it births institutional facts that would not exist if it were not for this juridical coding. For example, concepts such as 'corporation', 'intellectual property', 'contract' and 'property' only exist because law defines or 'constructs' them through coding.

In this closed system, it is therefore the experts who predominantly control the channel. This is because they have specialised knowledge that enables them to choose both the statutory language to draft laws (encoding), and how they will be applied to different coordination problems (decoding). In Pistor's terms, they do not just apply existing law, but get to actively fashion it.[41] For example, there are accounts of the ways in which Indian judges in the recent past have 'cherry-picked' legal issues for delivering more progressive judgements relating to gender issues than others.[42] Carol Smart captures how personal biases and social conditioning of legal experts determine such choices, enabling the legal systems to reinforce patriarchal structures.[43]

It is not just the substance of law where this power seeps in. These transmitters and receivers also control whether the channel will be used in the first place, by for instance negotiating contracts with settlement provisions that bind parties to waive their rights to go to Court. They therefore influence both the information to be transmitted and the channel it is transmitted by. Better resourced subjects, by having better and often more expensive legal representation, can then 'jam the signal' by asking for repetitive adjournments or by coercing the weaker parties to settle. The operational closure of law therefore can be said to lock-in power gaps based of the ones controlling information, who more often than not, are serving the interests of those with more power and resources. The consequences being, exclusion that is not just linguistic but also structural.

Reflexivity and power lock-ins

In Shannon's system, all that matters is the form of the code. The transmitters are different from the messages they transmit. In that sense, the code is independent of the message that it contains, the content of which is not so relevant for the transmission to be successful.[44] This, however, does not hold true in the case of law. In the legal system, the content of the message matters as much as, if not more than, its form. Therefore, no matter how much the law tries to rebalance society, it will end up reflecting power gaps, as long as they exist in the social reality it is trying to code. What the legal system can do however, is notice these in the coding process, and attempt to address them. And that it can only do through its agents.

Since the transmitters and receivers (experts) are also the subjects of law, and are constantly being governed by it, they inevitably form part of the social reality that law is coding. It is therefore neither the reality being coded, nor the process of coding, that is neutral. Unlike Shannon's codes and messages, law and social reality do not exist completely independent of each

[40] The ontological understanding of the social world as distinct from the natural world is based on the work of Bhaskar (n 8).

[41] Pistor (n 1) ch 7.

[42] Jayna Kothari 'Is the Supreme Court cherry-picking its gender battles?' in Tanja Herklotz and Siddharth Peter de Souza (eds), *Mutinies for Equality: Contemporary Developments in Law and Gender in India* (CUP 2021) 57.

[43] Smart (n 7).

[44] Shannon (n 12).

other. While they have their own separate existences, they affect each other through the dynamic of coevolution.[45] Law is constantly shaping the social reality it is coding and vice versa. It is therefore reflexive.

Reflexivity of law has implications for our understanding of social systems and the way they create and shift power. The co-existent nature of law and social reality and the way they affect each other implies that law operates in a dynamic, non-linear relationship with its external environment. Because law is coding social reality while simultaneously shaping it, it is misleading to say that law operates efficiently by being better aligned with its context. The very reality which law is supposed to represent is perpetually evolving because of the way it is being coded by law. It is this reflexivity, in turn, that enables the otherwise closed system to interact with its environment. It then follows that law is constantly coding the social reality of the legal experts who are meant to encode and decode it. This reveals what one may call the 'hyper-reflexivity' of law, which by projecting itself on to the environment it is reflecting, is in a way *coding itself*.

The access of any subject to the legal system is therefore not just a function of knowledge about the legal code. It is also a function of the way law, through its previous agents, has historically coded their own reality i.e. their *identity*. Identity here refers to the social reality of an individual, that is the social status or position that may or may not have been juridically coded yet. It exists by an individual's self-perception, regardless of whether the recognition by law or society aligns with that perception. The knowledge of legal experts as to how law works, places them in a privileged position, especially because they are aware of how law has coded their own identity. This is why the more diverse an identity group of experts in a legal system is, the more likely it is for the law to code varied forms of identity, thereby potentially increasing inclusivity.

For example, consider a case where a trans woman who is also a person of colour, Kiran, is forced to leave their workplace because of emotional harassment and a hostile environment created by their co-workers. The ease of navigating the system to seek an appropriate legal remedy will not only depend on their ability to access the system by knowing the law, but also on whether law is equipped to handle such a situation at all.

The access of any subject to the legal system is only partly a function of their knowledge about the coding process, and the resulting coding of their identity. It is also a function of the (dis)advantages that the subject might experience while seeking legal help. Therefore, it matters how law positions subjects by reference to the different vectors of their identity such as class, caste, race, gender, disability, religion and so on. It is important to clarify that I am not talking about procedural advantages or disadvantages. Those are parts of the 'channel' formed by legal and non-legal institutions, which is what the singularist vision mostly targets. I am talking about the foundational hurdles that route back to privilege (or the lack thereof) that the subject inherently carries because of their intersectional positional identity.[46]

In Kiran's example, the ease of navigating the system will for instance, depend on Kiran's educational status, socio-economic status, how they are perceived by the legal experts who are meant to help them and so on. If they decide to settle the dispute outside the

[45] Deakin, 'Evolution for our time: a theory of legal memetics' (n 25).

[46] Catalyst, *Intersectionality: When Identities Converge* (2020) <https://www.catalyst.org/research/intersectionality-when-identities-converge/> accessed 17 July 2023.

adjudicatory mechanism, it is worth considering how their history, past experiences, and future worries affect their negotiation leverage at the table. The impact of these factors might be very different for a heterosexual woman fighting the same legal battle, and even more so for a white heterosexual man from an upper-class group.

It is probably fair to conclude that at the surface level, all subjects of a legal system have the same 'key' at their disposal. The 'key' in the analogy would translate to tools of legal interpretation and adjudication available to all through channels like courts, lawyers and judges who could help in decoding law, and other sources of understanding legal language such as books or the internet. However, a deeper analysis of the decoding process reveals that there are two more layers to this: (1) each subject has their own social reality (a part of which is their identity) being constantly coded (or not) by law; and (2) the process of legal coding may or may not make the system more accessible depending on their individual socio-economic circumstances and accidents of birth.

Everyone in private law for example, is entitled to hold property, enter into a contract, and buy assets. It then falls upon public law to rectify the inequity that restricts access of some over the others to these rights based on their acquired privilege (such as wealth) or ascribed privilege (such as identity). However, public law can rectify inequalities only to the extent that it can (and wants to) notice them. Having understood law as an information system that encodes and decodes with the help of experts, it is these experts that form the 'eyes' and 'ears' of the system. By having control over the coding process, they get to determine what information gets to be transmitted and what gets to be vetted out as irrelevant or 'noise'. This makes selectivity an embedded feature of the legal system, which can never be truly neutral even when it seems or pretends to be.

Therefore, whether an individual's social reality has been sufficiently coded will largely depend on how well these experts comprehend that reality while coding, which may further be affected by their own identities, lived experiences, biases, ideologies, sensitisation, training and so on. This will then influence their ability to consult affected communities, interject or lobby during legislative processes, argue matters with an intersectional approach, give more importance to certain matters/clients/issues over others, or approach any legal issue with care and empathy. This essentially means that the questions of privilege and power cannot be ignored while brainstorming solutions, especially when the ones being currently offered require further coding of law into digital code.

This is a problem that is not unique to the law. Algorithms too have the potential to 'shadow power'[47] and reinforce biases. Kate Crawford for example explains 'the white guy problem in artificial intelligence' research by emphasising the role of underrepresentation among prominent voices in the field. The concentration of primarily white male researchers from the West has led to a disproportionate emphasis, focus, and funding on problems that are specifically threats to them, such as 'singularity' and 'existential risk.'[48] Questions of justice and inequality, seemingly negligible threats based on the perception of these expert

[47] Doha Debates, 'Bias in A.I. for Women and People of Colour | Speaker Spotlight: Joy Boulamwini' (16 April 2019) <https://www.youtube.com/watch?v=z1w0ZVrzZjw> accessed 17 July 2023.

[48] Kate Crawford, 'Artificial Intelligence's White Guy Problem' *The New York Times* (26 June 2016) <https://nytimes.com/2016/06/26/opinion/sunday/artificial-intelligences-white-guy-problem.html> accessed 17 July 2023.

researchers, are noticeably missing from the plethora of research being published in these areas.[49] This problem is likely to seep further into the practice of law if we moved from text-driven to code and/or data-driven law, which would just shift the power from experts in legal language to experts in computational language.[50] This will lead to a further reduction in the number of people who know and understand the 'language' of the law (which will no longer be text-driven), thereby exacerbating, rather than addressing the problems of inaccessibility and both linguistic and structural exclusivity.[51]

Adaptability and 'cognitive openness'[52] of law

While the boundaries of legal language (or code) make law exclusive, and its communication with the society makes it reflexive, I argue here that it is external noise within the legal system that makes it adaptable. Shannon's system treats noise as an undesirable element. For Shannon, it is extra information that disrupts the transmission. It is primarily because what Shannon's theory explains is a linear process of internal communication from an information source to a destination.[53] The objective of his work is to make this transmission as quick and efficient as possible. Reducing the amount of information to be encoded/decoded would compress the file to be transmitted, thereby reducing the cost and the power required to transmit it. This mitigates the risk of error in transmission.

When it comes to the role of noise, the legal system departs from Shannon's system in primarily two ways. First, compression of information and thus efficiency is not the only objective of law. Therefore, noise is not as undesirable as it is for Shannon's system. Second, unlike Shannon's system which is linear and static, the legal system, by way of its reflexivity, is constantly coding, shaping, and responding to its external environment. It can be argued here that the system's dynamic nature and adaptability is partly enabled by the 'noise' which lets it interact with the outside environment. Noise is therefore not just desirable but rather necessary to ensure reflexivity.[54]

The 'noise' or extra information that may seem redundant today is retained within the legal system to accommodate unpredictable ways in which its environment may take shape in the future. One example of this is the way anti-discrimination law in various countries has accommodated the evolving debates over 'gender', 'sex' and 'gender identity'. This legal evolution would not have been possible if a precise definition of either of these terms was included within

[49] J Oliver Conroy, 'Power hungry robots, space colonization, cyborgs: inside the bizarre world of longtermism' *The Guardian* (20 November 2022) <https://www.theguardian.com/technology/2022/nov/20/sam-bankman-fried-longtermism-effective-altruism-future-fund> accessed 17 July 2023.

[50] Cobbe (n 5).

[51] Frank Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (Harvard University Press 2016).

[52] According to Luhmann, in addition to being operationally closed, law is also cognitively open because it gets influenced by and responds to its changing environment. See Luhmann (n 18) 8.

[53] Figure 1.

[54] The desirability of noise has often been discussed in neuroscience literature as well. Noise is the 'new signal' that helps the brain generate novel solutions to complex problems. See Thomas Nail, 'Why Making Our Brains Noisier Feels Good' (*Nautilus*, 17 February 2021) <https://nautil.us/why-making-our-brains-noisier-feels-good-238128/> accessed 17 July 2023.

legal text.[55] Every legal system has a memory of its own, in the sense that it remembers how a social reality was coded decades ago and how its coding evolved and adapted to the changes in its environment.[56] While Shannon's frame helps in understanding to some extent how information is *transmitted* within the legal system, it does not do enough to explain how it is *retained* in the system and then used by the system to communicate externally.

This intertemporal coupling of law and society that requires law to retain information over time might be better explained with the help of Luhmann's theory, the underpinnings of which have so far aligned with the other two critical claims of exclusivity and reflexivity.[57] Luhmann's idea of law as an autopoietic social system that is not just 'operatively closed' but also 'cognitively open' extends *ITL* beyond Shannon's frame.[58]

In Luhmann's terms, law's evolution is possible due to its internal code of communication, and its internal operations need to be normatively unaffected by the social environment.[59] However, to co-evolve *with* society, law needs to respond to the environment outside its boundaries, hence requiring it to be cognitively open. Specifically, extra external information (which may or may not seem relevant at the time of coding) is useful if the environment is prone to shocks.[60] This incentivises the legal system to retain this extra information. The retention is made possible by the inherent flexibility in text-driven law, as manifested in the 'vagueness'[61] and 'plasticity'[62] of language.

Vagueness is a quality that has been argued to be desirable, in contrast to attempts towards more precision in drafting legal statutes.[63] Lee A. Bygrave, for example, notes that the legal community has not yet developed, through systematic reflection, a stable analytical apparatus for defining the concept of 'data'.[64] Some of the reasons include the strategy of enacting generic and flexible definitions. This is to enable those definitions to be inclusive enough to accommodate developments that law cannot foresee at the time they were drafted. These strategies are also an attempt to reduce the transaction costs that would otherwise be enormous in the process of updating and

55 Asia Pacific Transgender Network and UNDP, *Legal Gender Recognition: A Multi-Country Legal and Policy Review in Asia* (2017) <https://www.undp.org/asia-pacific/publications/legal-gender-recognition-multi-country-legal-and-policy-review-asia> accessed 17 July 2023.

56 Deakin, 'Juridical Ontology: The Evolution of Legal Form' (n 10).

57 Deakin, 'Evolution for our time: a theory of legal memetics' (n 25).

58 Luhmann (n 18).

59 Jiri Priban, 'Law as a Social System by Niklas Luhmann, tr by KA Ziegart' (2005) 32(2) Journal of Law and Society 325.

60 Deakin, 'Evolution for our time: a theory of legal memetics' (n 25); Niles Eldredge, Time Frames: The Rethinking of Darwinian Evolution and the Theory of Punctuated Equilibria (Princeton University Press 1985).

61 Ira Chadha-Sridhar, 'The Value of Vagueness: A Feminist Analysis' (2021) 34(1) Canadian Journal of Law and Jurisprudence 59; Hrafn Ásgeirsson, *The Nature and Value of Vagueness in the Law* (Hart 2020); Timothy Endicott, *Vagueness in Law* (OUP 2000). These works explain how the content of the law is determined by what lawmakers communicate, and why vagueness in law is sometimes desirable.

62 Mireille Hildebrandt, 'Code Driven Law: Scaling the Past and Freezing the Future' in Simon Deakin and Christopher Markou (eds), *Is Law Computable? Critical Perspectives in Law and Artificial Intelligence* (Hart 2020) 67.

63 Chadha-Sridhar, 'The Value of Vagueness: A Feminist Analysis' (n 61).

64 Lee A Bygrave, 'Information Concepts in Law: Generic Dreams and Definitional Daylight' (2015) 35(1) Oxford Journal of Legal Studies 91.

reformulating the law to catch up with technological changes.[65] Another factor is a problem of what Roger Brownsword calls 'normative disconnection.'[66] To avoid the risk of defining a term that is 'over-inclusive' such that it ends up encompassing situations that do not have a proper regulatory connection, lawmakers sometimes choose simply not to define certain terms. Thus, over-precise legal terms run significant risks — lack of flexibility on the one hand and over-inclusivity on the other.

It is however not just vagueness in law that allows for adaptability. Another feature that enables 'noise' to make the system adaptable comes from the 'plasticity' inherent in text-driven form of legal language, a term used by Hildebrandt to argue against a shift from text-driven to code and/or data-driven law.[67] The form of legal code is linguistic in nature, as opposed to the binary digital code in Shannon's system. This means that legal terms retain within themselves historic changes in their meaning as language evolves.[68] For instance, the legal subjectivity of Kiran will be recognised today by certain jurisdictions and areas of law that have evolved to recognise trans persons' rights, even if Kiran's identity does not fit the traditionally defined binary categories of male and female.

Numbers and digital code are not plastic in the same way. Therefore, while data and/or code-driven law might be more equipped than text-driven law to better scale the past, it will in Hildebrandt's words, also 'freeze the future'. This is because code and/or data-driven law will lock the classification and meaning of the reality to what it was at the time of coding.[69]

Conclusion

An exploration of law through a combination of external frames, Shannon and Luhmann, has led to a *theoretical* understanding of law as 'code'. An attempt to model information flows within law, (using Shannon's concepts of coding/decoding) and outside of law (using Luhmann's concept of autopoiesis) has revealed the influence of experts on both the translation and transmission processes. This theoretical exploration reveals the three *critical* claims of exclusivity, reflexivity, and adaptability of law, and how they can be deployed to show that law reinforces and reflects power in the reality it codes. In that sense, while Cobbe asks the right questions — how to address the structural problems with the way law interacts with society — Pistor nudges us in a helpful direction.

What does this analysis mean for technological interventions in law and the movement to shift from natural language to digital code as a prospective solution towards inclusivity and access? The access of experts to legal language enables them to control and vet the information flows as transmitters and receivers. A shift in the form of representation of law — from text-driven to code and/or data-driven — is likely to make the legal system more exclusive than it already is. The control will simply shift from one type of agents to another, i.e. from legal experts to technical experts, potentially replicating the white guy problem in AI

65 Coase (n 36).

66 Roger Brownsword, *Rights, Regulation, and the Technological Revolution* (OUP 2008) 166.

67 Hildebrandt, 'Code Driven Law: Scaling the Past and Freezing the Future' (n 62).

68 Deakin, 'Juridical Ontology: The Evolution of Legal Form' (n 10); Deakin, 'Evolution for our time: a theory of legal memetics' (n 25).

69 Hildebrandt, 'Code Driven Law: Scaling the Past and Freezing the Future' (n 62) 5.

research for law. The legal system then risks losing its adaptability because of computational code not being as flexible as natural language. The point being, social systems such as law and technology will tend to reinforce power gaps, because firstly, the inherently political realities they are coding will never be neutral, and secondly, the agents who code them will always be a part of that reality.

The solution must therefore lie in designing and training systems to identify the structural power gaps they are coding, while also mitigating concentration of control among the agents. Sensitising and diversifying the agents is, therefore, only a part of the solution. What we need is better communicative systems that are designed as a result of better communication among their agents.

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A reply to the author

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Law as code deals with the process of law making and the ways this process both reflects and reinforces established systems of power and inequalities such systems embody. The ultimate objective of the paper is to provide analytic reflections that may help sustain the reflexivity and adaptability of law and combat its predilections. None of these objectives, the author claims, could be accomplished apart from the analytic deconstruction of the process through which the making of law entails reading, representing, and, ultimately, shaping reality. While inherently mediated by natural language and the conventions of writing, this process has over the last few decades increasingly been cast in the context of a technologised world, pervaded by data and the computational procedures consequent upon the spread of digital technologies across most walks of living. The paper accordingly confronts law as code in this double sense, that is, as (1) a representation (and eventual shaping) of reality in the form of text-based law and (2) as the outcome of the encroachment of computer code and digital data into the process of law making. It is unclear though how computer code and digital data are supposed to shape the making of law. The idea that computer code may work as law in the sense that Lessig first introduced is clearly ruled out as an object of analysis. It is therefore quite likely that the author assumes the representation, collection, and interpretation of events (and evidence) by means of computer code and digital data interfere with the process of law making. This is how I interpret her claim of the looming involvement of computer scientists into the making of law. I find the paper both timely and interesting.

The author draws on (and reinterprets) Shannon's formal theory of communication as the backbone for deconstructing the process of law making and its social context. While recognising the differences between communication viewed as a formal process of encoding, transmitting, and decoding syntactic tokens and the interpretive (semantic and pragmatic) work of law making, the author still feels that Shannon's formal theory of communication provides a proper analytic framework for understanding the cognitive and social context in which the making of law is embedded. At the same time, the author underlines that her purpose is not to link Shannon's theory of communication to law making in any substantial way. As she states,

> I am not 'applying' Shannon's theory to law and have deliberately refrained from transplanting the technical solutions offered by Shannon for digital systems (specifically those towards reducing noise and optimising efficiency of communication) to the legal system.

But then why Shannon? Why not other models in which communication is analysed more thoroughly and with much more emphasis on the cultural, social, and institutional contexts in which it is embedded (see e.g. [5, 6, 13])? These are questions that inevitably emerge as one seriously ponders the position of the author. The reason which the author provides for using Shannon do not seem to me to address satisfactorily these questions. There is no doubt that Shannon's theory of communication commands huge respect and has an authoritative appeal that recounts the undisputable contribution Shannon has made to

information science and to thinking more widely. However, 'The agent-based critique of the legal system' that the author invokes as one of the main reasons for using Shannon could be better performed, I feel, by drawing on later and richer theories of communication that feature the social, cultural, and institutional subtleties and complexities in which cognition and interaction are embedded. Looked upon the present horizon, Shannon's theory is a depiction of the bare bones of communication that essentially served the purpose of formalisation of the process of encoding, transmitting and decoding messages.

I feel equally doubtful as regards the author's use of Luhmann to describe and analyse the communicative openness of law as opposed to its operational closure. It is true that Luhmann made this distinction himself. However, if the key objective is to analyse how the linguistic mediation of law makes it a cognitively and communicatively open process that helps maintain its capacity to reflect upon the demands of the social orders, adapt, and develop, then Luhmann seems to me not to be the straightforward source of inspiration. There is of course a steady friction between the operational closure and reproduction of a system (e.g., law) and its communicative openness and development. Luhmann's elegant theory could certainly be drawn upon to frame the problem. But the detailed analysis of this friction, I believe, would require access to other frameworks that give language and the processes of meaning construction, establishment and decline a much more prominent place.

These remarks take us to the heart of the contemporary issue, mentioned earlier in this commentary, concerning the expanding involvement of technologies of computing and communication across most walks of living and the likely implications these developments may have upon law [11, 12]. A specific manifestation of these developments is the profusion of digital data, and the role data may eventually assume as carriers of events, instruments of evidence and tools of judicial decisions. These issues recur throughout the paper, but they are never really dealt with. To her merit, the author clearly recognises such a situation when she refers to Bygrave [4] to state that 'the legal community has not yet developed, through systematic reflection, a stable analytical apparatus for defining the concept of data.' This is, I suggest, a bigger issue that extends beyond law. It is refracted throughout the social sciences that have been taken aback by the quick march of digital data and the ways by which data reweave the social and communicative fabric of current societies.

An important step towards addressing the cardinal role of data in the current world (and in the process of law making) is the recognition of data as *artifacts of cognition and knowledge* that perform a variety of critical semiotic/cognitive, epistemic, and communicative functions. Such a broader conception of data must be brought to the fore, added, and occasionally juxtaposed to the widespread technical treatment of data as data points; that is, standardised and homogeneous occurrences that can be listed, counted, aggregated and computed to assist the making of inferences concerning the events which data eventually register or summarise [2, 3, 9].

Data are artifacts of cognition and knowledge as far as they are used to mark, select, encode, and register the facts of social life. In this respect, data work as signs have done throughout history, that is, they demarcate areas of life and allow events within these areas to be recorded, indexed, and archived (stored). The fact that in the context of the internet and of the pervasive use of potent digital devices that characterise current life such signs take on the format of data incidents or points standardised enough to be related to other data and possibly aggregated and computed does not

change their essential character as signs through which facets of reality are selected, encoded, and recorded. A social media token such as like or a web browser cookie makes sense only within a prior framework of assumptions about users qua persons, life habits and preferences and the ways these can be mediated by data [7, 14]. The same holds true for data that at first glance may seem straightforward transformations of clearly demarcated facts as in music listening and film watching in streaming platforms [1]. A clear definition of listening or watching duration (highly variable among users) is required in order for a track or film to be counted as listened or watched, an issue that is much more complex than it may seem, granted the large variability (and duration) of music genres and films.

These observations acquire a poignant relevance once it is realised that these ways of marking and recording events (here users and their whereabouts) are not inevitable and could have been otherwise had other predilections been the basis of marking, encoding, and recording [8, 10]. Data making entails a variety of predilections some of which are certainly linked to privilege and power and others to cultural beliefs, social inertia or indifference. It is the work of the social scientists (and legal scholars) to analyse the origin and use of these predilections, a critical analytic task that calls for a *social science of data* distinct from data science [3]. Such an analytic mission should not be conflated with the working of algorithms. Algorithms can certainly embody privileges and predilections of various kinds in the ways they calculate. But algorithms can work only as far as they are wired to reality, a function that can only be achieved through data. As we put it elsewhere, data 'are the "sensing arms" of algorithms, the means through which algorithms transcend their operational closure as procedures of calculation and link to reality' [2].

Besides the cognitive and semiotic performances of data develop the epistemic functions which data assumes in variety of contexts in which I would readily include that of law. Data as an instrument of knowledge requires frameworks that dictate what types of data matter, how to generate, package, analyse, and critically, relate them with other types of data to produce insights about selected areas of living (e.g., education, health care, crime, traffic). The production of knowledge by means of crunching large data numbers cannot happen automatically, even though the sheer availability of data may incite the haphazard (and possibly meaningless) experimentation with diverse types of data.

I have come a long way from the central focus of this interesting paper, but I believe I have touched upon an issue that still looms large in the overall problematic set forth by the author and the perspectives this journal invites. I hope the ideas of data (distinct from code and software) as an artifact of cognition and knowledge may furnish the starting point for approaching some of the issues raised by the ongoing technological transformation of contemporary societies and some of the challenges that I assume confront law in this data age.

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Author's response: Revisiting reflexivity in law and data

Bhumika Billa

I am grateful for Jannis Kallinikos's deep and constructive engagement with the paper. Kallinikos accurately captures my argument — that a shift from natural language to computational language in legal coding will compromise the reflexivity and adaptability of legal systems. This is because programming languages, as Kumiko Tanaka-Ishii argues, are not reflexive in the way that natural languages are.[1] In other words, computer systems have not evolved to a stage where they can understand their own outputs and account for feedback in further processing of subsequent inputs.

This is where data becomes relevant. In an automated decision-making system, for example, the data used to design a set of algorithms will significantly influence the decisions that the algorithms arrive at.[2] But the role of data in societies goes beyond the garbage-in-garbage-out problem. Kallinikos's body of work is an important reminder that data needs to be studied not just as a resource by economists, or as an input by computer scientists, but as an 'artifact of cognition',[3] a mirror that shapes the world as much as it captures it, just like law. The paper is, therefore, part of a larger project that aims to study (1) how the cognitive systems or artifacts of law on the one hand and data on the other are co-evolving with social reality and (2) what risks are involved in re-designing either one to completely depend on the other. Until both legal and computer systems learn to respond to feedback loops (more efficiently than each of them currently does), progressively rectifying and rebalancing power with each transmission, they will naturally reinforce and multiply the inequalities embedded in the realities they are trying to code.

Given the limited reflexivity of programming languages, redesigning legal systems to purely run on data and code will further exacerbate the 'epistemic injustice'[4] that results from these knowledge-production and meaning-making (i.e. 'coding') processes, firstly in the way reality is being translated into legal language, and secondly in the way law is shaping that social reality. This duality aligns with Luhmann's idea of cognitive openness. Kallinikos replies, 'Luhmann's theory could certainly be drawn upon to frame the problem, a detailed analysis of the friction between operational closure and cognitive openness might require other frameworks'. Indeed, that has been my attempt in the paper. I borrow these ideas from

1 Kumiko Tanaka-Ishii, *Semiotics of Programming* (Cambridge University Press 2010).

2 Joy Buolamwini and Timnit Gebru, 'Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification' (2018) 81 Proceedings of Machine Learning Research, Conference on Fairness, Accountability, and Transparency 1.

3 Cristina Alaimo and Jannis Kallinikos, 'Organizations Decentered: Data Objects, Technology and Knowledge' (2022) 33(1) Organization Science 19.

4 Miranda Fricker, *Epistemic Injustice: Power and the Ethics of Knowing* (Oxford University Press 2007).

Luhmann to build my analysis, using Shannon amongst others.

John Fiske maps and identifies that communication has been studied either as transmission or as a semiotics (i.e. meaning-making).[5] Shannon's model of transmission is useful because it separates the primary parties involved in communicating the message ('legal subjects') from the ones that encode or decode that message ('experts'), which is also an inherent feature of legal systems. While the semiotic theories of communication are the obvious next step to continue analysing law-society interactions, the fundamental theories of Shannon and Luhmann cannot be ignored in getting there. In that light, the *Information Theory of Law* might have the potential to bridge these two discourses in communication theory.

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