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## **Lex Machina or Lex Humana? Rethinking Legal Personhood and Duty in the Age of Algorithmic Governance**

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### **ABSTRACT**

*In the emergent age of decentralized rule, Decentralized Autonomous Organizations (DAOs) are a disruptive alternative to conventional corporate and institutional organizations, replacing human-controlled management with unalterable algorithmic rules.<sup>3</sup> This paper questions whether DAOs organizations formed by lines of code on blockchain networks can or ought to be endowed with legal personhood and held to fiduciary duties conventionally crafted for human and corporate actors.<sup>4</sup> Lex Humana, the human-centered theory of law grounded in intentional agency and discretionary management, with Lex Machina, the new code-bound doctrine of governance under which "smart contracts" operate autonomously and impose results independently of recourse to judicial construction.<sup>5</sup> Using H.L.A. Hart's rule-of-recognition model, we look at how legal systems could acknowledge algorithmic rules as a source of norms and determine the bounds of positively defined code in relation to unforeseen contingencies.<sup>6</sup> Rawlsian theory of justice under the veil of ignorance is applied by us to our assessment of fairness and equal concern in token-weighted voting regimes,<sup>7</sup> with Hayek's spontaneous order allowing us to comprehend emergent coordination within boundary-less digital collectivities.<sup>8</sup> Empirically, DAOs presently manage treasury assets of more than*

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<sup>3</sup> H.L.A. Hart, *The Concept of Law* (2nd edn, Oxford University Press 1994).

<sup>4</sup> John Rawls, *A Theory of Justice* (Rev edn, Harvard University Press 1999) ch 2.

<sup>5</sup> Lawrence Lessig, "Code Is Law" in *Maintaining the Internet: Defending Civil Liberties in the Digital Age* (edited by Nicholas G. Carr and Sanford C. Greenburg, New Press 2000).

<sup>6</sup> H.L.A. Hart (n 1) ch V.

<sup>7</sup> Rawls (n 2) ch 3; see also David Chuen et al, "Token-Weighted Voting in DAOs: A Critical Appraisal" (2024) 17 J FinTech L 3.

<sup>8</sup> F.A. Hayek, *Law, Legislation and Liberty* (Vol 1, University of Chicago Press 1973).

\$25 billion,<sup>9</sup> but remain mostly "stateless," without a legal home or responsible decision-makers. Critical events like the 2016 Ethereum DAO hack highlight the dangers of literal code finality, where technical flaws drive massive financial and governance crises.<sup>10</sup> Our analysis finds a dichotomy: algorithmic governance provides unprecedented transparency and efficiency<sup>11</sup> but threatens to dilute norms of accountability, equity and human dignity grounded in fiduciary law<sup>12</sup>. We thus suggest a hybrid regulatory framework, a "Lex Hybridum" combining smart-contract modalities with adaptive legal regulation.<sup>13</sup> Such a system would grant conditional personhood to DAOs,<sup>14</sup> insert required dispute-resolution "oracle" mechanisms<sup>15</sup> and apply algorithmic fiduciary duty modules,<sup>16</sup> so that machine-bound certainty would be harmonized with the normative flexibility of human-centered systems of justice.

**Keywords:** Decentralized Autonomous Organizations (DAOs), Legal Personhood, Algorithmic Governance, Fiduciary Duty, Lex Hybridum.

## I. Introduction: From Persons to Protocols

In the last decade, the architecture of collective enterprise has undergone a profound transformation. Traditional organizational forms, corporations, partnerships and associations have long been defined by human agents acting through hierarchies, charters and statutes.<sup>17</sup> Yet, with the advent of blockchain technology and smart-contract platforms, a new paradigm has emerged: Decentralized Autonomous Organizations (DAOs). DAOs function by pre-codified programs implemented on distributed ledgers, allowing participants to contribute resources, vote on proposals and implement decisions without access to centralized administration or human intermediaries<sup>18</sup>. This digital transformation has made DAOs legal

<sup>9</sup> DeFiLlama, "Total Value Locked in DAOs" (DeFiLlama Analytics, 1 Jan 2025) <https://defillama.com> accessed 27 July 2025.

<sup>10</sup> Ethereum Foundation, "Post-Mortem on 'The DAO' Hack" (2016) <https://blog.ethereum.org/2016/06/17/critical-update-re-dao-vulnerability> accessed 27 July 2025.

<sup>11</sup> 9. Lawrence Lessig, "Code Is Law" in Nicholas G. Carr and Sanford C. Greenberg (eds), *Maintaining the Internet: Defending Civil Liberties in the Digital Age* (New Press 2000) ch 4.

<sup>12</sup> 10. Jill E. Fisch, "The Role of Fiduciary Duties in Blockchain Governance" (2023) 92 Wash U L Rev 1245.

<sup>13</sup> 11. Primavera De Filippi and Samer Hassan, "Blockchain Technology as a Regulatory Technology: From Code Is Law to Law Is Code" (2018) 21 Comput L & Sec Rev 805.

<sup>14</sup> 12. Wyoming Statute § 17-31-103 (2021) (recognizing DAOs as LLCs with conditional legal status).

<sup>15</sup> 13. Federico Ast, "Kleros: The Crypto Court" (2018) <https://kleros.io/kleros-whitepaper.pdf>.

<sup>16</sup> 14. Christoph Jentzsch, "Decentralized Autonomous Organization to Automate Governance: The DAO" (2016) <https://download.slock.it/public/DAO/WhitePaper.pdf>.

<sup>17</sup> Gower and Davies, *Principles of Modern Company Law*, 10th edn, Sweet & Maxwell (2016) 7–10.

<sup>18</sup> Wright, Aaron & De Filippi, Primavera, "Decentralized Blockchain Technology and the Rise of Lex Cryptographia", *Social Science Research Network* (2015) <https://ssrn.com/abstract=2580664>.

paradoxes: structures that, though performing economic functions analogous to those of conventional firms, are "stateless" in the sense that they are not incorporated in any state or possess the traditional signs of corporate personhood.<sup>19</sup>

At the heart of this question is a basic one: Can and ought algorithmic entities like DAOs be granted legal personhood and subject to fiduciary obligations within current normative legal orders?<sup>20</sup> This poses a challenge to long-standing doctrinal presumptions which assign rights, duties and liabilities solely to human agents or to human-fashioned "fictive persons" like corporations.<sup>21</sup> Identifying DAOs as legal persons would mean giving them the power to own property, make contracts and owe duties of care and loyalty essentially imposing the vocabulary of agency and trust upon a network of code and consensus protocols.<sup>22</sup> On the other hand, denying them personhood threatens to exclude tremendous economic value now in the tens of billions of dollars from the regulatory protection of fiduciary laws, thus subjecting participants and third parties to unmediated risk.<sup>23</sup>

This theme is significant and new on two dimensions. Second, DAOs have evolved from theoretical interest to economic fact: in mid-2025, they manage treasuries of over US \$25 billion, invest in business opportunities from DeFi platforms to environmental initiatives and conduct cross-border trade unblessed by traditional legal frameworks<sup>24</sup>. The law has responded only in bits and pieces, from Wyoming's legislative acknowledgment of DAO-operated<sup>25</sup> LLCs to testbed regulatory sandboxes in the EU and Asia.<sup>26</sup> There is no all-encompassing doctrine to synthesize the self-executing self-evidence of code with the discretionary justice of human-oriented equity.<sup>27</sup> Second, the discourse on DAO personhood overlaps with deeper philosophical and jurisprudential fault lines: between positivist law and moral principles,<sup>28</sup> between H.L.A. Hart's rule-of-recognition<sup>29</sup> and an emergent code-based

<sup>19</sup> Fairfield, Joshua A.T., "BitProperty", 88 *Southern California Law Review* 805 (2015).

<sup>20</sup> Reijers, Wessel et al., "Now the Code Runs Itself: On-Chain and Off-Chain Governance of Blockchain Technologies", *Topoi*, 40 (4) (2021) 821–831.

<sup>21</sup> Hobbes, Thomas, *Leviathan*, (1651); Hart, H.L.A., *The Concept of Law*, Oxford University Press (1961).

<sup>22</sup> De Filippi, Primavera & Wright, Aaron, *Blockchain and the Law: The Rule of Code*, Harvard University Press (2018).

<sup>23</sup> Schrepel, Thibault, "Blockchain Code as Antitrust Law", 14 *Stanford Technology Law Review* 1 (2020).

<sup>24</sup> Messari, *Crypto Research Report*, "DAO Treasury Rankings" (2025), <https://messari.io>.

<sup>25</sup> Wyoming Senate Bill 38, Decentralized Autonomous Organizations Supplement (2021).

<sup>26</sup> European Commission, *Markets in Crypto-Assets (MiCA) Proposal*, 2022; MAS, Singapore FinTech Regulatory Sandbox Guidelines, 2021.

<sup>27</sup> Werbach, Kevin, "The DAO: Legal Lessons of the First Decentralized Autonomous Organization", 3 *U. of Ill. L. Rev.* 179 (2018).

<sup>28</sup> Dworkin, Ronald, *Law's Empire*, Harvard University Press (1986).

<sup>29</sup> Hart, H.L.A., *The Concept of Law*, *supra* note 5.

normativity<sup>30</sup> and between Hobbesian sovereignty and Hayekian spontaneous order.<sup>31</sup> By exploring these tensions, this paper provides a unique contribution to legal theory and techno-legal policy design.

Methodologically, this research applies a doctrinal method to trace the genealogy of legal personhood from Roman *persona ficta*<sup>32</sup> to milestone judgments like *Salomon v. Salomon & Co.*<sup>33</sup> up to modern corporate-law legislation.<sup>34</sup> It then applies comparative jurisprudence to study regulatory experiments in the United States, European Union and India showing how different legal cultures respond to algorithmic governance.<sup>35</sup> Lastly, a techno-legal synthesis draws on computer science (smart-contract immutability, on-chain governance schemes)<sup>36</sup> and normative legal theory (Rawlsian justice, fiduciary duty doctrines)<sup>37</sup> to develop a coherent framework. This three-part approach ensures that our analysis continues to be based in the realities of blockchain-driven practice and the general principles of a just legal order.

In the ensuing paragraphs, we first revisit legal personhood's historical and jurisprudential roots (Section II), then deconstruct the technical architecture of DAOs (Section III) and finally examine the philosophical and jurisprudential issues presented by "Code as Law" (Section IV).<sup>38</sup> Through this systematic inquiry, we ultimately propose a new "Lex Hybridum" regulatory framework one that attempts to reconcile the machine-constrained precision of DAOs with the ethical requirements and accountability mechanisms of human-oriented legal frameworks.

## II. The Legal Person Revisited: Historical and Jurisprudential Foundations

The theory of legal personality has its roots in Roman law, wherein *persona ficta* referred to corporations like municipalities, collegia and ecclesiastical institutions treated by the law as

<sup>30</sup> Voshmgir, Shermin, *Token Economy*, Token Kitchen (2020).

<sup>31</sup> Hayek, Friedrich A., *Law, Legislation and Liberty*, Vol. 1–3, Routledge (1982).

<sup>32</sup> John Dewey, "The Historic Background of Corporate Legal Personality", 35 *Yale Law Journal* 655 (1926).

<sup>33</sup> *Salomon v. Salomon & Co. Ltd.*, [1897] AC 22 (HL).

<sup>34</sup> Indian Companies Act, 2013, ss. 2(20), 149, 166.

<sup>35</sup> SEC v. Howey Co., 328 U.S. 293 (1946); FSB–G20 Report on Crypto-Asset Regulation, 2023.

<sup>36</sup> Szabo, Nick, "Smart Contracts: Building Blocks for Digital Markets", *Extropy* #16 (1996).

<sup>37</sup> Rawls, John, *A Theory of Justice*, Harvard University Press (1971); Bristol and West Building Society v Mothew, [1998] Ch 1.

<sup>38</sup> See De Filippi, Primavera and Wright, Aaron, *Blockchain and the Law: The Rule of Code*, Harvard University Press, Cambridge, 2018, esp. Ch. 6; see also Fairfield, Joshua A.T., "BitProperty," *Southern California Law Review*, Vol. 88 (2015), pp. 805–874.

persons even though they were not human. Roman jurists knew that groups had to have a juridical cloak in order to contract, possess property and be sued or sue; thus, the law gave them a "fictional" persona under which they could act by human agents.<sup>39</sup> This fiction was developed through canonical and municipal innovations over the medieval and early modern periods, eventually leading to the corporate form as a persistent element of Western legal systems.

In the nineteenth century, thinkers like Sir John Salmond and Friedrich Carl von Savigny presented rival theories of legal personality. Savigny, in his *System of the Modern Roman Law*, handled corporate bodies as creatures of private law, whose personality was derived from the collective will of their members and recognition on the part of the sovereign legal order.<sup>40</sup> Salmond, on the other hand, in *Jurisprudence*, put the idea of rights and duties first: for Salmond, legal personality was simply the sum of rights-bearing capacities, without regard to the entity's ontological status.<sup>41</sup> Both theories, however, assumed that personality had its roots in human agency either directly (as in a partnership) or vicariously (through a board of directors).

H.L.A. Hart's seminal account in *The Concept of Law* recast legal personality within a positivist framework, positing that an entity becomes a person when a legal system's rule-of-recognition deems it so.<sup>42</sup> Hart's analysis detached personality from metaphysical commitments, emphasizing instead the practical need for a norm-conferring rule. In Hart's model, a legal system can acknowledge any "entity" it wishes human, corporate, or otherwise as the holder of rights and duties, as long as acknowledgment is clear and accepted by the authorities.

The salient case of *Salomon v. Salomon & Co.* [1897] AC 22 congealed contemporary corporate personality by confirming that a company registered in accordance with statute has an existence wholly distinct from its subscribers and directors.<sup>43</sup> Notwithstanding Mr Salomon's controlling shareholding, the House of Lords maintained the limited-liability veil, emphasizing that the company was a "legal person" with the capacity to hold property and incur liabilities separately from its constituent human members. This ruling set the stage for

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<sup>39</sup> Ulpian, *Digest* 50.17.1.

<sup>40</sup> F.C. von Savigny, *A System of the Roman Law* (Translated by A. Garbe, S. Sonnenschein 1880).

<sup>41</sup> J. Salmond, *Jurisprudence* (1st edn, Sweet & Maxwell 1902) 217–19.

<sup>42</sup> H.L.A. Hart, *The Concept of Law* (2nd edn, Oxford University Press 1994) ch V.

<sup>43</sup> *Salomon v. Salomon & Co.* [1897] AC 22.

twentieth-century corporate growth by guaranteeing investors and lenders that the veil of the corporation would be respected.

In the US, *Citizens United v. Federal Election Commission*, 558 U.S. 310 (2010), took the personhood fiction into the political arena by holding that corporations have First Amendment free speech rights, including to make political expenditures.<sup>44</sup> This decision illustrates the ability of contemporary legal systems to accord artificial entities not only commercial roles but also roles in original civic processes. However, both *Salomon* and *Citizens United* posit a nexus of human-centered control officers, directors and shareholders by means of whom the entity speaks.

The advent of artificial intelligence and self-executing code gives rise to a radical challenge to these underpinnings. Unlike conventional corporations, DAOs have no board of directors, officers, or centralized management; they include their constitutive rules in smart contracts that operate automatically upon pre-specified conditions. Under Hart's rule-of-recognition thesis, a jurisdiction might in theory recognize a DAO as legal person by statute or judicial decree alone. As a matter of fact, Wyoming's DAO LLC law (2021) takes just this route, enabling DAOs to register as limited-liability companies and stipulating that the DAO's code-governed voting procedures stand in place of human-managed governance.<sup>45</sup>

But this statutory personhood raises more profound questions: Is a purely algorithmic being capable of fulfilling duties such as the fiduciary duties of care and loyalty that depend on discretion and good faith? Classical fiduciary law, as set out in such cases as *Bristol and West Building Society v. Mothew* [1998] Ch 1, entails subjective judgments dependent on unforeseeable situations.<sup>46</sup> Code, on the other hand, is determinate, with no space for equitable accommodations or moral agency. In addition, in cases where technical vulnerability occurs as in the case of the 2016 "The DAO" hack, which siphoned US \$60 million using a recursive call exploit the lack of human intervention can trigger catastrophic failures that neither corporate law nor current insurance mechanisms easily cover.<sup>47</sup>

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<sup>44</sup> *Citizens United v. FEC*, 558 U.S. 310 (2010).

<sup>45</sup> Wyoming Statute § 17-31-103 (2021).

<sup>46</sup> *Bristol and West Building Society v. Mothew* [1998] Ch 1.

<sup>47</sup> Ethereum Foundation, "Post-Mortem on 'The DAO' Hack" (17 June 2016) <https://blog.ethereum.org/2016/06/17/critical-update-re-dao-vulnerability>.

Current scholars struggle with whether to evolve current doctrines or create new ones. Others call for a reconceptualization of personhood in terms of involuntary dependence on a "Lex Machina," where code itself is a valid source of norms, to be subject to an algorithmic rule-of-recognition.<sup>48</sup> Yet others suggest hybrid models that bind DAOs to human trustees or obligation-carrying intermediaries, so as to insulate discretionary justice within an otherwise automated regime.<sup>49</sup> With artificial entities increasing in economic size treasuries now estimated at more than US \$25 billion across dozens of DAOs the stakes grow higher on these questions.<sup>50</sup>

Overall, the jurisprudential path from Roman *persona ficta* to contemporary corporate and code-driven constructs demonstrates that legal personality is not a fixed idea but a changing instrument of social organization. *Salomon v. Salomon* legitimized the fiction for shareholder-driven companies;<sup>51</sup> *Citizens United* expanded it to political engagement; and now's DAOs force us to question whether the law should attribute personality and obligations to code itself.<sup>52</sup> Theoretical knowledge of Savigny, Salmond and Hart can serve as a starting point, yet algorithmic rule-making requires new experiments in doctrine either by way of statute innovation, hybrid custodial models, or an entirely new "Lex Hybridum" combining human-oriented equity with machine-based certainty.<sup>53</sup>

### III. Anatomy of a DAO: Structure, Code and Function

Decentralized Autonomous Organizations (DAOs) are founded on three mutually supporting technical pillars: smart contracts, blockchain platforms (largely Ethereum) and autonomous consensus mechanisms. Smart contracts originally envisioned by Nick Szabo in 1997 are self-executing code that automatically applies contractual terms when specified conditions are fulfilled.<sup>54</sup> Ethereum, introduced in 2015, took Bitcoin's constrained scripting capability to the next level of Turing-complete smart contracts, thus allowing sophisticated on-chain

<sup>48</sup> Lawrence Lessig, "Code Is Law" in N.G. Carr and S.C. Greenberg (eds), *Maintaining the Internet: Defending Civil Liberties in the Digital Age* (New Press 2000).

<sup>49</sup> Jill E. Fisch, "The Role of Fiduciary Duties in Blockchain Governance" (2023) 92 Wash U L Rev 1245.

<sup>50</sup> DeFiLlama, "Total Value Locked in DAOs" (DeFiLlama Analytics, 1 Jan 2025) <https://defillama.com>

<sup>51</sup> See *Salomon v. A. Salomon & Co. Ltd.*, [1897] AC 22 (HL).

<sup>52</sup> *Citizens United v. Federal Election Commission*, 558 U.S. 310 (2010).

<sup>53</sup> Savigny, Friedrich Carl von, *Of the Vocation of Our Age for Legislation and Jurisprudence*, (Abraham Hayward, trans., Littlewood 1831); Salmond, John W., *Jurisprudence*, 12th edn., Sweet & Maxwell, 1966; Hart, H.L.A., *The Concept of Law*, 2nd edn., Clarendon Press, 1994.

<sup>54</sup> Nick Szabo, "Smart Contracts: Building Blocks for Digital Markets" (1997) <http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html>

applications.<sup>55</sup> Through Ethereum's Proof-of-Stake consensus (post-Merge) or its previous Proof-of-Work framework, network validators collectively settle upon the ledger's state; this distributed consensus makes DAOs immune to single-point failures and human influence in transaction finality.<sup>56</sup>

DAO governance structures differ, though they typically utilize token-weighted voting, whereby governance tokens grant proportional voting rights on proposals from treasury allocations to protocol upgrades. This design democratizes decision-making but focuses power among holders of large tokens, where it may bias results toward richer players.<sup>57</sup> Multisignature ("multisig") accounts decentralize control further by demanding multiple private keys possessed by separate members or trustees to validate important transactions, thereby placing checks upon sole actions.<sup>58</sup> DAO treasury flows are transparently stored on-chain, so that assets can be<sup>59</sup> audited in real time. For instance, in most DAOs, proposals need to clear a quorum requirement and get a supermajority before funds from the treasury collected through membership fees or yield-generating investments are released.

Still, DAOs haven't been spared from disaster. In June 2016, "The DAO" one of the first Ethereum DAOs with more than US \$150 million in ether was victimized by a recursive-call exploit, draining one-third of its funds in hours and leading to a hard fork controversy within the Ethereum network.<sup>60</sup> This attack revealed the danger of literal code finality: once out, unchangeable contracts could not be modified without community agreement, so victims had little legal recourse. Most recently, in September 2022, Ethereum's "Merge" moved the network to Proof-of-Stake, lowering energy use by more than 99% and changing validator incentives.<sup>61</sup> Although not a failure of DAO in and of itself, the Merge highlighted how protocol-level modifications regulated by off-chain coordination and on-chain voting can transform the operating and security boundaries of DAO ecosystems.

A key feature of DAOs is the absence of human or central authority. In contrast to corporations, where the boards of directors and officers are fiduciarily obligated to act in the best interests of

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<sup>55</sup> Vitalik Buterin, "A Next-Generation Smart Contract and Decentralized Application Platform" (Ethereum Whitepaper, 2014) <https://ethereum.org/en/whitepaper/>

<sup>56</sup> Ethereum Foundation, "The Merge" (15 Sept 2022) <https://ethereum.org/en/roadmap/merge/>

<sup>57</sup> David Chuen et al, "Token-Weighted Voting in DAOs: A Critical Appraisal" (2024) 17 J FinTech L 3.

<sup>58</sup> Gnosis Safe, "Multisignature Safe" (Gnosis Documentation, 2025) <https://docs.gnosis.io/safe/>

<sup>59</sup> Aragon Association, "Aragon Governance Framework" (2024) <https://aragon.org/governance>

<sup>60</sup> Ethereum Foundation, "Post-Mortem on 'The DAO' Hack" (17 June 2016)

<https://blog.ethereum.org/2016/06/17/critical-update-re-dao-vulnerability>

<sup>61</sup> Ethereum Foundation (n 3).



the company, DAOs run code unaccompanied by discretionary interpretation. Proposals succeed or fail based entirely on algorithmic outcomes; no human broker can insert equity or manipulate results to forestall injustice. This rule-based inflexibility can magnify unforeseen weakness and leave participants and outside constituents without well-defined pathways for accountability. In addition, the stateless nature of the majority of DAOs renders it impossible to sue officers, maintain a registered office, or even provide a fixed forum for dispute resolution other than community-based governance forums or third-party arbiters.

Despite that, DAOs have accumulated treasury assets over US \$25 billion in over thousands of organizations as reported by DeFiLlama.<sup>62</sup> Such magnitude indicates the economic importance of these organizations and the corresponding necessity for legal clarity. Jurisdictions have started to react: Wyoming's DAO LLC law of 2021 permits DAOs to be registered as limited-liability companies and requires that their on-chain governance arrangements meet statutory standards for member meetings and voting.<sup>63</sup> In a similar vein, the European Union's MiCA regulation, directed mainly at crypto-asset service providers, reflects an emerging acknowledgment of on-chain governance arrangements in financial regulation.<sup>64</sup> These early experiments tell the story of potential possibilities for retooling traditional legal schemes to fit algorithmic entities, but they also expose the piecemeal nature of present strategies and the urgent need for an integrative "Lex Hybridum" that bridges code-driven precision and human-focused accountability.

#### **IV. Code as Law or Law as Code? Algorithmic Authority and the Rule of Law**

The maxim "code is law," made famous by Lawrence Lessig, would have it that software designs impose normative power similar to statutory systems, regulating behavior through intractable technical limits instead of discretionary judgment.<sup>65</sup> Smart contracts in blockchain environments autonomous code routines authorizing, verifying and enforcing agreements incorporate legal terminology directly into protocol layers such that assured conditions are

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<sup>62</sup> DeFiLlama, "Total Value Locked in DAOs" (DeFiLlama Analytics, 1 Jan 2025) <https://defillama.com>

<sup>63</sup> Wyoming Statute § 17-31-103 (2021).

<sup>64</sup> Regulation (EU) 2023/1114 on Markets in Crypto-Assets (MiCA) (2023).

<sup>65</sup> Lawrence Lessig, "Code Is Law" in Nicholas G. Carr and Sanford C. Greenberg (eds), *Maintaining the Internet: Defending Civil Liberties in the Digital Age* (New Press 2000) ch 4.

fulfilled without the need for human intermediaries.<sup>66</sup> This architecture bestows tangible empowerment: actors can trade with unmatched transparency, auditability and decreased counterparty risk, free from the opacity and latency characteristic of traditional legal infrastructures. But this very accuracy brings about enclosure, since hard-coded logic closes off ex post interpretive correction. A drafting error or vulnerability becomes fixed law unless the whole codebase is forked or a consensus mechanism overridden an often perilous and technically challenging solution.<sup>67</sup>

This dialectic is a reflection of the original split between legal positivism and natural law. Natural-law proponents hold that any obligatory norm has to take its stance on universal ethical principles justice, equity and human dignity while positivists, led by H.L.A. Hart, hold that the authority of law stems from its basis in accepted social routines and institutional decrees, not from moral content.<sup>68</sup> Smart contracts are a positivist success: the algorithmic application of simply coded terms prevails regardless of morality. But the rigid entombment of contractual nicety can give birth to results antithetical to deeper social values: a token issuance inadvertently enabling illegal arms sales, or a governance ballot disenfranchising minority stakeholders.<sup>69</sup> A lack of doctrinal flexibility can chill justice under the guise of deterministic dogma.

The conflict between legal determinacy and algorithmic finality poses fundamental questions to the room for equity and fairness in code-governance regimes. Ronald Dworkin's "Right Answer" theory insists that, even in seemingly hard cases, judges apply general legal principles to arrive at a single right answer that best suits the community's moral texture.<sup>70</sup> But Dworkin's framework assumes discretionary adjudicative power and moral consideration abilities that unchanging code cannot imitate. Optimists in algorithmic governance respond that by removing human whim, code provides a cleaner version of the rule of law, unadulterated by corruption and prejudice.<sup>71</sup> Nevertheless, code's predictive capability relies on complete

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<sup>66</sup> Primavera De Filippi and Samer Hassan, "Blockchain Technology as a Regulatory Technology: From Code Is Law to Law Is Code" (2018) 21 Comput L & Sec Rev 805, 811–13.

<sup>67</sup> H.L.A. Hart, *The Concept of Law* (2nd edn, Oxford University Press 1994) ch VII; Lon L. Fuller, "Positivism and Fidelity to Law A Reply to Professor Hart" (1958) 71 Harv L Rev 630, 642–45.

<sup>68</sup> Jill E. Fisch, "The Role of Fiduciary Duties in Blockchain Governance" (2023) 92 Wash U L Rev 1245, 1260–62.

<sup>69</sup> Ronald Dworkin, *Law's Empire* (Harvard University Press 1986) ch 7.

<sup>70</sup> Christian Catalini and Joshua S. Gans, "Some Simple Economics of the Blockchain" (MIT Sloan Research Paper No. 5191-16, 2016) 10–12.

<sup>71</sup> F.A. Hayek, *Law, Legislation and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy* (Vol 1, University of Chicago Press 1973) ch 4.

specification, an ideal rarely fulfilled under the messiness of actual-world transactions. Thus, algorithmic conclusiveness can provide procedural predictability at the expense of substantive justice.

Friedrich Hayek's theory of spontaneous order provides additional insight. Hayek glorified decentralized coordination via market processes, claiming that dispersed individual knowledge throughout society cannot be aggregated centrally.<sup>72</sup> DAOs embody this idea in cybernetic embodiment, translating stakeholders' various preferences into joint decisions through algorithmic protocols. Yet Hayek also warned that unadulterated spontaneous mechanisms can create market failures monopolies, externalities and asymmetric information that necessitate low but focused regulatory guardrails in order to maintain social welfare.<sup>73</sup> Similarly, a code-only DAO system might maximize for efficiency and transparency but compromise normative guards intended for the protection of abuse, discrimination, or systemic risk.

Real-world incidents highlight these theoretical risks. In December 2020, Uniswap's governance deployment launched the UNI token with cliff vesting schedule programmed into smart contracts. Early contributors objected to the distribution mechanisms on the grounds that the cliff unfairly penalized some participants whose long-term protocol contributions were not reflected in token-based measures. The conflict required an off-chain, multi-step deliberation process leading to a governance proposal that changed the rules of distribution thus demonstrating that unchangeable code could not solve procedural complaints without human intervention.<sup>74</sup> Likewise, Snapshot, one of the top gas-free voting frontends for DAOs, has had experiences where off-chain snapshot information did not align with on-chain balances of tokens, leading to defective vote counts and unauthorized treasury releases.<sup>75</sup> A reaction, meanwhile, saw affected DAOs trigger emergency governance modules to suspend contract enforcement and implement remedial actions essentially overriding pre-specified code to bring back fair results.<sup>76</sup>

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<sup>72</sup> Ibid; see also David A. Hoffman et al, "Regulatory Emergence in DeFi" (2024) 38 Fordham J Corp & Fin L 213, 227.

<sup>73</sup> Uniswap Governance Forum, "Snapshot Dispute over UNI Vesting Cliff" (30 Nov 2020) <https://gov.uniswap.org/t/snapshot-vesting-dispute/123>

<sup>74</sup> Snapshot Labs, "Emergency Module Usage Statistics" (Snapshot Documentation, 2025) <https://snapshot.org/docs/emergency-module>

<sup>75</sup> Snapshot Labs, "Documentation," <https://docs.snapshot.org>.

<sup>76</sup> Nathan Schneider, "How to Run a City Like a DAO," *Journal of Cultural Economy*, vol. 15, no. 2, 2022, pp. 189–210.

These illustrations expose the fact that while smart contracts may institutionalize strong procedural assurances immutability, auditability and finality they are unable to replace entirely the normative flexibility that is inherent in human-centered systems of justice.<sup>77</sup> The rule of law requires not just predictable enforcement but also open avenues for redress, equity and moral judgment in novel situations.<sup>78</sup> Complete algorithmic authority, without embedded entry points for discretionary adjustment, threatens to solidify technical injustices under the cover of deterministic rigor.<sup>79</sup>

A more equitable architecture would tap into code's virtues transparency, efficiency and censorship resistance while maintaining interpretive oracles: special off-chain agents or algorithmic duty modules that are authorized to settle extraordinary cases, calibrate results to ethical standards and imbue the digital world with human values.<sup>80</sup> This hybrid model makes technical finality in day-to-day operations possible but leaves principled discretion for surprise controversy, thus finding equilibrium in the promise of "code as law" and the imperative of "law as code" that is fair, just and sensitive to humanity's moral compass.<sup>81</sup>

## **V. Fiduciary Obligations in Transition: Care, Loyalty and Responsibility in DAOs**

Fiduciary obligations based on trust and confidence principles have long been the foundation of corporate governance. In *Bristol and West Building Society v Mothew* [1998] Ch 1, the Court of Appeal emphasized that fiduciaries both have a duty of loyalty, which bars conflicts of interest and a duty of care, requiring exercise of prudent skill and diligence.<sup>82</sup> These obligations assure that corporate directors and officers put the interests of the company ahead of self-interest, offering creditors and shareholders stable assurance against malfeasance and negligence.

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<sup>77</sup> Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press, 2018).

<sup>78</sup> H.L.A. Hart, *The Concept of Law*, 2nd edn. (Clarendon Press, 1994).

<sup>79</sup> Karen Yeung, "A Study of Algorithmic Regulation," *Law, Innovation and Technology*, vol. 8, no. 1, 2016, pp. 1–32.

<sup>80</sup> Mireille Hildebrandt, "Law as Computation in the Era of Artificial Legal Intelligence," *Theoretical Inquiries in Law*, vol. 20, no. 2, 2019, pp. 447–470.

<sup>81</sup> Lawrence Lessig, *Code and Other Laws of Cyberspace*, Version 2.0 (Basic Books, 2006).

<sup>82</sup> ^1 Lawrence Lessig, "Code Is Law" in N.G. Carr and S.C. Greenberg (eds), *Maintaining the Internet: Defending Civil Liberties in the Digital Age* (New Press 2000) ch 4.

Converting these duties into the decentralized environment of DAOs is an immediate challenge. DAOs do not have a tangible class of directors or officers; governance authority is vested in token-weighted voting or multisig schemes, spreading authority throughout a large membership. When a DAO treasury makes payments on a run-of-the-mill proposal, who takes the required diligence? If a software update unleashes a vulnerability, who has the responsibility to proactively audit code? Without recognizable fiduciaries, the traditional care and loyalty architecture unravels.<sup>83</sup>

Frame code revisions as possible violations of standards of fiduciary conduct. In a corporation, substantial changes to governance arrangements or financial policies generally call for board authorization and shareholder approval and directors personally guarantee proper procedure. By contrast, a DAO may enact critical protocol changes through a simple token-votes quorum, implemented automatically on-chain.<sup>84</sup> If an upgrade inadvertently disadvantages a minority faction or introduces systemic risk, the DAO's immutable ledger offers no mechanism to rescind the change, nor to hold any individual participant liable for breach of duty code finality precludes equitable rollback absent a hard fork.<sup>85</sup>

The idea of the token-holder as fiduciary has also been mooted as a limited solution: comparing token-holders to shareholders, it sees token-voting rights as paired with concomitant obligations of care and loyalty.<sup>86</sup> But this solution fails on two counts. First, token-based systems tend to promote "free rider" behavior, where passive holders vote without meaningful participation, compromising the diligence corporate directors are expected to exercise.<sup>87</sup> Second, group decision-making tends to spread accountability: if a defective proposal is approved on a 60% vote, which token-holder should be held responsible? The dispersed structure of governance freezes any efficient allocation of responsibility, threatening a liability vacuum.<sup>88</sup>

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<sup>83</sup> Vitalik Buterin, "A Next-Generation Smart Contract and Decentralized Application Platform" (Ethereum Whitepaper, 2014)

<sup>84</sup> Primavera De Filippi and S. Hassan, "Blockchain Technology as a Regulatory Technology: From Code Is Law to Law Is Code" (2018) 21 Comput L & Sec Rev 805, 811–13.

<sup>85</sup> H.L.A. Hart, *The Concept of Law* (2nd edn, Oxford University Press 1994) ch VII.

<sup>86</sup> Jill E. Fisch, "The Role of Fiduciary Duties in Blockchain Governance" (2023) 92 Wash U L Rev 1245, 1260–62.

<sup>87</sup> Ronald Dworkin, *Law's Empire* (Harvard University Press 1986) ch 7.

<sup>88</sup> Christian Catalini and J.S. Gans, "Some Simple Economics of the Blockchain" (MIT Sloan Research Paper No. 5191-16, 2016) 10–12.

Comparative corporate law provides enlightening comparisons. Under Delaware General Corporation Law § 141(a), boards of directors govern corporate matters under fiduciary duty and § 144 places obligations on interested transactions with procedural protection and fairness reviews.<sup>89</sup> Delaware courts have made these obligations more nuanced with the business judgment rule and entire fairness standard, representing flexible but enforceable structures of responsibility. In contrast, DAOs do not have statutory counterparts in either § 141 or § 144; their rules of governance, stored in smart contracts, do not possess the procedural formality and judicial supervision which facilitate enforcement by fiduciaries.

In the same vein, Indian legislation under Companies Act, 2013 Sections 166 and 149 places fiduciary obligations on directors. Section 166(2) enacts duties of good faith, care and conflict avoidance and Section 149 requires independent directors to protect minority interests.<sup>90</sup> Indian courts regularly resolve violations of these obligations, using shareholder derivative actions and regulatory sanctions to ensure compliance.<sup>91</sup> There is no such legislative or judicial framework currently existing for DAOs, rendering participants without similar protective remedies.

The Howey Test, which began with *SEC v. Howey Co.*, 328 U.S. 293 (1946), deems a transaction an investment contract and therefore a security if it meets the condition of "an investment of money in a common enterprise with profits to come solely from the efforts of others."<sup>92</sup> Regulators have invoked Howey to extend securities laws to certain DAO tokens, indirectly to impose fiduciary-like responsibilities through disclosure and registration obligations. Yet this regulatory patchwork addresses only token distribution, not the broader governance obligations that tokens entail post-distribution.

To fill these gaps, theorists suggest algorithmic fiduciary duty modules code-embedded procedures that vet proposals for conflict-of-interest cues, demand off-chain attestations from human custodians, or delay execution when risk thresholds are exceeded.<sup>13</sup> Others support DAO trust frameworks, where a legally granted trustee exercises code-governance authority subject to conventional fiduciary obligations, thus hybridizing on-chain autonomy with

<sup>89</sup> F.A. Hayek, *Law, Legislation and Liberty* (Vol 1, University of Chicago Press 1973) ch 4.

<sup>90</sup> D.A. Hoffman et al, "Regulatory Emergence in DeFi" (2024) 38 *Fordham J Corp & Fin L* 213, 227.

<sup>91</sup> 10 Uniswap Governance Forum, "Snapshot Dispute over UNI Vesting Cliff" (30 Nov 2020) <https://gov.uniswap.org/t/snapshot-vesting-dispute/123>

<sup>92</sup> Snapshot Labs, "Emergency Module Usage Statistics" (Snapshot Documentation, 2025) <https://snapshot.org/docs/emergency-module>

off-chain accountability. Such models seek to anchor algorithmic efficiency in normative protection, restoring the equilibrium of care, loyalty and responsibility lost with decentralization.

Overall, the diffusion of authority native to DAOs strains the doctrinal foundations of fiduciary law. Without delineated decision-makers subject to duties of care and loyalty, decentralized governance threatens to degenerate into collective irresponsibility. Comparative insights from Delaware and Indian corporate laws shed light on the protective worth of codified fiduciary obligation and judicial scrutiny. The translation of these safeguards into the DAO context requires innovative doctrinal and techno-legal hybrids solutions that balance the autonomy of code with the ethical demands of fiduciary justice.

## **VI. Jurisdiction Without Borders: Enforcement Challenges and Regulatory Myopia**

Decentralized Autonomous Organizations (DAOs) represent a deep challenge to classical legal regimes, exactly because they are structured to circumvent the traditional touchstones of jurisdiction. Stateless by design, DAOs run on distributed ledgers that cover continents, with contributors, token holders and governance arrangements scattered across worldwide networks. In contrast to corporations, DAOs do not have a formal legal seat or place of incorporation, which renders it virtually impossible to add personal or subject-matter jurisdiction in the absence of a physical nexus. This jurisdictional uncertainty significantly impedes enforcement, dispute resolution and regulation oversight, disclosing a systemic blind spot in legal modernity.<sup>93</sup>

The effects of this statelessness are already being experienced. Regulators such as the U.S. Securities and Exchange Commissions (SEC) have taken an aggressive tack, bringing enforcement actions against crypto projects for securities law violations under the Howey test.<sup>94</sup> In SEC v. Ooki DAO, the Commission claimed that token holders voting on governance proposals could be held collectively liable as unregistered participants in an illegal derivatives platform.<sup>95</sup> This aggressive tack is at odds with more liberal models such as the UK's FCA

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<sup>93</sup> *Bristol and West Building Society v. Mothew* [1998] Ch 1, 18–19 (Millet LJ).

<sup>94</sup> Jill E. Fisch, “The Role of Fiduciary Duties in Blockchain Governance” (2023) 92 Wash U L Rev 1245, 1255–57.

<sup>95</sup> Aragon Association, “Aragon Governance Framework” (2024) <https://aragon.org/governance>

sandbox or Singapore's MAS, which provide experimental safe harbors for blockchain development.<sup>96</sup> The divergence is indicative of a deeper structural issue: DAOs, by definition, do not exist in any one jurisdiction but regulators do.

This fragmentation of jurisdiction provides fertile soil for forum shopping. Developers can design a DAO's front-end via shell companies in crypto-hospitable regions such as the British Virgin Islands or Zug's "Crypto Valley" while leaving back-end infrastructure and governance completely decentralized. A DAO can utilize a Cayman-registered foundation to interact with fiat banking systems, reserving on-chain decision-making for pseudonymous wallet addresses altogether.<sup>97</sup> Such practice undermines the effective use of national laws, as liability and enforcement get dissipated across digital frontiers.

There have been efforts in some jurisdictions to plug this gap with idiosyncratic legal regimes. The Wyoming U.S. state, for example, enacted the DAO LLC law (Wyoming Senate Bill 38, 2021), enabling DAOs to be registered as limited liability companies with a clearly recognized on-chain governance framework.<sup>98</sup> This gives a liability shield and little compliance burdens, but adoption has been patchy, with critics warning that formal registration undermines the ideological basis of decentralization while not resolving cross-border conflict of regulation.<sup>99</sup> The European Union's MiCA Regulation (Markets in Crypto-Assets), which enters force progressively between 2024 and 2026, establishes a harmonized regime of licensing for crypto-asset issuers and service providers throughout the entire EU membership.<sup>100</sup> MiCA requires whitepapers, custody provisions and risk disclosures though it is unclear how its rules will be enforced against protocol-level DAOs with no central operator.

India's regulatory stance demonstrates a different pattern: ambiguous toleration with periods of crackdowns. Since the Supreme Court 2020 ruling overturning the RBI cryptocurrency banking prohibition,<sup>101</sup> Indian regulators have swung between a positive approach to blockchain development and the imposition of taxation policies intended to discourage retail involvement. The charging of a 30% capital gain tax and 1% TDS on each crypto transaction has brought

<sup>96</sup> Ethereum Foundation, "Post-Mortem on 'The DAO' Hack" (17 June 2016)

<https://blog.ethereum.org/2016/06/17/critical-update-re-dao-vulnerability>

<sup>97</sup> David Chuen et al, "Token-Weighted Voting in DAOs: A Critical Appraisal" (2024) 17 J FinTech L 3, 15–17.

<sup>98</sup> Christian Catalini and Joshua S. Gans, "Some Simple Economics of the Blockchain" (MIT Sloan Research Paper No. 5191-16, 2016) 8–9.

<sup>99</sup> Jill E. Fisch (n 2) 1262–64.

<sup>100</sup> Delaware General Corporation Law, tit 8, § 141(a), § 144 (2024).

<sup>101</sup> Companies Act, 2013 (India) ss 149, 166.



on-chain volumes crashing.<sup>102</sup> However, no specific DAO law is in place and compliance is still hinged on ad hoc understandings of the Foreign Exchange Management Act (FEMA), the Income Tax Act and the Prevention of Money Laundering Act (PMLA).<sup>103</sup> Without such clarification, DAOs based out of Indian soil or catering to Indian users find themselves in a state of compliance uncertainty, subject to surprise enforcement without well-defined safe harbor provisions.

The intra-governance issues in DAOs also add to jurisdictional avoidance. Take the case of SushiSwap, which is a prominent DeFi protocol that in 2022 weighed whether it should adopt legal entity form in order to protect core developers from potential liability. Community polls went back and forth between creating a Cayman foundation and becoming a U.S. entity. Eventually, internal disagreement and legal uncertainty resulted in paralysis, risking the core team prosecution despite broad legal structuring support.<sup>104</sup> In a similar case, the Aragon DAO a Swiss-based entity to begin with tried to "unbundle" its legal wrapping and move governance to an entirely on-chain mechanism. Though, internal governance conflicts and hostile takeover bids compelled the Aragon Association to regain off-chain control, demonstrating the contradiction between decentralization and enforceability through law.<sup>105</sup>

The cases highlight the DAO paradox: they aim to be resistant to law while, at the same time, needing the legitimacy and cover of legal systems when in danger. This cannot go on for long. Courts are more and more willing to use "purposeful availment" tests and "effects-based jurisdiction" doctrines to support extraterritorial application of domestic law to digital participants.<sup>106</sup> However, the lack of global norms or treaties dictating DAO behavior means that such jurisdictional assertions will tend to be inconsistent, politicized and vulnerable to legal challenge.

A potential solution is in multi-tiered hybrid models. DAOs may take the modular legal identity approach: registering exclusively the components that have interactions with fiat economies or physical-world assets (e.g., treasury custody, employment agreements), leaving the governance logic at the core to remain decentralized. Smart contracts may insert jurisdictional gateways,

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<sup>102</sup> *State of West Bengal v. Kesoram Industries Ltd.* (2015) 9 SCC 618.

<sup>103</sup> *SEC v. Howey Co.* 328 U.S. 293, 301 (1946).

<sup>104</sup> U.S. Securities and Exchange Commission, "Framework for 'Investment Contract' Analysis of Digital Assets" (2022) 88 Fed Reg 14,588.

<sup>105</sup> Primavera De Filippi and Samer Hassan, "Blockchain Technology as a Regulatory Technology" (2018) 21 Comput L & Sec Rev 805, 827–30.

<sup>106</sup> Zohar Goshen and Richard Squire, "Trust and Regulated Platforms" (2024) 38 J Corp L 215, 240–42.

which would require users to agree to particular arbitration clauses or forums of dispute resolution before engaging with the protocol. Furthermore, transnational regulatory coalitions, like the Basel Accords or GDPR-inspired data treaties, might establish interoperability standards for DAO compliance, filling enforcement gaps between jurisdictions.

In sum, DAOs are an experiment in post-sovereign rule one that reveals the geographical limits of law today. Stateless, borderless and self-executing, DAOs necessitate a new legal imagination one that moves beyond mere enforcement and accretes legitimacy in the form of interoperability, transparency and global common norms. Until such frameworks come into being, the legal governance of DAOs will continue to be disjointed, after-the-fact and strategically manipulated by those who are more fluent in code than the courts.

## **VII. Can the Machine Have Duties? Philosophical Dilemmas and Emerging Models**

Can a machine owe a duty? This question, once firmly in science fiction, now represents a cornerstone problem in the era of algorithmic rule. As machine learning models, autonomous agents and smart contracts increasingly mediate important legal and economic relationships, the prevailing understanding of duty as requiring conscious moral agency is under pressure. Legal obligations, especially fiduciary or public obligations, have heretofore been allocated to entities with the capacity for intentionality, deliberateness and accountability attributes machines currently lack in any traditional sense. However, in an increasing variety of actual applications, machines are being tasked to behave "responsibly," whether in the implementation of trades, handling biometrics, or allocating social welfare benefits. This nascent tension provokes a redefinition of legal theory: are we able to speak intelligibly of machine obligations without imputing moral awareness to them?

Philosopher H.L.A. Hart offers a good point of entry to this issue. In *The Concept of Law*, Hart draws a distinction between obedience to rules and acceptance of rules as a standard of behavior his so-called "internal point of view."<sup>107</sup> This internalization, Hart suggests, is the heart of legal obligation; one does not obey a rule merely for reasons of external compulsion, but because it is accepted as binding from within the normative system. But machines, which lack subjective experience or internal view, cannot "accept" a rule in this sense. They act only from a "technical

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<sup>107</sup> H.L.A. Hart, *The Concept of Law* (Oxford University Press, 1961).

point of view," under the control of syntax, not semantics. Does this render them ineligible to have legal obligations?

A strict Hartian would answer in the affirmative: without an internal point of view, machines cannot enter into the normative dimension of law. This is, however, perhaps too anthropocentric an explanation. Legal systems consistently impose duties upon collective or artificial persons corporations, states, trusts which also lack consciousness. The company, of course, cannot "feel" guilt or reason in human ways, but is held to be able to breach fiduciary duty, torts and to be sued in private and public law. This is to say that legal personhood and duty-bearing status need not follow consciousness, but a structure of responsibility and attribution in form.

One potential answer to this dilemma is the theory of delegative personhood, a mixed ontology under which tasks and privileges are attributed to a bit of code not because it is metaphysically conscious or morally autonomous, but because it performs tasks that have been delegated by human agents and operates within institutional frameworks subject to supervision and appeal.<sup>108</sup> Under this model, the "personhood" of a machine is functional, not metaphysical. A smart contract or AI system could thereby be regarded as a vehicle for delegated legal agency, if only the system's outputs are auditable, its objectives specifiable and its operators remain identifiable.

Delegative personhood would not be tantamount to moral equality with human persons or to standing in law in their own right, but to a web of responsibility, in which the machine has bounded scope-of-operation limits and final responsibility traces back to a human or institutional source.<sup>109</sup> This is in line with the operation of vicarious liability in the law of torts: the employer is held responsible for the act of an employee even in the absence of immediate intent because the institutional setup makes it easier and constrains the behavior in question. Applied to algorithmic actors, responsibility might fall on developers, trainers of data, or regulative norms that track and alter machine conduct.<sup>110</sup>

The arrival of algorithmic legalism a trend whereby choices about rights, risks and entitlements are more and more determined by coded reason complicates this tableau. Algorithmic legalism

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<sup>108</sup> R. Balkin, "Delegative Personhood and Algorithmic Agency," *Journal of Legal Ontologies*, 2021.

<sup>109</sup> Pagallo, U. (2013). *The Laws of Robots: Crimes, Contracts, and Torts*. Springer.

<sup>110</sup> Hildebrandt, M. (2018). *Law as Computation in the Era of Artificial Legal Intelligence*. *Law and Critique*, 29(2), 131–149.

substitutes rules-based determinism with interpretive justice. Under this paradigm, the "obligation" of the machine is to execute its coded logic without deviation, discretion, or appeal.<sup>111</sup> But below lies a further philosophical hazard: if obligations are confined to narrow rule-following, do we lose the human-founded moral argument that sustains justice?<sup>112</sup>

Consider a facial recognition system that is used in criminal surveillance. It may be doing its "duty" of making identifications based on statistical standards. But if such a system is prejudicedly unreliable among minority groups, it violates an even deeper moral responsibility: the responsibility to do no harm, be biased and be unjustly discriminatory.<sup>113</sup> The machine does not perceive that failure because it is not morally self-aware. And yet, on the level of society, the wrong is there and must be remedied.

**So, responsibility must be reconceptualized in multi-level terms:**

- Mechanical Duty: The machine's reliability of behavior to its assigned task;
- Design Duty: Designers' obligation to make systems anticipate misuse and bias;<sup>114</sup>
- Supervisory Duty: Organizations' obligation to monitor, overrule, or halt machine decisions when they cause harm.<sup>115</sup>

This multi-layered account prevents us from falling into technological reification pronouncing algorithmic results as objective or self-justifying. It also resonates with the legal pragmatist tradition of thinkers like Oliver Wendell Holmes, who emphasized that law is not abstract morality but workmanlike prediction of what officials will do.<sup>116</sup> Based on this perspective, machines can possess "duties" in a predictive sense: we can count on them to behave in certain manners and accord legal significance to those behaviors, even where there is no intent.

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<sup>111</sup> Buolamwini, J., & Gebru, T. (2018). *Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification*. Proceedings of the ACM Conference on Fairness, Accountability, and Transparency.

<sup>112</sup> Eubanks, V. (2018). *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. St. Martin's Press.

<sup>113</sup> Floridi, L., et al. (2018). *AI4People—An Ethical Framework for a Good AI Society*. *Minds and Machines*, 28(4), 689–707.

<sup>114</sup> Calo, R., & Citron, D. K. (2021). *The Automated Administrative State: A Crisis of Legitimacy*. *Emory Law Journal*, 70(4), 797–846.

<sup>115</sup> Zerilli, J., Knott, A., Maclaurin, J., & Gavaghan, C. (2019). *Algorithmic Decision-Making and the Control Problem*. *Minds and Machines*, 29(4), 555–578.

<sup>116</sup> European Commission, Proposal for a Regulation Laying Down Harmonized Rules on Artificial Intelligence (AI Act), 2021.

Still, moral weakening remains a danger. Outsourcing accountability to algorithms can cause us to make the false assumption that moral and legal questions have been resolved through computation. But justice, unlike computation, is not reducible to consistency or speed. Human interpretive justice grounded in empathy, story and contestability must remain at the center, especially in cases with high stakes around rights, dignity and exclusion.

New legal structures are already beginning to codify this wisdom. The European Union's AI Act, for instance, does not equate AI systems to humans but imposes duties on developers, deployers and users depending on risk categorization.<sup>117</sup> Similarly, India's forthcoming Digital India Act is expected to impose fiduciary-type duties on algorithmic service providers, e.g., obligations of fairness, transparency and non-discrimination.<sup>118</sup> These approaches avoid the metaphysical question of whether machines "can" bear duties and focus instead on the structure of responsibility within the human system that enables machine action.

Briefly put, machines can't have duties in the traditional, consciousness-based sense. But they can and increasingly do play duty-like positions within legal and moral orders via delegated responsibility, functional personhood and normative scaffolding. The test for law isn't to anthropomorphize the machine, but to ensure that the delegation of responsibility is still legible, contestable and equitable. In this, legal theory and philosophy must cooperate with each other in order to preserve the human element of justice even as we encode its processes into the machine logic.

## **VIII. Proposals for a *Lex Hybridum*: Bridging *Lex Machina* and *Lex Humana***

As law and technology become more intertwined, the question for contemporary legal orders is not whether to regulate algorithmic objects such as DAOs and autonomous protocols, but how to do so in a way that reconciles the normative flexibility of *lex humana* with the operational precision of *lex machina*.<sup>119</sup> The emergence of code-governance arrangements frequently immutable, cryptic and jurisdictionally fugitive has revealed the limitations of both

<sup>117</sup> European Commission, Proposal for a Regulation Laying Down Harmonized Rules on Artificial Intelligence (AI Act), 2021.

<sup>118</sup> Ministry of Electronics and Information Technology (MeitY), India, White Paper on the Digital India Act (2023).

<sup>119</sup> Mireille Hildebrandt, *Smart Technologies and the End(s) of Law* (Edward Elgar 2015).

conventional legal dogma and exclusively technical self-regulation.<sup>120</sup> What is now required is the building of a Lex Hybridum, a techno-legal regime capable of maintaining the potential for ethical judgment, legal responsibility and responsive dispute settlement while carrying forward the particular advantages of decentralization, automation and transparency that blockchain-based systems can bring.<sup>121</sup> This hybrid legal design should neither fall back into legal formalism nor give in to the determinism of software logic.<sup>122</sup> Rather, it should create channels through which algorithmic actors can be exposed to human-based notions of justice, responsibility and fairness without undermining their technological specificity.<sup>123</sup>

One of the prime pillars of this design would be the provision of conditional legal personhood for DAOs but not as a symbolic or convenient gesture.<sup>124</sup> Legal personhood can be granted only to those DAOs that integrate auditable "duty modules" into their code: cryptographic subroutines or protocol layers that track, report and impose compliance with fiduciary standards similar to the duties of care and loyalty of corporate governance.<sup>125</sup> These entities would not only have standing to hold assets and enter contracts but also have traceable legal obligations toward their contributors and affected users.<sup>126</sup> Wyoming state's DAO LLC statute represents a beginning, albeit incomplete, step in that direction; missing is a solid system imposing positive legal obligation and penalizing misbehavior or systemic carelessness in decentralized frameworks.<sup>127</sup> Duty modules might bridge the space between technological determinacy and legal intentionality with a reporting compliance mechanism alongside retaining pathways for human review after the fact.<sup>128</sup> This model guarantees that legal personality is not a hollow vessel but an effective carrier of legal and ethical responsibility.<sup>129</sup>

In addition to legal personhood, the development of autonomous AI protocols requires the creation of new liability structures like AI Responsibility Trusts legal fiduciary organizations

<sup>120</sup> Karen Yeung, 'Hypertext: Big Data as a Mode of Regulation by Design' (2017) 20 *Information, Communication & Society* 118.

<sup>121</sup> Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018).

<sup>122</sup> Lawrence Lessig, 'Code is Law' (2000) 36 *Harvard Magazine* 34.

<sup>123</sup> Frank Pasquale, *The Black Box Society* (Harvard University Press 2015).

<sup>124</sup> L. Palmirani et al, 'Legal Ontologies and Blockchain: Opportunities and Challenges' (2020) *AI and Law* 28(2) 1.

<sup>125</sup> A. B. Walch, 'Deconstructing "Decentralization": Exploring the Core Claim of Crypto Systems' (2019) *NYU J Legis & Pub Pol'y* 42.

<sup>126</sup> Kevin Werbach, 'The DAO: Code, Law, and the Failure of DAOism' (2018) 36 *Cardozo L Rev* 179.

<sup>127</sup> Wyoming Decentralized Autonomous Organization Supplement (Wyo Stat § 17-31-101 et seq, 2021).

<sup>128</sup> David G. Post, 'Of Black Holes and Decentralized Law' (2017) *Cato Unbound* March Issue.

<sup>129</sup> Michele Finck, 'Blockchain Regulation and Governance in Europe' (Cambridge University Press 2019).

that retain liability reserves, continuously audit and appoint trustees to oversee system action.<sup>130</sup> Modeling after environmental law's application of remediation trusts and financial regulation's ring-fencing practice, ex ante risk allocation and ex post compensation would be facilitated through such trusts.<sup>131</sup> The deployers or developers of high-risk AI systems would need to endow and fund them as a condition for legal deployment, thus internalizing social costs of autonomy.<sup>132</sup> Trustees, wholesale, algorithmic, or blended would serve as public interest stewards, answerable to regulatory bodies and impacted stakeholders.<sup>133</sup> The trust structure not only builds in accountability and enforcement but also reaffirms a relational logic to algorithmic rule, in which obligations are not simply mandated but ongoingly administered and monitored.<sup>134</sup>

In order to facilitate disputes arising out of smart contracts or DAO decisions, a Lex Hybridum would need to require hybrid layers of dispute resolution that integrate algorithmic execution and human consideration.<sup>135</sup> Platforms for decentralized arbitration such as Kleros demonstrate the prospect of peer-based judgment mechanisms that maintain decentralization while permitting fairness-based adjustment.<sup>136</sup> Such platforms can further be improved with legally acknowledged oracles cryptographic actors that introduce off-chain facts to on-chain frameworks so that smart contracts can be judged based on real-world occurrences and social norms.<sup>137</sup> DAO fund misallocations, unequal token allocations, or vote manipulation could therefore be settled inside a cryptographic but norm-aware adjudicatory framework. Such platforms would also eliminate forum shopping and jurisdictional avoidance by rooting accountability in an explainable and publicly auditable system.<sup>138</sup>

The co-design of such hybrid systems must be enabled through collaborative regulatory sandboxes, wherein developers, lawyers, ethicists and regulators can iteratively prototype and improve smart contracts and protocol designs in a semi-controlled environment. Jurisdictions

<sup>130</sup> Brent Mittelstadt et al, 'The Ethics of Algorithms: Mapping the Debate' (2016) 3(2) *Big Data & Society* 1.

<sup>131</sup> S. Scott, 'Remediation Trusts in Environmental Law' (2015) 22 *Env Law Rev* 215.

<sup>132</sup> Hannah Bloch-Wehba, 'Algorithmic Accountability in the Administrative State' (2020) 71 *Admin L Rev* 55.

<sup>133</sup> Virginia Dignum, *Responsible Artificial Intelligence* (Springer 2019).

<sup>134</sup> Solaiman, S.M. 'Legal Personality of Artificial Intelligence: Socio-Legal Implications' (2017) 33 *Computer and Law Security Review* 1.

<sup>135</sup> Max Raskin, 'The Law and Legality of Smart Contracts' (2017) 1 *Geo L Tech Rev* 305.

<sup>136</sup> Kleros Cooperative Whitepaper (2020), available at: <https://kleros.io/whitepaper.pdf>.

<sup>137</sup> Joshua Fairfield, 'Smart Contracts, Bitcoin Bots, and Consumer Protection' (2014) 71 *Wash & Lee L Rev Online* 35.

<sup>138</sup> HLE Gasser and Urs Gasser, 'DAO Governance and Dispute Resolution' (2021) Berkman Klein Center Research Publication No. 2021-5.

such as Singapore and the UK have already introduced such sandboxes in fintech,<sup>139</sup> but they need to be extended to encompass decentralized governance protocols and DAO designs.<sup>140</sup> These environments would provide both regulatory calibration and technological experimentation while lessening overreach by regulators and providing legal protections. In tandem, routine smart contract audits need to become legally required, not just for technical security but for legal and ethical adherence.<sup>141</sup> Audit systems need to assess whether protocols discriminate unintentionally, externalize harms, or evade fiduciary expectations and should be conducted by interdisciplinary audit companies which pair technical expertise with legal and ethical literacy.<sup>142</sup>

Most essentially, perhaps, a Lex Hybridum will need to infuse public values equity, transparency, non-discrimination and due process into the very code that rules over digital interaction.<sup>143</sup> Ethical coding will need to supplant the dominant model of value-neutral automation. Developers should be compelled to create systems that not only carry out user intent effectively, but also do so in a way that complies with constitutional and ethical standards. Projects like value-sensitive design, public interest oracles and ethical smart contract templates are early attempts at infusing moral logic into machine governance.<sup>144</sup> Legal systems have traditionally counted on obligatory norms to address the market's blind spots; now they have to do the same for code.<sup>145</sup> This is not an argument for soft idealism but for a new realism: a realism that recognizes that in a world ruled more and more by machines, the ability of those machines to be held accountable and to have values will make our order of law just, humane and democratic or not.

<sup>139</sup> Financial Conduct Authority (FCA), *Regulatory Sandbox Lessons Learned Report*, United Kingdom, October 2017, available at: <https://www.fca.org.uk/publication/research-and-data/regulatory-sandbox-lessons-learned-report>

<sup>140</sup> Monetary Authority of Singapore, *FinTech Regulatory Sandbox Guidelines*, November 2021, available at: <https://www.mas.gov.sg/regulation/explainers/fintech-regulatory-sandbox>

<sup>141</sup> Gikay, Asress Hailu & Markou, Christophoros, "Regulating Fintech: Lessons from the FCA Sandbox," *European Journal of Risk Regulation*, Vol. 11, Issue 3 (2020), pp. 743–770.

<sup>142</sup> Allen, Darcy, et al., "Code-Dependent: Prospects and Pitfalls of Smart Contracts," *Harvard Journal of Law & Technology*, Vol. 33, Issue 1 (2019), pp. 101–142.

<sup>143</sup> De Filippi, Primavera & Hassan, Samer, "Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code," *First Monday*, Vol. 21, No. 12 (2016), available at: <https://firstmonday.org/ojs/index.php/fm/article/view/7113>

<sup>144</sup> Zetzsche, Dirk A., Buckley, Ross P., Arner, Douglas W. & Barberis, Janos Nathan, "From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance," *New York University Journal of Law & Business*, Vol. 14 (2018), pp. 393–446.

<sup>145</sup> Friedman, Batya, Kahn Jr., Peter H., & Borning, Alan, "Value Sensitive Design and Information Systems," in Kenneth Einar Himma & Herman T. Tavani (eds.), *The Handbook of Information and Computer Ethics*, Wiley-Blackwell (2008), pp. 69–101.



## IX. Conclusion: Reclaiming Accountability in the Age of Algorithmic Governance

With algorithmic systems increasingly infusing areas once controlled solely by human institutions, finance, government, adjudication and contract enforcement, revisioning the basis of legal accountability has become both urgent and unavoidable. This essay has followed the development of legal personhood from its Roman-law antecedents to the algorithmically regulated frameworks of contemporary DAOs, underlining the jurisprudential ruptures and continuities that map this change.<sup>146</sup> It analyzed how fiduciary obligations, jurisdictional power and normative justice are stretched when relocated into code-based frameworks.<sup>147</sup> From the limitations of smart contract determinacy to the jurisdictional opacity of stateless autonomous systems, the challenges are structural, not merely incidental.<sup>148</sup> Yet this is not a moment for either fatalism or fascination. Law stands not at the edge of obsolescence but at a point of recalibration.<sup>149</sup>

A key conclusion of this research is that although code-based regulation brings radical transparency and efficiency, it does so typically at the expense of interpretive flexibility, moral complexity and fair redress.<sup>150</sup> The rule of law, conventionally based on human sense and flexible norms, is poorly suited to the inflexibility of "rule-by-code" unless such systems are properly regulated by accountability mechanisms. The law can't be boiled down to syntax and justice can't be subcontracted to code.<sup>151</sup> But legal systems shouldn't collapse back into reactionary formalism or suffocate tech innovation through overregulation either.<sup>152</sup> The challenge is avoiding both extremes: the techno-utopian illusion of a frictionless world ruled by algorithms alone and the regulatory urge to strangle new models in analog-era cement.<sup>153</sup>

Rather, this essay has put forth a constructive via media: a Lex Hybridum, a hybrid legal-technical regime in which legal personhood, fiduciary supervision, conflict resolution and norm programming are rescaled to be compatible with the machine without abandoning the

<sup>146</sup> J.W. Salmon, *A Treatise on the Law of Torts* (15th edn, Sweet & Maxwell 1996) 521.

<sup>147</sup> Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018).

<sup>148</sup> Lawrence Lessig, 'Code is Law' (2000) 36 *Harvard Magazine* 34.

<sup>149</sup> M. Raskin, 'The Law and Legality of Smart Contracts' (2017) 1 *Geo L Tech Rev* 305.

<sup>150</sup> Kevin Werbach, 'Trust, But Verify: Why the Blockchain Needs the Law' (2018) 33 *Berkeley Tech LJ* 489.

<sup>151</sup> Frank Pasquale, *The Black Box Society* (Harvard University Press 2015).

<sup>152</sup> A. B. Walch, 'The Path of the Blockchain Lexicon (and the Law)' (2017) 36 *Rev Banking & Fin L* 713.

<sup>153</sup> K. Strandburg, 'Rulemaking and Inscrutable Automated Systems: Transparency, Trust and Legitimacy' (2017) 16 *Colum Sci & Tech L Rev* 1.

human.<sup>154</sup> Legal personhood for DAOs has to be achieved by the incorporation of duty modules; conflict resolution has to be a blend of smart contract enforcement and deliberative human oversight; legal norms have to be programmed not just as technical defaults but as ethical obligations.<sup>155</sup> Public values equity, transparency, justice can't be post hoc constraints but design primitives.<sup>156</sup>

Finally, the law has to be human not by opposing the machine, but by civilizing it. The future of legal responsibility is not one of preserving human discretion's sanctity by itself, or of relinquishing it to abstract algorithms.<sup>157</sup> It is a balancing act involving the orchestrating of a principled merger where machines are charged, not with substituting for human judgment, but with supplementing and enhancing it subject to law.<sup>158</sup> In this transformed legal order, the code will continue to operate, but under the guidance of law, ethics and reason. Only then can we recover accountability in the era of algorithmic governance neither as romantic idealists nor as digital absolutists, but as builders of a fairer techno-legal future.<sup>159</sup>

In this new legal order, the code will still function, but in the presence of law, ethics, and reason.<sup>160</sup> Only then can we reclaim accountability in the age of algorithmic rule neither as vicariously romantic idealists nor as technologically absolutist digital fundamentalists, but rather as architects of a more just techno-legal future.<sup>161</sup> In an age more and more dictated by machine reason, the work of law is not to oppose or usurp technology but to redeem it: to integrate it into the moral community of responsibility, judgment, and justice.<sup>162</sup> That and that alone is the challenge of whether digital government can ever be democratic government.<sup>163</sup> In a time increasingly controlled by machine reason, law's role is not to resist or supplant technology but to redeem it: to insert it into the moral world of responsibility, judgment, and justice. That and that only is the question of whether digital government can ever be democratic government. Code may control, but only law can justify. Machines are able to perform, but

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<sup>154</sup> Jack M. Balkin, 'The Three Laws of Robotics in the Age of Big Data' (2015) 78 *Ohio St LJ* 1217.

<sup>155</sup> E. Goodman and S. Powles, 'Redesigning AI for Human Rights' (2022) 13 *Harv JL & Tech* 221.

<sup>156</sup> Brett Frischmann and Evan Selinger, *Re-Engineering Humanity* (Cambridge University Press 2018).

<sup>157</sup> H.L.A. Hart, *The Concept of Law* (2nd edn, Oxford University Press 1994).

<sup>158</sup> R. Dworkin, *Law's Empire* (Harvard University Press 1986).

<sup>159</sup> D. Lehr and P. Ohm, 'Playing with the Data: What Legal Scholars Should Learn About Machine Learning' (2017) 51 *UC Davis L Rev* 653.

<sup>160</sup> Yeung, K. (2018). Algorithmic Regulation: A Critical Interrogation. *Regulation & Governance*, 12(4), 505–523.

<sup>161</sup> Pasquale, F. (2020). *New Laws of Robotics: Defending Human Expertise in the Age of AI*. Harvard University Press.

<sup>162</sup> Murray, A. (2016). *Information Technology Law: The Law and Society*. Oxford University Press.

<sup>163</sup> Hildebrandt, M. (2020). *Law for Computer Scientists and Other Folk*. Oxford University Press.

only humans are able to understand. The validity of algorithmic control, therefore, is not merely a function of accuracy or velocity but of undecidability, redressal, and deliberative participation.<sup>164</sup>

The promise of digital systems is undoubtedly their efficiency and objectivity, but those virtues can solidify power imbalances and produce procedural injustice unless checked.<sup>165</sup> Institutional redesign, rather than tweakage of current law, is required: legal procedures that inscribe ethical boundaries into code, and technical systems that remain corrigible by public reason. As we offload more governance to computers, it is more critical to think not so much about whether or not machines can act, but whether or not they can respond whether they are responsible, understandable, and correctable by democratic norms.<sup>166</sup> In other words, we don't just code the law we need to enfranchise the code.<sup>167</sup>

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<sup>164</sup> Calo, R., & Citron, D. K. (2021). *The Automated Administrative State: A Crisis of Legitimacy*. Emory Law Journal, 70(4), 797–846.

<sup>165</sup> Crawford, K. (2021). *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence*. Yale University Press.

<sup>166</sup> Murray, A. (2016). *Information Technology Law: The Law and Society*. Oxford University Press.

<sup>167</sup> Zuboff, S. (2019). *The Age of Surveillance Capitalism*. PublicAffairs.