

THE UPSTREAM MIGRATION OF POWER

Toward a Theory of Infrastructural Constitutionalism

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Title: *The Upstream Migration of Power. Toward a Theory of Infrastructural Constitutionalism.*

Abstract

The expansion of algorithmic systems into the infrastructures of governance marks a structural transformation in the material conditions under which constitutional authority operates. Across contemporary legal orders, legally consequential decisions are increasingly shaped upstream by computational architectures whose normative force precedes formal acts. Yet constitutional grammar remains predominantly act-centered, anchoring attribution, justification, and review to downstream decisions.

This article argues that algorithmic governance generates a structural constitutional deficit whenever the locus of effective determination diverges from the locus of constitutional responsibility. The deficit manifests along three interrelated dimensions: knowledge, control, and justification. When infrastructural opacity exceeds institutional reconstructive capacity and systemic dependency attenuates normative primacy, constitutional review risks becoming formally intact but substantively ceremonial.

To address this misalignment, the article develops two structural principles. *Algorithmic sovereignty* denotes the capacity of a constitutional order to retain normative primacy over infrastructures generating legally consequential effects within its jurisdiction. *Reconstructibility* designates the institutional capacity to retrace and articulate the pathways through which algorithmic systems shape outcomes in terms compatible with judicial protection, due process, and democratic accountability. Together, these principles ground a theory of *infrastructural constitutionalism*.

Keywords: *Constitutional theory; Algorithmic governance; Infrastructural power; Algorithmic sovereignty; Judicial review; European constitutionalism.*

I. Introduction—From Explainability to Infrastructural Mutation

Power has not disappeared; it has migrated upstream.

Constitutional theory did not arise to regulate tools; it arose to discipline power. Its central grammar—attribution, justification, and review—was forged in response to visible authority: monarchic will, legislative command, administrative discretion. Even when authority became impersonal and bureaucratic, it remained act-centered.¹ Power manifested itself in decisions, norms, sanctions, and institutional competences. Constitutionalism organized friction around those moments. It slowed power, required reasons, and preserved revisability. The ultimate pathological feature of power, from this perspective, was not deviation or iniquity, but omission.

The progressive integration of algorithmic systems into governance does not merely introduce a new regulatory domain.² It unsettles the material conditions under which this grammar operates. Machine-learning systems now mediate access to credit, welfare benefits, employment screening, migration status, fraud detection, prudential supervision, market surveillance. In many sectors, algorithmic outputs do not replace formal decisions; they condition them. They structure thresholds of suspicion, risk categorizations, supervisory intensity, and allocation priorities. The decisive determinants of legal consequence increasingly reside upstream from the formal act.

At first glance, this development appears as a familiar regulatory problem. If algorithms influence rights, transparency must be enhanced. If models discriminate, fairness constraints must be imposed. If explanations are insufficient, liability must be allocated. Early legal engagement with AI governance understandably followed this path. Explainability became the focal concept; opacity was framed as a deficit of information.

My own research trajectory, shaped by legal and institutional practice, began within that paradigm. The initial inquiry concerned legal responsibility in AI-assisted decision-making, particularly in prudential contexts. The questions appeared precise: *when a system generates a risk assessment that affects credit allocation or supervisory classification, who bears responsibility if the output is flawed? How should explainability standards be structured to preserve legal accountability?*

That inquiry gradually exposed a deeper difficulty. Explainability is not a technical feature of models but a precondition of constitutional intelligibility.³ Without the

¹ This paper was prepared for the *Conference on Technology, Philosophy, and Law*, held under the theme “*Androids Legislating (The Debate Opens)*” on May 18, 2026, at the *Congreso de los Diputados*. It forms part of a broader research programme into the algorithmic mutation of power, and extends arguments developed in García-Maceiras, JM (2026) “*Normativity without an Author*” (DOI 10.5281/zenodo.19442185).

² Scholars have increasingly emphasized the regulatory function of technical and digital architectures. See generally Lawrence Lessig, *Code and Other Laws of Cyberspace* (Basic Books 1999); Julie E. Cohen, *Between Truth and Power: The Legal Constructions of Informational Capitalism* (Oxford University Press 2019); Karen Yeung, ‘Algorithmic Regulation: A Critical Interrogation’ (2018) 12 *Regulation & Governance* 505.

³ The importance of intelligibility and traceability in automated decision-making has been widely discussed. See Sandra Wachter, Brent Mittelstadt and Luciano Floridi, ‘Why a Right to Explanation of Automated

institutional capacity to retrace the pathway from input to outcome in normatively articulable terms, responsibility becomes formal rather than substantive. Courts may assign liability and regulators may impose sanctions, yet the epistemic basis of the decision remains partially inaccessible.

The problem therefore shifted from explanation to the distribution of responsibility. In complex infrastructures, responsibility fragments across designers, data curators, deployers, and institutional decision-makers. Formal attribution persists, but epistemic control becomes diluted. Institutions may remain legally responsible for systems whose operative logic they do not meaningfully command. From there, a further threshold becomes visible. Opacity is not constitutionally problematic because it frustrates curiosity; it becomes relevant when it exceeds institutional reconstructive capacity. When that threshold is crossed, the issue is no longer regulatory adequacy. It becomes structural.⁴

This article is the result of that progressive displacement of focus: from explainability, to responsibility distribution, to opacity thresholds, to systemic opacity risk, and finally to the constitutional architecture within which algorithmic governance operates. What emerges is not a demand for better compliance, but the recognition of a new condition: algorithmic governance marks a structural mutation in the material conditions under which constitutional authority is constituted, exercised, and contested.

I.1. Mutation as Structural Transformation

To describe the present shift as a *mutation* is not rhetorical excess. It signals a transformation in the material substrate through which normativity operates. As Koselleck observed, temporal acceleration generates semantic strain, exposing the lag between inherited constitutional concepts and transformed conditions of experience. Constitutional language evolves slowly; technological infrastructures evolve rapidly. A structural lag emerges.

Algorithmic governance intensifies that lag. Constitutional grammar presupposes that power crystallizes in identifiable acts. Even where discretion is broad, the decision remains temporally bounded and institutionally attributable. Judicial review presupposes that reasons can be articulated *ex post*.

Algorithmic systems, by contrast, distribute decisional weight across training data, feature selection, optimization targets, and threshold calibration. The decisive determinants of outcome may therefore have been configured long before the formal act is taken. The decision becomes the visible endpoint of a probabilistic architecture whose

Decision-Making Does Not Exist in the GDPR' (2017) 7 *International Data Privacy Law* 76; Lilian Edwards and Michael Veale, 'Slave to the Algorithm?' (2017) 16 *Duke Law & Technology Review* 18.

⁴ The applied dimension of this research has been explored through a series of studies on AI explainability and opacity in banking, including: *The Banking Risk of AI Explanation* (ADR Notebooks No. 1, 2026); *The Five Beacons Model* (ADR Notebooks No. 2, 2026) DOI: 10.5281/zenodo.18647317); *Tolerance for Opacity* (ADR Notebooks No. 3, 2026) DOI: 10.5281/zenodo.19144304); and *Systemic Opacity Risk* (ADR Notebooks No. 4, 2026) DOI: 10.5281/zenodo.19148608.

operative logic lies upstream. The mutation consists precisely in this relocation of effective normativity from juridical act to computational pre-structuring. In a deeper, heuristic sense, this shift might be described as a kind of genetic migration of power: the operative determinants of authority relocate from the visible surface of legal acts to the infrastructural conditions that generate them.

In Blumenberg's terms, algorithmic infrastructures function as contemporary mediating constructions: they render complexity tractable while simultaneously constructing a horizon of relevance that pre-structures institutional discretion. Mediation is never neutral. In selecting variables, optimizing metrics, and calibrating thresholds, infrastructures determine what counts as risk, anomaly, or normality. Constitutionalism traditionally intervenes at the moment of decision. Algorithmic governance shifts the decisive moment upstream. Law remains formally present, but it becomes partially derivative of infrastructural configuration. The mutation is therefore not about automation replacing human judgment, but about architecture pre-structuring judgment.

I.2. The Act-Centered Design of European Constitutional Grammar

The European constitutional order—nationally and supranationally—was designed for act-centered power.⁵ The jurisprudence of the Court of Justice of the European Union developed doctrines of proportionality, effective judicial protection, and supremacy in a context where authority manifested in legislative measures, administrative decisions, or regulatory acts. Even the expansion of judicial review over complex economic regulation preserved this ontology. There was always an act to review.

This act-centered grammar has long been recognized as vulnerable to displacement in the context of European integration, where the transfer of competences and the expansion of supranational adjudication altered the locus of legislative authority. Yet the present mutation differs in kind. The question is no longer primarily one of vertical allocation between national and supranational institutions, but of horizontal migration: the relocation of operative determination from formal acts to infrastructural design.

Similarly, the post-war constitutional settlement embedded strong judicial review to prevent arbitrary state power. The constitutional imagination was shaped by visible authority and by the need to discipline it through rights and hierarchical normativity. The grammar is consistent: identify the act, attribute it to an authority, require justification, enable review. Algorithmic governance entangles each step. The grammar persists; its reference point shifts.

⁵ On the act-centered structure of European constitutional legality and its transformation under conditions of regulatory complexity, see Neil Walker, *Intimations of Global Law* (Cambridge University Press 2015) ch 3; Sabino Cassese, 'The Global Polity' (2012) 8 *Global Jurist* 1.

I.3. From Regulatory Challenge to Constitutional Problem

It is tempting to treat this shift as an advanced regulatory issue. The European Union's legislative response—most prominently the Artificial Intelligence Act—reflects a regulatory approach grounded in risk classification, documentation duties, data governance standards, and human oversight requirements.

Such instruments are necessary. But they presuppose that compliance obligations suffice to preserve constitutional alignment. The deeper question is whether constitutional conditions themselves remain intact when normativity migrates into infrastructure. The issue is not whether algorithms are accurate, but whether the constitutional mechanisms of attribution, justification, and review remain coextensive with operative power.

Three displacements converge: institutions may rely on systems whose internal logic exceeds their cognitive grasp (epistemic displacement); decisive configuration occurs prior to and independently of the formal act (temporal displacement); and normative force migrates into design choices not experienced as legal acts (structural displacement).

These displacements generate a constitutional threshold problem. Constitutional orders tolerate complexity and discretion within limits. They presuppose that reasons can ultimately be articulated in a shared discursive space. When opacity becomes systemic—when no actor within the constitutional structure can meaningfully retrace operative logic—constitutional language risks formalism.

The problem is therefore not opacity *per se*, but opacity exceeding reconstructive capacity. At that point, we no longer face a regulatory gap. We confront a constitutional misalignment between the locus of power and the locus of review.

I.4. The Strong Thesis

The argument advanced in this article can now be stated explicitly: while the constitutional grammar of Europe was designed for act-centered power, algorithmic governance operates infrastructurally. Although the analysis is grounded in the European constitutional experience, the structural problem addressed here arises wherever governance becomes mediated by algorithmic infrastructures.

This misalignment generates a structural tension. If constitutional scrutiny remains downstream—focused exclusively on visible acts—while decisive determinants reside upstream in computational architectures, constitutionalism risks bifurcation. Formal legality will persist, yet operative normativity may crystallize elsewhere.

If constitutional review remains act-centered, three consequences follow: (i) judicial review risks ceremonialism; (ii) responsibility becomes formal rather than substantive; and (iii) constitutional primacy degrades into jurisdiction without control.

The argument advanced here differs from standard debates on algorithmic accountability. The issue is not merely the opacity of automated decisions, but the structural relocation of norm-generating power from institutional acts to infrastructural architectures.

The claim is not that constitutionalism is obsolete, nor that algorithmic governance is inherently incompatible with constitutional order. The claim is structural: constitutional control must migrate toward the infrastructures that pre-structure decision if it is to remain effective.

I.5. Roadmap

The sections that follow proceed in five steps. Section II deepens the philosophical account of infrastructural mutation. Section III identifies the resulting constitutional deficit, distinguishing deficits of knowledge, control, and justification.⁶ Section IV situates constitutionalism at a bifurcation between incremental adaptation and structural recalibration. Section V develops the concept of *algorithmic sovereignty* within Europe's multilevel constitutional architecture. Section VI introduces *reconstructibility* as a threshold condition for effective judicial protection, due process, and democratic accountability. Section VII articulates the contours of what may be termed *infrastructural constitutionalism*.

The objective is not technocratic supervision or judicial expansionism. It is to preserve the revisability of power in an environment where power increasingly resides in architecture.

II. The Infrastructural Mutation

Architecture now rivals legislation as a mode of rule.

The claim advanced in the previous section was that algorithmic governance does not merely complicate regulation, but signals a mutation in the material substrate through which normativity operates. To sustain that claim, *mutation* cannot function as metaphor. It must designate a structural transformation in the conditions under which constitutional categories retain meaning.

This argument should be distinguished from strands of digital constitutionalism that seek to constitutionalize online spaces or platform governance as such.⁷ The claim advanced here is narrower and more structural. It does not propose the constitutionalization of the digital sphere *per se*. It contends that when normative force migrates into infrastructures—digital or otherwise—that pre-structure access to rights and public burdens at systemic scale, constitutional scrutiny must migrate accordingly.

⁶ The notion of *structural constitutional deficits* has been explored in different contexts of multilevel governance. See Miguel Poiaras Maduro, *We the Court* (Hart 1998); Alec Stone Sweet, *The Judicial Construction of Europe* (Oxford University Press 2004).

⁷ Tarleton Gillespie, 'The Relevance of Algorithms' (2014) *Media Technologies*.

This section proceeds in two movements. First, it clarifies the structure of mutation as temporal, epistemic, and institutional displacement. Second, it renders that displacement visible through paradigmatic examples of algorithmic infrastructures—not to describe their technical functioning, but to show how decision dissolves into architecture.

II.1. Mutation as Temporal Compression

Modern constitutional grammar presupposes temporally bounded acts. Decisions occur at identifiable moments; measures are adopted; sanctions imposed. Review then interrogates those moments. Constitutional language is deliberately resistant to rapid change, precisely because it anchors legitimacy. That stability is a virtue—but it generates lag.

Algorithmic governance intensifies this temporal compression. Computational systems evolve iteratively: models are retrained, parameters recalibrated, datasets updated continuously. Institutional and doctrinal frameworks, by contrast, evolve through legislative cycles and judicial deliberation. The temporal rhythms diverge.

The divergence is not merely practical but conceptual. Constitutional categories—decision, discretion, responsibility, proportionality—presuppose discrete moments of authority. When the decisive determinants of outcome reside in ongoing retraining cycles and dynamic threshold calibration, the *moment* of decision becomes diffuse. Normative consequence increasingly results from cumulative calibration rather than singular volition.

The mutation therefore consists in a compression of operative time and an expansion of infrastructural pre-structuring. Authority no longer crystallizes primarily at the moment of adjudication, but in the continuous configuration of the environment within which adjudication occurs.

II.2 Mediation and the Construction of Relevance

Algorithmic infrastructures function as contemporary mediating constructions. They promise relief from informational overload by rendering complexity tractable through statistical compression. Yet mediation is never neutral. In selecting variables, optimizing metrics, and calibrating thresholds, infrastructures construct a horizon of relevance that pre-structures institutional discretion.

Institutional knowledge is never immediate. Understanding is mediated through interpretive structures that shape what appears salient. In contemporary governance, algorithmic infrastructures increasingly determine which patterns count as risk, which anomalies trigger scrutiny, and which behaviors fall within tolerable bounds.

From a constitutional perspective, the decisive point is not that mediation exists, but that it operates upstream from formal decision. Constitutionalism historically interrogated the justification of acts within a given field of relevance. Algorithmic infrastructures

participate in defining that field itself. What appears at the moment of decision as neutral output is the crystallization of upstream relevance construction.

Here the mutation becomes visible: constitutional review remains oriented toward the justification of acts, while normativity increasingly takes shape through infrastructural mediation.

II.3. Governmentality Without Normative Articulation

Foucault's analysis of governmentality emphasized the shift from sovereign command to the management of populations through dispositifs that structure the milieu. Power operates not only by issuing decrees, but by shaping conditions. Algorithmic infrastructures intensify this modality. They distribute probabilities across populations, identify anomalies, and channel institutional attention toward statistically defined risk.

Unlike classical administrative dispositifs, however, algorithmic systems operate through correlation that resists translation into normative reasons. They generate scores, rankings, or alerts that may guide institutional action without articulating the grounds of that guidance in discursive form. The jurisprudence of the Court of Justice has already recognized that such informational architectures may exert normative influence capable of affecting fundamental rights.⁸

The risk is not abdication of decision. It is derivation of decision. Authority increasingly follows infrastructural outputs whose justificatory grammar is statistical rather than normative. As the space of optimization expands, the space of reasons contracts.⁹ Constitutionalism is concerned not with efficiency, but with legitimacy.¹⁰ When governance migrates into environments that pre-structure discretion, the conditions of legitimacy shift accordingly.

II.4. From Decision to Infrastructure

The structural character of the mutation becomes clearer when examined across paradigmatic domains.

(a) Credit Scoring

In contemporary banking, creditworthiness is rarely assessed through individualized deliberation alone. Statistical scoring systems classify applicants based on predictive correlations derived from historical data. The formal decision to grant or deny credit remains institutionally attributable. Yet the operative threshold—what score counts as acceptable risk—is configured upstream. Model architecture embeds assumptions about acceptable default probability, variable weighting, and tolerance for false positives. The

⁸ *Google Spain v AEPD (C-131/12 Court of Justice of the European Union)*

⁹ Christopher Hood, *The Tools of Government* (Macmillan 1983)

¹⁰ For related conceptualizations of legitimacy in algorithmic governance see Frank Pasquale, *The Black Box Society* (Harvard University Press 2015); Danielle Citron, 'Technological Due Process' (2008) 85 *Washington University Law Review* 1249.

decision ratifies an infrastructural classification. The constitutional issue is not the permissibility of risk assessment, but whether the operative determinants of access to economic participation remain retraceable and justifiable within a shared normative framework.¹¹

(b) Automated Anti-Money Laundering Monitoring

Financial institutions increasingly rely on automated monitoring systems to detect suspicious transactions. Alerts are generated through pattern recognition across vast datasets, and investigative resources are allocated according to risk scores. Again, the formal act—reporting or freezing assets—remains attributable. Yet the prioritization of suspicion is infrastructural. Threshold calibration constructs the environment of surveillance before any individual assessment occurs.

(c) Predictive Supervisory Tools

Supervisory authorities employ predictive analytics to identify institutions likely to experience distress or non-compliance. Supervisory intensity is dynamically adjusted. Inspections become risk-based. Governance here explicitly acknowledges infrastructural mediation. The allocation of public authority depends on statistical architecture. The question is not efficiency, but whether constitutional review can meaningfully interrogate model design when supervisory burdens or reputational consequences arise.

II.5. Dematerialization of the Decisional Moment

In classical constitutional imagination, power materializes in an act. It can be located temporally and institutionally. Even where discretion is broad, the act remains the focal point of justification and review. In infrastructural governance, the decisive determinants are dispersed across data selection, model architecture, parameter tuning, retraining cycles, and threshold calibration. The formal decision persists, but its operative core lies elsewhere. The same pattern recurs: the dematerialization of the decisional moment.

This displacement generates a constitutional asymmetry. Review remains oriented toward the visible endpoint, while power operates through invisible pre-structuring. In this sense, infrastructures increasingly function as environments within which legal obligations are implemented and enforced, a development already visible in cases concerning digital platforms and content moderation.¹²

The jurisprudence of the Court of Justice contains an early intimation of this shift. In *Digital Rights Ireland*, the annulment of the Data Retention Directive did not turn on a

¹¹ *SCHUFA Holding* (C-634/21 Court of Justice of the European Union)

¹² *Glawischnig-Piesczek v Facebook Ireland* (C-18/18 Court of Justice of the European Union)

single administrative act, but on the structural design of a regime mandating generalized data retention. Constitutional review targeted architecture rather than application.¹³

II.6. From Technical Complexity to Structural Shift

It is crucial to resist mischaracterization. Complexity alone does not produce mutation. Administrative governance has long relied on expertise and statistical methods. What distinguishes the present shift is the integration of adaptive computational systems into the core infrastructures of governance.¹⁴

Three features mark its structural character. *Scalability* embeds classification at population level. *Adaptivity* alters operative parameters continuously without discrete legal acts. *Opacity gradients* resist full articulation in normative language even where documentation exists. Together, these features relocate normativity upstream. Architecture increasingly rivals legislation as a mode of rule.¹⁵

The constitutional problem does not arise because algorithms are used. It arises because their integration renders visible a displacement long incubating within technocratic governance: the shift from command to calibration. Governance becomes continuous adjustment rather than episodic rule application. Constitutionalism was designed to confront command. It must now confront calibration.

II.7. Visibility of the Displacement

The infrastructural mutation does not predetermine constitutional failure. It clarifies the structural conditions under which constitutional categories must operate. If act-centered grammar remains sufficient to penetrate infrastructural pre-structuring, adaptation may suffice. If not, a constitutional deficit emerges.

The mutation therefore marks a threshold. It forces a question that the next section addresses directly: *what happens when operative determinants of legally consequential outcomes exceed the reach of attribution, justification, and review?*

III. The Constitutional Deficit

Formal attribution without epistemic control produces nominal responsibility.

The infrastructural mutation described in the previous section does not in itself entail constitutional rupture. Constitutional orders have historically absorbed new modalities of power—industrial administration, economic regulation, supranational governance—through doctrinal refinement rather than collapse. The relevant question is therefore not whether algorithmic infrastructures exist, but whether their integration generates a

¹³ *Digital Rights Ireland (Joined cases C-293/12 and C-594/12 Court of Justice of the European Union)*

¹⁴ Mireille Hildebrandt, *Law for Computer Scientists and Other Folk* (Oxford 2020)

¹⁵ See also Langdon Winner, 'Do Artifacts Have Politics?' (1980) 109 *Daedalus* 121.

misalignment between the locus of effective power and the mechanisms designed to discipline it.

A constitutional deficit arises when the operative determinants of legally consequential outcomes exceed the reach of attribution, justification, and review. It is not defined by regulatory imperfection or technical opacity as such. It designates a structural asymmetry: power migrates upstream into infrastructures, while constitutional scrutiny remains downstream, focused on visible acts.

Much of the contemporary debate on algorithmic governance frames the problem in terms of transparency. Yet opacity in complex socio-technical systems is rarely reducible to the mere absence of disclosure. A more precise account understands *opacity as the degradation of reconstructibility*: the progressive loss of the ability to reconstruct, in intelligible terms, the pathway linking inputs, computational processes, and normative outcomes.¹⁶

Reconstructibility, in this sense, denotes the structural capacity of a governance system to render the operation of power epistemically traceable and normatively intelligible. When reconstructibility deteriorates, authority may continue to operate effectively, but the conditions under which its exercise can be critically understood, justified, and contested become structurally weakened.

The infrastructuralization of governance intensifies precisely this risk. As decision-making processes migrate into computational architectures, the pathways through which authoritative outcomes are produced increasingly escape meaningful reconstruction by the institutional actors formally responsible for them. The problem, therefore, is not merely opacity, but the erosion of reconstructibility as a condition for the intelligibility of authority.

This section disaggregates that deficit into three analytically distinct but mutually reinforcing dimensions: a deficit of knowledge, a deficit of control, and a deficit of justification. Each corresponds to a core constitutional commitment—and each is strained when governance becomes infrastructural.

III.1. Act, Norm, and Discretion: The Classical Architecture

Constitutional doctrine remains predominantly oriented toward discrete legal acts, presupposing identifiable decisions and attributable authorship. European constitutional doctrine rests on a stable ontology of power: authority manifests through

¹⁶ For a fuller theoretical account of *reconstructibility* as a condition of epistemic accountability in complex governance systems, see García-Maceiras, JM, *The Banking Risk of AI Explanation* (ADR Notebooks No 1, 2026); García-Maceiras, JM, 'The Five Beacons Model: A Prudential Architecture for AI Explainability and Legal Liability in Banking' (DOI 10.5281/zenodo.18647317, 2026), and García-Maceiras, JM, 'Tolerance for Opacity: A Threshold Framework for AI-Driven Banking' (2026).

norms and acts. Norms establish general frameworks; acts apply them to concrete situations. Even where administrative discretion is broad, it is exercised within hierarchically structured competences and remains subject to review for legality, proportionality, and equality.

The jurisprudence of the Court of Justice of the European Union, like that of national constitutional courts, presupposes this architecture. Proportionality analysis evaluates whether a measure pursues a legitimate aim, is suitable, necessary, and proportionate *stricto sensu*. Effective judicial protection presupposes that an act can be challenged and that the reasons underlying it can be examined.

This grammar is act-centered. It assumes that the decisive moment of authority can be identified, attributed, and reconstructed within argumentative space. Algorithmic governance strains that ontology not because it eliminates acts, but because it redistributes decisional weight across infrastructural layers that precede and condition the act. The visible decision remains; its operative determinants may not. The deficit begins at that point of misalignment.

III.2. Deficit of Knowledge

Constitutional accountability presupposes that the authority exercising power possesses sufficient cognitive access to the grounds of its decision. Knowledge need not be exhaustive, but it must be adequate for meaningful justification and review.

In algorithmically mediated environments, epistemic asymmetries proliferate. High-dimensional models may operate through correlations resistant to full human comprehension. Proprietary systems may restrict access to architecture or training data. Continuous retraining may alter operative parameters without discrete authorization. The result is not ignorance, but bounded understanding.¹⁷

This boundedness generates a constitutional tension: if the institution formally responsible for a decision cannot meaningfully retrace the operative pathway from input to output, its justificatory capacity weakens. Responsibility risks becoming nominal. The deficit of knowledge is not identical with opacity. Opacity becomes constitutionally relevant only when it exceeds the institutional capacity required for reasoned justification—when “knowing enough” for accountability can no longer be secured.

III.3. Deficit of Control

Knowledge alone does not exhaust constitutional demands. Authority must not only understand but control the conditions under which power is exercised.

The classical administrative state presupposes hierarchical subordination. Even where public authorities rely on expertise or external contractors, ultimate control remains within the constitutional chain of validity. Decisions are attributable because institutions

¹⁷ Julie E. Cohen, *Configuring the Networked Self* (Yale University Press 2012).

retain the capacity to modify, suspend, or withdraw the arrangements through which authority is exercised.

Algorithmic infrastructures complicate that assumption. Systems may be developed by external providers, trained on globally sourced data, and integrated deeply into operational processes. The cost of disengagement may be prohibitive. Technical dependence can crystallize into structural entrenchment.

Where infrastructural configurations become effectively irreversible—through economic lock-in, systemic integration, or lack of alternatives—constitutional control attenuates. Authority becomes partially derivative of architectures that public institutions do not fully command. This deficit concerns reversibility: the practical capacity to intervene. Without retained capacity for revision, sovereignty degrades into formal jurisdiction without operative mastery.¹⁸

III.4. Deficit of Justification

European constitutionalism embeds a culture of reason-giving. Decisions affecting rights must be justified. Proportionality analysis, equality review, and procedural fairness all presuppose that power can be articulated within a shared normative language.

Algorithmic outputs, especially those derived from statistical learning, do not naturally inhabit that language. They yield probabilistic correlations rather than reasons in the argumentative sense. A model may indicate a higher risk of default or fraud, but correlation does not automatically translate into normative justification.

This tension compresses the space of reasons. Public explanations may rely on general formulations—“elevated risk based on multiple factors”—while operative determinants remain buried in statistical weightings inaccessible to discursive reconstruction. The deficit of justification arises when the reasons publicly articulated diverge materially from the determinants that actually shaped the outcome. At that point, review risks becoming procedural rather than substantive.

Judicial review within the Union legal order presupposes that the reasoning underlying public decisions remains accessible to legal scrutiny; without such accessibility, contestation risks becoming largely formal.¹⁹ The danger is not automation, but insulation: the progressive insulation of operative determinants from the justificatory grammar through which legitimacy is assessed.

¹⁸ On the transformation of sovereignty under conditions of technological governance see Benjamin Bratton, *The Stack: On Software and Sovereignty* (MIT Press 2016); Julie Cohen, *Between Truth and Power* (Oxford University Press 2019).

¹⁹ *Berlioz Investment Fund v Directeur de l'administration des contributions directes* (C-682/15 Court of Justice of the European Union)

III.5. Effective Remedy Under Strain

The right to effective judicial protection is a cornerstone of the European legal order. Individuals must have access to a remedy capable of addressing violations of rights. Such remedy presupposes not only formal standing, but the practical possibility of contestation.

In algorithmically mediated environments, effective remedy encounters structural constraints. If the decisive determinants of a classification reside in complex and evolving models, the challenger may lack access to meaningful grounds of contestation. Disclosure may provide partial information, yet fail to capture the operative logic of the system at the relevant time. Moreover, where outputs are probabilistic rather than deterministic, contestation becomes diffuse: the individual can challenge a score's application while remaining unable to challenge the architecture that generated it.

The constitutional significance of this development becomes particularly visible in light of the principle of effective judicial protection, long recognized by the Court of Justice as foundational. Where the pathways leading to legally consequential outcomes become partially opaque, the practical effectiveness of judicial protection risks being undermined.²⁰

III.6. From Knowledge to Imputability

The three deficits—knowledge, control, justification—converge on the problem of imputability. Constitutional responsibility requires that power be attributable to an authority capable of justification and revision. Formal attribution may persist even when epistemic and practical control diminish. Law can designate an institution as responsible for algorithmically mediated decisions; but if that institution lacks meaningful access to, or control over, the infrastructural determinants of outcome, imputability becomes attenuated.

The difficulty is not merely technical but narrative: responsibility presupposes the possibility of reconstructing an institutional sequence linking actors, reasons, and outcomes in a form intelligible to review. When infrastructural determination outruns institutional narrative, responsibility becomes formal.

The Court's judgment in *SCHUFA* illustrates the phenomenon of pre-structuring. An automated scoring system was recognized as capable of producing effects that, while formally mediated by subsequent human discretion, materially shaped the outcome of credit decisions. The recognition that algorithmic scoring may generate legally relevant effects even absent formal decisional authority underscores the constitutional salience of infrastructural determinants.

This attenuation does not necessarily invalidate decisions. It signals structural strain. The deeper the migration of normativity into architectures insulated from constitutional

²⁰ *Unibet v Justitiekanslern* (C-432/05 Court of Justice of the European Union)

interrogation, the greater the gap between formal and substantive responsibility. The deficit is cumulative: epistemic limits weaken justification; weakened justification undermines review; constrained control inhibits revision. Together, they produce misalignment between operative power and constitutional discipline.²¹

III.7. Deficit Without Collapse

It would be premature to describe this condition as constitutional crisis. European constitutional orders retain significant adaptive capacity. Legislative initiatives, including the Artificial Intelligence Act, seek to embed safeguards upstream. Courts are increasingly attentive to the implications of algorithmic mediation for fundamental rights. Administrative practice evolves.

The deficit identified here is not a diagnosis of failure, but a structural warning. If doctrines of proportionality, equality, and effective remedy can be recalibrated to penetrate infrastructural pre-structuring—if knowledge, control, and justification can be institutionally secured—incremental adaptation may suffice. If, however, infrastructural opacity and dependency systematically outpace constitutional reach, review risks becoming ceremonial: formally intact, substantively attenuated.

The deficit therefore marks a point of bifurcation. It forces a question: *can act-centered constitutional grammar absorb environment-centered governance without structural recalibration?*

IV. Constitutionalism at a Bifurcation

When power migrates upstream, review that remains downstream becomes ceremonial.

The preceding analysis identified a structural constitutional deficit generated by the infrastructural mutation of governance. The deficit does not yet amount to rupture. It signals misalignment. The critical question is whether this misalignment can be absorbed through doctrinal adaptation within the existing act-centered grammar, or whether it requires a deeper recalibration of constitutional method.

European constitutionalism stands at a bifurcation. The choice is not between constitutionalism and technology, nor between regulation and laissez-faire. It is between two models of constitutional response: incremental adaptation within inherited categories, or structural extension of constitutional scrutiny into infrastructural environments. The bifurcation is neither rhetorical nor abstract. It concerns the future ontology of constitutional power.

IV.1. The Analogy of Post-War Recalibration

European constitutionalism has previously confronted moments in which inherited categories proved insufficient to discipline emergent modalities of power. The post-war

²¹ *Schrems II (C-311/18 Court of Justice of the European Union)*

constitutional settlement was not a marginal refinement of nineteenth-century liberal constitutionalism. It was a structural recalibration.

Classical liberal constitutionalism focused on parliamentary supremacy and formal legality. The catastrophes of the twentieth century revealed that legality alone did not secure liberty. The response was not abandonment of constitutional grammar, but its deepening: entrenched fundamental rights, constitutional courts, supranational integration, and proportionality as a structured method of justification.

Hierarchical models of normativity, most prominently articulated by Kelsen, secured the primacy of norm over power through formal ordering. Yet hierarchy presupposes that the production of normative effect remains traceable to legally cognizable acts. When decisive parameters migrate into pre-normative architectures—calibration thresholds, optimization criteria, adaptive retraining cycles—the question is no longer solely whether norms are hierarchically ordered, but whether the conditions of their operative production remain constitutionally bounded.²²

The present moment is analogous in structure, though distinct in content. The shift from act-centered governance to infrastructural calibration challenges the implicit ontology of power presupposed by post-war constitutionalism.

IV.2. The Incrementalist Path

The first branch of the bifurcation may be termed *incremental adaptation*. On this view, algorithmic governance represents an intensification of administrative complexity rather than a qualitative transformation. The constitutional response therefore consists in extending existing doctrines upstream without altering their structure.

Under this approach, proportionality evaluates reliance on algorithmic systems as it evaluates any administrative technique. Effective judicial protection requires disclosure sufficient for contestation. Equality doctrine addresses discriminatory effects arising from biased data or model design. Infrastructure becomes another object of review, analogous to expert advice or delegated regulation. The decisive moment remains the formal act.

Incrementalism offers institutional continuity. It avoids conceptual inflation and preserves doctrinal stability. It assumes that constitutional categories are sufficiently elastic to absorb infrastructural mediation without structural reorientation.

Yet this path carries a risk: that review is extended to infrastructure formally, without penetrating its operative logic. Where constitutional scrutiny remains episodic and act-centered while infrastructures evolve continuously and adaptively, misalignment may persist beneath the surface of compliance.

²² LM (*Celmer case*) (C-216/18 PPU Court of Justice of the European Union)

IV.3. The Risk of Ceremonial Review

Ceremonial review designates a condition in which constitutional mechanisms operate formally yet fail substantively to discipline operative power.

From the standpoint of discursive constitutionalism, legitimacy depends upon the possibility of public justification within a shared normative horizon. Where operative determinants remain inaccessible to that justificatory space, review risks becoming ceremonial: formally intact, substantively attenuated. Infrastructural opacity thus threatens not only control, but communicative legitimacy.

The risk materializes when courts verify the existence of documentation, risk assessments, or oversight procedures without interrogating whether those arrangements secure meaningful reconstructibility. Proportionality may be applied to reliance on an algorithmic system, yet the court may lack institutional capacity to evaluate the architecture generating its outputs.

Ceremonial review does not result from judicial indifference. It results from structural asymmetry. When infrastructural determinants are technically dense, proprietary, and dynamically evolving, judicial interrogation retreats to procedural surface. Constitutional vocabulary persists; constitutional grip weakens.

IV.4. The Structural Transition Path

The alternative branch of the bifurcation entails recognizing infrastructural power as a constitutional site in its own right.

This does not require abandoning hierarchical normativity. On the contrary, it requires extending the logic of normative primacy into the infrastructures that condition norm application. If validity presupposes hierarchical subordination, infrastructures producing legally consequential effects must remain situated within that hierarchy.

Nor does this path entail judicial engineering of technology. It entails recalibrating the reach of constitutional principles so that design choices capable of generating systemic effects acquire constitutional salience. Threshold calibration in high-impact systems may require structured justification. Continuous retraining may require continuous oversight rather than episodic review.

Structural transition therefore implies migration of constitutional scrutiny upstream—not to replace technical governance, but to preserve the conditions under which constitutional discipline remains effective.

IV.5. Adaptation or Reorientation?

The bifurcation ultimately turns on an empirical and institutional question: *can existing constitutional mechanisms meaningfully interrogate infrastructural determinants without structural extension?*

If proportionality analysis can penetrate upstream design; if effective remedy can secure reconstructive access; if equality doctrine can discipline statistical classification; then adaptation may suffice. If, however, infrastructural opacity and dependency systematically outpace these mechanisms—if deficits of knowledge, control, and justification persist—constitutionalism must reorient its grammar.

The stakes are not symbolic. They concern the future locus of legitimacy. In an environment-centered regime of governance, authority is exercised not only through commands, but through calibration. If constitutional scrutiny remains confined to visible acts, decisive power will drift beyond its effective reach.

IV.6. The European Context

The European constitutional order is uniquely positioned at this bifurcation. Its multilevel architecture already accommodates overlapping sources of authority. Supremacy and direct effect ensure penetration of Union law into domestic legal orders. Fundamental rights bind both Union institutions and Member States when implementing Union law.

Infrastructural constitutionalism does not displace this framework; it extends it. The question is not only how competences are distributed across levels, but whether the infrastructures through which those competences are exercised remain intelligible and revisable within the composite order.

Regulatory initiatives such as the Artificial Intelligence Act reflect awareness that algorithmic systems are not neutral tools but governance infrastructures requiring *ex ante* discipline. Yet regulation alone does not resolve the constitutional bifurcation. The deeper issue is whether the constitutional grammar of Europe—designed for act-centered power—can be extended coherently into infrastructure-centered governance without loss of internal coherence.

IV.7. A Moment of Constitutional Self-Reflection

Bifurcations are not crises; they are moments of self-reflection. European constitutionalism has repeatedly adapted to new forms of power without abandoning its core commitments. The present challenge differs in that it concerns not only the distribution of competences, but the material conditions under which decisions are formed.

If constitutionalism remains attached exclusively to visible acts, it risks gradual decoupling from operative power. If it extends uncritically into infrastructure, it risks technocratic overreach. The path forward must therefore be principled rather than reactive.

The next sections articulate two structural principles—*algorithmic sovereignty* and *reconstructibility*—that operate across the bifurcation. They are compatible with

incremental adaptation, yet decisive if structural reorientation proves necessary. They seek neither rupture nor complacency, but alignment.

What is ultimately at stake is not the regulation of technology, but the constitutional location of authority in computational polities. If power increasingly operates through infrastructural calibration rather than discrete commands, constitutionalism must determine whether its principles attach only to visible acts or also to the architectures that prestructure them.

V. Algorithmic Sovereignty

Algorithmic sovereignty is not about owning technology, but about retaining normative primacy.

If infrastructural mutation displaces the locus of effective normativity, and constitutionalism stands at a bifurcation between adaptation and reorientation, the first structural principle required to prevent misalignment is algorithmic sovereignty.

Algorithmic sovereignty denotes the capacity of a constitutional order to preserve normative primacy over infrastructures that generate legally consequential outcomes within its jurisdiction. The concept does not revive classical notions of indivisible state supremacy. In the European constitutional tradition, sovereignty no longer denotes exclusive territorial control. It designates normative authority within a layered and plural order.

The relevant question is therefore not whether sovereignty should be reclaimed in a technological or territorial sense, but whether constitutional primacy can be preserved when binding effects are increasingly generated through computational infrastructures.

V.1. Conceptual Differentiation

Public discourse frequently conflates several adjacent notions. *Technological sovereignty* refers to the capacity to develop and maintain critical technologies without external dependency. *Data sovereignty* concerns control over data storage, transfer, and jurisdictional reach. *Digital sovereignty* encompasses broader strategic autonomy in digital infrastructures and platforms.

Algorithmic sovereignty is distinct from each. It does not require domestic ownership of all relevant technologies, nor does it demand autarky in digital infrastructure. Its focus is narrower and juridical: whether systems that generate binding or rights-affecting consequences within a constitutional space remain effectively subordinated to that space's normative hierarchy.

A system may be developed abroad and operated transnationally yet remain subject to algorithmic sovereignty if constitutional authorities retain meaningful capacity to impose normative constraints on its deployment, access sufficient epistemic insight into its functioning, and suspend or recalibrate its operation where incompatibility arises.

Conversely, a domestically developed system may undermine algorithmic sovereignty if it operates beyond effective constitutional reach.

Algorithmic sovereignty therefore concerns normative primacy over infrastructural power, not technological origin.

V.2. The Multilevel European Setting

The European constitutional order provides a particularly complex terrain for this principle. Union law claims primacy within its fields of competence. National constitutional courts retain guardianship over constitutional identity and fundamental rights. The Court of Justice ensures uniform interpretation and effective judicial protection across Member States.

Algorithmic infrastructures do not align neatly with territorial competences. Cloud services, foundational models, and data ecosystems operate across jurisdictions. Supervisory authorities, financial institutions, and administrative bodies increasingly integrate systems whose technical cores may lie outside direct European control.

The adoption of the Artificial Intelligence Act reflects an attempt to project Union normative standards upstream into system design and deployment. By imposing obligations on providers and deployers of high-risk systems, the Union asserts regulatory authority over infrastructures producing significant effects within its jurisdiction.

Yet regulation alone does not exhaust sovereignty. Compliance frameworks may coexist with structural dependency. If institutions lack epistemic capacity to interrogate complex systems, or if economic lock-in renders disengagement impracticable, normative primacy risks attenuation. Algorithmic sovereignty therefore requires more than rule-setting; it requires retained capacity for constitutional control.

V.3. Three Structural Conditions

Algorithmic sovereignty may be specified through three cumulative conditions: normative reach, epistemic capacity, and reversibility.

(a) Normative Reach

Constitutional principles—equality, proportionality, effective judicial protection—must attach not only to formal decisions, but to the infrastructures conditioning them. Normative reach requires authority to impose design-stage constraints where infrastructures generate legally consequential effects. Without such reach, infrastructures risk becoming *de facto* constitutional actors insulated from hierarchical discipline.

(b) Epistemic Capacity

Normative authority without understanding risks symbolism. Sovereignty presupposes institutional competence sufficient to evaluate whether infrastructural configurations comply with constitutional standards. This does not require judges to become engineers, but it does require embedded expertise capable of interrogating complex systems. Where interpretive access is mediated exclusively by private providers, normative primacy becomes derivative.

(c) Reversibility

A constitutional order must retain the practical capacity to suspend, modify, or withdraw systems whose operation proves incompatible with constitutional commitments. Excessive infrastructural entrenchment—through economic lock-in, technical integration, or lack of alternatives—renders revision prohibitively costly. When recalibration becomes practically impossible, sovereignty becomes nominal. Sovereignty is preserved not by constant exercise, but by credible possibility.

V.4. Rejection of Competing Models

Clarifying algorithmic sovereignty requires rejecting alternative conceptions. It rejects techno-nationalist sovereignty. Constitutional primacy does not require exclusive domestic production of algorithmic systems. Protectionist insulation cannot substitute for normative alignment. It rejects pure market governance. Competitive pressures optimize efficiency, not constitutional legitimacy. Markets cannot substitute for normative subordination where infrastructural power affects rights or public burdens at systemic scale.

It rejects fully delegated private constitutionalism. Allowing large-scale system providers to define governance standards autonomously—through internal ethics boards or voluntary codes—risks privatizing constitutional choice. While co-regulation may be valuable, ultimate normative authority cannot be outsourced. Algorithmic sovereignty thus occupies a middle ground: assertive without being autarkic, plural without being permissive.

V.5. Sovereignty and Hierarchy

The deeper constitutional significance of algorithmic sovereignty lies in its relationship to hierarchy. Hierarchical constitutional orders presuppose that lower-order acts derive validity from superior norms. Infrastructural mutation threatens to invert this relation. When statistical architectures pre-structure decision environments, they risk becoming *de facto* determinants of normative outcome without explicit authorization.

Algorithmic sovereignty restores alignment by ensuring that infrastructural configurations remain subordinate to constitutional hierarchy. Design choices with systemic impact must remain open to interrogation under superior norms. This does not constitutionalize every technical parameter. It establishes that where infrastructural

choices materially affect rights or public burdens, they cannot be shielded from hierarchical discipline.

V.6. The Limits of Sovereignty Alone

Even fully secured, algorithmic sovereignty does not resolve the constitutional tension identified earlier. A constitutional order may retain normative reach, epistemic capacity, and reversibility, yet still confront a deeper problem: the intelligibility of algorithmic outputs within the space of reasons required for legitimacy.

Sovereignty secures the *location* of authority. It ensures that infrastructures remain within constitutional hierarchy. It does not ensure that their operative logic can be reconstructed and justified in discursive form. For that, a second structural principle is required.

If sovereignty prevents external displacement of power, reconstructibility prevents internal opacity from hollowing legitimacy. The two principles are distinct yet interdependent.

V.7. Institutional Mediation and Judicial Limits

Extending constitutional scrutiny to infrastructural determinants does not entail judicial engineering of technical systems. Courts are neither designed nor democratically mandated to optimize algorithms. *Infrastructural constitutionalism* presupposes institutional mediation: structured expert input, confidential evidentiary procedures, and regulatory interfaces capable of translating technical complexity into legally intelligible form.

Comparable mechanisms already operate in domains such as competition law and financial supervision. The objective is not to replace technical governance with adjudication, but to preserve the conditions under which adjudication remains meaningful.

Algorithmic sovereignty therefore prepares, but does not complete, the constitutional response to infrastructural governance. It secures normative primacy. The next section addresses the complementary condition: how authority remains intelligible, contestable, and revisable once sovereignty is preserved.

VI. Reconstructibility

Explainability informs; Reconstructibility governs.

If algorithmic sovereignty secures the location of normative authority, reconstructibility secures its intelligibility. The abovementioned constitutional deficit culminates in a compression of justification: operative determinants migrate into infrastructures whose internal logic may resist articulation within the shared grammar of constitutional reason.

Sovereignty can ensure that such infrastructures fall within jurisdictional reach. It cannot ensure that their outputs remain susceptible to justification, contestation, and revision.

Reconstructibility names the structural condition under which algorithmically mediated governance remains constitutionally accountable. Reconstructibility requires that the pathway from input to legally relevant output remain institutionally retraceable and normatively intelligible. It is not reducible to explainability; it is not satisfied by documentation alone; and it does not require total transparency of every parameter. It designates the institutional capacity to retrace, rearticulate, and—where necessary—revise the pathway from input to binding effect in terms compatible with effective judicial protection, due process, and democratic accountability.

Reconstructibility can thus be defined as the structural capacity of a governance system to permit the intelligible reconstruction of the causal and normative chains through which authoritative outcomes are generated. Under conditions of infrastructural governance, this capacity becomes increasingly fragile.

VI.1. Beyond Explainability

Debates on explainable AI have generated interpretability techniques, counterfactual explanations, model cards, and documentation practices. Regulatory frameworks—including the Artificial Intelligence Act—embed transparency and record-keeping obligations. These developments are indispensable. Yet explainability, understood narrowly as model-level interpretability, is constitutionally insufficient for some reasons. In this sense, the constitutional concern is not opacity understood as mere absence of transparency, but *opacity as the degradation of reconstructibility*: the progressive loss of the institutional capacity to retrace and justify the pathway from data to authoritative outcome.

Interpretability does not guarantee institutional accessibility: a model may be explainable in technical terms and still remain unusable for courts or affected individuals without structured translation into legal categories. Besides, output-level explanation may fail to capture upstream determinants—data selection, optimization targets, threshold calibration—that shape the environment of decision. Furthermore, explainability is often framed as a right to information; reconstructibility concerns a deeper question: whether constitutional institutions retain the capacity to reconstruct decisional pathways so that power remains revisable. Transparency is seeing the machine; reconstructibility is understanding the judgment.

VI.2. Reconstructibility as a Three-Dimensional Condition

Reconstructibility integrates three dimensions: epistemic, discursive, and institutional.

(a) Epistemic Dimension

Institutions must possess sufficient knowledge to retrace how relevant inputs contributed to a given output at the time the decision was operationalized. This does not

require elimination of complexity or full disclosure of source code. It requires bounded intelligibility: *can the institution identify which variables materially influenced the outcome, under which configuration, and according to which performance criteria?* Where continuous retraining alters parameters, reconstructibility requires versioning, logging, and preservation of decision-relevant states. Without temporal traceability, retrospective review becomes illusory.

(b) Discursive Dimension

Epistemic access must be translatable into normative justification. Constitutional review operates within a shared argumentative grammar—proportionality, equality, legality, reasonableness. Statistical correlation must therefore be capable of re-articulation within that grammar. Reconstructibility demands that the pathway from data to decision be narratable as a sequence of normatively intelligible steps open to contestation. Otherwise review collapses into deference to technical authority, and accountability becomes ceremonial.

(c) Institutional Dimension

Reconstructibility requires mechanisms of revision. It is not sufficient that a pathway can be reconstructed; it must be possible to modify thresholds, retrain models, or suspend deployment when incompatibilities are identified. Institutional arrangements must therefore connect epistemic retracing to corrective capacity. Otherwise reconstructibility remains descriptive rather than normative.

VI.3. Threshold Logic and Bounded Opacity

Constitutional governance has never required perfect transparency. Discretion, confidentiality, and technical expertise have long operated within tolerated zones of opacity. What constitutionalism supplies are thresholds—points at which opacity becomes incompatible with accountability.

Algorithmic opacity must be treated analogously. Opacity becomes constitutionally problematic when it exceeds reconstructive capacity. The threshold is crossed not when a model is complex, but when no actor within the constitutional structure can meaningfully retrace its operative determinants. This logic avoids two extremes: it rejects the fantasy of total transparency, and it rejects complacent acceptance of Black-box authority. Reconstructibility bounds opacity so that complexity does not harden into unreviewable power.

VI.4. Governance by Thresholds and Continual Calibration

Algorithmic systems are not static. They evolve through retraining, parameter tuning, and data updates. Constitutional oversight cannot therefore remain episodic. Reconstructibility requires governance by thresholds rather than isolated interventions.

This introduces continual calibration: the ongoing adjustment between system optimization and normative constraint. Trade-offs arise across multiple axes—performance metrics versus equality constraints, false positives versus proportionality, efficiency gains versus procedural safeguards. Reconstructibility requires that these trade-offs be institutionally visible and subject to periodic review. Where calibration occurs silently within technical teams without normative oversight, constitutional control attenuates.

VI.5. Friction as Constitutional Technique

Constitutionalism has historically introduced friction into power: it slows execution, requires reasons, and creates institutional pause for contestation. Algorithmic infrastructures, by contrast, optimize fluidity. Reconstructibility reintroduces friction deliberately.

Friction may take the form of mandatory logging before outputs are operationalized, structured human oversight for high-impact contexts, or audit mechanisms triggered by anomalies. Its purpose is not to paralyze governance, but to preserve the space of reasons before statistical output crystallizes into binding effect. Without friction, infrastructural governance risks seamless authority: output flows into action without normative interrogation. Friction is the procedural manifestation of reconstructibility.

VI.6. Privatization of Proof

When the evidentiary grounds of a decision reside within proprietary systems—protected by trade secrecy or technical complexity—the basis of justification becomes partially insulated from scrutiny. Individuals may be informed of outcomes without access to operative determinants. A distinctive constitutional concern in algorithmic governance is the *privatization of proof*.

Reconstructibility requires that proof remain, at least in structured form, contestable. This does not mandate full disclosure of intellectual property. It requires institutional mechanisms—confidential judicial access, independent auditing, regulatory inspection—capable of bridging proprietary barriers. Where proof is privatized, accountability collapses. A constitutional order cannot accept binding decisions whose evidentiary foundations are effectively inaccessible.

VI.7. Differentiating Key Concepts

To avoid conceptual inflation, *reconstructibility* must be distinguished from adjacent notions. *Interpretability* concerns technical comprehensibility of a model's internal logic; *auditability* concerns inspection for compliance with predefined standards; *traceability* concerns logging and tracking system operations over time. Reconstructibility integrates these elements within a constitutional horizon: system operations must be retraceable in a manner sufficient to support justification, contestation, and revision under constitutional principles.

A system may be auditable yet not reconstructible if audits verify procedural compliance without enabling normative interrogation. It may be interpretable yet not reconstructible if interpretive insight cannot be translated into discursive justification. Reconstructibility is therefore a higher-order condition: it aligns technical transparency with constitutional accountability.

VI.8. Reconstructibility and Core Constitutional Guarantees

Reconstructibility operates as a structural precondition for three central guarantees:

Effective Judicial Protection—Courts must be able to examine not only the formal act but the infrastructural determinants that shaped it. Without reconstructive access, judicial review risks formalism.

Due Process—Affected individuals must have meaningful opportunity to contest the grounds of decisions. Contestation presupposes intelligible reasons. Reconstructibility secures the minimum epistemic conditions for such contestation.

Democratic Accountability—Legislatures and regulators must be able to evaluate systemic effects of infrastructures. Continuous calibration between performance and rights impact requires institutionalized oversight.

Put simply: a decision that cannot be reconstructed cannot be constitutionally justified.²³

VI.9. The Structural Function of Reconstructibility

Reconstructibility does not eliminate opacity; it bounds it. It ensures that complexity does not harden into unreviewable authority. Where algorithmic sovereignty secures hierarchical subordination of infrastructure to constitutional order, reconstructibility secures internal intelligibility and revisability. One addresses location; the other articulation. Together, they respond to the deficits identified in section III: sovereignty restores control; reconstructibility restores justification.

If both are institutionally secured, algorithmic governance can be integrated within constitutional order without structural displacement. If either fails, the infrastructural mutation risks hollowing constitutionalism from within.

In this sense, algorithmic sovereignty and reconstructibility operate as complementary guarantees. Sovereignty secures the hierarchical subordination of infrastructures to constitutional authority; reconstructibility secures the epistemic and discursive conditions under which that authority remains intelligible and contestable.

²³ *Associação Sindical dos Juizes Portugueses v Tribunal de Contas* (C-64/16 Court of Justice of the European Union)

VI.10. Tensions and Limits

Reconstructibility is a structural condition, not a guarantee of epistemic perfection. Complexity may exceed full retrospective intelligibility. Constitutionalism cannot demand exhaustive transparency without paralyzing adaptive systems. The relevant threshold is bounded reconstructive capacity, not total visibility.

Legitimate claims of confidentiality, security, or intellectual property may constrain disclosure. Yet such constraints cannot justify complete insulation from institutional scrutiny. Structured access mechanisms must mediate the tension between secrecy and accountability.

Institutional capacity varies. Courts and regulators may lack technical expertise. Infrastructural constitutionalism therefore implies procedural adaptation—expert panels, independent audits, calibrated evidentiary standards—rather than naïve reliance on traditional review formats. Recognition of these limits strengthens rather than weakens the argument: it situates reconstructibility within feasible constitutional practice.

VII. Infrastructural Constitutionalism

Constitutionalism has always followed power. Power is now infrastructural.

The preceding sections identified an infrastructural mutation in the conditions of governance, diagnosed the constitutional deficit it generates, and articulated two interdependent structural principles—*algorithmic sovereignty* and *reconstructibility*—as minimal conditions for constitutional alignment. What remains is to concentrate the doctrinal implications of this analysis under the heading of *infrastructural constitutionalism*.

It does not introduce a new field of law. It clarifies a transformation within constitutional method itself. It is neither a program of judicial technocracy nor a call for centralized algorithmic planning. It is a reorientation of constitutional attention toward the architectures that prestructure decision in contemporary polities.

VII.1. Concept

Constitutionalism has historically disciplined acts. It presupposes that power manifests in identifiable decisions, norms, or omissions attributable to institutional actors. Even structural doctrines—separation of powers, federalism, supremacy—remain oriented toward the distribution and control of competences exercised through acts.

Infrastructural constitutionalism begins from a descriptive shift. In computationally mediated governance, decisive determinants increasingly reside in architecture rather than in isolated decisions. Code, data environments, interoperability standards, ranking systems, and risk-calibration models shape the conditions under which discretion is exercised.

The conceptual move is modest but consequential: constitutional scrutiny must extend from decisions to the infrastructures that condition them. This does not dissolve the distinction between public and private authority. It recognizes that infrastructures—whether publicly or privately operated—may generate effects functionally equivalent to public power when they structure access to rights, opportunities, or public burdens at systemic scale.

VII.2. Genealogy

The intuition that certain infrastructures warrant constitutional attention is not unprecedented. Nineteenth- and early twentieth-century public-utility regulation confronted privately owned systems—railroads, telegraph networks, electricity grids—whose control over essential services conferred quasi-public authority. Regulatory doctrines evolved to prevent discriminatory access and ensure continuity of service. Although not articulated in contemporary constitutional vocabulary, these developments reflected recognition that infrastructural control could threaten equality and accountability.

In the European context, post-war integration constitutionalized economic infrastructures. The jurisprudence of the Court of Justice transformed market freedoms into directly effective norms, embedding supranational constraints within domestic legal orders. Economic infrastructure became a site of constitutional discipline.

Digital infrastructures represent a further intensification. Platforms, cloud architectures, payment systems, and algorithmic classification engines operate transnationally and at systemic scale. Their governance choices structure communicative visibility, economic participation, and regulatory prioritization. *Infrastructural constitutionalism* does not invent a new object of constitutional concern; it renders explicit a trajectory in which infrastructures acquire constitutional salience when their control shapes fundamental conditions of participation.

VII.3. Infrastructural Power

To justify constitutional extension, infrastructural power must be distinguished from ordinary private influence.

Infrastructural power operates through pre-structuring rather than command. It shapes the field of possible action before explicit decision occurs. Its defining features include systemic scale, path dependence generated by network effects and switching costs, opacity gradients, and the capacity to determine which options appear viable prior to deliberation.

From a republican perspective, such power approximates domination when it places individuals or institutions in a condition of dependence without effective recourse.²⁴ Institutional political economy reinforces this insight: control over data flows,

²⁴ Philip Pettit, *Republicanism: A Theory of Freedom and Government* (Oxford University Press 1997)

interoperability standards, or ranking criteria can function as structural gatekeeping. Markets alone do not neutralize such power where concentration and lock-in prevail.

Infrastructural constitutionalism responds not to influence as such, but to entrenched pre-structuring that affects constitutional goods—equality, liberty, democratic participation—at systemic scale.

VII.4. Doctrinal Vectors

Translating this perspective into doctrine does not require abandoning classical constitutional guarantees. On the contrary, it requires identifying vectors through which infrastructural concerns can enter constitutional adjudication.

Fundamental rights—Where infrastructural actors shape rights enjoyment at scale, courts may reinterpret positive obligations, requiring public authorities to secure effective protection within infrastructural environments.

Equality—Infrastructures may entrench structural disadvantage through algorithmic bias or differential access conditions. Equality doctrine must adapt to forms of technologically mediated differentiation without collapsing into technical review.

Procedural guarantees—Infrastructural governance relies on automated classification and opaque moderation. Constitutionalism demands contestability, reason-giving, and review as structural requirements, not discretionary corporate policies.

Rule of law and Democracy—Structural principles require infrastructural interpretation. Predictability, accountability, and public justification are challenged when authority operates through inscrutable architectures. These implications demand constitutional articulation, not merely sectoral regulation.

VII.5 Illustrative Implications for Institutional Design

The foregoing analysis does not entail a program of institutional engineering. Infrastructural constitutionalism is not a design manual, nor does it prescribe uniform governance architectures. Yet if algorithmic sovereignty and reconstructibility are taken seriously as constitutional conditions, certain implications for institutional design become analytically visible.

Design-stage decisions acquire constitutional salience where they prestructure access to rights or public burdens at systemic scale. This does not imply that every technical parameter becomes justiciable. It implies that choices concerning threshold calibration, performance trade-offs, or data inclusion may fall within the horizon of constitutional scrutiny when they materially condition legally consequential outcomes.

Institutional mediation becomes a constitutional requirement rather than a technical convenience. Where infrastructural complexity exceeds ordinary judicial cognition, constitutional review presupposes structured interfaces—expert bodies, confidential

evidentiary procedures, or independent audits—capable of translating technical architectures into legally intelligible form. The point is not to transform courts into engineers, but to preserve the conditions under which adjudication remains meaningful.

Reversibility must be institutionally preserved. *Infrastructural constitutionalism* does not demand constant intervention, but it presupposes retained capacity for recalibration or withdrawal. Where economic lock-in, technical integration, or proprietary opacity render disengagement practically impossible, constitutional authority risks becoming nominal.

Governance by thresholds rather than isolated acts becomes constitutionally relevant. In adaptive systems, normative alignment cannot be secured through episodic review alone. The constitutional question shifts from whether a single decision was lawful to whether the ongoing calibration of the system remains compatible with constitutional guarantees.

These implications are not offered as a blueprint. They serve to illustrate the type of institutional conditions under which infrastructural governance may remain intelligible, revisable, and subordinated to constitutional authority. Their precise articulation remains contingent on legal tradition, institutional capacity, and democratic choice.

VII.6. Implications within European Constitutional Law

Within the European constitutional order, infrastructural constitutionalism does not require doctrinal rupture. It requires reinterpretation.

Legality must extend to design parameters materially shaping rights and obligations. *Judicial review* must be capable, at least in principle, of interrogating infrastructural determinants. *Proportionality* must account for system calibration, not only outcome. *Multilevel alignment* must ensure that Union regulation, national constitutional guarantees, and Charter rights jointly discipline infrastructural power.

Regulatory instruments such as the Artificial Intelligence Act embed important design-stage obligations. Yet regulatory compliance does not exhaust constitutional legitimacy. The latter concerns the structural conditions under which power remains intelligible and revisable.

VII.7. Comparative and Transnational Dimensions

Algorithmic infrastructures rarely respect territorial boundaries. Governance models diffuse transnationally, and standards adopted by dominant actors may function as de facto global norms.²⁵

²⁵ For comparative developments see Cary Coglianese and David Lehr, 'Regulating by Robot' (2017) 105 *Georgetown Law Journal* 1147; Karen Yeung and Martin Lodge (eds) *Algorithmic Regulation* (Oxford University Press 2019).

Comparative constitutional analysis reveals divergent responses, yet a shared structural problem: the migration of normative force into architecture. *Infrastructural constitutionalism* does not prescribe uniform institutional solutions. It identifies a condition confronting constitutional orders wherever governance becomes infrastructural.

VII.8 What *Infrastructural Constitutionalism* Is Not

Clarification requires negative definition. *Infrastructural constitutionalism* is not a claim that every digital system has constitutional status; not a mandate for judicial micro-management of technology; not a program of centralized algorithmic planning; and not a rejection of innovation or efficiency.²⁶

Nor does it deny the disciplining role of competition in certain markets. Its claim is narrower: where infrastructural control acquires systemic significance for constitutional goods, market dynamics alone cannot substitute for normative subordination. *Infrastructural constitutionalism* does not expand judicial power; it reallocates constitutional attention.

VII.9. Stakes

The ultimate stake is the future locus of constitutional limitation. Architecture increasingly rivals legislation as a mode of rule. Design choices embed norms prior to formal articulation. Thresholds coded into systems may shape distribution more decisively than statutes.

If constitutionalism remains exclusively act-centered, it risks bifurcation: law will continue to speak the language of rights while infrastructures silently condition outcomes. If constitutionalism extends coherently into infrastructural environments—without abandoning its commitment to reasoned limitation—it can absorb the mutation.

Algorithmic sovereignty secures hierarchical primacy. *Reconstructibility* secures intelligibility and revisability. *Infrastructural constitutionalism* integrates both within a coherent constitutional method.

VIII. Conclusion—Constitutionalism After Architecture

The expansion of algorithmic infrastructures into the core processes of governance confronts constitutional law with a transformation that is both subtle and profound. Public authority is no longer exercised solely through discrete acts, identifiable decisions, or formally articulated norms. Increasingly, it is embedded in architectures of data processing, probabilistic inference, and automated classification that shape the

²⁶ On the risk of constitutional over-expansion see Gunther Teubner, *Constitutional Fragments* (Oxford University Press 2012).

conditions under which decisions are made, opportunities allocated, and risks distributed.

Architecture now rivals legislation as a mode of rule. This transformation does not abolish the traditional forms of public power. Courts continue to review administrative acts, legislatures enact norms, and executive authorities retain formal responsibility. Yet the locus of effective determination has begun to migrate. Where institutional outcomes depend on infrastructures whose internal operations remain partially opaque, the constitutional grammar designed for act-centered governance encounters its structural limits.

The challenge, therefore, is not merely regulatory but constitutional. It concerns the capacity of constitutional orders to retain normative primacy over the infrastructures that increasingly mediate the exercise of authority. Where the conditions under which public decisions emerge are shaped by technical architectures insulated from effective scrutiny, constitutional guarantees risk becoming downstream correctives applied to processes whose decisive logic lies elsewhere.

This article has argued that responding to this development requires a shift in constitutional attention. Algorithmic governance generates a structural tension between the formal location of responsibility and the infrastructural location of influence. When this divergence becomes sufficiently pronounced, mechanisms designed to review acts may fail to reach the environments within which those acts are effectively produced.

Infrastructural constitutionalism captures the need for constitutional control to extend beyond discrete decisions toward the architectures that condition their emergence. It does not entail the juridification of technology or the replacement of political decision by technocratic supervision. It affirms a simpler proposition: infrastructures capable of producing legally consequential effects must remain subject to principles of intelligibility, revisability, and institutional accountability.

Within this framework, two ideas are decisive. *Algorithmic sovereignty* designates the capacity of a constitutional order to ensure that infrastructures operating within its jurisdiction remain subordinated to publicly accountable norms. *Reconstructibility* denotes the institutional ability to retrace and rearticulate the pathways through which algorithmic systems contribute to legally relevant outcomes. Together, they express a common intuition: authority mediated through complex architectures must remain capable of entering the space of public justification.

The argument advanced here does not replace the classical categories of constitutional law. Fundamental rights, equality before the law, procedural guarantees, democratic accountability, and the rule of law remain its normative core. What must evolve are the institutional techniques through which these principles operate when governance is increasingly mediated by infrastructures rather than solely by acts.

Seen in this light, the present transformation is best understood as a *migration*. Constitutionalism has historically followed the changing forms of power—from

monarchic prerogative to administrative discretion, from legislative supremacy to judicial review. As power becomes infrastructural, constitutional control must migrate accordingly.

The structural tension identified throughout this article may ultimately be summarized in a simple proposition: in algorithmically mediated governance, authority is exercised upstream while constitutional responsibility remains anchored downstream. The central task of constitutional law in computational polities is therefore to realign these loci of power and accountability.

Constitutional orders confront a choice. They may treat algorithmic infrastructures as merely technical instruments, leaving constitutional scrutiny confined to the visible acts that follow their outputs. Or they may recognize that when architectures structure the field of decision, constitutional discipline must extend to the environments within which authority is formed. The difference between these paths will determine whether constitutionalism remains a living constraint on power or becomes a downstream commentary on processes it no longer effectively governs.

Whether constitutional orders will succeed in this adaptation remains uncertain. What is clear is that the future of constitutional government will depend not only on the norms that law proclaims, but on its capacity to see, interrogate, and discipline the architectures through which authority increasingly operates.

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