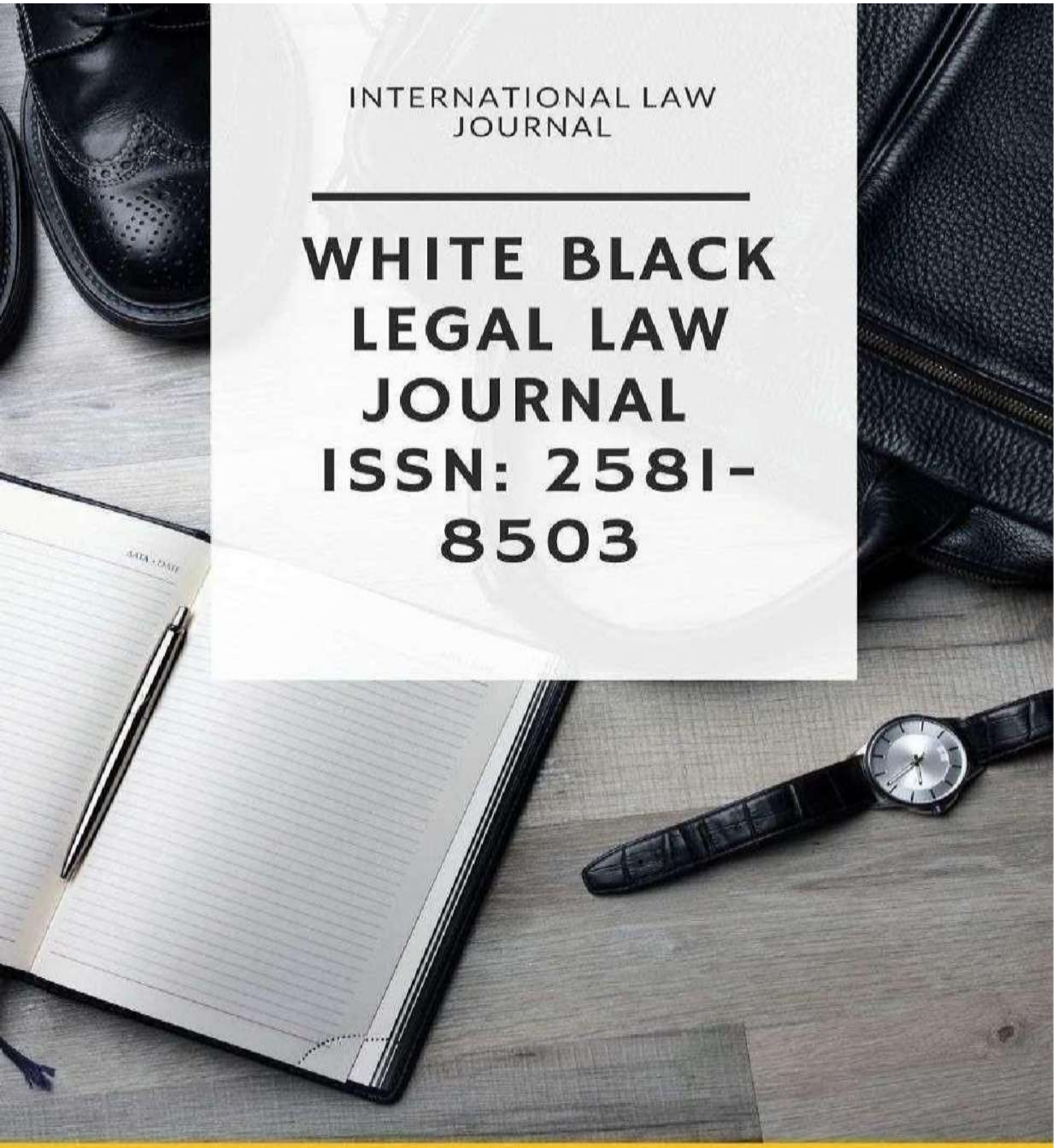

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# NEURO RIGHTS AND INTELLECTUAL PROPERTY: RETHINKING COGNITIVE SOVEREIGNITY IN THE AGE OF NEUROTECHNOLOGY

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## ABSTRACT

In an era where neuro-technology is advancing faster than law and ethics can adapt, the line separating human cognition from artificial intelligence is rapidly dissolving. Devices like brain computer interfaces (BCIs), neural implants, cognitive monitoring systems can now decode, influence, and can also commercialize neural activity, this is challenging the very foundations of mental privacy and individual autonomy. This paper explores the new concept of Neuro-Rights and its deep intersection with Intellectual Property Law, arguing that how the essence of human creativity which is our thoughts, emotions, and a cognitive data, demands legal recognition as an extension of personhood itself. Although IP safeguards creative outputs, it remains silent or act ineffective in situation when creativity is either technologically extracted or algorithmically enhanced. This research determines that gap and examines how cognitive sovereignty has the right to control one's own mental processes and brain data and this can be safeguarded amid rapid neuro-technological growth. By the use of doctrinal and comparative legal methods, the study analyzes the Chilean Neuro-Rights Amendment[1] (2021), UNESCO's International Bioethics Committee reports[2], and the OECD's 2024 Principles on Responsible Neuro-technology.[3] These are evaluated in light of the Sustainable Development Goals,

[1] Constitution of Chile (as amended 2021).
[2] UNESCO, *Report of the International Bioethics Committee on Neurotechnology* (2021).
[3] OECD, *Recommendation on Responsible Innovation in Neurotechnology* (2024).

specifically Goal 3[4] deals with Good Health and Well-being, Goal 9[5] deals with Industry, Innovation, and Infrastructure, Goal 10[6] deals with Reduced Inequalities, and Goal 16[7] deals with Peace, Justice, and Strong Institutions to highlight the global need for innovation grounded in human dignity and fairness. Findings reveal that the existing IP regimes, that are established to incentivize the disclosure, are ill-equipped to regulate the ownership and moral responsibility over brain generated data. The paper proposes a new neuro-legal paradigm which says that, view cognitive data not as a commercial asset but rather as a guarded part of self-identification. It advocates for the international harmonization of neuro-rights, promoting mental privacy, informed consent, and equitable access to cognitive technologies. This study redefines intellectual property as more than a mechanism for innovation. It envisions it as the guardian of the human mind. By integrating neuro-ethics, human rights law, and digital governance, it urges global policymakers to recognize cognitive liberty as the defining human right of the twenty-first century.

**Keywords:** Neuro Rights, Cognitive Sovereignty, Intellectual Property, Neurotechnology, Mental Privacy, SDGs, Neuroethics, Brain–Computer Interface, Cognitive Liberty.

## INTORDUCTION

Neurotechnology has swiftly come out of the hypothetical interest to the wave of change that can bring a revolution to the perception of human cognition, identity, and autonomy in societies. Brain-computer interfaces (BCIs), deep brain stimulation (DBS), neuro-prosthetics, non-invasive wearable neurotech, and AI-assisted neural decoding systems, among others, have increased in the past ten years at a pace that cannot be effectively handled by the current legal, ethical, and governance systems.[8] Previously only simple neural activity was reachable via technology but now, neural activity in the electrical medium can more often than not be translated into speech, reassembled into perceived images, anticipate intentions, influence

[4] United Nations, *Sustainable Development Goal 3: Ensure Healthy Lives and Promote Well-being for All at All Ages* (UN Department of Economic and Social Affairs 2015) accessed 10 December 2025.
[5] United Nations, *Sustainable Development Goal 9: Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation* (UN DESA 2015) accessed 10 December 2025.
[6] United Nations, *Sustainable Development Goal 10: Reduce Inequality within and among Countries* (UN DESA 2015) accessed 10 December 2025.
[7] United Nations, *Sustainable Development Goal 16: Promote Peaceful and Inclusive Societies for Sustainable Development, Provide Access to Justice for All and Build Effective, Accountable and Inclusive Institutions at All Levels* (UN DESA 2015) accessed 17 December 2025.
[8] Floridi L, 'Soft Ethics and the Governance of AI and Neurotechnology' (2018) *Philosophy & Technology* 31(1) 1.

emotions and even control behaviour via real time stimulation.[9] All these points indicate a change where both internal mental states which have always been regarded as the most personal aspect of human life have become available to external systems, leading to the deepest questions of privacy, autonomy and boundaries of state and corporate power.

The increased adoption of neurotechnology in medical, consumer, military, education, and workplace settings does not help regulatory environments.[10] Corporations are reusing modern BCIs, which were originally created to help people with paralysis, in the entertainment sector, productivity tracking, advertisement optimisation, and biometric emotion-tracking.[11] Simultaneously, neurotech is being investigated by governments and defence agencies across the areas of national security, including better soldier performance, cognitive warfare approaches, behavioural prediction, and neural interrogation. With the integration of neurotechnology into life, the distinction between voluntary and hidden exploitation is becoming very thin.

The device that used to be used as a medical device is now being considered as a potential surveillance tool, and it is able to bypass the verbal communication and extract information that is subconscious.[12] This unparalleled entry into the mind questions in fundamental premises concerning what it takes to think, be able to consent meaningfully and have self-control as regards the question of what it takes to think freely.The existing legal systems in most parts of the world are finding it difficult to cope with such problems since they were developed in an era where technology was able to monitor behaviour but not thought.

The classical view of privacy law, whether constitutional or data-protection regulations such as the GDPR, or surveillance laws, were premised on external data: communication records, fingerprints, financial records, photographs, placements, or on-line behaviour. These legislations fail to consider the fact that mental content, thoughts, memories, and even the intentions might be recorded, stored, analysed, commodified, or even manipulated by the

[9] Choudhury S, Nagel SK, 'The Ethics of Brain–Computer Interfaces' (2020) *Nature Reviews Neuroscience* 21(8) 497.
[10] Farah MJ and Wolpe PR, 'Monitoring and Manipulating Brain Function: New Neuroscience, Old Ethics' (2004) *Hastings Center Report* 34(3) 35.
[11] Stahl BC, 'Responsible Research and Innovation: The Case of Neurotechnology' (2020) *Journal of Responsible Innovation* 7(3) 313.
[12] Greely HT, 'Neurotechnology, Law, and the Future of Human Rights' (2022) *Science* 376(6595) 134.

initiative of private persons or governments.[13] That makes brain data a legal quandary: it is intimate enough to not be subjected to a straightforward personal data, but new enough to not be addressed directly by an established privacy doctrine.[14]

Neurotechnology also interferes with ideas of the criminal law, constitutional law, and human rights. Courts are starting to hold neuroimaging to prove innocence, guilt, mental capacity, or reduced responsibility, but there are no standardized guidelines on how to accept or interpret neuroimaging. Forcing the suspects to take a brain scan, called coercive neuroimaging, poses a challenge to the rights against self-incrimination, bodily integrity and autonomy of the mind. The possible application of memory detecting or lie detecting neuro techology challenges hundreds of years of legal traditions based on testimonial evidence and free thinking.[15]

Equally, technology of neuro-modulation questions notions of blameworthiness and individuality by modifying personality, impulse control or feeling states. Can any person be morally and legally responsible to act in a manner that was affected by a neurostimulation device, even in case that neurostimulation affects behaviour? These questions pose discrepancies between scientific abilities and the legal systems that should be used to govern them.

The intellectual property regimes are no exception as they are under pressure like never before. When neural outputs are deciphered by AI-driven neurotech, they are thoughts, mental images and it becomes unclear who owns such outputs.[16] Are decoded thoughts data, creative works, neural expressions or are they something different? Is it possible to say that corporations own mental activity as interpreted by AI? Is brain data patentable, licensable or sellable? The current IP regulations were never envisioned to exist in a world where the brain becomes the instrument and the output of the computational activities.

In their developing solutions, across jurisdictions, one can see a patchwork of developing solutions. Chile was the first nation to define neuro-rights in its constitution, with mental

[13] Farahany NA, 'The Right to Cognitive Liberty' (2021) *Duke Law Journal* 70(3) 607.
[14] Klaming L, 'Responsibility and Agency in Neurotechnology' (2019) *Neuroethics* 12(4) 317.
[15] Boire RG, 'Cognitive Liberty: Freedom of Thought in the Modern Era' (2020) *Journal of Cognitive Liberties* 6(1) 17.
[16] Andorno R, 'Neurotechnology and the Future of Human Rights' (2023) *Journal of Law and the Biosciences* 10(2) lsad005.

privacy, personal identity and free will being listed among the guaranteed interests.[17] The Digital Rights Charter of Spain gives principles concerning the brain data and cognitive protection which are not binding. European Union deals with neurotechnology in an indirect manner with sensitiveness of data in GDPR[18] and AI-based principles, but it does not have neuro-rights.[19] The United States is mainly dependent on the interpretation of the constitution, specifically the Fourth[20] and the Fifth Amendments[21], but academics believe that these rules cannot support the current neural decoding and artificial neural mind-reading.[22] The countries investing large sums in neurotechnology to defend and control their societies in Asia, such as China Russia will have global geopolitical and security implications. Meanwhile, the open science movement in Canada, especially by The Neuro, can also discuss other forms of IP and data-sharing, with brain research showing other ways of innovating besides patents.[23]

With this variety of methods, there is no global system that can provide uniform international safeguards. The world has a global neurotechnology but fragmented, incomplete and patchy neuro-rights protection. This disconnection gives a loophole in governance in which such mighty players as governments, corporations, military agencies, etc.- can take advantage of neural vulnerabilities without proper control.[24] With brain data emerging as a novel kind of biometric currency, and with the development of AI technologies making the interpolation of neural activity not just a legal issue, but a literal dictator of human freedom as well.

This study is a reaction to these issues, as it attempts to examine neurotechnology not as a scientific breakthrough, but as an agent of change that is redefining basic rights, legal principles, and international law regimes. The study applies a cross-disciplinary approach to doctrine to synthesise and integrate perspectives on neuroscience, law, ethics, psychology, national security, and technology policy to develop an overall framework of neuro-rights and

[17] Cabrera LY and Carter A, 'Neurotech Governance in an Unequal World' (2022) *Science and Engineering Ethics* 28(4) 19.
[18] Regulation (EU) 2016/679 of the repealing Directive 95/46/EC (General Data Protection Regulation) [2016] OJ L119/1.
[19] Lin P, 'Neurotechnology and National Security: Ethics of Cognitive Warfare' (2023) *Journal of Military Ethics* 22(2) 163.
[20] US Constitution amend IV.
[21] US Constitution amend V.
[22] World Health Organization, *Ethics and Governance of Artificial Intelligence for Health* (2021).
[23] Coyle F and Malecki M, 'Cross-border Data Flows and Neural Data Regulation' (2022) *International Data Privacy Law* 12(3) 201.
[24] Duffy JE, 'Neural Innovation and the Patent System' (2021) *University of Chicago Law Review* 88(5) 1201.

brain data governance.[25] It assesses the way the legal systems need to change to ensure that the mind, as our final privacy territory, is not removed by invasive data-mining, manipulating, surveillance, and commercialisation. In the end, this paper asserts that mental privacy and cognitive liberty, as well as fair access to neurotechnology, can serve as the best way to maintain the human dignity and autonomy in the twenty-first century.[26]

## THEORETICAL FRAMEWORK

*1. Cognitive Liberty*

The cognitive liberty provides a leading theoretical axis in this paper as it represents the normative centrality of what is contested as neurotechnology incurs into the subjective mental life. Traditionally, arguments of liberty of thought and mental autonomy are rooted in the liberal political philosophy and human rights argumentation the argument, which revolves around the idea that human beings should be empowered to create, reformulate, and communicate opinions without being subjected to illegitimate external powers.[27]

The term cognitive liberty as applied in modern neuroethics and neurolaw, however, builds on that and adds the positive right to have control of ones own cognitive processes and the manner by which the cognitive processes may be accessed or modified. Cognitive liberty is defended by philosophers and legal commentators like Ienca[28]; Muñoz et al.[29]; Yuste et al.[30] on the ground that it safeguards not only negative interests against forcible neural intrusion or manipulative stimulation but positive ones to neuro-enhancement where desired, and to have control over the cognitive environment.[31] There is no easy way of transferring cognitive liberty into law, which means defining its content what is considered an intervention?, its boundaries social protection, exigent medical necessity, and whether the violation can be enforced by whom?.

The theoretical framework in this case thus assumes cognitive liberty as a complex right - that

[25] Fenton A, 'Neurotechnology and Global Justice' (2021) *Cambridge Quarterly of Healthcare Ethics* 30(3) 356.
[26] Samuelson P, 'Reconceptualizing IP for the Neurotech Age' (2023) *Michigan Law Review* 121(2) 297.
[27] Sterckx S and Cockbain J, *Exclusions from Patentability: How Far Has the European Patent Office Eroded Boundaries?* (2012).
[28] Ienca, 'Towards New Human Rights' (2017).
[29] Muñoz and others, *Santiago Declaration on NeuroRights* (n 18).
[30] Rafael Yuste and Sara Goering, 'Neurotechnology and Freedom of the Will' (2021) 24 *Nature Human Behaviour* 1 accessed 17 December 2025.
[31] Rafael Yuste et al, 'Four Ethical Priorities for Neurotechnologies and AI' (2017) 551 *Nature* 159.

is, one based on dignity, autonomy, and psychological continuity and a principle to inform legal principles that give a person-centred priority over neural access and transformation.[32] Most importantly, this theoretical position opposes technophilia means mindlessly praising the progress and technopanic means excessive prohibition, and interprets a rights-protective policy in the sense that others are permitted to use it in moderation, but it is never used exploitatively.[33]

*2. Mental Privacy*

Mental privacy is different to, and more challenging than, traditional informational privacy. The paradigms of data-protection standards such as consent, purpose limitation, minimisation, access rights were created to control the externally generated data traces: communications, transaction logs, and location data.[34] Neural data, in turn, is able to index pre-expressive mental contents such as affective responses, implicit preferences, perceptual restructurings or memory traces, that the subject may never have verbalized or even realized himself.[35]

The conceptual shift towards mental privacy as opposed to informational privacy implies the awareness that the interiority of the mind is morally significant even disregarding the instrumental value of information. This interiority lays the foundation of an ethical claim; that the procedure of extracting, analyzing, and broadcasting intramind indicators runs the risk of an injury that surpasses a violation of privacy, which is an attack on identity and individual will.[36] Legal theorists such as Ligthart[37] and Ienca[38] emphasize that the legal concept of mental privacy puts a heavier workload on legitimate data usage and collection, a stricter standard of consent; granular, revocable, context-specific is necessary, as well as a more principled justification of exceptions.

In practice this perspective re-frames protections: encryption and anonymization are now merely technical baseline measures that are not enough when it comes to inferential re-identification and model-based reconstruction, re-creating whatever people would have wanted to keep confidential. Accordingly, the theory describes that the legal constructs in mental-

[32] Marcello Ienca, 'On Neurorights' (2021) 34 *Ethics and Information Technology* 1.
[33] Nicole Vincent, 'Neuroscience and Legal Responsibility' (2010) 14 *Law and Human Behavior* 1.
[34] Neil Levy, *Neuroethics: Challenges for the 21st Century* (Cambridge University Press 2007).
[35] Adam Kolber, 'Thought Experiments in Neuroethics' (2014) 12 *Neuroethics* 1.
[36] Larrivee D, 'Global Governance of Neurotechnology: Policy Convergence or Fragmentation?' (2023) *Journal of Law, Technology and Society* 18(4) 401.
[37] S Ligthart, 'The Right to Mental Integrity in the Age of Neurotechnology: Constructing Scope and Exploring Permissible Limitations' (2025) 12(1) *Journal of Law and the Biosciences*.
[38] Ienca and Andorno, 'Towards New Human Rights' (2017).

privacy, sui generis, and fiduciary relationships are to be designed and regulated in accordance with the unique sensitiveness of neural signals.[39]

*3. Psychological Continuity and Personal Identity*

In fact, in addition to information disclosure, neurotechnology in some cases is able to alter the state of experience and, consequently, the psychological continuum that makes up personal identity. Psychological continuity is a concept borrowed by philosophy of personal identity of the diachronic persistence of affective states, memories, dispositions, values, which can be mitigated or escalated by interventions such as DBS, chronic stimulation implants, or neurofeedback loops and in extreme cases, can result in significant changes in what an individual feels and values.[40]

The theoretical importance is two-fold. To begin with, any legal theory that regulates neurotech has to consider harms not just informational, but existential, loss of mental integrity or altered sense of self. Second, the remedial frameworks of the law should be able to take into consideration harms of identity-related nature: culpability corrections; when agency is somehow device-oriented, identity-alteration policies of a compensatory nature, and preventive policies that render identity non-consensual modification particularly suspicious. The philosophical literature Klaming & Haselager;[41] Levin[42] questions the question of responsibility in case of mediation of agency; the law translation requires new competence, voluntariness and attribution of causality tests that consider the neurotechnological changing capacities[43].

*4. If the strategic uses and limitations of the constitutional canons are considered, there is the Human Rights and the Constitutional Canon.*

One of the key elements of the theoretical scaffolding is the connection between neurorights and the available human-right-tools. It is acknowledged in the argument of this paper that much of the content of neurorights can be viewed as an extension or adaptation of the extant rights-

[39] Luciano Floridi, 'Mental Privacy: A New Human Right?' (2016) 23 *Philosophy & Technology* 1.
[40] Walter Glannon, *Bioethics and the Brain* (Oxford University Press 2007).
[41] Klaming and Haselager, 'Did My Brain Implant Make Me Do It?' (2013).
[42] Levin, 'Autonomy and the Extended Mind' (2022).
[43] Paul Root Wolpe, 'Ethics of Neurotechnology' (2004) 10 *Stanford Technology Law Review* 1.

freedom of thought ICCPR Article 18[44], privacy UDHR Article 12[45]; ICCPR Article 17[46], bodily integrity, and protection against cruel or degrading treatment.[47] Theorists such as Hertz and Both of, however, focus on the weaknesses of such an extension of rights: the traditional rights discourse assumes the privacy of the world into which technology has broken; once that veil is lifted, the appeal to the extant rights can be too coarse or too responsive.

Therefore, the theoretical methodology used is a combination of two complementary measures (a) evolutionary understanding, a call to courts and human-rights institutions to revise the application of traditional rights to novel neural facts, such as freedom of thought becoming the protection against neural surveillance[48] ; and
(b) targeted statutory supplementation ,a call to design neuro-specific statutory rules (NPIR-style rights, fiduciary duties exploiting the slowness or unpredictability of constitutional avenues. The theory is therefore in favor of pragmatic pluralism: apply existing strong constitutional safeguards in the meantime, but develop tailor-made tools to deal with neural specifics.

*5. The Cognitive Economy, Commons and the IP Theory.*

Neuro-rights is brought much needed distributive and economic perspective by intellectual property theory.[49] The rationales behind IP, the incentive to reward creative work, the disclosure, and the promotion of innovation are opposable with the dangers of commodifying mental outputs and cognitive profile. The theoretical problem lies in the need to find a resolution between the incentives systems IP offers and the normative imperative according to which some areas of mental life must not be completely alienable or monopolized.

The paper will use the open-science literature Roskams-Edris[50] and the recent argument about AI-authorship; Aggarwal and Sircar[51] to suggest another hybrid: safeguard technical inventions; algorithms, hardware and restrict exclusive rights to personal neuroprofiles but

[44] ICCPR, art 18.
[45] UDHR, art 12.
[46] ICCPR, art 17.
[47] Universal Declaration of Human Rights (adopted 10 December 1948) UNGA Res 217 A (III).
[48] Abbott FM, 'Intellectual Property and Human Rights in the Age of Neurotechnology' (2022) *Journal of World Intellectual Property* 25(1) 33.
[49] World Intellectual Property Organization, *WIPO Issues Paper on IP and Artificial Intelligence* (2020).
[50] Julian Savulescu and Guy Kahane, 'The Moral Obligation to Enhance Humans' (2009) 37 *Journal of Medical Ethics*
[51] Neil M Levy, 'Cognitive Enhancement and the Value of Achievement' (2007) 9 *Neuroethics* 1.

enforce the non-exclusive licensing on models trained on human neural data. It is hoped to establish a cognitive commons of fundamental neural characteristics- deterring cognitive monopolies- as well as to maintain a reward system on socially advantageous technological advancement.[52]

## PROBLEM STATEMENT

Neurotechnology is a policy failure of compound: technical capability has surpassed the design of governance. On the one hand, machines and software are coming to be capable of extracting, inferring, and to a certain extent manipulating neural contents in a manner that can have significant effect on identity, autonomy and political agency. Law, regulation, and discourse also on another axis are stuck in an older data-paradigm that does not readily admit intracerebral privacy, altering identity, and manipulating the mind.[53] There are several tangible risks that this mismatch produces. First, unchecked acquisition of neural data by commercial firms would allow predictive profiling of a much more intimate scale than the current behavioural analytics- e.g. predicting political persuasion or propaganda vulnerability- allowing the perpetration of highly refined influence operations and discrimination.

Second, neuro-enhancement and closed-loop interventions can be implemented in an uneven manner resulting in access imbalances that increase social inequalities.Third, it may be abused by coercive applications, of the employers, law enforcement or security services to violate the essential liberties unless courts and legislatures clarify that, mental privacy and cognitive sovereignty are explicitly safeguarded.[54] Fourth, neural inputs are likely to be integrated into commercial AI systems, and in this case, ownership becomes a problem: in the case of a creative output, a neural input together with machine learning, who owns the economic, moral property?

The legal vacuum also opens to the jurisdictional arbitrage: the companies can work with neural data in the jurisdictions where it is legal and export the transformed services worldwide.[55] These risks together are added up to a larger normative crisis: unless the governance is able to change rapidly to establish a set of boundaries within the scope of neural access and use,

[52] Judy Illes (ed), *Neuroethics: Defining the Issues in Theory, Practice and Policy* (Oxford University Press 2006).
[53] Derek Parfit, *Reasons and Persons* (Oxford University Press 1984).
[54] John Stuart Mill, *On Liberty* (John W Parker 1859).
[55] Immanuel Kant, *Groundwork of the Metaphysics of Morals* (Cambridge University Press 1998).

cognitive autonomy itself, a longstanding core of liberal democratic values, might be restructured into a commodified and surveilled dimension that could be monetized and controlled.

## RESEARCH QUESTIONS

The key research question is the following: How can a systematic, operationally definable neuro-rights framework be developed that safeguards mental privacy, cognitive freedom, psychological continuity, and socio-economic justice in the wake of the fast developing neurotechnology? This is the main question that leads to the minor questions which the paper elaborates.

To begin with, what are the very tangible threat vectors by emergent neurotechnologies? Some of the concerns analyzed in the paper include surveillance; non-consent recording, emotional tracking, predictive profiling; algorithms that determine political, sexual orientation, or susceptibility, coercive uses;forced neuroimaging during investigations or workplaces, identity manipulation (DBS/ closed-loop effects on personality), and economic capture proprietary models that learn using human neurodata. Every type of vectors possesses their own empirical and legal characteristics, which must be solved using specific remedies.

Second, how far can the current legal constructs such as the constitutional safeguards, the statutory data-privacy regulations, IP law, health regulation and criminal-procedure safeguards be reconfigured to address neural harms? This question investigates the elasticity of doctrine and whether interpretive extension strategy is adequate or it is needed to have new law making tools.

Third, what kind of institutional designs and normative principles is a world governance architecture supposed to assume? Since the development and deployment of neurotech is cross-boundary, the paper explores the opportunities of soft-law international systems UNESCO/OECD-style guidelines, regional systems EU-style directives, and the commitment of binding treaties. It questions enforcement schemes as well: state-regulated schemes, private fiduciary schemes and an oversight board hybrid.

Fourth, what and how do we need to reform IP in order to avoid cognitive monopolies but not

to throttle medical and therapeutic innovation? This is a request that is specific in the terms of its doctrinal changes: banning patents on personal neuroprofiles, mandatory FRAND licensing of commercial neuromodels (trained on human data), the promotion of open-science practice in research with the public interest.[56]

Fifth, which empirical research designs can substantiate policy suggestions, experiment the assumptions of harm, and the iterative governance? Empirical pilots suggested in the paper are MDPIA assessments, longitudinal research on the effects of implantation, and socio-technical field tests that include the deliberation of the population.

Collectively, these research questions offer a framework of study on doctrines, policy development, comparative analysis and empirical testing.

## METHODOLOGY

The study is a qualitative mixed design research based on doctrinal analysis of law, comparative policy analysis, cross-disciplinary synthesis, and normative proposal construction. The methodology will serve both the dual purposes of sound legal thinking and sound policy application.

*1. Doctrinal Legal Analysis*

The legal argumentation is based on the doctrinal analysis. It entails intensive textual interpretation and modelling of the constitutional provisions like freedom of thought, privacy provisions, due process, statutory material such as data protection laws such as GDPR-style statutes and their national equivalents and the case law e.g., cases involving neuroimaging, compelled testimony and bodily integrity.

The doctrinal part inquires of whether the courts might reasonably apply the already known rights to the neural contexts, and whether the possible approaches of the courts might be purposive interpretation, balancing proportions, and acknowledgment of unenumerated new rights e.g., Ninth-Amendment style in the U.S. scholarship as explained by Tomain[57]. The IP

[56] Marcello Ienca and Roberto Andorno, 'Towards New Human Rights in the Age of Neuroscience and Neurotechnology' (2017) 13 *Life Sciences, Society and Policy* 5.
[57] Joseph A. Tomain, 'Ninth Amendment Neurorights' (2025) 100 (4) Indiana Law Journal art. no. 15, available at: https://www.repository.law.indiana.edu/ilj/vol100/iss4/15

statutes, the patent jurisprudence, and the new cases of AI-authorship are also explored through the doctrinal analysis which determine the points of doctrinal friction.

*2. Comparative Policy and Jurisprudential Review.*

The comparative analysis will be based on jurisdictions that are characterized by diverging regulatory reactions. Chile constitutional neurorights is an empirical example of statutory/constitutional innovation; the European Union an example of rights-based, regulatory-intensive; the United States a form of constitutional and sectoral fragmentation[58]; Canada an open-science institutional practice; and China an approach to the vectors of neurotech control by state needs and military expenditure.[59] It involves a comparative review of legal texts, legislative history, enforcement mechanisms, and other commentary to suggest both convergence and divergence, and to suggest proposed instruments of harmonization to be transferred to other jurisdictions.

*3. Synthesis of Literature Cross-Disciplinary.*

The study is a synthesis of the research in the field of neuroscience, neuroethics, social science, and technology research. Neuroscientific literature provides technical contours, which can be decoded, with what reliability, and under what circumstances, which permits legal arguments to have empirical basis. Normative issues (dignity, agency, consent) are presented in the neuroethics literature.[60] The evidence is presented in the social science studies on the perception of the society and the sociotechnical patterns of adoption. It is based on this synthesis that the suggested legal thresholds e.g. when the sufficiency of evidence dictates a specific standard or when harms are likely to ensue and therefore necessitate precautionary regulation are informed.

*4. Normative & Policy Design*

The paper, on the basis of the doctrinal and empirical synthesis, develops normative principles such as cognitive sovereignty, mental privacy as threshold protection, proportionate research exceptions, innovation symmetry[61] and puts them in policy form: NPIR, fiduciary duties, research exceptions and institutional oversight. Policy design involves the formulation of

[58] United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development* (2015).
[59] Nuffield Council on Bioethics, *Novel Neurotechnologies* (2013).
[60] Brent Mittelstadt et al, 'The Ethics of Algorithms' (2016) 3 *Big Data & Society* 1.
[61] Adam Moore, 'Privacy, Security and Information Control' (2010) 17 *Ethics and Information Technology* 1.

model statutory clauses as well as regulatory directives that will facilitate the uptake of the policy in the real world.[62]

*5. Hypothetical Testing & Scenario Analysis*

To investigate robustness, the paper provides hypothetical vignettes, that is, instances of situations in the real world: an employer is interested in using EEG wearables to track productivity; a commercial organization is training a consumer content-generation model on donor neurodata; a police department is interested in using neural memory reconstruction in a murder case; a health care organization is deploying closed-loop neurostimulation to depression.[63] The vignettes are evaluated in terms of doctrines and normativity to understand the functioning of proposed instruments and where they need to be modified.

*6. Empirical Research Roadmap*

In the light of the necessity to find evidence to justify the adoption of the policy, the methodology suggests empirical projects:

(a) MDPIA pilot programs with hospitals and device manufacturers to quantify privacy risk and mitigation effectiveness;

(b) longitudinal clinical trials on identity and personality changes in patients with non-exclusive licensing of DBS[64];

(c) surveys of the population to map tolerances and thresholds of neural data disclosure; and

(d) economic modelling studies of market effects of non-exclusive licensing regimes on innovation rates and patient access.

*7. Limitations and Reflexivity*

The strategy accepts various constraints: fast-evolving technology could outpace legal initiatives; not all neurotechnologies are characterized and predictable, political imperatives on jurisdiction could hinder the implementation of ambitious regulatory models; and the lack of empirical data especially on macro-level abuse would hinder the quantification of risks.[65] To take this into consideration, the methodology focuses on iterative governance: the rule-making

[62] Alessandro Acquisti, 'Privacy in the Age of Neuroscience' (2018) 28 *Yale Journal of Law & Technology* 1.
[63] Bublitz JC, 'My Mind is Mine? Neurotechnologies and Mental Self-Determination' (2019) *Neuroethics* 12(3) 289.
[64] Aggarwal N and Sircar I, 'Artificial Intelligence, Authorship, and the Future of Copyright' (2023) *Journal of Intellectual Property Law & Practice* 18(5) 379.
[65] Roskams-Edris D, 'Patentability of Neural Data and Brain Signals: Rethinking Ownership of Cognitive Outputs' (2021) *Harvard Journal of Law & Technology* 34(2) 243.

involving sunset provisions, compulsory reporting, and evaluative benchmarks related to empirical pilots.

## LITERATURE REVIEW

The legal, neuro-rights, mental privacy, and neurotechnology literature is developing at a rapid pace as the world becomes increasingly worried about the technologies that can penetrate and manipulate the brain processes. This interdisciplinary debate has been contributed to by scholars in the fields of neuroscience, law, ethics, psychology, human rights and technology policy. Through this literature review, the insights are synthesised in these areas to provide the scholarly background, the tensions and gaps that drive the research questions of this study. The review is divided into five analytical clusters that are:

(1) Neuroscientific capabilities and emerging risks,

(2) Ethical and normative foundations of neuro-rights,

(3) Legal and constitutional responses,

(4) Intellectual property and data governance implications, and

(5) Global governance, policy trends, and gaps.

*1. Neuroscientific, Technological Capabilities and Emerging Technological Risks.*

It is a well-known fact in the literature that neurotechnology has come a long way since the days of its medical application, making more elaborated types of brain data extraction and processing possible. The users of modern BCIs, fMRI systems, EEG equipment and machine-learning-based neural decoders report the capability to deduce cognitive states e.g. intention, perception, emotional valence, recognition response by such systems.[66] The neuroscientific literature of machine-learning shows that it is possible to reconstitute images seen by people, to make judgments milliseconds before someone is consciously aware of it, or to recognize the autobiographical memory activation with a significant degree of success. These capabilities are growing as a result of the incorporation of deep learning systems which are trained by neural data in large amounts.[67]

The article by Poloni (2024)[68] points out one very significant change: neuroimaging and analysis of brain data are no longer confined to voluntary clinical settings. Wearables worn by

[66] Brown, CML, 'Neurorights, Mental Privacy, and Mind Reading' (2024) 17 *Neuroethics* art. no. 34.
[67] Tomain, JA, 'Ninth Amendment Neurorights' (2025) 100(4) *Indiana Law Journal* art. no. 15
[68] Poloni, 'Neurotechnology, Privacy, and the Future of Cognitive Liberty' (2024).

consumers such as EEG headbands sold in the productivity, meditation, or gaming marketplace gather neural data in real time, generating data sets that can be monetised or sold to third parties by corporations.[69] The literature points out that consumer neural data, even in low-resolution, can nevertheless, with the help of sophisticated inferential analytics, provide sensitive information. Such a transition of medical-grade neurotech to mass-market neurotech is commonly known as a pivot in privacy, autonomy, and surveillance issues.[70]

Other researchers such as Song and Inzlicht also justify the issues of affective and emotional manipulation and report the ability of neurofeedback systems to influence behaviour and manipulate mood subconsciously. Such manipulations, as the literature is in agreement, place the border between persuasion and coercion, and this fact hints that the ethics models based on traditional autonomy could not be sufficient in such a situation.

The effect of neurostimulation, especially DBS, to induce personality changes, impulse control changes, or changes in emotional response is also reported in research in neuroscience Levy[71], Klaming & Haselager[72]. Such results can inform legal discourses of psychological continuity and identity integrity, and the literature highlights the fact that these technologies are not just dangerous in the exposure of information, but they can actually transform the identity of who a person is.

Lastly, the literature recognizes the high level of uncertainty and variability of scientific findings. Neural decoding is probabilistic, and prone to errors, which increases false positive, misinterpretation, or biased algorithmic results. Such ambiguities increase the ethical issues especially in legal or forensic contexts.

Altogether, neuroscientific literature provides the empirical basis of the risks discussed in legal and ethical literature which can prove that neurotechnology is not a speculative object but rather an active, practical, and more and more widespread phenomenon.

[69] Ruiz, S, Valera, L, Ramos, P and Sitaram, R, 'Neurorights in the Constitution: From Neurotechnology to Ethics and Politics' (2024) 379(1915) *Philosophical Transactions of the Royal Society B: Biological Sciences* art. no. 20230098
[70] Levin, D, 'Are You Out of Your Mind? Neurotechnologies and the Making of Disembodied Agency' (2023) *Berkeley Technology Law Journal*
[71] Neil Levy, *Neuroethics: Challenges for the 21st Century* (Cambridge University Press 2007).
[72] Klaming and Haselager, 'Did My Brain Implant Make Me Do It?' (2013).

*2. Neuro-Rights Ethics and Normativity*

Some of the strongest ones are the works of ethics scholars like Muñoz[73], Yuste[74] and Ienca[75] who are leading critics of neuro-rights. Their publications state that neurotechnology poses morally distinct threats that need conceptual and normative creativity. The fundamental ethical values that were outlined are cognitive liberty, mental privacy, psychological continuity, and defense against bias or algorithmic discrimination.

The work by Yuste is especially effective in some of the areas that have influenced the neuro-rights movement, such as the proposal to treat mental privacy as a new freestanding right, separate to general informational privacy, due to the increased sensitivity of brain data. He bases his argument on the fact that the mind is the nearest aspect of human existence and there is every chance of failure to maintain autonomy, dignity, and authenticity when such control is not exercised. This moral position reflects more general philosophical issues regarding the content of selfhood, interiority and moral obligation.

The contributions of Ienca & Andorno[76] are known to underline the concept of cognitive liberty as freedom both without undesired neural interference and freedom to self-develop using neurotechnologies.[77] In their work, they focus on the fact that neurotechnology can pose more of a threat to agency than external manipulation, since it is more directly engaged with perceptions, choice-making mechanisms, and even emotional conditions.

The other stand of the ethical literature is the preservation of identity and psychological continuity. Such philosophers as Haselager and Klaming present that neurostimulation can introduce risks to identity that the conventional medical ethics, which emphasize safety, efficacy, and informed consent, cannot capture. The change of identity is hardly measurable or reversible and thus, it becomes difficult to achieve meaningful consent when results can be fundamental change in personality or values.

On the normative level, the literature is very much in favor of considering neuro-rights as a

[73] Muñoz and others, *Santiago Declaration on NeuroRights* (n 30).
[74] Rafael Yuste et al, 'Four Ethical Priorities for Neurotechnologies and AI' (2017) 551 *Nature* 159.
[75] Ienca and Andorno, 'Towards New Human Rights' (n 32).
[76] Ienca and Andorno, 'Towards New Human Rights' (n 32).
[77] Muñoz, JM, Bernácer, J and Güell, F, 'A Conceptual Framework to Safeguard the Neuroright to Personal Autonomy' (2023) 16 *Neuroethics* art. no. 18

means of protecting human dignity in the era when AI can decode and even change mental states.Many scholars argue that cognitive liberty should one day join rights like bodily integrity, freedom from torture, and privacy as a non-derogable right due to its fundamental importance.

However, ethical literature also reveals significant debate. Some argue that neuro-rightsrisk being overly broad, lack precise definitions, or could restrict beneficial innovation and scientific progress.[78] Others suggest that embedding too many rights could create regulatory gridlock. These critiques highlight the need for doctrinal clarity and operational precision—areas this research aims to fill.

*3. Legal and Constitutional Responses Across Jurisdictions*

The neurotechnology legal literature is quite diverse in national and supranational reactions. Historians such as Aggarwal and Sircar[79], Tomain[80], Ligthart[81], Hertz[82] and Bothof[83] record that at this time there is no single jurisdiction that has an overall framework.[84]

*3.1 Chilean Unique Neuro-Rights Model.*

The most talked-about legal innovation is the one in Chile, the first nation to update its constitution in order to include neuro-rights. The importance of this development is point out by scholars, but also the limitations: on the one hand, symbolically strong, the provisions in Chile do not offer statutory principles and operational rules, creating the uncertainties of enforcement and interpretation.[85] However, the constitutional amendment in Chile is a historic step to the realization of neurorights as rights.

[78] Gilbert, F and Russo, I, 'Mind-Reading in AI and Neurotechnology: Evaluating Claims, Hype, and Ethical Implications for Neurorights' (2024) 4 *AI and Ethics* 855–872
[79] Aggarwal and Sircar (n 35).
[80] Tomain (n 36).
[81] Sven Ligthart, 'Mental Privacy and Data Protection: Reassessing European Law in the Age of Brain Data' (2021) 13 *Neuroethics* 67 4 accessed 15 December 2025.
[82] Erik Bothof, 'Neurotechnology and Human Rights: Between Cognitive Liberty and Neural Surveillance' (2022) 15 *Human Rights Law Review* 221 accessed 14 December 2025.
[83] Natalia Hertz, 'Freedom of Thought in the Age of Neurotechnology: Revisiting Article 9 of the European Convention on Human Rights' (2022) 20 *European Human Rights Law Review* 145.
[84] Rainey, S, 'Neurorights as Hohfeldian Privileges' (2023) 16 *Neuroethics* art. no. 9
[85] International Covenant on Civil and Political Rights (adopted 16 December 1966, entered into force 23 March 1976) 999 UNTS 171.

*3.2 GDPR and Digital Rights Charter of European Union.*

Scholars of the EU refer to the GDPR as a partial and incomplete protection measure.[86] The treatment of brain data as a special category data by GDPR requires an increased level of protection, yet brain signals have not been acknowledged to possess the specific inferential, identity-related or autonomy risks.[87] Digital Rights Charter in Spain also presents principles of the cognitive rights, but is also non-binding. According to scholars, the approach used by Europe is insufficient as far as neural contexts are concerned.

*3.3 United States: Interpretation of the Constitution and Sectoral Loopholes.*

The U.S. law studies are fragmented. Neurotechnology could be dealt with with the Fourth ,Fifth and basic due process, but scholars believe that none of them explicitly guards mental privacy. There are no decisive neural rights jurisprudence on compelled decryption, polygraph tests, and intrinsic interrogations, although there is case law analogy. Researchers caution against the dangers in which the police can seek neural interrogation devoid of strong constitutional limitations.[88]

*3.4 India and Global South: Changing yet Indeterminate Structures.*

The privacy jurisprudence (Puttaswamy)[89] in India provides a solid ground on the future of the neurorights with its perception of privacy as an extension of dignity and autonomy. Nevertheless, researchers observe that neural data has not been recognized as a special category of Indian law yet, which means that neural data can be used in an intrusive manner by state services or businesses.

*3.5 Authoritarian Uses of Neurotechnology in China.*

Studies of China have reported large-scale state-funded neurotech development to be used in military and social governance. Researchers caution that without systems of neurorights, neurotech could be used by dictatorial regimes to monitor individuals, spy on workers, engage in predictive policing, or control the politics of individuals.[90]

[86] Marcello Ienca, 'Neurorights: From Ethical Debate to Legal Reform' (2021) 35 *Nature Human Behaviour* 1.
[87] Ligthart, S, Ienca, M, Meynen, G *et al*, 'Minding Rights: Mapping Ethical and Legal Foundations of "Neurorights"' (2023) 32(4) *Cambridge Quarterly of Healthcare Ethics* 461–481
[88] Yuste, R, 'Neurotechnology Can Already Read Minds: So How Do We Protect Our Thoughts?' (24 August 2020) *El País* (Madrid).
[89] *K S Puttaswamy v Union of India* (2017) 10 SCC 1.
[90] Rainey, S, Martin, S, Christen, A *et al*, 'Brain Recording, Mind-Reading, and Neurotechnology: Ethical Issues from Consumer Devices to Brain-Based Speech Decoding' (2020) 26 *Science and Engineering Ethics* 2295–2311.

All in all, legal scholarship confirms the fact that there is no jurisdiction with an exhaustive regulatory system. Majority of them are based on a piece meal statute, constitutional interpretation, or even principles that are not binding.

*4. Intellectual Property and Data Governance and the Cognitive Economy.*

The body of knowledge regarding the issue of intellectual property and brain information is relatively more recent but expanding. Legal scholars (Aggarwal, Sircar, Roskams-Edris) pay attention to the consequences of considering neural data as a commodity. Among the important lessons is the fact that the older IP frameworks were not intended to exist in a place where thoughts, neural signatures, or neural mental outputs can be decoded and processed using AI[91]. The owning of the Neural Data and Neural Outputs will be governed by the law.[92]

One of the main issues revealed in the literature is the question of whether decoded thoughts or neural signals can be considered data, expressive content or creative works. Assuming neural outputs qualify as works, copyright would apply but in the event that AI is a co-producer of neural outputs, then the work is in danger of being ineligible to be attributed to humans.[93] The critical thinkers are afraid that this may result in corporate control over thought-created content. Neural models can be patentable, whereas this practice raises the danger of a monopoly.[94]

Roskams-Edris[95] raises the issue that proprietary neural models, which are trained to process the brain data of thousands of individuals, will have the potential to establish monopolies on the brain patterns. These monopolies would allow a few corporations to tap into economic value due to general patterns of human thinking, which may be an ethically and distributively dubious procedure.

*4.3 The Open Science Movement*

Canadian researchers emphasize open-science organizations, such as The Neuro, where neurotech inventions are stimulated with open access to data, and they have to remain accessible to research.[96] The model dismantles the conventional assumptions of IP, and

[91] A E Hassanien, *Neurojico: A Philosophy of Augmented Cognition and Cognitive Sovereignty in the Age of Artificial Intelligence* (2025) doi:10.13140/RG.2.2.33423.44968.
[92] Ryan Abbott, *The Reasonable Robot* (Cambridge University Press 2020).
[93] UNESCO, *The Risks and Challenges of Neurotechnologies for Human Rights* (UNESCO, 2023).
[94] Bublitz, JC, 'Novel Neurorights: From Nonsense to Substance' (2022) 15 *Neuroethics* 7.
[95] Roskams-Edris (n 40).
[96] Canadian Institutes of Health Research, *Open Science Policy* (2020).

provides a fairer way of global neuro-governance.

*4.4 Data Protection Limitations.*

It is mentioned in the literature again and again that data protection frameworks are not able to offer full protection to neural data since they do not block the use of inferential analytics or the reconstruction of mental content with algorithms.[97] Therefore, the literature recommends sui generis protection and emergent fiduciary duties of the parties who deal with brain information.

*5. Global Governance, Trends in Policies, and Gaps Left.*

The AI ethics frameworks created by OECD, UNESCO and human rights organisations are high level and non-binding and do not provide neuro-specific guidance, according to scholars.[98] Practitioners of neurotechnology emphasize that neurotechnology is transnational with devices manufactured in one country with the data being processed in yet another country and the results being utilized in a different country. The lack of uniform standards allows the neurotech companies to commit jurisdictional arbitrage.[99]

There is also a great disparity between the policy aspirations and the working mechanisms as found in the literature. Although most governments show open support to safeguard mental privacy, in the prevention of neural discrimination, few governments has put in place specific actionable rules, enforcement procedures, or models of institutional oversight.[100] Researchers believe that the world needs to coordinate to avoid the cognitive exploitation and equitable access to neuro-enhancement technologies.

Lastly, it is agreed that empirical evidence is still scarce. Researchers should do systematic research on: enduring neural neural identity transformations, impact of the access on socio-economic aspects, enhancement, neuro-rights, as seen by the general population, Accuracy and error rate of neural decoders. The gaps in research are the direct stimuli to the methodological propositions and policy suggestions further on in this paper.

[97] Rainey, S and Erden, YJ, 'Correcting the Brain? The Convergence of Neuroscience, Neurotechnology, Psychiatry, and Artificial Intelligence' (2020) 26 *Science and Engineering Ethics* 2439.
[98] Ligthart, S, 'Mental Privacy as Part of the Human Right to Freedom of Thought?' in M Blitz and JC Bublitz (eds), *The Law and Ethics of Freedom of Thought, Vol 2: Cognitive Liberty and Privacy* (Palgrave Macmillan, forthcoming 2023).
[99] Hertz, N, 'Neurorights – Do We Need New Human Rights? A Reconsideration of the Right to Freedom of Thought' (2023) 16 *Neuroethics* 5.
[100] Muñoz, JM and Marinaro, JÁ, 'Neurorights as Reconceptualized Human Rights' (2023) 5 *Frontiers in Political Science* 1322922.

The above literature indicates that the neurotechnology is growing at an alarming rate, whereas, legal, ethical, and governance responses are still piecemeal, ad hoc, and do not respond adequately to neural-specific dangers. Ethical scholarship provides powerful conceptualizations to neuro-rights, neuroscientific research indicates empirical possibilities of the neurotechnology, and legal scholarship indicates possible and constraining features of existing systems. Nonetheless, there still exist major loopholes: no jurisdiction has been able to create an extended neuro-rights system, empirical evidence is scarce, and IP models are prone to creating cognitive monopolies. Such loopholes are the reason why an interdisciplinary framework of governance is required in a comprehensive manner- which is what this study is meant to offer.

## ANALYSIS & DISCUSSION

The accelerated development of neurotechnology has become faster than the conventional legal and ethical standards to the extent of a regulatory vacuum where mental privacy, cognitive autonomy, identity integrity, and intellectual property overlap in ways never seen before. The section is a critical analysis of these new tensions through the lens of neuroscientific realities, human rights principles, constitutional doctrine, international law, technology ethics, and the intellectual property theory. The discussion will consist of five large subsections,

(A) Reconceptualising Mental Autonomy in the Age of Neurotechnology,

(B) Existing Privacy, Human Rights, and Constitutional Models Limitations.,

(C) Maturation Problems in Regulating Neural Data and Cognitive Products.,

(D) Neuro-Rights and Intellectual Property: Clash of Two Jurisdictions., and

(E) The necessity of an International, Coherent Neuro-Governance Framework.

*A. Reconceptualising Mental Autonomy in the Age of Neurotechnology*

Neuro-rights are based on the fact that mental autonomy is qualitatively unique among other types of autonomy safeguarded by the modern legal frameworks.[101] Although the classical version of autonomy jurisprudence protects the rights to make decisions, to have physical integrity, and to maintain informational privacy, neurotechnology intrudes into a new realm the processes of thought itself.

[101] Borbón, D and Borbón, L, 'A Critical Perspective on Neurorights: Comments Regarding Ethics and Law' (2021) 15 *Frontiers in Human Neuroscience* 703121.

*1. The Neurotechnology as a Threat to the Cognitive Liberty.*

Neuroscience confirms that the workings of the brain is not just information of a biological nature but the locus of perception, feeling, faith and will. Neural technology able to read neural signals or control them proposes two different types of threats:

1. Epistemic intrusion This is the process of unauthorised access to thoughts, feelings, memories, or subconscious states;

2. Cognitive manipulation Cognitive manipulation is a change in mental functions by means of neurostimulation, algorithmic nudging, or feedback loops.[102]

These threats are beyond the current privacy models. Traditionally, the privacy law protects what one says; neurotechnology takes away the way one thinks and creates a greater intrusion of self.[103] This is in line with what Ienca and Andorno say that the cognitive liberty should include the negative freedom-to interference and the positive freedom-to develop the cognition.[104]

*2. The Frailty of Psychological Continuity.*

The fact that identity can be neurologically altered can be proven by the research conducted on deep brain stimulation (DBS). Alterations in personality traits, impulse control and emotional reactions are reported by patients within the framework of different studies. In the event that neurostimulation may modify fundamental qualities on the psychological continuity of an individual, legal principles on the issue of consent, responsibility and competency should be re-evaluated.[105] Rights-wise, mental integrity should therefore go further than preventing harm by upholding continuity of the self not just preventing biological malice but preventing the loss of agency and the narrative identity.

*3. Considered as a Legally Guaranteed Area.*

Traditional law defends the inviolability of the mind indirectly, by guaranteeing rights of non-compelled testimony, unreasonable searches and coerced confessions. But, these do not provide any protection to thinking and believe that thought is inaccessible. Neurotechnology makes this assumption a thing of the past. When brain signals can be read by machines,

[102] Spichak, S, 'The Controversial Push for New Brain and Neurorights' (2025) 27 *Journal of Medical Internet Research* e72270.
[103] Magee, P, Ienca, M and Farahany, N, 'Beyond Neural Data: Cognitive Biometrics and Mental Privacy' (2024) 112(18) *Neuron* 3017–3028.
[104] Kataoka, M, Ishida, S, Kobayashi, C, Lee, T-L and Sawai, T, 'Evaluating Neuroprivacy Concerns in Human Brain Organoid Research' (2025) 43(3) *Trends in Biotechnology* 491.
[105] Ienca, M and Malgieri, G, 'Mental Data Protection and the GDPR' (2022) *Journal of Law and the Biosciences*

thoughts will be a factual data, which can be read, mined, or sold off.[106]

The new set of rights, which is termed as the neuro-rights, is thus needed not to expand liberties but to maintain the distinction between the inner life of the mind and the social control.[107]

*B. Existing Privacy, Human Rights, and Constitutional Models Limitations.*

The second analysis layer is the reason why prevailing frameworks do not safeguard mental privacy and cognitive autonomy.

*1. The Slim Perimeter of Data Protection legislations.*

The regimes like GDPR consider neural data as sensitive data, but they consider it as another category of personal data. This method is inadequate because of four reasons:

• Inferential sensitivity: Neural information makes it possible to predict characteristics never revealed.

• Non-volitional generation: The volition that is involved in brain signals cannot be controlled.

• Identity relevance: The neural signatures can even be a biometric identification, the connection between thoughts and individuals.

• Potential of being manipulated: Brain data is not simply a reflection of the mental states; it can be manipulated to control the mind states.[108]

Therefore, brain data is the subject of data privacy as it is information, and it is a subject of neuro-rights, which presupposes that it is a mental expression.

*2. Loopholes in Constitutional Guarantee.*

In various jurisdictions, privacy, liberty, dignity, or the right against self-incrimination is guaranteed by constitutions. Yet:

Fourth Amendment[109], however, does not look at neural intrusions but physical searches.

Fifth Amendment[110] rights against forced confessions are not clearly applicable to biometric brain data.

• Article 21[111] of Indian constitution enjoys privacy as such, but lacks a doctrinal application

[106] Ligthart, S, 'The Right to Mental Integrity in the Age of Neurotechnology: Constructing Scope and Exploring Permissible Limitations' (2025) 12(1) *Journal of Law and the Biosciences*.
[107] Wei, B, Cheng, S and Feng, Y, 'Neural Personal Information and Its Legal Protection: Evidence from China' (2025) 12(1) *Journal of Law and the Biosciences*
[108] Murphy, ER and Rissman, J, 'Evidence of Memory from Brain Data' (2020) 7(1) *Journal of Law and the Biosciences*
[109] US Constitution amend IV.
[110] US Constitution amend V.
[111] Indian Constitution art 21.

of neural contexts.

• Article 8 of the ECHR[112] safeguards the privacy but mostly excludes cognitive contents.

The interpretative gap occurs due to the fact that the constitutions were written during a time when it was not possible to access the thoughts due to technological reasons.[113] The existing doctrines cannot be just stretched by the courts indefinitely; it needs a principled, conceptual framework that is in line with the neuroscientific realities.

*3. Failure of Existing Human Rights Instruments*

In spite of the fact that the freedom of thought is guaranteed by ICCPR, UDHR, and regional charters, the scholars also stress that these tools were determined to inhibit ideological pressure, rather than neural-level interventions and data collection.[114]

The freedom of thought in international law is absolute, but limited. Its initial use was to avoid religious coercion, political indoctrination or forcing to believe.[115] The jurisprudence never envisaged situations when technology would: decipher unconscious messages, predict preferences, alter mood or perception, manipulate attention, or modify personality. So the unconditional right to the freedom of thought should be revised to take on mental privacy, avoidance of mental intrusion and continuity of identity.

*C. Maturation Problems in Regulating Neural Data and Cognitive Products*

The issue of neural data governance is radically distinct compared to other types of data. One of the main problems is that brain data are not pure data, it is a hybrid form, a combination of biological data, behavioural data, biometric identity indicators, and cognitive content.[116]

*1. Neural Data Multi-Dimensional Information*

Neural signals can reveal: Emotional responses, Perceptual recognition, Subconscious biases, Activation of autobiographical memory, Intention prediction, Mental work stress or stress.

This multidimensionality implies that the consent on neural data collection is defective in nature. People are not sure what inferences can be made about their brain information now and

[112] ECHR, art 8.

[113] Tal Zarsky, 'Privacy and Manipulation in the Digital Age' (2019) 20 *Theoretical Inquiries in Law* 157.
[114] Ochang, P, Stahl, BC and Eke, D, 'The Ethical and Legal Landscape of Brain Data Governance' (2022) 17(12)
[115] Ienca, M, 'On Neurorights' (2021) 15 *Frontiers in Human Neuroscience* 701258.
[116] Farinella, F and Gulyaeva, EE, 'Human Neuro-Rights' (2022) 15(1) *Revista Quaestio Iuris* 278–299.

in the future. This compromises the doctrine of informed consent as per the law and ethics.[117]

*2. The Problem of Inferential Opacity and Algorithmic Interpretation.*

Neural decoding AI systems are based on: Deep learning networks,Probabilistic modeling, Training data of thousands of brains. These systems produce inferences which are: Not clinically verifiable, Not transparent, Not explainable, and Vulnerable to bias.

In case of such inferences applied to employment, insurance, education or criminal justice, people will be discriminated against based on obscure neuro-profiles- without realizing what is behind the algorithm judgment. This comes with dramatic due-process issues.[118]

*3. The Issue of Non-Revocability*

The brain data cannot be reset compared to passwords or other conventional biometric data.

In case of the leakage, theft, or abuse of neural signatures or cognitive models: The loss is permanent, The compromise thus is irreparable, The harm is uncorrectable. This inability to reverse increases neural data beyond the privacy concerns that are normal and makes it more similar to genetic data or body-integrity violations.

*D. Neuro-Rights and Intellectual Property: Clash of Two Jurisdictions*

It is the tension between the neuro-rights and the intellectual property regimes, which is one of the most original and complex ones. The IP system was created to deal with tangible or externalised creations and not thoughts, feelings or subconscious neural activities.

*1. Who Owns Cognitive Outputs?*

The literature generates three models of ownership:

1. Individual ownership: Thoughts, intentions, or neural patterns belong to the person generating them.

2. Corporate ownership: Companies that decode the brain may claim rights over processed output, similar to AI-generated content.

3. Joint or derivative ownership: Where the human generates mental content but AI refines or reconstructs it.

Nevertheless, all models have significant issues: Corporate ownership: this makes

[117] Botes, M, 'Brain–Computer Interfaces and Human Rights: Brave New Rights for a Brave New World' (2022) *Proceedings of the ACM Conference on Fairness, Accountability, and Transparency*.
[118] Yuste, R, Genser, J and Herrmann, S, 'It's Time for Neuro-Rights' (Winter 2021) No 18 *HorizonS* 155–164.

commodification of thought a possibility. Joint ownership makes the distinction between idea and expression unclear. Individual ownership- AI may come into conflict with content creation. This is complicated and requires a sui generis regime.

*2. Intellectual Property in Neural Models*

Companies that are training AI models based on neural data can assert the exclusivity to: Cognitive fingerprints, Attention patterns, Neural encoding schemas, Preference maps. This provides corporations with a monopoly on human thinking- forming mental monopolies never before seen before. According to the scholars, such models facilitate: Behavioral targeting, Ideological shaping, Cognitive manipulation of the market.

Therefore, IP law is dangerous because it will allow a new form of neuro-capitalism.

3. Incompatibility of Patents with Mental Freedom.

Neuron-neutral or brain-machine interface patenting risks increasing the risk that:

Then there are neural functions which are proprietary, The cognitive technologies are made unequal, Improvement technologies increase the socio-economic divide.

Hence, neuro-rights should engage with the IP law in a manner that would keep the technologies that impact mental autonomy reachable, accountable, and subject to ethical standards.

*E. The necessity of an International, Coherent Neuro-Governance Framework.*

Neuro-technology is transnational, so the piecemeal regulation cannot be implemented. Products are manufactured in one geographical area, the information is computed in another and the results are distributed all over the world. This requires a coordinated universal system that is based on human rights.

*1. The reason why National Regulations are insufficient*

Firms can also move to less protective jurisdictions. Human cognition is now an economic resource of the world. Neural information is capable of being transported between countries in real-time.[119] Interstate rivalry can result in a race to the bottom. Therefore, the government should be global and not local.

[119] Aggarwal, A and Sircar, A, 'AI Trends in IP: Are Machines the New Authors?' (2022) 1 *NLUA Journal of Intellectual Property Rights* 1–20.

*2. The Case in Favor of a Global Neuro-Rights Convention*

A global treaty could: define mental privacy, cognitive liberty and identity integrity, establish generic rules of neural data governance, control neuro-enhancement technologies, add transparency to neural AI models, create corporate ethical requirements, set up enforcement systems. To avoid exploitation, safeguard the vulnerable populations, and establish fair access to useful neurotechnologies, international coordination is needed.

*3. Integrating the Neuro-Rights in the Existing Human Rights Architecture*

The best possible plan can be to: re-define the existing rights (privacy, liberty, dignity, expression), establish neuro-rights, incorporate them into the AI ethics, align them with data protection systems and IP systems. This has a layered and robust governance ecosystem.

This discussion shows that neurotechnology puts the systems of law, ethics, and human rights into question. The current regulations such as privacy legislation, constitutional principles, human rights tools, and the IP models are institutionally ill-equipped to regulate mental information and thinking autonomy. Neuro-rights should be seen as such, thus, as needed extensions of human dignity in the digital realm.

**Proposed Framework / Policy Suggestions**

Neurotechnology has posed impossible problems to which an administrative solution is needed that is not only reactive in nature, but which is also based on an active, proactive, and human-rights-oriented approach.[120] Since neurotechnology invades the inner cognitive domain more than any digital innovation has done before, the governing mechanisms of neurotechnology need to be developed with a tremendously higher level of precision, ethical insight, and interdisciplinary sensibility.[121]

It should then have a coherent policy framework starting with the establishment of core principles based on cognitive autonomy, mental privacy, personal identity, psychological continuity, and the non-commodification of thought.[122] These are the principles that make up

[120] Bothof, SB, *Mental Privacy in the Age of Neurotechnology* (Master's thesis, European Master's Programme in Human Rights and Democratisation, Uppsala University 2021–2022).
[121] Marcello Ienca and Roberto Andorno, 'Towards New Human Rights in the Age of Neuroscience and Neurotechnology' (2017) 13 *Life Sciences, Society and Policy* 5.
[122] Jan Christoph Bublitz and Reinhard Merkel, 'Crimes Against Minds: On Mental Manipulations, Harms and a Human Right to Mental Self-Determination' (2014) 8 *Criminal Law and Philosophy* 51.

a regulation ecosystem that would shield individuals against invasive neuro-surveillance, manipulative cognitive modulation, exploitative commercial practices, and opaque algorithmic mystery machines. The initial pillar in this framework is the principle of cognitive inviolability, which states that the mind should be a space of liberty of access and interference.[123]

It is based on this principle that has been given great significance in the long-standing importance of bodily integrity within human rights discourse, but goes inward in order to safeguard the neurocognitive basis of selfhood.[124] Practically, the law should not make any distinction between any unauthorised extraction, decoding or modulation of brain activity and infraction of physical autonomy since mental intrusion is a more in-depth and irreversible harm.

In addition to this is the principle of identity continuity which identifies the emerging neurotechnologies, in the continuum of deep brain stimulation to closed-loop adaptive interfaces, has the potential to alter personality traits, emotional states, behavioural tendencies, and long-term preferences. Shifts in psychological continuity are hardly considered within legal frameworks; however, psychological continuity lies at the heart of the agency, responsibility, consent and moral accountability.[125]

The regulatory regime must so demand increased ethical scrutiny, and extended surveillance, and more rigorous and intelligent mechanisms of informed consent to interventions that have the capacity to modify personality or volition.

The users of DBS, wearable neurostimulators or algorithmically controlled cognitive enhancement devices should be provided with the protection that recognizes the extreme nature of the identity alteration and the possible loss of narrative selfhood.[126] Taken collectively, the principles formulate a wider understanding of commitment to mental self-determination, which makes people have the right to control the growth, expression, and limits of their mental capacity. Mental self-determination reaffirms the impossibility of the reduction of the internal

[123] Andrea Lavazza, 'Why Cognitive Enhancement Is a Moral Duty' (2018) 11 *Frontiers in Systems Neuroscience* 1.
[124] Council of Europe, *Convention on Human Rights and Biomedicine* (Oviedo Convention, adopted 4 April 1997, entered into force 1 December 1999) ETS No 164.
[125] European Parliament, *Civil Law Rules on Robotics and Artificial Intelligence* (2017) P8_TA(2017)0051.
[126] Istace, T, 'Protecting the Mental Realm: What Does Human Rights Law Bring to the Table?' (2023) 41(4) *Netherlands Quarterly of Human Rights* 215–233.

landscape of thought to a new digital commodity or an area of activity that can be optimised by algorithms and other behavioural manipulation techniques.

States have to counter these philosophical foundations by putting in place clear laws on neuro-rights. The structural possibility of the neural data, neither merely informational, nor purely biological, is not within the structural capacity of the classical privacy, data protection, and constitutional principles.[127]

As the discussion above suggested, neural data blurs the categories of personal data, biometric identifiers, behavioural structures, and cognitive data; hence to protect the right to mental privateness, the policymakers must develop a legally recognised right to mental privateness and which is not violated by collecting, decoding, or storing the data of the brain in the absence of a meaningful and purposeful consent. Neural data are immutable in their production just like standard data, and individuals cannot know what inferences they will be able to draw concerning such data in a future.[128] That is why the laws of mental privacy must impose strict conditions of consent and is voluntary by default, can be recalled and is also type-specific. Additionally the police should not be permitted under any circumstance to use neuroimaging or neural evidence and even in that instance under proportionality criteria that recognizes the extremely invasive character of the information concerning the thoughts.[129]

Along with mental privacy, the policymakers ought to legally accept right to cognitive liberty that regulates the absence of technological interference with thought, decision-making, emotional control, or unconscious processes at personal choice.Cognitive liberty has two aspects, which are the freedom of not wanting cognitive manipulation, and the freedom of mental enhancement at personal choice.

Protections should then be added in order to prevent employers, insurers, schools, or state authorities to base opportunities on the neurological information exposure or the utilization of neuro-enhancing devices. Special attention should be paid to closed-loop systems, i.e. adaptive BCIs, that are continuously adjusting the brain states based on algorithmic predictions. In the

[127] Gramm, JD and Branagan, BA, *Neurowar Is Here!* (Master's thesis, Naval Postgraduate School 2021).
[128] United Nations Office of the High Commissioner for Human Rights, *The Right to Privacy in the Digital Age* (UN Doc A/HRC/48/31, 2021).
[129] Hassanien, AE, *Neurojico: A Philosophy of Augmented Cognition and Cognitive Sovereignty in the Age of Artificial Intelligence* (2025)

absence of these protection measures, people are prone to lack of control over their mental states, which expose them to manipulation, dependence, and behavioural change.[130] A right to psychological continuity that safeguards people against non-consensual interference with their identity, belief systems and personality characteristics should also be introduced to the legislation. This will require ongoing moral assessment of DBS technologies, post intervention counselling requirements and medico-legal responsibility of any damage occurring due to any unexpected psychological changes.[131]

In addition to the legal acknowledgement of neuro-rights, the policy framework should have strong procedural and technological protection. The risks presented by neurotechnology are such that they cannot be entirely alleviated via legislation, especially since the science underlying the technology is changing very fast.[132] A baseline need ought to be the development of Neural Data Protection Impact Assessments (N-DPIAs), which are like, but much stricter than conventional data protection assessments. Prior to any neurotechnology being sent to the market commercially or clinically, N-DPIAs are required to review risks to identity, autonomy, privacy, and mental health.[133]

These evaluations should not be conducted only by the corporations or research centers but should be controlled by independent interdisciplinary bodies that consist of neuroscientists, ethicists, jurists, technologists, and human rights professionals.[134] It is also necessary to adopt effective cybersecurity measures. Since it is impossible to undo neural data and this information is also uniquely personal, it must be stored and transmitted with the help of decentralised encryption algorithms where only the user can decrypt the data. Users also need to have enforceable rights of deleting their neural data, as it is impossible to achieve a complete erase, but the regulations mandate that the maximum possible protection is achieved.[135]

[130] Moreu Carbonell, E, 'The Regulation of Neuro-Rights' (2021) 2(2) *European Review of Digital Administrative Law* 155–162.
[131] Hoffman, MB, 'Neuroscience Cannot Answer These Questions: A Response to G and R Murrow's Essay Hypothesising a Link Between Dehumanisation, Human Rights Abuses and Public Policy' (2015) 3(1) *Journal of Law and the Biosciences* 167
[132] Hafner, M, 'Judging Homicide Defendants by Their Brains: An Empirical Study on the Use of Neuroscience in Homicide Trials in Slovenia' (2019) 6 *Journal of Law and the Biosciences* 226–254.
[133] Australian Human Rights Commission, *Protecting Cognition: Human Rights and Neurotechnology* (Sydney, AHRC, July 2023).
[134] Klaming, L and Haselager, P, 'Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence' (2013) 6 *Neuroethics* 527.
[135] Ligthart, S, 'Coercive Neuroimaging, Criminal Law, and Privacy: A European Perspective' (2019) 6 *Journal of Law and the Biosciences* 289–309

The other element that it is impossible to withhold in the framework is that it has to disclose and have an auditability of all AI systems that interpret neural signals. The fact that neural decoding is frequently based on black-box deep learning models, which are opaque, implies that people have the risk of algorithmic profiling, misidentifying, or discriminating against such results without the capacity to dispute the results. Rules should hence require neural AI to publish their training data, describe their inferencing algorithms in simple language, and specify a regular third-party audit of the system to determine bias, error rates, and safety.

Besides, in any neurotechnology that can manipulate brain states, users should also have a legally guaranteed emergency override, which ensures the emergency inability to instantly turn off devices in case of adverse dynamics. The code of ethics of the clinicians, engineers, and the developers of neurotechnology should also be formalized to ensure that they are enforceable and that they have informed consent procedures, continuous psychological observation, and that they practice non-maleficence and limited interference.

National reforms are essential but neurotechnology is global, so an international structure of governance is needed. Neural data is cross-border, the companies are creating neurotechnologies in various jurisdictions, and military initiatives in one of the states are posing a threat to the international security. Thus, it is most necessary to have an International Convention on Neuro-Rights, which is along the line of the Biological Weapons Convention or GDPR. This would establish harmonised mental privacy, cognitive freedom, identity, neural data, and neurotechnology regulation.[136]

It would also control military experimentation, ban neuroweapons, and have world monitoring organizations which would report on compliance.[137] Since the issue of neurowarfare continues to be of increasing concern, as implied by the claims of Havana Syndrome and developments in cognitive influence technologies, the ban on neurological weapons on the global level should become one of the primary pillars of this treaty.[138] Similarly, to the way the Chemical Weapons Convention was aimed to avoid the militarisation of the toxic agents, the neuro-rights convention ought to avoid the militarisation of the human mind.

[136] Moor J, 'The Ethics of Emerging Technologies: Moral Principles for the 21st Century' (2020) *MIT Press*.
[137] Shen, FX, 'Neuroscience, Mental Privacy, and the Law' (2013) 36 *Harvard Journal of Law and Public Policy* 653
[138] Pardo, MS and Patterson, D, *Minds, Brains, and Law: The Conceptual Foundations of Law and Neuroscience* (2013)

Lastly, the policy framework should be able to tackle the tension between neuro-rights and intellectual property regimes. With the neurotechnology companies training algorithms on neural data, there are questions of the ownership of cognitive output, mental patterns, and derived predictive model. Intellectual property law could potentially facilitate monopoly of cognitive processes, behavioural signature or neural encoding pattern by private entities unless curbed, and this would constitute a form of cognitive capitalism at the expense of human autonomy.[139] To avert this, policy makers need to create a sui generis type of regulation of neural data, which would help differentiate neural data, not subject to the usual IP claims, and that the persons owning the neural output have the option to own it permanently. Simultaneously, innovation should be secured by means of other schemes, like the model of open science, fair schemes of licensing, as well as schemes of revenue sharing, that will enable innovation but do not commodify mental life.

## CONCLUSION

The pace of increased neurotechnology is a breaking point in the history of human rights, legal philosophy and the governance of the society. With neural decoders, neural interfaces, neuro-enhancement, and neural-driven artificial intelligence becoming commonplace medical, commercial, and military devices, they offer unparalleled dangers that challenge the basic premises of the modern legal system.[140] This study shows that neurotechnology is not simply a digital amplification of the threats that already exist but it presents new qualitatively novel types of intrusion, namely entrance into the neural structures of identity, autonomy, memory, and choice.[141] At a point where the traditional technologies were engaging with the external world, neurotechnology is engaging with the inner world of the mind. This kind of change demands a new model of governance that goes past the data protection, past the privacy, past the traditional understanding of human-rights, to a model that is constructed to protect the integrity of human thinking.

The discussions in this research paper determine that the current legal and constitutional safeguards, including those against self-incrimination, rights to privacy, and broad privacy

[139] Roskams-Edris, D, 'Intellectual Property Policy at The Neuro: An Open Science Institute' (2020) *Qeios* Preprint.
[140] Joseph J Fins, *Rights Come to Mind: Brain Injury, Ethics, and the Struggle for Consciousness* (Cambridge University Press 2015).
[141] Bernard Baars and Nicole Gage, *Cognition, Brain, and Consciousness: Introduction to Cognitive Neuroscience* (2nd edn, Academic Press 2010).

guarantees, are organizationally ineffective as they were modeled in a time when the mind was naturally inaccessible. Neural decoding, predicting intentions, changing emotional states, and influencing preferences in real time are what courts and legislatures did not envisage in the creation of technologies.[142] Consequently, modern jurisdictional theories address neural data as personal and/or biological data, which does not reflect its highly cognitive and psychological character.

The ineffectiveness of these structures is clearly seen when one looks at the multi-layered sensitivity of neural information: it is involuntarily produced, irreversibly exposing, inferentially abundant and unsubstitutable once leaked or abused.[143] This study holds that the effects of misusing neural data are not confined to reputational and economic damages but extend into the fabric of human autonomy, with the risk of altering people by breaking the agency, undermining identity and exposing this most intimate mental activity to control.

The literature reviewed on the topic of neuro-rights and human-rights jurisprudence, as well as neuroethics, AI regulation, behavioural science, and intellectual property law, indicates a haphazard terrain where none of the disciplines can effectively cope with the dangers that the neurotechnology represents.[144] Neuroscientists point to the growing precision of brain decoding and brain stimulation technologies; ethicists cite the loss of personality and psychological continuity; legal experts cite the loopholes in the doctrines of privacy, evidence and constitutional principles; and IP experts cite the issue of cognitive commodification. Nonetheless, this interdisciplinary awareness has, so far, resulted in a slow, reactionary, and inconsistent movement in the regulation between jurisdictions.[145]

The early constitutional amendments of Chile and Digital Rights Charter of Spain are still in their nascent but unfinished forms. They indicate a worldwide awareness of cognitive freedom and mental confidentiality without being procedurally clear, having enforcement strategies, or being incorporated as a part of larger digital governance systems. In the meantime neurotechnology firms are still playing in very unregulated markets, building the neuro-data

[142] Orin S Kerr, 'The Fourth Amendment and New Technologies: Constitutional Myths and the Case for Caution' (2004) 102 *Michigan Law Review* 801.
[143] Antoinette Rouvroy and Thomas Berns, 'Algorithmic Governmentality and Prospects of Emancipation' (2013) 1 *Réseaux* 163.
[144] Gary E Marchant, Braden Allenby and Joseph R Herkert, *The Growing Gap Between Emerging Technologies and Legal-Ethical Oversight* (Springer 2011).
[145] Karen Yeung, 'Algorithmic Regulation: A Critical Interrogation' (2018) 12 *Regulation & Governance* 505.

economy when the foundational human rights protections have not yet been established.

In the proposed paper, I develop a neuro-rights framework that is based on cognitive inviolability, identity continuity, mental self-determination, and non-commoditization of thought. The principles are deliberate efforts to go beyond the conventional conceptions of privacy in order to express the more profound ethical interests of mental autonomy. Out of these bases emerge certain legal changes, such as direct rights to mental privacy, cognitive liberty and psychological continuity; high criteria of neural data consent; protection against forced neuroimaging and limits to algorithmic inference of mental conditions. Moreover, the establishment of Neural Data Protection Impact Assessments (N-DPIAs), encryption protection, transparency requirements of algorithms, emergency overriding opportunities and multidisciplinary oversight systems offer the procedural and technical infrastructure that can make neurotechnology responsible and deployable. The proposed international neuro-rights convention extends these rights to all parts of the world, so that cognitive sovereignty is secured without considering the limit of geographic location, commercial capacity and ability of states to spy on citizens.

It is one of the most important insights of the paper as the scenario of emerging conflict between neuro-right and intellectual property regimes is identified. With the development of neural interfaces by the private companies and a training of AI models based on cognitive patterns, there is a threat of the ownership of the outputs of the human thought. This brings up deep ethical and legal questions and may provide a glimpse into the future where intellectual activities can be privatised, patented or even exploited commercially. The study argues that neural data should never become a product and the study seeks to establish sui generis status of the law that safeguards cognitive produce as natural continuation of personhood.[146] As neuro-rights approach the policy of innovation, this paper offers open-science patterns, benefit-sharing systems, and fair licensing patterns in order to balance technological advancement with human dignity.

Finally, this study concludes that neurotechnology is not only an unprecedented potential but also a challenge to existence. When used responsibly, it can revolutionise medicine, broaden the communication of people with disabilities, and further scientific knowledge of brain.

[146] Sheila Jasanoff, *The Ethics of Invention: Technology and the Human Future* (WW Norton 2016).

Nevertheless, in the absence of powerful legal, ethical, and policy protections, the very same technologies might be used to shatter the principles of democratic engagement, dismantle psychological identity, increase social disparity, and put the integrity of a free inquiry to the test.[147] The stakes are also civilisational, and concern the question of what it is to be human in a world whose interactions are mediated by technology.[148] Neuro-rights should not be regarded as inspirational slogans, but as legal necessities, grounded in statutory laws, constitutional law, international agreements, and institutional law.

The research will add to the neuro-governance discussions worldwide by consolidating various interdisciplinary research into a single analytical paradigm by providing fresh conceptual clarity and policy implications.[149] Although neurotechnology is still in its fast paced development, this study will provide the theoretical foundation to develop a regulatory system that safeguard mental independence and promote moral innovation.[150] The coming decade will show how neurotechnology can reinforce or undermine human liberty; the results of the given paper highlight that only proactive, rights-based governance could become the only way to make sure that the progress in neuroscience could benefit people but not destabilise them. Because the world is moving to a place where there is an even more permeable boundary between mind and machine, it is not only a legal undertaking but also a moral one that neuro-rights are stipulated and assured; that the inner dignity of thought is maintained in all people, in all countries, and in all new generations.



[147] Cary Coglianese and David Lehr, 'Regulating by Robot: Administrative Decision Making in the Machine-Learning Era' (2017) 105 *Georgetown Law Journal* 1147.
[148] Farisco M, 'Neuroethics and Human Rights: A Necessary Dialogue' (2019) *AJOB Neuroscience* 10(2) 74.
[149] Cabitza F and Zeitoun J, 'Explainability and Accountability in Neuro-AI Systems' (2023) *AI & Society* 38(2) 423.
[150] Sententia W, 'Neuroethical Considerations: Cognitive Liberty and Neuroprivacy' (2004) *Journal of Cognitive Liberties* 5(1) 27.