

# NEURORIGHTS IN THE AGE OF NEUROTECHNOLOGY AND DIGITAL HEALTH. ARE NEW RIGHTS NECESSARY TO PROTECT THE MIND?

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**Abstract:** The present paper is concerned with the ongoing debate on neurorights from the standpoint of legal philosophy. The fundamental question is whether these rights should be understood as a reinterpretation of existing fundamental rights or as a distinct emerging legal category. Methodologically, the paper combines conceptual analysis, comparative law and the study of international soft law instruments in order to assess the legal status and practical function of neurorights. It then analyses their ethical and normative foundations, placing particular emphasis on human dignity, personal autonomy, mental privacy, mental integrity and personal identity. Furthermore, it explores their legal ramifications within the framework of comparative law, international soft law and digital health. In this realm, the collection, processing and interpretation of neurodata give rise to the question of whether conventional legal safeguards remain sufficient.

**Keywords:** Neurorights, Digital health, Neurodata, Mental privacy, Neurotechnologies

## Summary

1. Neurotechnology, emerging risks and the conceptual framework of neurorights. 2. Neuroethics and the ethical foundations of neurorights. 3. The implementation of neurorights in legal systems. 4. The internationalization of neurorights. Between soft law and comparative reception. 5. Digital health and neurorights. Shortcomings in the healthcare framework and the need for enhanced protection. 6. Conclusion. References.

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## 1. NEUROTECHNOLOGY, EMERGING RISKS AND THE CONCEPTUAL FRAMEWORK OF NEURORIGHTS

The development of neuroscience and neurotechnology, in close interaction with artificial intelligence systems, has generated new possibilities for interconnection between the nervous system and technological tools capable of recording, decoding, and even modulating brain activity (Bastidas Cid, 2025, p. 23). According to UNESCO (2023, p. 1), neurotechnology is defined as “a set of devices and procedures used to access, monitor, investigate, evaluate, manipulate and/or emulate the structure and function of the neural systems of animals or humans”.

Its most notable applications are in the healthcare sector, where it facilitates the diagnosis and treatment of neurological disorders such as Parkinson’s or Alzheimer’s. In this context, recording and neuroimaging techniques, such as electroencephalography, functional magnetic resonance imaging, positron emission tomography, and computed tomography, enable the identification of biomarkers, the characterisation of activity patterns, and the improvement of diagnostic accuracy. Meanwhile, neuromodulation techniques, such as deep brain stimulation or transcranial magnetic stimulation, have opened up new therapeutic avenues aimed at modulating dysfunctional neural circuits (Poeppel and Krause, 2008, p. 316). Added to this is the development of brain-computer interfaces, with applications in rehabilitation and in assisting communication or motor control for patients with neurological injuries, the effectiveness of which depends on the ability to process and decode neural signals using advanced algorithms (Bardají Gálvez and Bardají Gálvez, 2022, pp. 49–51).

However, the scope of neurotechnology extends beyond the healthcare sector and into a wide range of fields. In the workplace, it can be used to monitor workers’ fatigue or performance; in the consumer sector, through *neuromarketing*<sup>2</sup> (Walker Silva and Rojas Aguilera, 2023, p. 8); in the military, to assess soldiers’ mental states; and in education, to optimise pupils’ attention or specific cognitive abilities. Debates are also beginning to emerge in the administration of justice regarding the use of psychophysiological techniques (Elizalde Carranza, 2026, p. 16). This expansion of applications raises significant ethical and legal challenges, insofar as it may directly affect mental privacy, freedom of thought, personal autonomy and psychological integrity (Sunblad and Salaya Kalierof, 2025, p. 129).

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<sup>2</sup> In the study conducted by Walker Silva and Rojas Aguilera, *neuromarketing* is defined as: “the use of various brain imaging techniques, scans or other technologies for measuring brain activity to assess a subject’s response to products, *packaging*, advertising or other specific marketing elements. Thus, based on the data obtained, advertising, promotional campaigns, product sales or other activities can be carried out, ideally in a personalised manner”.

These developments entail significant legal risks. Among these, it is worth highlighting the intrusion into mental privacy through access to neurodata and the potential dissemination of mental content by companies and governments, which poses a direct threat to freedom of thought and expression; cognitive manipulation capable of influencing individual decision-making; technological inequality, which is likely to widen social and economic divides and generate new forms of discrimination (Cotino Hueso, 2017, p. 138); and the creation or amplification of algorithmic biases in systems that process neurodata or make inferences about mental states (De Asís, 2022, p. 58). In the face of such risks, reflection on neurorights offers an opportunity to construct an ethical and regulatory framework to guide the responsible development of these technologies.

In the current context, neurorights are emerging as a regulatory framework designed to protect the mental and cognitive sphere of the individual against neurotechnologies capable of recording, inferring, modulating or intervening in brain activity. Their purpose is to safeguard intrinsic aspects of the mind and human personality, such as mental privacy, cognitive autonomy, psychological integrity and personal identity (Cáceres et al., 2024, pp. 22-23; and Cáceres Nieto et al., 2022, pp. 69 et seq.). Among the main pioneers in the formulation of neurorights, Rafael Yuste and Marcello Ienca stand out. In general terms, Ienca (2021, p. 1) has defined neurorights as a set of “ethical, legal, social or natural principles of freedom or rights relating to a person’s cerebral and mental domain, that is to say, the fundamental norms for the protection and preservation of the human brain and mind”. This characterisation reveals that the concept is not limited to a closed catalogue of rights already enshrined in law, but rather refers to a more complex normative reality, at the intersection between existing law, proposals for legal innovation and emerging standards of technological governance.

From this perspective, neurorights can operate on at least three levels. Firstly, as rights already recognised in constitutions and international treaties, which are open to reinterpretation in light of the specific risks posed by neurotechnology. Understood in this way, neurorights can be conceived as a specific extension of human rights into a techno-scientific environment in which the mind is susceptible to being read, altered or enhanced through technologies, both invasive and non-invasive. This approach underpins a broad doctrinal debate. Its main purpose is to safeguard human dignity and personal autonomy in the face of new forms of access to and intervention in the mental sphere. This approach is also reflected in regulatory initiatives promoted by international organizations, such as UNESCO, which advocate for the establishment of robust regulatory frameworks, grounded in a human rights perspective, to address the challenges posed by emerging technologies, including artificial intelligence and neurotechnologies (Sanromán Aranda, 2023, p. 2326).

Secondly, neurorights can be understood as proposals for new, specific safeguards, the codification of which is being promoted in certain legal systems (Bardají Gálvez and Bardají Gálvez, 2022, pp. 63 ff.). This approach presents them as fundamental rights in the strict sense, which presupposes their express incorporation into constitutional texts or international instruments, with the aim of guaranteeing their direct legal effectiveness and judicial enforceability. Legal scholarship reveals a growing concern regarding regulatory gaps surrounding the protection of mental privacy, free will and the psychological integrity of individuals, particularly in the face of technologies capable of controlling human will and actions (Borbón Rodríguez et al., 2020, p. 136).

Thirdly, neurorights can function as guiding principles or *soft law* standards designed to steer, through ethical and legal parameters, the design, implementation and responsible use of these technologies. From this perspective, it is emphasised that artificial intelligence and neurotechnologies must be developed in accordance with values compatible with human dignity, avoiding destructive, discriminatory or bellicose uses (Sanromán Aranda, 2023, p. 2319). Such principles, such as beneficence, non-maleficence, autonomy and justice, constitute essential benchmarks for both legislative frameworks and public policies on technological innovation. This dimension is relevant because, before crystallising into fully enforceable rights, new regulatory demands tend to manifest themselves as principles of legal and political guidance (UNESCO, 2025; OECD, 2019). Consequently, neurorights do not constitute a closed category, but rather an ongoing legal and axiological construct, in which classical rights are reconfigured to adapt them to the new neurotechnological context. Whilst their eventual codification as fundamental rights still requires legislative and jurisprudential work that is as yet in its infancy, their operation as ethical-legal principles already offers a relevant guide for steering the responsible development of these technologies (De Asís, 2022, p. 59).

Nevertheless, the broad scope of the term does not justify classifying any principle related to the brain or the mind as ‘neurorights’. Some legal scholars have rightly warned of the risk of inflation and devaluation of rights-based language when claims are made without regard to criteria of necessity, specificity and practicality (Bublitz, 2022, pp. 3–5). In line with this critique, it has been noted that “it is still far too early to incorporate a new category of human rights” (Borbón et al., 2020, p. 135), although this does not preclude progress in its normative conceptualisation or in a critical reflection on its foundations and limits. For this reason, it is methodologically preferable to reserve the notion for those statements that directly protect legal interests linked to cerebral activity and the mental sphere, whether through express recognition or a systematic interpretation of existing rights.

One of the most influential frameworks for neurorights is that proposed by Yuste, Genser and Herrmann, who identify five areas of protection (Yuste et al., 2021, pp. 160–161): mental privacy, identity and personal autonomy, free will, mental integrity, and equal access to cognitive enhancement technologies. In a widely circulated formulation, the *Neurorights Foundation* maintains that these rights aim to guide and regulate both the development and use of neurotechnologies, ensuring protection against misuse (Cáceres et al., 2022, p. 22). The underlying issue therefore lies in how to structure an appropriate regulatory framework for a domain as complex as the human mind. This problem raises questions about the very nature of the mental and the relationship between the brain and the mind (Valenzuela Corales, 2022, p. 376).

In this context, cognitive freedom occupies a central position insofar as it can be understood as the right of every person to retain sovereignty over their own mind in the face of any form of neurotechnological monitoring, manipulation or imposition. It encompasses both the ability to retain control over one's own mental processes and the freedom to decide whether to use technologies capable of reading, modifying or inducing mental states (Farahany, 2019, pp. 98 ff.). It is, therefore, a safeguard designed to protect the autonomy of thought and decision-making against undue external interference (Rollnert Liern, 2024, pp. 23 ff.). Consequently, cognitive freedom is not merely another individual right, but a condition that enables free will, moral autonomy and the exercise of other freedoms (Sententia, 2004, p. 227). In this vein, Bublitz argues that cognitive freedom comprises two related dimensions: on the one hand, the ability to use neurotechnologies voluntarily; and, on the other, protection against their coercive, imposed or non-consensual use (Bublitz, 2013, p. 234).

Mental privacy, for its part, refers to protection against unauthorised access to thoughts, emotions and intentions through brain-reading or inference techniques. It constitutes an extension of traditional privacy rights, but with a more intimate and complex scope, as it relates directly to the contents of the mind. In this sense, neurodata and other tools capable of inferring information about mental states pose significant risks if not properly regulated (Walker Silva and Rojas Aguilera, 2023, p. 9). Strictly speaking, functional neuroimaging does not read thoughts in the literal sense, but it does allow for the inference of an individual's intentions, preferences or mental dispositions (Ienca and Andorno, 2017, p. 4). If mental content can be systematically monitored or inferred, there is a risk of creating societies in which surveillance reaches levels incompatible with individual freedoms and the pluralism of ideas. Protecting these freedoms requires defining clear limits on the use of technologies capable of accessing cerebral activity, ensuring that these tools are used with informed consent and in legitimate contexts (Pérez González, 2023, p. 99).

Mental integrity is presented as a safeguard against non-consensual or abusive interventions that invasively alter a person's cognitive, affective or volitional processes. This principle derives from traditional rights to physical integrity, but extends to protect the functioning of the brain as the biological basis of the mind (Reche Tello, 2024, pp. 201 ff.). It must therefore be understood as the right not to be subjected to interventions that compromise the stability of cognitive processes. Its relevance is heightened in workplace, military or educational contexts, where the manipulation of mental states might be justified on the grounds of improving performance or psychological resilience, raising ethical concerns regarding such interventions. Hence the need to establish precise limits to prevent technology from becoming a tool of coercion that is difficult to detect.

Particular consideration should be given to psychological continuity—or the preservation of personal identity, including autobiographical memory—in the face of potential external disruptions (Llamas and Marinaro, 2021, pp. 93–94). The Lockean tradition is illustrative in this regard, insofar as the continuity of consciousness and memory constitutes a decisive element in the formation of personal identity (Locke, 1999, pp. 318–319). The preservation of the continuity of identity is crucial for the perception of the self and emotional stability. However, the protection of psychological continuity cannot be understood as an absolute prohibition of every intervention capable of affecting memory, emotion or personality. Therapeutic interventions, especially those aimed at treating trauma, depression or severe neurological disorders, may be ethically and legally justified when they are based on informed consent, proportionality, medical necessity and respect for the subject's narrative identity. The central problem is therefore not whether neurotechnological interventions may affect identity, but under what conditions such effects remain compatible with autonomy and personal dignity.

A break in this continuity can have devastating effects on personal integrity, affecting one's perception of oneself and one's relationship with the environment. In a scenario where advanced technologies allow memories, emotions or personality traits to be modified, ensuring psychological continuity is essential to preserving the coherence of human experience. This principle takes on particular relevance in the debate on the use of technologies aimed at suppressing or reconfiguring traumatic memories (Adán Ríos, 2022, p. 13). Although such interventions could improve the quality of life for certain individuals, they also raise questions about the limits of technological intervention in subjective experience and the legal safeguards required (Plá Herrero, 2025, p. 642). In view of the above, neurorights constitute a normative endeavour aimed at protecting the most intimate dimension of the person in the face of neurotechnological development. They do not yet constitute a closed catalogue of fully codified fundamental rights, but rather a space for dogmatic re-elaboration in which the reinterpretation of classical safeguards converges with the possible formulation of specific protections against

unprecedented threats. The decisive question lies not merely in determining whether the creation of new rights is necessary, but in establishing whether existing law adequately protects the mental sphere against the emerging capabilities of neurotechnologies.

## 2. NEUROETHICS AND THE ETHICAL FOUNDATIONS OF NEURORIGHTS

The ethical reflection on neurorights that has been outlined here arises from the need to protect human dignity and personal autonomy in a context where technology not only transforms the environment but can also affect the conditions of human agency. On this basis, the intersection between neuroethics and law offers an ideal framework for addressing the challenges of neurotechnology and guiding its development in accordance with values such as dignity, autonomy and justice.

Neuroethics can be defined as an interdisciplinary field that examines the ethical, legal and social implications of neuroscience and neurotechnology, as well as the neurobiological foundations of ethical norms and moral values. It is a space for reflection linked to bioethics, moral philosophy, neuroscience, psychology, artificial intelligence, anthropology and law (Muñoz, 2023; Velasco Caballero, F., 2026, pp. 119-120). Since the beginning of the 21st century, the field of neuroethics has evolved around two main perspectives. Firstly, the ethics of neuroscience, which aims to develop an ethical framework to regulate neuroscientific research and the application of its findings in humans. Secondly, the neuroscience of ethics, which focuses on analysing how neuroscientific knowledge influences our understanding of ethics by investigating the neural bases of moral judgement and agency (Cortina, 2011, p. 44). This dual dimension necessitates a philosophical framework that is capable of critically interpreting neuroscientific progress.

Contemporary debates cover such significant issues as cognitive and moral enhancement, the manipulation of mental states, personal identity and psychological integrity, as shown in the works of Farahany and Bublitz on cognitive liberty, Sententia on mental self-determination and Ienca and Andorno on mental privacy and psychological continuity. In this context, the emergence of neurorights responds to growing concerns about the social impacts of these technologies. Neuroethics critically examines both advances in neuroscience and forms of neuroessentialism that reduce human identity to brain function. Furthermore, neuroethics intersects with law by exploring issues such as free will, criminal responsibility, and the ethical use of neuroscientific evidence in the courts (Cortez Ocaña et al., 2024).

The expansion of neurotechnologies has reshaped the practical significance of fundamental concepts such as human dignity and personal autonomy. Both values,

historically protected by constitutions and international human rights treaties, now face risks arising from these technologies, which are capable of recording, influencing, modulating and altering mental processes. The ethics of neurorights emerges as a theoretical and normative response aimed at identifying the legitimate limits of technological power when technology penetrates the inner self of the individual.

In this sense, human dignity takes on a new dimension in the neurotechnological context. From a classical philosophical perspective, dignity is understood as a quality inherent to every human being, derived from their rational and moral capacity. However, as González R. Arnáiz (2016, pp. 235–236 and 239–241) points out, the neurosciences and their materialist approach propose a reduction of the human being to its biological foundations, thereby questioning the primacy of reason and autonomy as distinctive elements of human dignity. This “neurocognitive turn” introduces a tension between the traditional view of dignity and certain contemporary conceptions that attribute the core of human behaviour to the brain.

For its part, personal autonomy, traditionally understood as the capacity to make free and deliberate decisions, faces unprecedented challenges today. These neurotechnologies, capable of reading thought patterns or inducing mental states, call into question the authenticity of human decisions. Ienca and Andorno (2017, p. 6) warn, in this regard, that these technologies could erode the capacity for self-governance by subtly influencing cognitive processes. Consequently, autonomy is conceived not only as an ethical principle, but also as a right that must be protected against potential forms of technological manipulation.

From an ethical perspective, human dignity and personal autonomy must be protected not only as individual attributes, but also as structural pillars of the democratic order. Dignity is non-negotiable, even in the face of technological advances that promise to enhance cognitive abilities or correct neurological deficits (Valenzuela Corales, 2022, p. 381). This principle demands that any neurotechnological intervention be subject to clear limits that prevent the instrumentalisation of the individual and ensure respect for their humanity. Autonomy, for its part, faces a dual challenge: on the one hand, ensuring that individual decisions are not unduly influenced by neurotechnologies; and, on the other, assuming the responsibility of ensuring equitable access to these tools, preventing them from becoming a privilege reserved for certain sectors. For this reason, the ethics of neurorights cannot be limited to a logic of mere non-interference, but must also incorporate a dimension of distributive justice.

The relationship between neurorights and neuroethics is, at this point, essential. Whilst the former are geared towards the legal protection of the human mind, neuroethics

provides a normative framework for analysing the moral implications of neurotechnologies. Law and ethics should converge in the safeguarding of fundamental values in the face of a new technological reality, although this convergence cannot be taken for granted. In practice, legal systems often react belatedly, incompletely or unevenly to technological change. Neuroethics therefore plays a critical role not only in inspiring legal regulation, but also in identifying the gaps, tensions and insufficiencies of existing legal frameworks. From this perspective, neuroethics constitutes the interdisciplinary foundation from which the contemporary discussion on neurorights emerges. (Borbón, 2025a, pp. 51 ff.).

In practical terms, the protection of dignity and autonomy requires specific public policies and legal frameworks. These regulations must ensure that neurotechnologies are used responsibly and that individuals have full control over their data and mental processes. Furthermore, it is essential to establish oversight mechanisms to identify and sanction potential abuses, ensuring that scientific advances do not result in violations of human rights. The importance of education and digital and neurotechnological literacy in promoting an ethical culture surrounding these tools must also be emphasised. Raising public awareness of their risks and benefits is necessary to encourage responsible and equitable use.

One of the most intense debates centres on the impact of neurotechnologies on agency and free will. Interventions such as deep brain stimulation or certain neural intervention techniques can influence human decisions without the individual being fully aware of it. This possibility calls into question the authenticity of autonomy and raises new questions about personal responsibility in contexts where decisions might be conditioned by external factors. Furthermore, experiments by Benjamin Libet and other researchers have shown that brain activity precedes conscious decision-making, suggesting that free will may be more limited than has traditionally been assumed (Cortina, 2011, pp. 164 ff.). This view challenges the ability of neurorights to protect autonomy within a framework in which neuroscience is redefining our understanding of human behaviour.

A second dilemma concerns access to brain activity, as well as the collection and processing of neurodata. Ienca and Andorno (2017, p. 6) argue that mental privacy should be considered an extension of traditional privacy rights, given that current technologies allow intentions, preferences or emotions to be inferred from neural activity. The regulation of this data poses practical problems, such as the need to prevent companies or institutions from using this information for commercial, discriminatory or behavioural manipulation purposes (Valenzuela Corales, 2022, p. 380).

A third dilemma concerns equitable access to neurotechnologies. Many of these tools, developed for therapeutic purposes, could become consumer goods restricted to the economic elite, thereby exacerbating social inequalities. Furthermore, the commercialisation of cognitive enhancement technologies raises ethical questions regarding the definition of normality and the risk of creating new forms of discrimination based on enhanced abilities (Yuste, Goering et al., 2017, p. 162). This issue highlights the need to develop public policies that ensure reasonably equitable access and prevent the exclusion of the most vulnerable groups (Garrigues Walker and González de la Garza, 2024, pp. 109-110).

A fourth dilemma concerns personal identity. The ability to intervene in personality, memory or emotions raises issues regarding the continuity of the self. The manipulation of brain activity can alter self-perception and cause internal conflicts in the construction of identity, particularly with invasive technologies. The right to psychological continuity, proposed by Ienca and Andorno (2017, p. 12), aims to address these concerns by ensuring that neurotechnologies do not interfere without consent with the subject's narrative coherence. However, its implementation faces practical challenges, including the difficulty of measuring and evaluating subjective transformations.

Philosophical perspectives on the ethical regulation of neurorights emphasise the need for an interdisciplinary approach that combines sound normative principles with mechanisms that can be applied in practice. Concepts such as cognitive freedom, informed consent and distributive justice constitute fundamental pillars for ensuring the responsible and equitable use of neurotechnologies. However, as some scholars warn, the implementation of these principles faces significant challenges, ranging from a lack of international consensus to the technical complexity of these technologies (Borbón and Muñoz, 2024, p. 120). Overcoming these challenges requires a joint effort by philosophers, scientists, legislators and civil society.

A key point in this debate is the distinction between normative ethics and applied ethics. Neurorights lie at the intersection of both spheres, as they seek not only to establish general principles, but also to ensure their applicability in specific contexts. This duality implies that any attempt to regulate these technologies must be based on a solid normative foundation that prioritises values such as dignity and autonomy, but which, at the same time, incorporates operational criteria to guide institutional decisions and technological practices.

In this sense, normative ethics establishes the general principles that justify the formulation of neurorights, whilst applied ethics deals with their implementation in specific situations. It is worth noting that ethical regulation must consider not only the

potential benefits of neurotechnologies, but also the risks of abuse and inequality that could arise from their misuse.

Cognitive freedom is one of the most hotly debated neurorights from a philosophical perspective and, for some authors, constitutes the ethical foundation and prerequisite for all other neurorights. A distinction can be made between a negative dimension, which protects individuals from unwanted interference in their mental activity, and a positive dimension, which promotes equitable access to certain cognitive enhancement neurotechnologies (Borbón and Muñoz, 2024, p. 115). This distinction reflects the tension between the protection of individual autonomy and the promotion of social justice. From a critical perspective, some scholars warn that the negative dimension may be relativised in contexts where neurotechnologies are used coercively, for example, in workplace or military settings, which “could erode its effectiveness as an ethical principle” (Valenzuela Corales, 2022, p. 380).

Another noteworthy issue is the paradox of informed consent in the neurotechnological context. Although it is a fundamental pillar of biomedical ethics, its application in this field raises questions about people’s actual ability to understand the implications of such interventions (González R. Arnáiz, 2016, p. 238). This concern is relevant in the use of invasive technologies, which can have unpredictable effects on identity and personality. Hence the interest in proposals such as dynamic consent, which allows individuals to withdraw or modify their consent as technological applications evolve. This approach recognises the changing nature of neurotechnologies and the need to adapt ethical safeguards to such developments.

Justice, understood as the equitable distribution of benefits and risks, constitutes another fundamental pillar in the ethical regulation of neurorights. Borbón and Muñoz (2024, p. 118) highlight that “inequality in access to these technologies could exacerbate existing social divides, creating new forms of exclusion and discrimination”. This argument ties in with theories of distributive justice aimed at correcting structural inequalities and promoting a more equitable society. Within this framework, we are faced with a new concept of digital justice, which is not limited to the distribution of material resources, but must also include the protection of fundamental rights in the technological context (Guapulema Ocampo, 2025, p. 2446).

The ethics of neurorights do not seek to curb neurotechnological innovation, but rather to subject it to conditions of legitimacy compatible with human dignity, personal autonomy, mental integrity and justice. Its main contribution lies in reminding us that, where technology can penetrate the mental sphere, the law cannot limit itself to reacting

*after the event*, but must anticipate protection criteria commensurate with the new vulnerability emerging at the interface between the brain, data and power.

### 3. THE IMPLEMENTATION OF NEURORIGHTS IN LEGAL SYSTEMS

The implementation of neurorights in legal systems poses complex challenges arising from their interdisciplinary character and the rapid evolution of neurotechnologies. The protection of rights such as mental privacy, cognitive freedom or mental integrity requires a regulatory framework capable of balancing technological advances with the demands of fundamental rights. A first challenge consists of defining the scope of neurorights in relation to already recognised guarantees. As López-Silva and Madrid (2021, p. 54) have pointed out, these rights can be understood as specific extensions of existing rights, such as privacy or personal autonomy. However, this conceptual proximity creates uncertainty regarding their boundaries and their doctrinal autonomy.

This difficulty is compounded by the lack of scientific consensus on fundamental questions, including the relationship between mind and brain, which complicates the formulation of clear and enforceable legal rules. Concepts such as mental integrity, neural privacy or psychological continuity remain difficult to translate into operational legal categories, potentially giving rise to imprecise or ineffective regulatory frameworks (Valenzuela Corales, 2022, p. 384). This problem highlights the need for sustained interdisciplinary dialogue among legal scholars, neuroscientists and philosophers in order to develop robust and coherent definitions. Given the continuing evolution of both scientific knowledge and technological capabilities, regulation should also follow a progressive, revisable and technologically informed approach, incorporating mechanisms for periodic review and regulatory updating without sacrificing legal certainty or coherence.

A key debate therefore concerns the most appropriate legal instrument for protecting neurorights. The central question is whether they should be incorporated into constitutional texts or instead developed through specific legislation and an evolutionary interpretation of existing fundamental rights. One strand of legal theory argues that their protection may be subsumed within existing legal frameworks, owing to the interpretative flexibility of rights such as privacy, integrity and autonomy (López-Silva and Madrid, 2021, p. 61). Other scholars, however, advocate the explicit constitutional recognition of these guarantees in order to reinforce their hierarchical status, visibility and effective protection. The Chilean experience, which seeks to enshrine special protection for brain activity and the information derived from it at the constitutional level, reflects this second approach. From this perspective, the explicit inclusion of neurorights in constitutional

texts constitutes “a necessary step towards recognising their importance as pillars of humanity in the face of technological advancement” (Borbón et al., 2020, p. 143).

The regulatory challenges posed by neurorights are not homogeneous. The protection of dignity, autonomy, mental privacy and mental integrity primarily requires restrictive and preventive legal measures aimed at limiting intrusive, coercive or non-consensual uses of neurotechnologies. By contrast, the guarantee of equitable access and social justice requires distributive and promotional measures, intended to prevent therapeutically beneficial neurotechnologies from becoming a privilege reserved for economic elites (Valenzuela Corales, 2022, p. 382). This risk necessitates the development of public policies that prioritise therapeutic uses, establish reasonable access criteria and prevent cognitive enhancement from becoming a privilege. These two dimensions may generate tensions: while the first seeks to restrict or prohibit certain neurotechnological uses, the second seeks to facilitate broader and fairer access when such technologies produce legitimate therapeutic benefits. This distinction supports the adoption of differentiated regulatory instruments and legislative techniques, including prohibitions, informed-consent requirements, supervisory mechanisms, access policies and public funding measures. In this regard, some legal scholars argue that legislation should “set clear and realistic priorities, focusing on protecting fundamental rights without compromising economic and social sustainability” (López-Silva and Madrid, 2021, p. 70).

Beyond its strictly legal dimension, the recognition of neurorights carries far-reaching social and cultural implications. These safeguards redefine perceptions of autonomy, privacy and personal identity in a context marked by the growing influence of emerging technologies. This impact not only transforms the relationship between individuals and technology, but also challenges the institutions responsible for regulating it.

One of the most significant effects is the rethinking of the relationship between human beings and the brain, which is now conceived as an entity deserving of legal protection. According to López-Silva and Madrid, the incorporation of neurorights underscores “the need to consider the brain not only as a biological organ, but also as a legal and ethical space that must be safeguarded against possible external interference” (2021, p. 64). This perspective implies a cultural revaluation of the brain as the core of human identity and agency, a shift that could transform social narratives about what it means to be human in the technological age.

On a cultural level, neurorights challenge traditional notions of privacy, freedom and responsibility. The ability of these technologies to infer thoughts, emotions or patterns

of behaviour raises questions about the limits of informed consent and the protection of privacy. The recognition of neurorights, therefore, not only protects individuals but can also strengthen trust in the institutions responsible for regulating such developments (Borbón et al., 2020, p. 137).

Another significant cultural impact can be seen in the redefinition of personal responsibility. When neurotechnologies can influence brain activity and shape decisionmaking, new dilemmas arise regarding the attribution of blame, merit or liability. These dilemmas may have far-reaching implications in sensitive areas such as education, the workplace and the criminal justice system and are particularly relevant to the attribution of legal responsibility. If neurotechnological devices can influence attention, impulse control, emotional responses or decision-making processes, traditional categories such as intention, consent, culpability and imputability may require careful reconsideration. This does not mean that neuroscience should replace legal judgement, nor that responsibility should be dissolved into neural causality. Rather, it suggests that legal systems may need more refined criteria to distinguish between ordinary decision-making, technologically conditioned conduct and cases in which external neurotechnological intervention significantly affects agency.

Ultimately, neurorights are not merely a response to technological advances, but also an opportunity to rethink and strengthen the ethical and legal principles that define us as a society. This objective requires a joint effort by legislators, scientists and society as a whole to ensure that regulatory frameworks are capable of responding to the challenges and opportunities of this century.

#### **4. THE INTERNATIONALIZATION OF NEURORIGHTS. BETWEEN SOFT LAW AND COMPARATIVE RECEPTION**

The integration of neurorights into international law poses highly complex challenges. This is due, on the one hand, to the diversity of national legal frameworks and, on the other, to the tensions between state sovereignty and the claim to universality of human rights. Added to this are technical and conceptual difficulties, as the protection of rights such as mental privacy, psychological integrity or personal identity requires a precise definition of the legal scope of the mental sphere in a context of rapid technological development. However, this very complexity also presents an opportunity to consolidate a global regulatory framework that protects individuals from the risks associated with the development and application of neurotechnologies.

In this scenario, two pathways for the incorporation of neurorights at the international level are emerging. The first consists of an evolutionary reinterpretation of

already recognised human rights to adapt them to ethical and technological demands (Cáceres Nieto and López Olvera, 2022, p. 70).

Alongside this, the advisability of incorporating neurorights into existing human rights declarations and covenants has been raised (Llano Alonso, 2024, p. 60). The interpretative flexibility of instruments such as the International Covenant on Civil and Political Rights allows neurorights to be integrated as an extension of already recognised rights, thereby avoiding the need to create a completely autonomous regulatory system from scratch. This approach has the advantage of building on existing legal frameworks, although it also carries the risk of diluting the specificity of neurorights within broader and less precise categories. This strategy could guarantee a minimum common standard of protection while allowing states to adapt its implementation to their particular legal and institutional contexts.

The second approach favours specific soft law instruments and, eventually, more precise treaty texts. In this regard, the Organization for Economic Co-operation and Development's (OECD), Recommendation on Responsible Innovation in Neurotechnology, adopted in 2019, marked a first milestone by establishing principles on safety, oversight, autonomy and human rights. More recently, in November 2025, UNESCO adopted the Recommendation on the Ethics of Neurotechnology, the first global standard dedicated to this subject, with a focus on human dignity, mental privacy, public governance and the protection of vulnerable groups.

Instruments of this nature provide guidance to states and contribute to the progressive development of common standards and oversight mechanisms. Any regulation on the subject should include a series of basic principles, such as “the protection of mental privacy, equitable access to neurotechnologies and the prohibition of cognitive manipulation without informed consent” (Cáceres Nieto and López Olvera, 2022, p. 72).

International cooperation is another indispensable element. Collaboration between states, scientific institutions and international organizations is essential to ensure that regulations on neurorights are based on the most up-to-date scientific knowledge and reflect best practices. Such cooperation would also enable common technical and ethical issues to be addressed, such as the definition of key concepts and the assessment of risks associated with neurotechnologies.

Finally, the effectiveness of any regulatory proposal requires the creation of international oversight and accountability mechanisms. The eventual establishment of an international committee of experts on neurorights could ensure the effective

implementation of these safeguards, monitor compliance and make recommendations to improve their application. Such a body could also act as a forum for resolving disputes and promoting dialogue among the various stakeholders involved in the regulation of neurotechnologies.

In comparative law, amongst the states that have made progress in regulating neurorights, Chile remains the pioneering benchmark. Act No. 21,383 of 2021 amended Article 19 of the Constitution by stipulating that “scientific and technological development shall be at the service of the people and shall be carried out with respect for life and for physical and mental integrity. The law shall regulate the requirements, conditions and restrictions for its use on persons, with particular regard to safeguarding brain activity and the information derived therefrom”. This provision entrusts the legislature with regulating matters that may affect neurocognitive activity and recognises specific protection for brain activity and neurodata (López-Silva and Madrid, 2022, pp. 55-56 y 58). In doing so, Chilean law not only affirms the primacy of human dignity and personal integrity over scientific and technological development, but also sets out to establish a sector-specific regulatory framework aimed at preventing undue interference in the mental sphere and strengthening the protection of neural privacy (Belloso Martín, 2022; Reche Tello, 2024, pp. 115–119).

Building on this precedent, other legal systems have made progress in various ways towards incorporating neurorights. Thus, in Brazil, the state of Rio Grande do Sul approved a reform to its state constitution in December 2023 to expressly recognise neurorights. The constitutional amendment incorporated the protection of mental integrity as a constitutional principle and, furthermore, established the duty to protect brain activity and neural data. This reform constitutes a milestone in the regional context and reinforces the trend towards safeguarding rights in the face of the challenges posed by emerging neurotechnologies (Reche Tello, 2024, p. 121; Borbón, 2025b, p. 345).

In Mexico, the constitutional reform initiative presented in 2023 represents a significant step forward in the protection of human rights against the development of neurotechnologies (Reche Tello, 2024, pp. 123–124). The proposal aims to incorporate the protection of mental privacy, psychological integrity and individual identity into Article 4 of the Constitution. This proposal responds to growing concerns regarding the use of technologies capable of accessing, modifying or influencing mental processes, and highlights the need to establish a legal framework to regulate their application in an ethical and responsible manner. The reform’s approach is structured around two fundamental pillars: the protection of brain data and the defence of personal integrity and identity as essential conditions of freedom (Miraut Martin, 2023, p. 106). Although the proposal does not cover all recognised neurorights, such as free will or protection against

algorithmic bias, it does constitute a regulatory starting point that could trigger a broader legislative and jurisprudential debate.

Argentina has made progress in regulating neurotechnologies in the criminal justice system through Bill 0339-D-2022, which proposes amendments to the Code of Criminal Procedure and the Law on the Enforcement of Criminal Sentences (Reche Tello, 2024, pp. 134–136; Borbón, 2025b, pp. 344–345). It incorporates the use of techniques such as brain imaging, establishing limits on their application through a court order and with the explicit and informed consent of the individual. Furthermore, it requires respect for mental activity and the exclusion of cognitive and algorithmic biases, thereby establishing a rights-based framework focused on neurorights. This proposal reflects a precise legislative technique that seeks to provide legal certainty regarding the use of technologies capable of inferring mental activity. The bill recognises the need to protect brain-mind integrity, understood as the defence of cognitive self-determination against intrusive interventions. By adopting an open-ended formula—‘all its aspects’—the contextual interpretation of the limits and scope of these technologies is left to the judge. In contrast to declaratory approaches, the proposal constitutes a concrete and progressive regulatory effort to safeguard fundamental rights in the era of neuroscience applied to criminal law.

Alongside the Argentine initiative, Colombia has recently joined the legislative debate through Bill 395 of March 2025, introduced in the Senate with the institutional support of the Ombudsman’s Office. The initiative aims to establish guiding principles on neuroscience, neurotechnologies and human rights, with particular attention to the protection of neurodata, mental privacy, personal identity and brain integrity (Borbón, 2025b, p. 349; Miranda Gonçalves, 2025, pp. 124–125).

In the United States, Colorado passed Bill 24-1058 in 2024, thereby expanding the category of sensitive data to include biological and neural data, and imposing enhanced safeguards for their processing (Yuste, 2025a, p. 724). Although this is not a constitutional reform, this measure sets a regulatory precedent of global significance by enshrining the protection of information derived from brain activity within a legal framework that safeguards privacy. Other states have followed this trend, such as California in 2024 (SB 1223), Montana in 2025 (SB 163) and, more recently, Minnesota (SF 1240). All these laws focus on the protection of brain information (neurodata) against the commercial use of neurotechnology (Velasco Caballero, 2026, p. 129).

In the European context, Spain occupies a prominent position through the adoption of the Charter of Digital Rights, a non-binding instrument, yet one that is forward-looking and provides guidance regarding the application and interpretation of rights in the digital

environment (Reguera Andrés and Cayón de las Cuevas, 2021, p. 216). This Charter not only addresses the implications of the digital environment but also encourages a global reflection on the centrality of the individual in technological development, promoting a humanistic digitalization that respects democratic values and safeguards dignity and fundamental rights (Barrio Andrés, 2025, pp. 372 et seq.). Furthermore, it includes specific sections on rights related to neurotechnology and artificial intelligence (Arellano Toledo, 2024, p. 11).

During Spain's presidency of the Council of the European Union, the León Declaration on European Neurotechnology was adopted in October 2023. The Declaration adopts a human-centred and rights-based approach, emphasising the need for proactive action in the development of neurotechnology. It seeks to position the European Union as a leader in this emerging field, fostering innovation and investment, whilst remaining aligned with European values, the Charter of Fundamental Rights of the EU and the European Declaration on Digital Rights and Principles. Its content emphasises the protection of human rights, the preservation of personal autonomy and the primacy of human control over technological processes, and consolidates a person-centred European model of neurotechnology (Rayón Ballesteros, 2026, pp. 92 and 97).

France introduced substantial reforms through Law No. 2021-1017, with the aim of regulating the use of technologies linked to brain activity in the field of bioethics (Reche Tello, 2024, pp. 131–134). In the criminal sphere, Article 18 of that law amended Article 225-3 of the Criminal Code, adding the use of “data derived from brain imaging techniques” as a punishable ground for discrimination. This inclusion strengthens protection against discriminatory practices based on predictive or intimate brain information, placing it on a par with genetic data or data relating to organ removal, and recognises its potential impact on decisions such as employment recruitment, access to insurance or financial services. In the civil sphere, the same Article amended the Civil Code, establishing that “brain imaging techniques may only be used for medical or scientific research purposes or in the context of forensic expertise, with the exception, in this context, of functional brain imaging”, excluding the latter due to its interpretative risks in legal proceedings. Meanwhile, Article 19 introduced Article L.1151-4 into the Public Health Code, which empowers the State to prohibit, by decree and following consultation with the High Health Authority, any technique that modifies brain activity and poses a serious danger to human health. These provisions reflect a precautionary and rights-based approach to the advancement of neurotechnologies, although it is noted that the concept of ‘danger’ remains legally undefined, which may require further clarification through case law to ensure the effective protection of fundamental rights.

The comparative overview shows that neurorights are being received through heterogeneous legal techniques. Some systems opt for constitutional recognition, as in Chile; others prefer sectoral data protection reforms, as in several US states; others rely on bioethical regulation, digital rights charters or soft law instruments. This diversity confirms that there is not yet a consolidated legal model of neurorights. It also suggests that the most realistic path may not be the immediate creation of a universal catalogue of new rights, but the progressive articulation of a multi-level framework combining constitutional interpretation, data protection, health law, bioethics and technological governance.

##### **5. DIGITAL HEALTH AND NEURORIGHTS. SHORTCOMINGS IN THE HEALTHCARE FRAMEWORK AND THE NEED FOR ENHANCED PROTECTION**

Digital health can be defined as the integration of information and communication technologies into healthcare with the aim of improving prevention, diagnosis, treatment and patient follow-up, as well as the efficiency of health system management (Pérez González, 2025, pp. 196–197). This concept encompasses tools such as electronic health records, telemedicine, mobile health applications (*mHealth apps*), wearable devices, artificial intelligence applied to medical diagnosis and treatment, big data analysis of health information and, increasingly, medical neurotechnologies based on brain-computer interfaces (Sarmiento-Pesántez et al., 2024, pp. 15 et seq.).

In this context, the relationship between digital health and neurorights assumes particular significance. The progressive digitization of healthcare not only enables more efficient and personalised health services but also entails the collection and processing of highly sensitive information, including neurodata and other data capable of inferring patients' mental health. In this sense, digital health becomes a paradigmatic case for determining whether the right to health and data protection are sufficient in themselves or whether, on the contrary, enhanced protection of the mental sphere is necessary.

From this standpoint, neurorights can be regarded as safeguards designed to preserve human autonomy and dignity in the face of the risks arising from the digitalization of healthcare. However, the Chilean precedent, by establishing special protection for brain activity and the information derived from it, together with the progressive consolidation of international standards such as the 2019 OECD Recommendation on Responsible Innovation in Neurotechnology and the 2025 UNESCO Recommendation on the Ethics of Neurotechnology, highlights the progress of this debate at the international level.

From a legal perspective, digital health is regulated within a fragmented and constantly evolving regulatory framework. At the international level, the World Health Organization's Global Strategy on digital health 2020 - 2025 (extended to 2027) promoted a model for health transformation, highlighting among its guiding principles interoperability, security and the ethical use of digital technologies (World Health Organization [WHO], 2021). At European level, Regulation (EU) 2025/327 on the European Health Data Space (EHDS), in force since March 2025, aims to ensure the cross-border portability of health data and its use for both clinical care and research and innovation purposes, including medical artificial intelligence applications (Jove Villares and Presno Linera, 2025, pp. 86–87).

The legal framework of digital health cannot be reduced to data protection. It is also grounded in the classical principles of health and medical law, including patient autonomy, informed consent, confidentiality, clinical safety, proportionality, therapeutic purpose, non-discrimination and respect for human dignity. These principles are particularly relevant when neurotechnologies are used in healthcare contexts, since interventions involving brain activity may affect not only bodily integrity but also mental privacy, personal identity and cognitive self-determination.

Within the Spanish legal system, Regulation (EU) 2016/679, the General Data Protection Regulation, establishes the overarching framework for the processing of health data and other special categories of personal data. This framework is supplemented by Organic Law 3/2018 on the Protection of Personal Data and Guarantee of Digital Rights, general health legislation and the 2021 Digital Health Strategy of the National Health System, which contributes to the regulation of healthcare digitalization. However, this framework does not explicitly address all the specific risks raised by neurodata and neurotechnological interventions in clinical contexts.

In the Spanish context, it is also worth highlighting the 2025 Draft Digital Health Law of Cantabria, as it expressly introduces specific protection for neurorights and neurodata in Chapter VII, articles 27 to 29, entitled “Neurotechnologies and digital health” (Yuste, 2025b, p. 236). This chapter aims to enshrine a series of specific safeguards for the interaction between technologies and the human brain within the public healthcare system. The innovative aspect of this proposal does not lie in incorporating already familiar emerging terminology (neurotechnologies, neurodata or neurorights), but in shifting the focus of protection from traditional health data towards the mental sphere and cognitive self-determination. In this way, the regulatory proposal aligns with international debates on mental privacy, cognitive freedom and mental integrity.

Article 27 defines neurotechnology as the set of “devices, techniques or systems that interact directly with the nervous system, whether invasively or non-invasively, for diagnostic, therapeutic, cognitive enhancement or monitoring purposes”. This definition encompasses both hardware and software that influences mental states, provided there is direct interaction with the nervous system, it covers medical and paraclinical uses, and it includes diagnostic, therapeutic, cognitive enhancement or monitoring purposes, in order to define the principle of proportionality in the assessment of risks and benefits.

For its part, Article 28 establishes the obligation to subject all neurotechnology to scientific, ethical and clinical evaluation prior to its application in patients, which reinforces preventive control over the use of neurotechnologies, going beyond mere compliance with general frameworks for data or medical devices, and in line with the governance of clinical artificial intelligence provided for in the regional proposal itself.

Article 29 enshrines a set of safeguards relating to neurorights and neuro-data, prohibiting the non-consensual manipulation of cognitive or emotional processes and ensuring control over personal identity, individual self-determination, sovereignty, freedom of decision-making, confidentiality, the security of data relating to one’s brain processes, and full ownership and control over such data. It also regulates the use of human-machine interfaces capable of affecting physical or mental integrity, and ensures that decisions and processes based on neurotechnologies are not conditioned by the provision of data. Furthermore, the second paragraph expressly equates neurodata with the special categories of personal data recognised by the Regulation (EU) 2016/679 and Organic Law 3/2018, with all their safeguards, thereby closing any potential legal loopholes that may arise when dealing with data inferred from neural signals and metadata that reveal mental states and are under-protected. These initiatives reflect a gradual process of integrating neurorights into the Spanish and European legal systems, which is still in its infancy but aimed at consolidating a comprehensive regulatory framework that harmonises technological innovation, the protection of fundamental rights and the demands of public ethics (Rayón Ballesteros, 2026, pp. 95-96).

Ultimately, digital health demonstrates that the protection of the mind cannot be considered a mere theoretical matter. When medical technology not only diagnoses or treats, but also records, infers or influences mental processes, neuroethics and the law are compelled to rethink the boundaries of privacy, autonomy, identity and personal integrity. Hence, the integration of neurorights into the field of digital health must be understood as a necessity in the face of a new form of rights infringement. Neurorights do not replace health law or data protection law, but they do highlight that both may prove insufficient when digital health impacts the patient’s mental sphere.

## 6. CONCLUSION

Neurorights have become one of the most significant concepts in recent legal thought, shifting the focus of protection from the external dimension of the individual towards their mental and cognitive sphere. This shift compels legal scholarship to reconsider whether the traditional categories of privacy, autonomy, integrity and freedom of thought remain adequate in the face of neurotechnologies capable of recording, inferring, modulating or altering brain activity.

Throughout this study, it has become clear that neurorights do not constitute a closed, uniform and universally accepted category of rights. Their legal status remains open, at least in three respects: as a reinterpretation of already recognised fundamental rights; as a proposal for the codification of new specific safeguards; and as a set of guiding principles for the ethical governance of neurotechnology. This threefold dimension explains both their theoretical strength and the conceptual and doctrinal difficulties that their formulation continues to pose.

From an ethical perspective, the debate highlights that human dignity, personal autonomy, mental privacy, mental integrity and the continuity of personal identity cannot be subjected to a purely functional or utilitarian logic of technological progress. Neurotechnologies offer undeniable opportunities, but, at the same time, they can become instruments of manipulation, surveillance or discrimination if they are not subject to clear legal limits and robust international oversight.

At the regulatory level, comparative law shows that we are no longer dealing with a merely speculative hypothesis. The Chilean experience, regulatory developments in the United States, European initiatives and recent work by international bodies highlight a gradual process of legalisation in these areas. However, this process remains fragmented, heterogeneous and, in many cases, disjointed, meaning that the existence of a consolidated legal framework for neurorights cannot yet be affirmed.

We may conclude by stating that, rather than proclaiming a new generation of rights, the urgent task is to develop a rigorous legal theory to protect the human mind in the era of neurotechnology and digital health. This reality demands the formulation of an interdisciplinary, prudent and rights-based response, capable of integrating neuroethics, philosophy, law, data protection and technological regulation. Only in this way will it be possible to ensure that scientific and technical development remains at the service of the individual and does not end up turning the mental sphere into a new space of legal vulnerability.

## REFERENCES

- ADÁN RÍOS, A. (2022). “Neuroderechos desde una actualización a la privacidad mental”, *Revista Jurídica Ius Doctrina*, 13(1), 1-17.
- ARELLANO TOLEDO, W. (2024). “Los neuroderechos y su regulación”, *Inteligencia Artificial: Revista Iberoamericana de Inteligencia Artificial*, 27(73), 4-13. <https://doi.org/10.4114/intartif.vol27iss73>.
- BARDAJÍ GÁLVEZ, A. and BARDAJÍ GÁLVEZ, L. (2022). “Neuroderechos: Ser o no ser. Una propuesta de adscripción sistemática en el ordenamiento jurídico español”, *Revista de Derecho y Genoma Humano*, 57, 47-74.
- BARRIO ANDRÉS, M. (2025). “La regulación de los neuroderechos en España”, en K. Herrera-Ferrá, J.M. Muñoz, H. Nicolini, et al. (eds.), *Neuroética, Neurotecnología e IA: Trayectorias y desafíos en Iberoamérica*, Madrid: Aranzadi La Ley, 365-383.
- BASTIDAS CID, Y. (2025). *La protección de datos cerebrales o neurodatos. Análisis jurídico de una nueva categoría especial de datos personales a la luz del Reglamento General de Protección de Datos de la Unión Europea*. Barcelona: J.M. Bosch Editor.
- BELLOSO MARTÍN, N. (2022). “A vueltas con la igualdad y la no discriminación en los neuroderechos. El reto del acceso equitativo a la mejora cognitiva”, en C. Gorzevski (Org.), *Direitos Humanos e participação política, Vol. XIII*. Porto Alegre: Imprensa Livre.
- BORBÓN RODRÍGUEZ, D.A., BORBÓN RODRÍGUEZ, L.F. and LAVERDE PINZÓN, J. (2020). “Análisis crítico de los NeuroDerechos Humanos al libre albedrío y al acceso equitativo a tecnologías de mejora”, *Ius et Scientia*, 6(2), 135-161. <https://doi.org/10.12795/IETSCIENTIA.2020.i02.10>
- BORBÓN, D. and MUÑOZ, J.M. (2024). “El neuroderecho a la libertad cognitiva: fundamentos y alcance de un derecho emergente”, *Ius et Scientia*, 10(1), 103-131. <https://doi.org/10.12795/IETSCIENTIA.2024.i01.05>
- BORBÓN, D. (2025a). “Neuroética y neuroderechos ante las propuestas de neurointervenciones coercitivas con fines de mejora moral en ámbitos penales”, *Cuadernos Electrónicos de Filosofía del Derecho*, 53, 33-69. <https://doi.org/10.7203/CEFD.53.30241>

- BORBÓN, D. (2025b). “Los neuroderechos en Iberoamerica”, en K. Herrera-Ferrá, J.M. Muñoz, H. Nicolini, et al. (eds.), *Neuroética, Neurotecnología e IA: Trayectorias y desafíos en Iberoamérica*, Madrid: Aranzadi La Ley, 339-353.
- BUBLITZ, J.C. (2013). “My Mind is Mine?. Cognitive liberty as a legal concept”, en E. Hildt y A. Francke (eds.), *Cognitive Enhancement*. Springer, Chapter 19, 233-264.
- BUBLITZ, J.C. (2022). “Novel neurorights: from nonsense to substance”, *Neuroethics*, 15(7), 1-15. <https://doi.org/10.1007/s12152-022-09481-3>
- CÁCERES NIETO, E. and LÓPEZ OLVERA, C.P. (2022). “El neuroderecho como un nuevo ámbito de protección de los derechos humanos”, *Cuestiones Constitucionales*, 46, 65-92. <https://doi.org/10.22201/ijj.24484881e.2022.46.17048>.
- CÁCERES, M.V, MAJUL. E, PALMERO, V., PEREA, A.I. and VICARIO, C. (2024). *Una aproximación a las neurotecnologías. Avances, ética y regulación de los neuroderechos*, Córdoba: Editorial Universidad Católica de Córdoba (Argentina). <https://librosdigitalesomp.ucc.edu.ar/index.php/educ/catalog/book/ethos9>
- CORTEZ OCAÑA, M.P., ESPINOSA PICO, P.E. and SUÁREZ LÓPEZ, A.G. (2024). “Las neurociencias en el ámbito legal: cerebro en la práctica jurídica y neuroderecho”, *Revista Cubana de investigaciones Biomédicas*, 43, 1-23. <https://revibiomedica.sld.cu/index.php/ibi/article/view/3610>
- CORTINA, A. (2011). *Neuroética y neuropolítica. Sugerencias para la educación moral*. Madrid: Tecnos.
- COTINO HUESO, L. (2017). “Big Data e Inteligencia Artificial. Una aproximación a su tratamiento jurídico desde los derechos fundamentales”, *Dilemata*, 24, 131-150. <https://www.dilemata.net/revista/index.php/dilemata/article/view/412000104>
- DE ASÍS, R. (2022). “Sobre la propuesta de los neuroderechos”, *Derechos y Libertades*, 47, 51-70. <https://doi.org/10.20318/dyl.2022.6873>
- DRAFT DIGITAL HEALTH LAW OF CANTABRIA (2025). Available at: <https://participacion.cantabria.es/documents/10711/454478/03+Anteproyecto+de+ley.pdf/4542166d-8b16-a53c-92ce-d9fb5ae7d688?t=174731030613>.

- ELIZALDE CARRANZA, M.A. (2026). “Neurotechnologies in the AI Act: Moving away from the neurorights debate”, *The Age of Human Rights Journal*, 26, 1-41. <https://doi.org/10.17561/tahrj.v26.9853>
- FARAHANY, N.A. (2019). “The cost of changing our minds”, *Emory Law Journal*, 69(1), 75-110. Available at: <https://scholarlycommons.law.emory.edu/elj/vol69/iss1/2>
- GARRIGUES WALKER, A. and GONZÁLEZ DE LA GARZA, L.M. (2024). *Qué son los neuroderechos y cuál es su importancia para la evolución de la naturaleza humana. Reflexiones sobre el derecho, las neurotecnologías y la IA emergentes*, Pamplona: Aranzadi.
- GONZÁLEZ R. ARNÁIZ, G. (2016). “El ‘giro neurocognitivo’ de la moralidad. Entre la neuroética y el neuroderecho”, *Ius et scientia*, 2(2), 235-248. <https://revistascientificas.us.es/index.php/ies/article/view/13243/11414>
- GUAPULEMA OCAMPO, M.C., PALATE SILVA, D.C., GUERRERO LARA, S.I. and CARRERA MEDINA, S.E. (2025). “El concepto de justicia en la era digital: Cómo las teorías clásicas de la justicia se aplican (o no) a problemas actuales como la brecha digital y el acceso a la información”. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades*, 6(1), 2443-2452. <https://doi.org/10.56712/latam.v6i1.3508>
- IENCA, M. and ANDORNO, R. (2017). “Towards new human rights in the age of neuroscience and neurotechnology”. *Life sciences, society and policy*, 13(5), 1-27. <https://doi.org/10.1186/s40504-017-0050-1>
- IENCA, M. (2021). “On neurorights”, *Frontiers in Human Neuroscience*, 15, 1-11. <https://doi.org/10.3389/fnhum.2021.701258>
- JOVE VILLARES, D. and PRESNO LINERA, M.A. (2025), “La salud en el entorno digital europeo”, *Cuadernos Constitucionales*, 6, 83-107. <https://doi.org/10.7203/cc.6.31339>
- LLAMAS, N.E. and MARINARO, J.A. (2021). “Neuroderecho: adaptabilidad de la normativa de derechos humanos con relación a las nuevas neurotecnologías y propuestas para su ampliación”, *SCIO: Revista de Filosofía*, 21, 83-111. [https://doi.org/10.46583/scio\\_2021.21.825](https://doi.org/10.46583/scio_2021.21.825)

- LLANO ALONSO, F. (2024). *Homo ex Machina. Ética de la inteligencia artificial y Derecho digital ante el horizonte de la singularidad tecnológica*, Valencia: Tirant lo Blanch.
- LOCKE, J. (1999). *Ensayo sobre el entendimiento humano*, translated by E. O’Gorman, 2ª ed. México: Fondo de Cultura.
- LÓPEZ-SILVA, P. and MADRID, R. (2021). “Sobre la conveniencia de incluir los neuroderechos en la Constitución o en la ley”, *Revista chilena de derecho y tecnología*, 10(1), 53-76. <https://doi.org/10.5354/0719-2584.2021.56317>
- LÓPEZ-SILVA, P. and MADRID, R. (2022). “Acerca de la protección constitucional de los neuroderechos: la innovación chilena”, *Prudentia Iuris*, 94, 39-68. <https://repositorio.uca.edu.ar/bitstream/123456789/15662/1/acerca-protecci%c3%b3n-constitucional.pdf>
- MIRANDA GONÇALVES, R. (2025). “La batalla legal de los neuroderechos: ¿nuevos Derechos Humanos o reinterpretación de los derechos ya consolidados?”, *Cuadernos Electrónicos de Filosofía del Derecho*, 54, 118-144. <https://doi.org/10.7203/CEFD.54.30593>
- MIRAUT MARTIN, L. (2023). *La formulación jurídica del libre desarrollo de la personalidad*. Madrid:Dykinson.
- MUÑOZ, J.M. (2023). "Neuroethics", *Encyclopedia Britannica*. <https://www.britannica.com/topic/neuroethics>
- OECD. (2019). *Recommendation on Responsible Innovation in Neurotechnology*. Disponible en: <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0457>
- PÉREZ GONZÁLEZ, D.E. (2023). *Estatuto jurídico del testamento vital*. Coruña: Colex.
- PÉREZ GONZÁLEZ, D.E. (2025). “Implicaciones de la Inteligencia Artificial en la realización del contenido normativo del derecho a la salud”, *Cuadernos Electrónicos de Filosofía del Derecho*, 54, 179-206. <https://doi.org/10.7203/CEFD.54.32054>

- PLÁ HERRERO, M.T. (2025). “Neuroderechos: relevancia jurídica y regulación a través de Derecho comparado”, *Cuadernos de Derecho Transnacional*, 17(1), 631-653. <https://doi.org/10.20318/cdt.2025.9346>
- POEPPEL, T.D. and KRAUSE, B.J. (2008). “Functional imaging of memory processes in humans: Positron emission tomography and functional magnetic resonance imaging”, *Methods*, 44 (4), 315–328. <https://doi.org/10.1016/j.ymeth.2007.02.017>
- RAYÓN BALLESTEROS, M.C. (2026). “Protecting the mind in the age of neurotechnologies: Spain faces the challenge of neurorights”, en A.M. D’Ávila Lopes, M.C. Rayón Ballesteros, T. Fukushi (Eds.), *Challenges for the regulation of neurotechnology companies*, Porto Alegre: Livraria do advogado editora, 85-100.
- RECHE TELLO, N. (2024). *Mens iura fundamentalia: la neurotecnología ante la constitución*. Coruña: Colex.
- REGUERA ANDRÉS, M.C. and CAYÓN DE LAS CUEVAS, J. (2021). “La garantía de los neuroderechos: a propósito de las iniciativas emprendidas para su reconocimiento”, *Derecho y Salud*, 31 Ext., 213-222. <http://hdl.handle.net/10902/24910>
- REGULATION (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). *Official Journal of the European Union*, L 119, 1–88. Available at: <http://data.europa.eu/eli/reg/2016/679/oj>
- REGULATION (EU) 2025/327 of the European Parliament and of the Council of 11 February 2025 on the European Health Data Space and amending Directive 2011/24/EU and Regulation (EU) 2024/2847. *Official Journal of the European Union*, L 327, 1–96. Available at: <http://data.europa.eu/eli/reg/2025/327/oj>
- ROLLNERT LIERN, G. (2024). *Los neuroderechos y la libertad de pensamiento*. Madrid: Dykinson.
- SANROMÁN ARANDA, R. (2023). “La Inteligencia Artificial: su alcance y falta de regulación jurídica y ética”, *Quaestio Iuris*, 16(4), 2314-2333. <https://doi.org/10.12957/rqi.2023.75222>

- SARMIENTO-PESÁNTEZ, M.M., ANDRADE-MOLINA, M.C., AGUIRRE QUEZADA, M.A. and VÁZQUEZ-VILLAVICENCIO, R.V. (2024). *Salud digital: Un nuevo paradigma en la salud impulsado por la tecnología, la educación y el derecho*. Editorial Latinoamericana de Investigación Contemporánea REDLIC. <https://doi.org/10.58995/lb.redlic.39>
- SENTENTIA, W. (2004). “Neuroethical considerations: cognitive liberty and converging technologies for improving human cognition”, *Annals of the New York Academy of Sciences*, 1013(1), 221-228. <https://doi.org/10.1196/annals.1305.014>
- SUNBLAD, G.M. and SALAYA KALIEROF, R. (2025). “Neuroderechos: Desafíos éticos y normativos en la era digital”. *Quaderns IEE*, 4(2), 112-141. <https://doi.org/10.5565/rev/quadernsiec.109>
- UNESCO. (2023). *Preliminary study on the technical and legal aspects relating to the desirability of a standard-setting instrument on the ethics of neurotechnology*. <https://unesdoc.unesco.org/ark:/48223/pf0000385016>.
- UNESCO. (2025). *Draft recommendation on the ethics of Neurotechnology*. Paris: United Nations Educational, Scientific and Cultural Organization. Disponible en: <https://unesdoc.unesco.org/ark:/48223/pf0000394866>.
- VALENZUELA CORALES, M.A. (2022). “Neuroderechos: hacia una fundamentación filosófica”, *Encuentros. Revista de Ciencias Humanas, Teoría Social y Pensamiento Crítico*, 16, 374-391. <https://doi.org/10.5281/zenodo.6917081>
- VELASCO CABALLERO, F. (2026). “Metodología para el derecho de la neurotecnología”, *Revista de Derecho Público: Teoría y Método*, 13. 109-154. [https://doi.org/10.37417/RDP/vol\\_13\\_2026\\_3297](https://doi.org/10.37417/RDP/vol_13_2026_3297)
- WALKER SILVA, N. and ROJAS AGUILERA, J. (2023). “Neuroderechos un intento de protección jurídica a las personas frente al uso de neurotecnologías”, *Revista de direito sanitario*, 23(1), e0014. <https://doi.org/10.11606/issn.2316-9044.rdisan.2023.194202>
- WORLD HEALTH ORGANIZATION. (2021). *Global strategy on digital health 2020-2025*. <https://www.who.int/publications/i/item/9789240020924>
- YUSTE, R., GOERING, S., et al. (2017). “Four ethical priorities for neurotechnologies and AI”. *Nature*, 551, 159-163. <https://www.nature.com/articles/551159a>

- YUSTE, R., GENSER, J. and HERRMANN, S. (2021). “It’s time for neurorights”. *Horizons: Journal of International Relations and Sustainable Development*, 18, 154-164. <https://www.jstor.org/stable/48614119>.
- YUSTE, R. (2025a). “Neurotecnología y neuroderechos”, en M.E. Casas Baamonde (Dir.), *Derecho y tecnologías*. Madrid: Ed. Centro de Estudios Ramón Areces, 719-725.
- YUSTE, R. (2025b). *Neuroderechos. Un viaje hacia la protección de lo que nos hace humanos*. Barcelona:Paidós.

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