*Page: 2111-2144* *URL: www.lijdlr.com*

LAWFOYER INTERNATIONAL JOURNAL OF DOCTRINAL LEGAL RESEARCH

ISSN: 2583-7753

# LawFoyer International Journal of Doctrinal Legal Research

**[ISSN: 2583-7753]**

**Volume 4 | Issue 2**

**2026**

*DOI: https://doi.org/10.70183/lijdlr.2026.v04.233*

# NEURO-RIGHTS AND CRIMINAL RESPONSIBILITY: RETHINKING MENS REA, MENTAL PRIVACY, AND CULPABILITY IN THE AGE OF BRAIN–COMPUTER INTERFACES

**Dr. Santosh Sati**[1]

## I. ABSTRACT

*The accelerating development of neurotechnology encompassing Brain Computer Interfaces (BCIs), neural implants, deep brain stimulation systems, and brain-signal decoding algorithms poses transformative yet profoundly disruptive challenges to the conceptual architecture of criminal law. The doctrines of mens rea, voluntary conduct, and individual culpability have historically presupposed an autonomous mental agent whose cognitive processes remain unmediated by external technological intervention. Contemporary neurotechnology undermines this presupposition by enabling real-time recording, computational interpretation, and deliberate modulation of neural activity fundamentally destabilizing the causal relationship between cognition and conduct upon which criminal accountability is premised. This article advances two interrelated arguments. First, Indian criminal jurisprudence, primarily codified in mid-nineteenth-century legislative instruments, lacks adequate doctrinal mechanisms to adjudicate liability in circumstances involving technologically induced neural compromise. Second, mental privacy is conceived as the right to cognitive sovereignty over one's thoughts, neural data, and mental states must be recognized as a constitutionally distinct fundamental right that transcends conventional informational privacy, extending protection to the neurobiological substratum of consciousness itself. Through systematic doctrinal analysis of criminal law principles and constitutional jurisprudence, the article identifies critical lacunae in existing legal frameworks and articulates a normative model for the attribution of criminal liability in cases of technologically*

[1] Assistant Professor & Programme Coordinator (LL.B.) at IMS Law College, Noida (India). Email: santosh.sati@imsnoida.com

 (ISSN: 2583-7753)

*mediated cognition. The study contributes original scholarship to Indian legal literature by rigorously situating neuro-rights within the constitutional framework of dignity, liberty, and autonomy, offering a prospective model essential to preserving the moral integrity of criminal justice in the neurotechnological era.*

## II. KEYWORDS

Neuro-Rights, Brain–Computer Interfaces, Mens Rea, Mental Privacy, and Criminal Responsibility.

## III. INTRODUCTION: NEUROTECHNOLOGY AND THE CRISIS OF CRIMINAL RESPONSIBILITY

Criminal law is constructed upon an epistemological assumption so foundational as to rarely require articulation: that human beings are autonomous agents, possessed of minds capable of forming intentions, exercising volition, and initiating conduct through processes originating entirely within the self.[2] Every pillar of criminal liability from actus reus to mens rea, from voluntariness to culpability derives its normative coherence from this presumption of mental sovereignty.[3] Yet this foundational premise now confronts an unprecedented technological challenge. Brain Computer Interfaces, neural implants, deep brain stimulation devices, and sophisticated brain-signal decoding systems have transitioned from speculative science into clinical and commercial reality, enabling extraordinary access to and systematic alteration of the neural substrates underlying human thought and behavior.[4]

---

[2] Teubner, G. (2017). How the law thinks: toward a constructivist epistemology of law. In *Legal Theory and the Social Sciences* (pp. 205-235). Routledge.

[3] Hashmi, M. A. I., Butt, M. F., Jawad, M., & Sultan, S. (2025). Criminal Liability in the Age of Autonomous Systems: Rethinking Mens Rea and Actus Reus. *The Critical Review of Social Sciences Studies*, *3*(3), 290-303.

[4] D. M. de Brito Fonseca, *Brain-Computer Interfaces and the Decoding of Thoughts as Personal Data of the Mind* (master's Thesis, Universidade NOVA de Lisboa, Portugal, 2023).

The therapeutic promise of these technologies is considerable and well-documented. BCIs restore communicative capacity to individuals with motor neuron disease and locked-in syndrome; deep brain stimulation alleviates treatment-resistant psychiatric disorders including depression and obsessive-compulsive disorder; neural prosthetics enable individuals with severe paralysis to operate robotic limbs through cognitive command alone.[5] Yet the identical technologies that restore agency to some individuals hold the capacity to systematically compromise the autonomy of others. When neural activity can be computationally decoded prior to its crystallization into conscious awareness, when behavioral impulses may be modulated by externally administered electromagnetic signals, and when the boundary between endogenous cognition and exogenous technological intervention becomes increasingly porous, the conceptual architecture of criminal responsibility is subjected to profound strain.[6]

Indian criminal jurisprudence, codified principally in the BNS, 2023, operates within conceptual parameters established during the mid-Victorian era. While legislative and judicial evolution has extended the law's reach to address mental illness, automatism, and various modalities of incapacity, the existing framework was neither designed nor adapted to address scenarios in which neural processes themselves become sites of deliberate or inadvertent technological intervention.[7] The mental element traditionally required for criminal liability presupposes internal causation: that intention, knowledge, and volition originate wholly within the accused's autonomous cognitive architecture.[8] Neurotechnology disrupts this foundational presumption by introducing external

---

[5] R. Gadot et al., "Efficacy of Deep Brain Stimulation for Treatment-Resistant Obsessive-Compulsive Disorder: Systematic Review and Meta-Analysis" 93 *Journal of Neurology, Neurosurgery & Psychiatry* 1166 (2022).

[6] Liane Young et al., "Disruption of the Right Temporoparietal Junction with Transcranial Magnetic Stimulation Reduces the Role of Beliefs in Moral Judgments" 107 *Proceedings of the National Academy of Sciences* 6753 (2010)

[7] K.D. Gaur, *Textbook on Indian Penal Code* 65-72 (Universal Law Publishing, New Delhi, 7th edn., 2020)

[8] Ilaria Zampieri, *The Troubled Relationship Between Neuroscience and Criminal Responsibility: An Overview and Case Study* (Ph.D. Thesis, IMT School for Advanced Studies Lucca, 2022).

causation directly into the domain of cognition generating what this article terms "technologically compromised mens rea.[9]"

This doctrinal inadequacy transcends theoretical abstraction. Judicial bodies in multiple jurisdictions have already encountered cases in which neural implants appeared to influence criminally relevant conduct, in which neuroimaging evidence was deployed to contest or support assertions of diminished capacity, and in which forensic neuroscience was introduced to complicate conventional assessments of culpability.[10] As neurotechnology becomes progressively embedded in medical, commercial, and potentially forensic contexts, Indian criminal law must develop principled doctrinal frameworks capable of responding to these challenges without abandoning the moral architecture upon which the entire edifice of punishment rests.[11]

Beyond the question of criminal responsibility lies a coordinated challenge of constitutional magnitude: whether mental privacy the right to cognitive sovereignty over one's thoughts, neural data, and mental processes should be recognized as a distinct fundamental right. The Supreme Court of India's landmark recognition of privacy as a fundamental right under Article 21 acknowledged the significance of informational privacy, bodily integrity, and decisional autonomy.[12] However, that judgment did not contemplate the unique vulnerabilities generated by technologies capable of accessing the neural correlates of thought itself, and its doctrinal architecture does not adequately encompass the specific harm that neurotechnology poses to cognitive sovereignty.

---

[9] Sadia Khan, Daniel Cole and Hamid Ekbia, "Autonomy and Free Thought in Brain-Computer Interactions: Review of Legal Precedent for Precautionary Regulation of Consumer Products" 15(1) *UC Law Science and Technology Journal* 95 (2024).
[10] G.M. Gkotsi and J. Gasser, "Neuroimaging in Criminal Trials and the Role of Psychiatrists Expert Witnesses: A Case Law Perspective" 65 *International Journal of Law and Psychiatry* 44 (2019)
[11] A. Bigenwald and F. Chambon, "Criminal Responsibility and Neuroscience: No Revolution Yet" 10 *Frontiers in Psychology* 1406 (2019)
[12] Aditya Singh, "Right to Privacy under Article 21: Expanding Horizons of Life and Personal Liberty" SSRN Electronic Journal, SSRN Abstract ID 5553959 (2025), available at SSRN.

This article proceeds in eight parts. Part II establishes the technical parameters of neurotechnology and articulates its legal relevance. Part III examines classical criminal law doctrines governing mens rea, voluntariness, and free will. Part IV analyzes the mechanisms through which neuro-intervention erodes these foundational concepts. Part V develops the constitutional case for mental privacy as a fundamental right grounded in dignity and autonomy. Part VI addresses the allocation of criminal liability in contexts involving neural manipulation. Part VII proposes a normative and regulatory framework for legal reform. Part VIII concludes with recommendations for preserving moral agency in an era of accelerating neurotechnological development.

### A. Research Objectives

This article seeks to:

1. Examine the extent to which emerging neurotechnologies, including Brain–Computer Interfaces and neural modulation systems, challenge the traditional criminal law doctrines of mens rea, voluntariness, and culpability;
2. Evaluate the adequacy of the existing Indian criminal law framework in addressing technologically mediated cognitive interference;
3. Analyse whether mental privacy and cognitive liberty warrant recognition as constitutionally protected rights under Article 21 of the Constitution of India; and
4. Propose a normative legal framework for allocating criminal responsibility and regulating neurotechnology in a manner consistent with constitutional values of dignity, autonomy, and individual liberty.

### B. Research Questions

The present study addresses the following research questions:

1. How do contemporary neurotechnologies affect the classical criminal law concepts of mens rea, voluntariness, and criminal responsibility?

 (ISSN: 2583-7753)

2. Does the existing Indian criminal law framework adequately address cases involving technologically compromised cognition and decision-making?
3. Should mental privacy and cognitive liberty be recognised as distinct constitutional rights within the ambit of Article 21?
4. What legal and regulatory reforms are necessary to govern neurotechnology while preserving criminal accountability and constitutional protections?

### C. Research Methodology

This study adopts a qualitative doctrinal legal research methodology based primarily on the analysis of constitutional provisions, statutory criminal law, judicial precedents, and contemporary legal scholarship relating to neurotechnology and criminal responsibility. The research further employs a comparative legal approach by examining selected international developments concerning neuro-rights and cognitive liberty, including comparative constitutional and regulatory responses. Relevant interdisciplinary literature from neuroscience, bioethics, and technology law is also examined to evaluate the implications of neurotechnology for existing doctrines of criminal liability and to formulate normative recommendations for legal reform within the Indian constitutional framework.

## IV. UNDERSTANDING NEUROTECHNOLOGY: BRAIN–COMPUTER INTERFACES AND NEURAL MANIPULATION

Neurotechnology encompasses a heterogeneous constellation of devices, algorithms, and techniques that interface directly with the nervous system to record, interpret, or modulate neural activity.[13] Brain–Computer Interfaces represent the most sophisticated category within this spectrum, enabling bidirectional communication between living

[13] Russell J. Andrews, Mushfika Sultana and Serafeim Perdikis, "Neurotechnology: Brain-Computer and Brain-Machine Interfaces" *MedLink Neurology* (7 September 2024)

neural tissue and external computational systems.[14] These technologies vary significantly along multiple dimensions: degree of invasiveness, spatial and temporal resolution, functional scope, and their capacity for cognitive interference, each of which carries distinct legal implications.

Non-invasive BCIs, exemplified by electroencephalography-based systems, record aggregate electrical signals from the scalp surface and translate them into machine-executable commands.[15] While practically useful for constrained applications, their spatial resolution and signal-to-noise characteristics substantially limit their capacity for fine-grained neural decoding. Invasive BCIs, by contrast, require surgical implantation of high-density electrode arrays into cortical tissue, enabling high-resolution recording and targeted stimulation of discrete neural populations.[16] Research platforms developed by emerging neurotechnology corporations have demonstrated the capacity to record from thousands of individual neurons simultaneously, achieving signal fidelity adequate for the decoding of complex behavioral intentions.[17]

Deep brain stimulation constitutes a distinct and legally significant category. Involving the implantation of electrodes within specific subcortical structures to deliver precisely calibrated electrical pulses, DBS was originally developed for the management of movement disorders but has subsequently been extended to psychiatric conditions including treatment-resistant depression, obsessive-compulsive disorder, and addiction. Critically, DBS does not merely record ongoing neural activity actively and continuously

---

[14] Robert M. Rothschild, "Neuroengineering Tools/Applications for Bidirectional Interfaces, Brain–Computer Interfaces, and Neuroprosthetic Implants: A Review of Recent Progress" 3 *Frontiers in Neuroengineering* 112 (2010).
[15] Dennis J. McFarland and Jonathan R. Wolpaw, "EEG-Based Brain–Computer Interfaces" 31 *Current Opinion in Biomedical Engineering* 1 (2017)
[16] Mark Hettick, Elton Ho, Adam J. Poole, Manuel Monge, Demetrios Papageorgiou, Kenichi Takahashi et al., "Minimally Invasive Implantation of Scalable High-Density Cortical Microelectrode Arrays for Multimodal Neural Decoding and Stimulation" *Nature Biomedical Engineering* 1 (2025)
[17] T. Chand, V.S. Nair, P.N. Srinivasu & V.J. Kumar, *Prospects and Challenges in Decoding Consumer Behavior Using Neurotechnology*, in Artificial Intelligence Applications for Brain–Computer Interfaces 161, 161–182 (2025).

modulates neural circuit dynamics, including those subserving mood regulation, motivational processing, impulse inhibition, and higher-order decision-making.[18] This distinction between observation and intervention is of fundamental legal significance.

Neural decoding technologies employ machine learning architectures to identify and interpret patterns within neural activity signals, inferring cognitive states, conscious intentions, or sensory experiences that the individual may not have chosen to communicate externally. Advanced systems have demonstrated the capacity to decode imagined or subvocalized speech, to reconstruct visual perceptions from cortical activity alone, and to predict discrete behavioral choices several seconds prior to the subject's conscious awareness of those decisions. This capacity to access pre-conscious neural processing raises profound questions regarding the temporal and epistemic boundaries of intention formation and the very nature of autonomous decision-making.

The legal significance of these technologies resides not in their therapeutic applications per se, but in their potential for cognitive surveillance, external behavioral modulation, and involuntary intervention.[19] Three scenarios are particularly challenging for existing legal categories. Non-consensual neural decoding may extract information regarding mental states, intentions, or knowledge without the individual's awareness or consent potentially enabling involuntary self-incrimination or facilitating predictive interventions predicated on pre-criminal neural signatures. Behavioral modulation through targeted neural stimulation may alter decision-making processes, impulse regulation, or emotional responses in ways that compromise genuine voluntariness without eliminating conscious experience. Algorithmic behavioral prediction based on decoded neural data may create pressure for preventive legal intervention before the

---

[18] Alana Arrouet, Jennifer Chandler, Steven Laureys and Roxane S. Hoyer, "The Brain's Moral Cascade: Large-Scale Brain Networks Dynamics During Norm-Guided Decision" SSRN Electronic Journal, SSRN Abstract ID 6144866 (2026), available at SSRN

[19] S. Ligthart, G. Meynen & D. Thomas, *Persuasive Technologies and the Right to Mental Liberty: The 'Smart' Rehabilitation of Criminal Offenders*, in **The Cambridge Handbook of Information Technology, Life Sciences and Human Rights** (2022).

commission of any overt act, raising the troubling prospect of liability predicated on neural predispositions rather than conduct.[20]

These scenarios diverge in important respects from the traditional categories of incapacity. An individual whose deep brain stimulator malfunctions or is deliberately manipulated by a third party may remain fully conscious, cognitively coherent, and apparently purposive in their conduct yet the causal antecedents of their behavioral impulses may be partially or wholly external to their autonomous agency. Existing criminal law defenses insanity, automatism, and involuntary intoxication presupposes either complete cognitive incapacity or voluntary consumption of impairing substances. They are structurally incapable of addressing the intermediate and novel condition in which cognitive capacity remains formally intact while cognitive autonomy is substantively compromised.[21]

## V. CLASSICAL CRIMINAL LAW DOCTRINE: FREE WILL, VOLUNTARINESS, AND MENS REA

Criminal liability in common law jurisdictions, including India, rests upon the conjunction of two essential elements: actus reus, denoting the proscribed conduct or its legally cognizable consequences, and mens rea, denoting the requisite mental state accompanying that conduct. This dual requirement reflects a foundational moral principle: that the imposition of criminal punishment is justified only where an individual has voluntarily engaged in wrongful conduct while possessed of a culpable mental state. The Supreme Court of India has consistently affirmed that mens rea

[20] Amnon Reichman & Giovanni Sartor, *Algorithms and Regulation*, in Constitutional Challenges in the Algorithmic Society 131, 131–181 (Hans-W. Micklitz, Oreste Pollicino, Amnon Reichman, Andrea Simoncini, Giovanni Sartor & Giovanni De Gregorio eds., Cambridge University Press, 2021).
[21] Laszlo Pokorny, *The Demonic Defense: A Forensic-Legal Analysis of Possession Claims in Criminal Proceedings Through the Psychopossession Framework* (Doctoral Dissertation, ICL Institute, 2026), DOI: 10.5281/zenodo.18263751

constitutes an essential ingredient of criminal liability, absent explicit statutory displacement.[22]

The concept of mens rea encompasses a graduated hierarchy of mental states intention, knowledge, recklessness, and criminal negligence each calibrated to reflect a different degree and quality of moral blameworthiness.[23] Under the Bharatiya Nyaya Sanhita (BNS), 2023, the provisions governing culpable homicide, causing grievous hurt, and numerous other offences require either intention to produce the prohibited consequence or knowledge that such consequence is substantially likely. This graduated architecture of culpable mental states presupposes that individuals possess the cognitive capacity to anticipate consequences, deliberate regarding prospective conduct, and exercise volitional judgment capacities whose integrity is assumed to be unaffected by external technological intervention.

Voluntariness functions as a logically prior precondition to the assessment of mens rea. A physical movement that occurs in the absence of a functioning will whether through reflex action, convulsion, or movement during unconsciousness cannot ground criminal liability regardless of the harm it produces.[24] This requirement ensures that criminal punishment attaches only to conduct that genuinely expresses the agency of a moral subject, rather than to physical events that merely bear a causal relationship to harm. In the absence of voluntary conduct, there is simply no act in the legally cognizable sense.

Indian criminal law recognizes several defensive doctrines premised on compromised mental capacity or absence of voluntariness. Section 22 of the Bharatiya Nyaya Sanhita (BNS), 2023 exculpates an accused who, at the time of the alleged offence, was by reason of unsoundness of mind incapable of knowing the nature of the act or that the act was

---

[22] R.S. Rudr, *Mens Rea and the Fine Line Between Culpable Homicide and Murder: Revisiting Legislative Intent vs. Judicial Activism*, 2(2) Motherhood International Journal of Research & **Innovation** 117 (2025).
[23] Daryna Byelikova, *The Notion of Criminal Intent: The Evolution of Mens Rea in Criminal Law* (Bachelor of Arts – Criminal Justice (Honours) Thesis, Mount Royal University, Apr. 2, 2019).
[24] I. Dulcu, *Automatism and Voluntariness: Towards a New Framework for Assigning Criminal Responsibility* (Doctoral Dissertation, University of Sussex, 2021).

either wrong or contrary to law. This provision, whose conceptual lineage traces to the M'Naghten Rules articulated by the House of Lords in 1843, requires a complete incapacity with respect to the nature or moral quality of the act.[25] Partial cognitive impairment, diminished capacity, or compromised volition unaccompanied by total cognitive incapacity falls outside the provision's ambit.

Section 23 of the Bharatiya Nyaya Sanhita (BNS), 2023 provides a defence where intoxication, administered against an individual's will or without their knowledge, produces incapacity equivalent to unsoundness of mind. The doctrine of automatism, while not expressly codified, has received judicial recognition in India as negating the voluntary character of conduct. Automatism encompasses states of unconscious, involuntary movement during which the individual's conscious will does not govern the body's actions, including states produced by epileptic episodes, somnambulism, or concussive conditions.[26]

These existing doctrines share a structural limitation of direct relevance to the neurotechnological challenge. They presuppose that incapacity, involuntariness, or cognitive impairment originates from one of three sources: internal pathological conditions such as mental illness; external chemical substances voluntarily consumed; or physiological dysfunction of neurological origin. None of these doctrines contemplate, nor is it structurally equipped to accommodate, the possibility that external technological intervention may alter neural processes in ways that compromise the authenticity of cognition and volition while preserving their outward phenomenological character.

The conceptual challenge posed by deep brain stimulation serves to illuminate the scope of this inadequacy. An individual with a DBS implant targeting neural circuits implicated in affective regulation may experience altered impulse control, heighten aggressive

[25] Stephen P. Garvey, "Agency and Insanity", 66(1) Buffalo Law Review 123, 123–191 (2018).
[26] Ioana Dulcu, *Automatism and Voluntariness: Towards a New Framework for Assigning Criminal Responsibility* (Ph.D. Thesis, University of Sussex, 2021)

ideation, or diminish moral inhibition as a consequence of improper device calibration or deliberate external manipulation.[27] Yet such an individual remains conscious, comprehends the nature of their conduct, and displays all outward characteristics of purposive action. The insanity defence is unavailable because cognitive incapacity is not established. The automatism doctrine is inapplicable because consciousness is retained. The result is a doctrinal lacuna of significant proportions.

The classical framework further presupposes clear temporal and causal boundaries: intentions form within the mind, volition translates intention into action, and voluntary acts produce consequences in the external world. Neural decoding technology destabilizes these boundaries by accessing pre-conscious neural activity that precedes and may diverge from consciously accessible intentional states.[28] If decoded neural data reveals behavioral predispositions of which the individual is not yet consciously aware, it becomes deeply uncertain which mental state the unconscious neural pattern or the conscious intention that may or may not subsequently emerge is the appropriate object of legal attribution. These are not peripheral anomalies susceptible to resolution through doctrinal extension; they reflect a structural incompatibility between classical criminal law theory and the realities of neurotechnological intervention.

## VI. NEURO-INTERVENTION AND THE EROSION OF MENS REA

The fundamental challenge posed by neurotechnology to criminal responsibility lies in its capacity to fragment, displace, or redistribute the mental states that law has traditionally attributed exclusively to individual human agents. This section analyses three analytically distinct dimensions of this erosion: the fragmentation of unified

[27] Andreas Horn & Wolf-Julian Neumann, "From Adaptive Deep Brain Stimulation to Adaptive Circuit Targeting", 21(10) *Nature Reviews Neurology* 556–566 (2025). DOI: 10.1038/s41582-025-01131-5.
[28] Anthony Mahabir, *Discrete States of Consciousness: An Inquiry into the Dynamics of Conscious Cognition Based on Neurophysiological Evidence* (master's Thesis, Utrecht University, 2015)

intentional states, the displacement of endogenous by exogenous causation, and the emergence of hybrid human-technological agency as a novel subject of legal analysis.[29]

### A. The Fragmentation of Intentional Mental States

Classical criminal law presupposes a unified, coherent mental state that may be characterised as intention, knowledge, or recklessness a single identifiable orientation of the mind toward the conduct and its consequences. Contemporary neuroscience, however, reveals that what subjective experience presents as unified consciousness is in fact an emergent property of distributed neural processes operating across multiple anatomically and functionally distinct brain systems, frequently with significant temporal gaps between unconscious neural processing and conscious phenomenal awareness. Technological interventions can selectively alter discrete components of this distributed processing architecture without commensurately affecting others, producing fragmented or internally inconsistent mental configurations that resist categorisation within existing legal taxonomies.

Consider the paradigmatic scenario of deep brain stimulation targeting reward-processing circuits for the treatment of refractory addiction. Stimulation parameters calibrated to suppress craving-related neural activity may simultaneously and inadvertently alter risk assessment, impulsivity regulation, or temporal discounting processes—cognitive dimensions that the individual may lack introspective access to detect. Where such an individual subsequently commits an acquisitive offence, the legal attribution of intentionality becomes genuinely problematic.[30] The individual's conscious deliberative processes may endorse the decision in question, yet the motivational architecture underlying that decision may have been technologically reconfigured in

---

[29] Elizabeth Shaw, "Neuroscience, Criminal Sentencing, and Human Rights", **63(4)** ***William & Mary Law Review*** **1409, 1409–1443 (2022)**

[30] Albert J. Fenoy, Joao Quevedo & Jair C. Soares, "Deep Brain Stimulation of the 'Medial Forebrain Bundle': A Strategy to Modulate the Reward System and Manage Treatment-Resistant Depression", **27(1)** ***Molecular Psychiatry*** **574, 574–592 (2022)**. DOI: **10.1038/s41380-021-01100-6**.

ways that compromise its authenticity as an expression of genuine autonomous preference.

The legal difficulty is not merely epistemic a question of whether the device in fact influenced the behavior but conceptual: which level of neural processing grounds legal mens rea when lower-level processes are technologically modified while higher-level conscious deliberation remains formally intact? Criminal law has historically treated the mind as an opaque system whose internal operations need not be interrogated, inferring mental states from external conduct, circumstantial context, and the accused expressed account of their own mental processes. Neurotechnology's capacity to open this opaque system reveals internal complexity that existing legal categories are ill-equipped to accommodate.[31]

### B. The Displacement of Internal by External Causation

The doctrine of mens rea presupposes that the criminal intentions, in the legally relevant sense, originate from within the accused's own autonomous mental processes. External coercion may operate to negate voluntariness, but it does so through mechanisms explicit threats or the direct application of force of which the individual is typically consciously aware and to which they consciously respond. Neuro-intervention introduces a qualitatively different modality of external causation: one that operates directly upon neural substrates, potentially without producing any conscious awareness that one's cognitive processes have been externally influenced.[32]

Clinical documentation in European jurisdictions has recorded instances in which individuals with implanted deep brain stimulation devices exhibited substantial alterations in personality, affective regulation, and behavioral control following device activation, reverting to pre-implantation behavioral baselines upon device removal. In

---

[31] Stephen J. Morse, "Actions Speak Louder Than Images: The Use of Neuroscientific Evidence in Criminal Cases", 3(2) *Journal of Law and the Biosciences* 336, 340–342 (2016)
[32] Nicole A. Vincent, Thomas Nadelhoffer & Allan McCay eds., *Neurointerventions and the Law: Regulating Human Mental Capacity* (Oxford University Press, 2020).

such cases, conventional defensive doctrines proved structurally inadequate. The insanity defence could not apply, because the accused retained the capacity to understand the nature and wrongfulness of their conduct. The automatism doctrine was inapplicable, because consciousness and apparent purposiveness were preserved throughout. Yet straightforwardly attributing full moral and criminal responsibility seemed normatively unjustifiable in light of the demonstrable causal contribution of external technological intervention to the conduct in question.[33]

Experimental neuroscience has further demonstrated that non-invasive techniques such as transcranial magnetic stimulation can transiently impair the neural substrates of moral judgment, harm aversion, and behavioral inhibition without producing any conscious phenomenological experience of impairment. The principle established by such evidence is profound: external electromagnetic intervention can modulate the neural processes underlying moral cognition and behavioral decision-making without the individual's awareness that their judgment has been compromised. When the causal source of a criminal intention lies wholly or substantially outside the accused's autonomous mental processes, the moral foundations of individual criminal responsibility are necessarily called into question.[34]

Philosophical accounts of autonomous agencies converge in requiring that actions genuinely flow from desires, values, and intentions that the agent authentically endorses upon reflective consideration intentions that are in some meaningful sense truly their own.[35] When neural processes are externally reconfigured, the condition of authenticity is fundamentally compromised. An individual may consciously endorse an intention in

---

[33] Laura Klaming & Pim Haselager, "Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence", 6(3) *Neuroethics* 527, 527–539 (2013)

[34] Dov Greenbaum, "Unraveling Ethical Complexities: Transcranial Magnetic Stimulation (TMS) in Non-clinical Settings and the Dilemmas of Neuroenhancement", in Veljko Dubljević & Jonathan R. Young eds., *TMS and Neuroethics* 91, 91–119 (Springer Nature Switzerland, Cham, 2025)

[35] Markus Schlosser, "Agency", in Edward N. Zalta ed., *The Stanford Encyclopedia of Philosophy* (Fall 2015 edn., Metaphysics Research Lab, Stanford University, 2015).

good faith, yet that very intention may have been technologically induced or substantially shaped by external intervention. The law's challenge is to develop principled mechanisms for distinguishing authentic from technologically induced or distorted intentions under conditions in which neurotechnology has rendered that boundary increasingly difficult to identify.[36]

### C. Hybrid Human-Technological Agency

The most conceptually challenging scenario for existing legal frameworks involves what this article designates "hybrid agency": situations in which criminally relevant conduct results from complex interactive causal dynamics between human deliberation and autonomous technological systems, such that neither can be meaningfully identified as the sole or primary causal author of the outcome.

Closed-loop BCI systems represent the paradigmatic instance of this challenge. Such devices continuously monitor decoded neural signatures and dynamically adjust stimulation parameters in real time based on algorithmically identified patterns. A device calibrated to suppress neural signatures associated with aggressive behavioral propensities might through malfunction, inadequate programming, or deliberate manipulation inadvertently amplify those very propensities. Criminal conduct following such a malfunction would be attributable neither to purely human agency nor to purely technological causation, but to a complex and potentially indeterminate interaction between the two. The causal contribution of each cannot be cleanly separated.

Existing legal frameworks for causal attribution in criminal law operate on the premise that responsibility can be traced backward through causal chains to identify responsible human agents, with technological systems serving as instruments rather than contributors to agency. Neurotechnology, by integrating directly with cognitive

[36] alya Deibel, "Demarcation Problems in Law and Neurotechnology: Persons, Cyborgs and Neurohackers", **39(3) *International Review of Law, Computers & Technology* 406, 406–425 (2025)**

processes, dissolves this instrumental distinction.[37] The problem is analytically distinct from challenges posed by autonomous systems in other legal domains, such as self-driving vehicles, because vehicle automation replaces human cognitive decision-making from the outside while remaining external to it; neural intervention operates from within the cognitive process itself, rendering causal attribution fundamentally more complex and contested. A more adequate response would require developing frameworks for distributed responsibility that can allocate culpability across multiple contributing factors human volition, technological influence, and system design while preserving the principle that criminal punishment requires individual moral blameworthiness.[38]

## VII. MENTAL PRIVACY AND COGNITIVE LIBERTY: TOWARDS A NEW FUNDAMENTAL RIGHT

Beyond questions of criminal liability lies a challenge of coordinate constitutional magnitude: whether individuals possess a fundamental right to mental privacy, conceived as cognitive sovereignty over their thoughts, neural data, and mental processes. This section argues that mental privacy constitutes a distinct fundamental right whose recognition is essential to the protection of human dignity and autonomy in the neurotechnological era, and that this right requires constitutional articulation beyond the existing framework of informational privacy.[39]

### A. The Insufficiency of Existing Privacy Doctrine

The Supreme Court's recognition of privacy as a fundamental right under Article 21, while constituting a watershed development in Indian constitutional jurisprudence, does not adequately address the distinctive vulnerabilities created by neurotechnology. The

---

[37] Laura Y. Cabrera & Jennifer Carter-Johnson, "Emergent Neurotechnologies and Challenges to Responsibility Frameworks", 54 *Akron Law Review* 1, 10–23 (2021)
[38] Sabine Gless, Emily Silverman & Thomas Weigend, "If Robots Cause Harm, Who Is to Blame? Self-Driving Cars and Criminal Liability", 19(3) *New Criminal Law Review* 412, 412–436 (2016)
[39] Patrick Chukwunonso Aloamaka, Peter O. Itsueli & Micheal O.I. Nwabuoku, "The Right to Cognitive Liberty: Protecting Mental Privacy in the Age of Neurotechnology", 17(2) *Cogito: Multidisciplinary Research Journal* 98, 98–121 (2025

privacy doctrine as currently elaborated focuses primarily on informational privacy, bodily integrity, and decisional autonomy categories that, while expansive, are structurally ill-suited to the unique harms that neural access and manipulation generate.

Neural data differs from conventional categories of personal information in at least three respects of constitutional significance. First, it provides access to mental content and pre-conscious cognitive processes that individuals may neither recognize nor intend to disclose. Informational privacy, as conventionally understood, protects data that individuals knowingly generate or provide in the course of their activities. Neural decoding can extract information about intentions, emotional states, memories, and deliberative processes that exist below the threshold of conscious awareness, and over which individuals have exercised no conscious control. Meaningful consent to such disclosure is structurally impossible because the individual lacks awareness of the content being disclosed.[40]

Second, neural data is identity-constitutive in ways that distinguish it categorically from other forms of personal information. Medical records, financial data, and location information describe contingent aspects of an individual's life history and circumstances.[41] Neural activity patterns constitute the physical substrate of consciousness, cognition, and personal identity as such. Access to neural data is access to the material foundation of mental life to the neurobiological processes through which an individual constitutes themselves as a person capable of deliberate self-governance, continuous identity, and autonomous moral agency.

Third, technological manipulation of neural processes threatens autonomy in a manner that is qualitatively distinct from other forms of privacy violation.[42] Informational

---

[40] Wayne Unger, "Stay Out of My Head: Neurodata, Privacy, and the First Amendment", 80(4) *Washington and Lee Law Review* 1439, 1439–1521 (2023)
[41] aurav Das, *Engagement-Constitutive Identity: A Unified Theory of Consciousness Across Substrates* (SSRN Working Paper, 2026)
[42] Daniel Susser, Beate Roessler & Helen Nissenbaum, "Technology, Autonomy, and Manipulation", 8(2) *Internet Policy Review* 1, 1–22 (2019)

privacy violations may enable surveillance, discrimination, or reputational harm; neural manipulation can alter the fundamental cognitive capacities volition, practical judgment, emotional regulation, and value formation that make autonomous agency possible. This extends beyond privacy in any conventional sense to implicate what has been characterized in legal and philosophical literature as "cognitive liberty": the right to self-determination over one's own consciousness and the processes of one's mental life.

### B. Mental Privacy as a Constitutional Fundamental Right

Mental privacy warrants recognition as a fundamental right grounded in the constitutional values of dignity, liberty, and autonomy as elaborated across Indian constitutional jurisprudence. Article 21's protection of life and personal liberty, interpreted expansively across a substantial body of Supreme Court decisions, encompasses not merely physical integrity but the psychological and cognitive dimensions of personhood essential to human flourishing. Human dignity, affirmed across multiple foundational constitutional judgments as the animating value of the rights framework, requires that individuals be treated as autonomous moral subjects capable of rational deliberation and self-governance, rather than as objects of external observation and manipulation. Neural surveillance and manipulation uniquely violate this dimension of dignity by treating the mind itself as an object of external technical inspection and control.[43]

The right to freedom of thought, while not enumerated explicitly in the Constitution's schedule of fundamental rights, has been recognized in judicial interpretation as implicit in the guarantee of freedom of speech and expression. Freedom of thought, however, becomes substantively hollow if thoughts themselves can be technologically accessed, decoded, or reconfigured without the individual's knowledge or consent. Mental privacy

[43] Sjors Ligthart, "Mental Privacy as Part of the Human Right to Freedom of Thought?", in Jan Christoph Bublitz & Marc Jonathan Blitz eds., *The Law and Ethics of Freedom of Thought, Volume 2: Cognitive Liberty, Mental Privacy, and International Law* 191, 191–215 (Palgrave Macmillan, Cham, 2026)

is therefore a necessary precondition for genuine freedom of thought, and its protection is required if freedom of thought is to constitute a meaningful constitutional guarantee rather than a formal abstraction.

Furthermore, the right against self-incrimination, protected under Article 20(3) of the Constitution, has been held by the Supreme Court in Selvi & Ors v. State of Karnataka[44] to protect a sphere of mental privacy against state compulsion. In that judgment, the Court held that involuntary administration of narco-analysis, polygraph examination, and brain-mapping techniques violate Article 20(3) because these methods compel individuals to provide potentially self-incriminating information against their conscious will, thereby forcefully intruding into mental privacy.

The logical extension of this reasoning, combined with the constitutional framework established in Puttaswamy[45], provides a robust jurisprudential foundation for recognizing mental privacy as a freestanding fundamental right with the following minimum content: a presumptive right against non-consensual neural surveillance, a prohibition on cognitive manipulation absent informed consent or compelling therapeutic necessity, a right to cognitive self-determination over neural data, and freedom from technological intrusion into the neural processes underlying thought, deliberation, and value formation.

### C. Comparative and International Dimensions

Before turning to comparative constitutional developments, it is necessary to consider India's domestic statutory framework governing digital personal data. The Digital Personal Data Protection Act, 2023 (DPDPA), read together with the Digital Personal Data Protection Rules, 2025, establishes a comprehensive framework regulating the processing of digital personal data through principles of lawful processing, consent, purpose limitation, data security, and accountability. However, neither the Act nor the

[44] (2010) 7 SCC 263: AIR 2010 SC 1974.
[45] *Justice K.S. Puttaswamy (Retd.) v. Union of India*, (2017) 10 SCC 1, 168–169

Rules expressly recognise neural data, brain signals, or other neurophysiological information as a distinct category warranting enhanced statutory protection. Unlike certain foreign jurisdictions that provide heightened safeguards for particularly sensitive forms of personal information, the Indian framework adopts a unified approach to digital personal data and does not specifically address the unique constitutional concerns arising from neurotechnology, including cognitive liberty, mental privacy, and protection against non-consensual neural surveillance or manipulation.

Consequently, although neural data generated through Brain–Computer Interfaces may fall within the broad definition of digital personal data where it relates to an identifiable individual, the present statutory framework remains inadequate to address the distinctive constitutional risks posed by technologies capable of recording, decoding, or modifying human thought processes. This legislative gap reinforces the need for recognising mental privacy as a distinct constitutional right supplementing, rather than replacing the protections presently available under the DPDPA.

India would not stand alone in affording constitutional recognition to cognitive liberty and mental privacy. The Republic of Chile amended its constitution in 2021 to explicitly protect brain activity and mental integrity, becoming the first state to constitutionalize neuro-rights as a distinct category of fundamental protection, prohibiting the use of neurotechnology to amplify, diminish, or disturb mental integrity without consent.[46]

The European Union's General Data Protection Regulation classifies biometric data as a special category warranting enhanced protection; scholarly and policy discourse across European institutions increasingly advocates extending analogous treatment to neural data given its unique sensitivity.[47] The International Covenant on Civil and Political

[46] Republic of Chile, Law No. 21.383, "Modifica la Carta Fundamental, para establecer el desarrollo científico y tecnológico al servicio de las personas", Diario Oficial, Oct. 25, 2021, amending Constitución Política de la República de Chile, art. 19(1).

[47] Els J. Kindt, "Biometric Data, Data Protection and the Right to Privacy", in *Privacy and Data Protection Issues of Biometric Applications: A Comparative Legal Analysis* 87, 87–272 (Springer, Dordrecht, 2013)

Rights protects freedom of thought and prohibits arbitrary or unlawful interference with privacy, while UNESCO's International Bioethics Committee has called for the recognition of neuro-rights as essential to human dignity. Recognizing mental privacy as a fundamental right under Indian constitutional law would align with these international developments while being firmly rooted in established domestic jurisprudence.

## VIII. CRIMINAL LIABILITY IN CASES OF NEURAL DATA MANIPULATION

### A. The Inadequacy of Existing Defences

As the preceding analysis demonstrates, existing defensive doctrines insanity, automatism, involuntary intoxication presupposes either complete cognitive incapacity or unambiguous involuntariness. Technological manipulation of neural processes produces neither condition in the paradigmatic case. An individual whose cognitive processes are subtly reconfigured by a malfunctioning or compromised neural device may retain full consciousness, comprehend the nature of their conduct, and display every outward characteristic of purposive action, while nonetheless experiencing a substantive compromise of their autonomous agency that none of the established defences are structurally capable of capturing.

The insanity defence under Section 22 of the Bharatiya Nyaya Sanhita (BNS), 2023 requires that the accused, by reason of unsoundness of mind, be incapable of knowing the nature of the act or that the act was either wrong or contrary to law. Most instances of technologically compromised neural function will not satisfy this threshold, because the accused typically retains formal cognitive competence even where their motivational or volitional architecture has been externally altered. The automatism doctrine requires unconscious, involuntary conduct, but neural interventions characteristically preserve consciousness and apparent purposiveness. The doctrine of diminished capacity, which some common law jurisdictions recognise as permitting partial reduction of culpability below the threshold of full insanity, has not been formally incorporated into Indian

criminal law, and even were recognised comparatively, it has been developed to address internal mental pathology rather than external technological intervention.

### B. Towards a Causation-Based Attribution Model

Rather than seeking to accommodate cases of neural compromise within existing defensive categories through strained doctrinal extension, Indian criminal law should develop an explicit causation-based attribution model that formally recognises technological intervention as a potential disruptor of autonomous agency.[48] This model should incorporate several analytically distinct components.

First, where credible scientific evidence establishes that an individual's neural processes were technologically altered at the time of the alleged offence whether through implanted devices, external stimulation, remote interface access, or other means a presumption of compromised voluntariness should arise, shifting to the prosecution the burden of affirmatively establishing that the accused nonetheless possessed sufficient autonomous control to sustain criminal liability.[49] This allocation reflects the principle that punishment requires genuine autonomous agency, and demonstrated technological intervention creates reasonable doubt about such autonomy that affirmative proof should be required to resolve.

Second, the law should recognise graduated standards of culpability reflecting the degree and nature of neural compromise, rather than maintaining a binary distinction between full criminal responsibility and complete exculpation[50]. This approach, analogous to the existing distinctions among murder, culpable homicide, and rash or negligent causing of

---

[48] Hifajatali Sayyed, "Artificial Intelligence and Criminal Liability in India: Exploring Legal Implications and Challenges", 10(1) *Cogent Social Sciences* 2343195 (2024)

[49] See Ioana Dulcu, *Automatism and Voluntariness: Towards a New Framework for Assigning Criminal Responsibility* 40–75 (Ph.D. Thesis, University of Sussex, 2021); Laura Klaming & Pim Haselager, "Did My Brain Implant Make Me Do It? Questions Raised by DBS Regarding Psychological Continuity, Responsibility for Action and Mental Competence", 6(3) *Neuroethics* 527, 527–539 (2013); *Woolmington v. Director of Public Prosecutions*, [1935] AC 462 (HL)

[50] William Hirstein, Katrina L. Sifferd & Tyler K. Fagan, *Responsible Brains: Neuroscience, Law, and Human Culpability* (MIT Press, 2018)

death, would enable proportionate attribution of responsibility in cases where autonomous agency is partially but not wholly displaced by technological factors.

Third, the temporal dynamics of neural interventions are legally relevant. Continuous, chronic interventions that fundamentally and persistently alter baseline neural architecture must be distinguished from acute, transient interventions that temporarily disrupt specific cognitive processes.[51] The law should develop distinct attribution standards for each category, reflecting the different degrees to which each compromises the subject's residual capacity for autonomous judgment.

Fourth, evidentiary standards must require objective, scientifically credible evidence of actual neural compromise including device records, independent medical documentation, and appropriate, neuroimaging data to prevent fabricated or exaggerated claims of technological interference from undermining the integrity of the criminal process.

### C. Allocating Responsibility to Technology Providers

Recognition of technological causation raises the further question of whether criminal or civil responsibility should extend beyond the individual accused to manufacturers, programmers, or institutional deployers of neurotechnology whose systems contributed causally to criminal conduct. Product liability doctrine provides one avenue, subjecting developers to civil liability for design defects, manufacturing defects, or failures to adequately warn of foreseeable risks, including foreseeable risks of compromising user autonomy or facilitating harmful conduct. Criminal liability for technology providers requires satisfaction of more demanding standards: evidence of knowing or reckless contribution to the specific criminal application, rather than merely foreseeable risk in the abstract. A nuanced regulatory framework, combining civil liability exposure with robust administrative oversight, may provide a more proportionate mechanism for

[51] Carol Kershaw & J. William Wade, *Brain Change Therapy: Clinical Interventions for Self-Transformation* (W.W. Norton & Company, 2014)

securing responsible development and deployment than criminal prosecution alone, which risks chilling beneficial therapeutic innovation.

### D. The Danger of Techno-Determinism

While the foregoing analysis argues for formal recognition of technological influence upon criminal agency, law must resist a deterministic approach that treats technological intervention as automatically or comprehensively negating human responsibility. Even where neurotechnology has materially influenced neural processes, individuals typically retain meaningful residual capacity for autonomous deliberation, value-guided judgment, and behavioral self-regulation.

The appropriate legal response is nuanced, case-specific assessment of the nature, degree, and demonstrable behavioral effects of the technological intervention in question not a categorical presumption that any neural device involvement extinguishes culpability. Courts must resist both the temptation to ignore technological causation and the opposite temptation to accord with its automatic exculpatory effect, developing instead principled frameworks for calibrated assessment of residual autonomous agency.[52]

## IX. SUGGESTIONS AND RECOMMENDATIONS

The foregoing analysis demonstrates that the existing Indian legal framework is insufficient to address the constitutional and criminal law challenges posed by emerging neurotechnology's. In light of the identified doctrinal and regulatory gaps, the following suggestions and recommendations are proposed to strengthen the protection of mental privacy, ensure principled attribution of criminal responsibility, and establish an effective legal framework for the governance of neurotechnology in India.

1. **Constitutional Recognition of Mental Privacy:** Mental privacy should be recognized as a fundamental right through authoritative Supreme Court

[52] Stephen J. Morse, "Brain Overclaim Syndrome and Criminal Responsibility: A Diagnostic Note", 3(2) *Ohio State Journal of Criminal Law* 397, 397–412 (2006)

interpretation or, ideally, explicit constitutional amendment. At minimum, this recognition should encompass a right against non-consensual neural surveillance except where authorized by law and strictly necessary for compelling governmental interests subject to proportionality review; a prohibition on cognitive manipulation absent informed consent or therapeutic necessity, with heightened scrutiny for applications involving vulnerable populations; rights of access, correction, and deletion with respect to neural data; and prohibition on commercial exploitation of neural information without meaningful, specific, and freely given consent.

2. **Criminal Law Reform:** Substantive criminal law requires legislative reform to address technologically mediated agencies directly. This should include explicit codification of a neural manipulation defence providing for graduated reduction or elimination of criminal liability where the accused's neural processes were technologically compromised at the time of the alleged offence, with standards calibrated to the extent of demonstrated compromise. Heightened culpability requirements should apply to offences involving neurotechnology deployed in ways that foreseeably compromise autonomy[53]. New specific offences should criminalize unauthorized access to neural data, non-consensual modulation of neural processes, and deployment of neurotechnology for purposes of coercion, exploitation, or behavioral control.

3. **Procedural Safeguards for Neuro-Evidence:** The deployment of neuroscience evidence in criminal proceedings requires robust procedural protection commensurate with its power and its susceptibility to misuse. The prohibition on compelled neural disclosure established in Selvi should be extended to all forms of involuntary neural monitoring, brain-signal decoding, and related techniques.

[53] Marcello Ienca & Roberto Andorno, "Towards New Human Rights in the Age of Neuroscience and Neurotechnology", 13(1) *Life Sciences, Society and Policy* 5, 1–27 (2017)

Strict admissibility standards should require courts to assess rigorously the scientific validity, methodological reliability, and contextual relevance of neuroscience evidence before admission, with particular scrutiny for claims of deception detection or behavioral prediction. Accused persons should have guaranteed access to independent neuroscience expertise to challenge prosecution evidence on equal terms[54]. The use of neural data for predictive risk assessment in sentencing or parole decisions should be prohibited except were supported by robust scientific validation and subject to comprehensive procedural protections.

4. **Regulatory Oversight:** Comprehensive regulatory governance of neurotechnology development and deployment should encompass targeted expansion of medical device regulation to incorporate assessment of autonomy-relevant effects; mandatory ethics review for human subjects' research in neurotechnology; post-market behavioral surveillance mechanisms for deployed neurotechnology; transparent disclosure requirements enabling genuinely informed consent; and international coordination to prevent regulatory arbitrage. Regulatory frameworks must be sufficiently adaptive to remain effective as the technology continues to develop at a pace likely to outstrip conventional legislative responses.

## X. CONCLUSION: PRESERVING MORAL AGENCY IN THE AGE OF NEUROTECHNOLOGY

Criminal law's foundational doctrines mens rea, voluntariness, individual culpability rest upon assumptions regarding the autonomy and integrity of human mental processes that contemporary neurotechnology now systematically challenges. Technologies that enable external access, computational interpretation, and deliberate modulation of neural

[54] Karolina Kiejnich-Kruk, "The Advent of Neurotechnology in Criminal Evidence Proceedings: New Challenges to the Privilege Against Self-Incrimination", 34(1) *European Journal of Crime, Criminal Law and Criminal Justice* 1, 1–25 (2026)

activity disrupt the causal relationship between mind and conduct upon which the entire edifice of moral and legal responsibility is constructed. Traditional defensive doctrines, premised on the categories of insanity, automatism, or involuntary impairment, are structurally incapable of accommodating the intermediate and novel condition in which consciousness and apparent volition are preserved while cognitive autonomy is substantively compromised through external technological intervention.

This article has argued that Indian criminal jurisprudence requires fundamental reform across multiple registers to address these challenges adequately. Recognition of mental privacy as a constitutionally distinct fundamental right, grounded in the values of dignity, liberty, and autonomy, is essential to protecting cognitive sovereignty as access to the neural correlates of thought becomes technologically feasible. Criminal law must develop nuanced doctrinal frameworks for the attribution of responsibility in cases of technologically mediated agency, capable of acknowledging external causal contribution without abandoning the moral principle that punishment requires individual blameworthiness. Procedural rules governing the admission and use of neuro-scientific evidence must be subjected to rigorous scientific and legal scrutiny. Regulatory frameworks must ensure that neurotechnology development proceeds with adequate institutional attention to its implications for human autonomy, dignity, and moral agency.

These reforms are matters of urgent legal necessity, not merely academic anticipation. Neurotechnology is advancing from experimental laboratory settings to clinical deployment and commercial application at a pace that significantly exceeds the adaptive capacity of existing legal frameworks. Judicial bodies will inevitably confront cases involving neural manipulation, cognitive surveillance, and technologically mediated agency without the doctrinal instruments necessary to resolve them coherently and justly. Without principled frameworks adapted to these realities, courts will be compelled to apply nineteenth-century conceptual tools to twenty-first-century conditions—generating legal injustice and doctrinal incoherence in equal measure.

Beyond the specific domain of criminal law, the challenge of neurotechnology raises foundational questions regarding the nature of personhood, the conditions of genuine autonomy, and the requirements of human flourishing in an era of radical technological capability. If thoughts can be decoded, intentions predicted, and cognitive processes externally reconfigured, what remains of the authentic self that law presupposes as the subject of rights and responsibilities? A political community in which mental life is subject to surveillance, in which intentions can be anticipated before they are consciously formed, and in which cognitive processes can be externally modulated cannot sustain the conditions of genuine autonomous deliberation, authentic democratic participation, or meaningful individual dignity that constitutional governance requires. Protecting neuro-rights is therefore not merely a matter of individual entitlement; it is a precondition of the collective conditions necessary for a free society.

Future scholarships must extend the framework proposed here to examine specific applications including forensic neural decoding, civil liability regimes for neural manipulation, international harmonization of neuro-rights protections, and the broader implications of neurotechnology for legal concepts of personhood, identity, and responsibility. The law's engagement with these questions must remain continuous, rigorous, and prospective if the foundational values of human dignity, autonomy, and moral agency are to be preserved in an age of accelerating neurotechnological transformation.

## XI. REFERENCES

### A. Statutes and Legislative Materials

1. Bharatiya Nyaya Sanhita, 2023.
2. Bharatiya Nagarik Suraksha Sanhita, 2023.
3. Constitution of India.
4. Digital Personal Data Protection Act, 2023.
5. Digital Personal Data Protection Rules, 2025.

6. Republic of Chile, Law No. 21.383, *Modifica la Carta Fundamental, para establecer el desarrollo científico y tecnológico al servicio de las personas*, Diario Oficial (25 October 2021).

**B. Cases**

**1. Indian Cases**

- *Justice K.S. Puttaswamy (Retd.) v. Union of India*, (2017) 10 SCC 1.
- *Selvi & Ors. v. State of Karnataka*, (2010) 7 SCC 263: AIR 2010 SC 1974.

**2. Foreign Case**

- *Woolmington v. Director of Public Prosecutions*, [1935] AC 462 (HL).

**C. Books**

1. Gaur KD, *Textbook on Indian Penal Code* (7th edn., Universal Law Publishing 2020).
2. Hirstein William, Katrina L. Sifferd & Tyler K. Fagan, *Responsible Brains: Neuroscience, Law, and Human Culpability* (MIT Press 2018).
3. Kershaw Carol & J. William Wade, *Brain Change Therapy: Clinical Interventions for Self-Transformation* (W.W. Norton & Company 2014).
4. Vincent Nicole A., Thomas Nadelhoffer & Allan McCay (eds.), *Neurointerventions and the Law: Regulating Human Mental Capacity* (Oxford University Press 2020).

**D. Book Chapters**

1. Andrews Russell J., Mushfika Sultana & Serafeim Perdikis, 'Neurotechnology: Brain-Computer and Brain-Machine Interfaces' in *MedLink Neurology* (2024).
2. Ienca Marcello & Roberto Andorno, 'Towards New Human Rights in the Age of Neuroscience and Neurotechnology'.

3. Kindt Els J., 'Biometric Data, Data Protection and the Right to Privacy' in *Privacy and Data Protection Issues of Biometric Applications* (Springer 2013).
4. Ligthart Sjors, 'Mental Privacy as Part of the Human Right to Freedom of Thought?' in Jan Christoph Bublitz & Marc Jonathan Blitz (eds.), *The Law and Ethics of Freedom of Thought, Volume II* (Palgrave Macmillan 2026).
5. Ligthart Sjors, G. Meynen & D. Thomas, 'Persuasive Technologies and the Right to Mental Liberty' in *The Cambridge Handbook of Information Technology, Life Sciences and Human Rights* (2022).
6. Reichman Amnon & Giovanni Sartor, 'Algorithms and Regulation' in Hans-W. Micklitz et al. (eds.), *Constitutional Challenges in the Algorithmic Society* (Cambridge University Press 2021).
7. Schlosser Markus, 'Agency' in Edward N. Zalta (ed.), *The Stanford Encyclopedia of Philosophy* (Fall 2015 Edition).
8. Teubner Gunther, 'How the Law Thinks: Toward a Constructivist Epistemology of Law' in *Legal Theory and the Social Sciences* (Routledge 2017).

**E. Journal Articles**

1. Aloamaka Patrick Chukwunonso, Peter O. Itsueli & Micheal O.I. Nwabuoku, 'The Right to Cognitive Liberty: Protecting Mental Privacy in the Age of Neurotechnology' (2025) 17(2) *Cogito: Multidisciplinary Research Journal* 98.
2. Bigenwald A. & F. Chambon, 'Criminal Responsibility and Neuroscience: No Revolution Yet' (2019) 10 *Frontiers in Psychology* 1406.
3. Cabrera Laura Y. & Jennifer Carter-Johnson, 'Emergent Neurotechnologies and Challenges to Responsibility Frameworks' (2021) 54 *Akron Law Review* 1.
4. Fenoy Albert J., Joao Quevedo & Jair C. Soares, 'Deep Brain Stimulation of the Medial Forebrain Bundle' (2022) 27(1) *Molecular Psychiatry* 574.

5. Gadot R. et al., 'Efficacy of Deep Brain Stimulation for Treatment-Resistant Obsessive-Compulsive Disorder' (2022) 93 *Journal of Neurology, Neurosurgery & Psychiatry* 1166.
6. Gkotsi G.M. & J. Gasser, 'Neuroimaging in Criminal Trials and the Role of Psychiatric Expert Witnesses' (2019) 65 *International Journal of Law and Psychiatry* 44.
7. Gless Sabine, Emily Silverman & Thomas Weigend, 'If Robots Cause Harm, Who Is to Blame? Self-Driving Cars and Criminal Liability' (2016) 19(3) *New Criminal Law Review* 412.
8. Greenbaum Dov, 'Unraveling Ethical Complexities: Transcranial Magnetic Stimulation in Non-Clinical Settings' (2025).
9. Hashmi M.A.I. et al., 'Criminal Liability in the Age of Autonomous Systems: Rethinking Mens Rea and Actus Reus' (2025) 3(3) *The Critical Review of Social Sciences Studies* 290.
10. Horn Andreas & Wolf-Julian Neumann, 'From Adaptive Deep Brain Stimulation to Adaptive Circuit Targeting' (2025) 21(10) *Nature Reviews Neurology* 556.
11. Kiejnich-Kruk Karolina, 'The Advent of Neurotechnology in Criminal Evidence Proceedings' (2026) 34(1) *European Journal of Crime, Criminal Law and Criminal Justice* 1.
12. Klaming Laura & Pim Haselager, 'Did My Brain Implant Make Me Do It?' (2013) 6(3) *Neuroethics* 527.
13. McFarland Dennis J. & Jonathan R. Wolpaw, 'EEG-Based Brain–Computer Interfaces' (2017) 31 *Current Opinion in Biomedical Engineering* 1.
14. Morse Stephen J., 'Brain Overclaim Syndrome and Criminal Responsibility' (2006) 3(2) *Ohio State Journal of Criminal Law* 397.

15. Morse Stephen J., 'Actions Speak Louder Than Images' (2016) 3(2) *Journal of Law and the Biosciences* 336.

16. Shaw Elizabeth, 'Neuroscience, Criminal Sentencing and Human Rights' (2022) 63(4) *William & Mary Law Review* 1409.

17. Susser Daniel, Beate Roessler & Helen Nissenbaum, 'Technology, Autonomy and Manipulation' (2019) 8(2) *Internet Policy Review* 1.

18. Unger Wayne, 'Stay Out of My Head: Neurodata, Privacy and the First Amendment' (2023) 80(4) *Washington and Lee Law Review* 1439.

19. Young Liane et al., 'Disruption of the Right Temporoparietal Junction with Transcranial Magnetic Stimulation Reduces the Role of Beliefs in Moral Judgments' (2010) 107 *Proceedings of the National Academy of Sciences* 6753.

**F. Theses and Dissertations**

1. Byelikova Daryna, *The Notion of Criminal Intent: The Evolution of Mens Rea in Criminal Law* (BA (Hons.) Thesis, Mount Royal University 2019).

2. Dulcu Ioana, *Automatism and Voluntariness: Towards a New Framework for Assigning Criminal Responsibility* (PhD Thesis, University of Sussex 2021).

3. Fonseca D.M. de Brito, *Brain-Computer Interfaces and the Decoding of Thoughts as Personal Data of the Mind* (Master's Thesis, Universidade NOVA de Lisboa 2023).

4. Mahabir Anthony, *Discrete States of Consciousness* (Master's Thesis, Utrecht University 2015).

5. Pokorny Laszlo, *The Demonic Defense* (Doctoral Dissertation, ICL Institute 2026).

6. Zampieri Ilaria, *The Troubled Relationship Between Neuroscience and Criminal Responsibility* (PhD Thesis, IMT School for Advanced Studies Lucca 2022).

**G. Working Papers and SSRN Papers**

1. Arrouet Alana et al., 'The Brain's Moral Cascade: Large-Scale Brain Networks Dynamics During Norm-Guided Decision' (SSRN Abstract No. 6144866, 2026).
2. Das Gaurav, *Engagement-Constitutive Identity: A Unified Theory of Consciousness Across Substrates* (SSRN Working Paper, 2026).
3. Singh Aditya, 'Right to Privacy under Article 21: Expanding Horizons of Life and Personal Liberty' (SSRN Abstract No. 5553959, 2025).

**H. International Instruments**

1. International Covenant on Civil and Political Rights, 1966.
2. UNESCO, International Bioethics Committee Reports on Neurotechnology and Human Rights.