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Protecting the Last Private Frontier: Neurorights, Brain-Data Privacy and the Indian Legal Landscape-Lessons from Chile

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Abstract: *The rapid development of neurotechnology, artificial intelligence (AI), brain-computer interfaces (BCIs), electroencephalography (EEG), neuroimaging and other brain-sensing technologies is creating new possibilities for understanding and interacting with the human brain. These technologies offer significant benefits in healthcare, neurological rehabilitation, assistive communication, scientific research and human-computer interaction. At the same time, they generate highly sensitive forms of information commonly referred to as neurodata or brain data. Unlike conventional personal information, neurodata may reveal, or potentially permit the inference of, aspects of a person's cognitive condition, emotional responses, attention, preferences, neurological characteristics and behavioural patterns. This raises important questions concerning privacy, autonomy, dignity, freedom of thought and mental integrity.*

The emerging concept of "neurorights" seeks to address these concerns by developing legal and ethical safeguards for the human mind. Chile represents an important comparative example because its Law No. 21.383 of 2021 amended Article 19(1) of the Chilean Constitution to require that scientific and technological development serve persons and respect physical and psychological integrity, with particular protection for brain activity and information derived from it. The subsequent decision of the Chilean Supreme Court concerning the Emotiv Insight EEG device further demonstrated the practical legal significance of brain-data protection.

India does not presently have a dedicated comprehensive neurorights statute. Nevertheless, the constitutional jurisprudence concerning privacy, dignity, autonomy and mental integrity provides an important foundation. In particular, Justice K.S. Puttaswamy (Retd.) v. Union of India recognized privacy as a constitutionally protected right and emphasized the relationship between privacy, autonomy, dignity and the sanctity of the mind. Similarly, Selvi v. State of Karnataka addressed the constitutional implications of techniques such as narco-analysis, polygraph examination and Brain Electrical Activation Profile testing, thereby providing an important foundation for discussions concerning mental privacy and compelled access to information associated with the mind.

This paper examines whether India's existing constitutional and data-protection framework is sufficient to address the distinctive risks associated with neurodata. It compares the Chilean approach with India's constitutional privacy jurisprudence and the Digital Personal Data Protection Act, 2023 and Rules, 2025. The paper argues that neurodata warrants enhanced protection because of its potential to expose information that an individual may never have consciously communicated. It proposes a technology-neutral Indian neurorights framework based on mental privacy, cognitive liberty, meaningful consent, purpose limitation, data minimisation, security, non-discrimination and independent oversight.

Keywords: *Neurodata, Neurorights, Mental Privacy, Cognitive Liberty, Data Protection.*

I. INTRODUCTION

The quick advancement of emerging technologies has greatly altered the way in which personal information is generated, collected and processed. In the past, digital technology mainly involved information that individuals gave consciously, for example their names, photographs, financial details, online behaviour and biometric identifiers. The latest developments in neurotechnology are leading to a completely different scenario. Technologies including Electroencephalography (EEG), Brain-Computer Interfaces (BCIs), neuroimaging systems and neural sensors are able to pick up signals relating to activity in the human nervous system. These signals can then be analysed using Artificial Intelligence (AI) and Machine Learning (ML) so that patterns can be identified and information regarding cognitive or behavioural traits may be produced.

The information acquired through such technologies is generally known as neurodata or brain data. This type of neurodata is especially sensitive since its importance may go beyond what is directly picked up by a device. The neural signals might, according to the technology and the methods of analysis employed, be processed in such a way as to enable inference regarding aspects of attention, emotional reactions, neurological disorders, preferences or behaviour patterns. The problem is therefore not merely one of traditional informational privacy; it also involves questions about mental privacy, personal autonomy, cognitive liberty, human dignity and mental integrity.

The fact that such concerns have arisen has led to the formation of the idea of 'neurorights'. By and large, neurorights involve suggested legal and ethical safeguards meant to protect people from inappropriate access to, use of, or interference with information and processes connected with the human brain. The neurorights literature deals with a number of key areas such as mental privacy, cognitive liberty, mental integrity, personal identity and protection against discrimination on the basis of neurodata.

The significance of neurorights becomes more evident when you take into account the growing use of AI in the field of neurotechnology. Since machine-learning systems are capable of processing large amounts of neural signals and detecting patterns which cannot be seen by ordinary observation, a new kind of privacy issue arises—the possibility that information could be inferred from neural activity even if the individual has not consciously communicated it. As a result, traditional methods which rely solely on the collection and protection of personal data will not be sufficient for dealing with the risks connected to neural information.

Chile is a clear example of a nation which has addressed these growing concerns through changes to its constitution. In 2021 the country passed Law No. 21.383, whereby Article 19(1) of its Constitution was amended in order to include provisions relating to scientific and technological development and in particular to brain activity and the information obtained from it. This move has therefore established Chile as a significant example in the international debate on neurorights.

The Emotiv Insight EEG headset was then the subject of an important case by the Chilean Supreme Court. This case brought forward questions about the collection, processing and protection of information derived from brain activity and showed that neurorights can have real-world consequences for consumer neurotechnology and for the processing of digital data.

India at the moment does not possess a specific comprehensive law relating to neurorights. Yet the constitutional framework of India includes certain principles which can be used in relation to new neurotechnologies. Article 21 of the Constitution guarantees life and personal liberty, and in the case of *Justice K.S. Puttaswamy (Retd.) v. Union of India* the Supreme Court affirmed privacy as a fundamental right closely linked to dignity, autonomy and individual liberty. The case of *Selvi v. State of Karnataka* also examined the constitutional implications of techniques involving the extraction of information connected with mental processes.

India has likewise established a general framework for the protection of digital personal data via the Digital Personal Data Protection Act, 2023 and the Digital Personal Data Protection Rules, 2025. Yet there is still a significant question regarding whether such a general data-protection framework is adequate for dealing with the particular features of neurodata.

The paper therefore looks at the legal and technological problems connected with neurodata and compares the legal situation in India with that in Chile; it also suggests a framework for protecting neurodata in India while striking a balance between individual privacy, technological innovation, medical research and legitimate scientific activity.

II. OBJECTIVES

This study's main aim is to look at the privacy, legal, ethical, and cybersecurity issues connected with emerging neurotechnology and to evaluate whether the current legal framework in India is adequate for protecting neurodata.

The specific objectives of the study are:

- 1) We should look at the idea of neurorights and the main elements that make it up, such as mental privacy, cognitive liberty and mental integrity.
- 2) We need to study the technological characteristics of EEG, Brain-Computer Interfaces, neuroimaging and AI-based neural-signal processing.
- 3) The aim is to identify the privacy and cybersecurity risks involved in the collection and processing of neurodata.
- 4) The need to examine the constitutional relevance of Article 21 and the right to privacy in relation to the protection of mental and neural information.
- 5) Look at the importance of *Justice K.S. Puttaswamy (Retd.) v. Union of India* and *Selvi v. State of Karnataka* in the Indian context.
- 6) Look at Chile's constitutional stance on neurorights and consider the importance of the Chilean Supreme Court's ruling regarding the Emotiv Insight EEG device.
- 7) We need to assess whether India's current data-protection framework is adequate in dealing with the particular risks linked to neurodata.

- 8) The aim is to identify the legal and technological shortcomings in the present Indian framework.
- 9) Suggest a preliminary framework aimed at improving the protection of neurodata in India.

III. METHODOLOGY

The study employs a doctrinal, comparative and interdisciplinary research method which combines a legal analysis with an examination of the relevant concepts in neurotechnology, artificial intelligence and cybersecurity.

A. Doctrinal Legal Research

The part dealing with doctrine looks at the main and secondary legal materials that are relevant to privacy and neurotechnology; it includes constitutional provisions, court decisions, legislation and regulatory materials.

Particular attention is given to:

- Article 21 of the Constitution of India;
- the constitutional right to privacy;
- Justice K.S. Puttaswamy (Retired) v. Union of India;
- Selvi v. State of Karnataka;
- the Digital Personal Data Protection Act, 2023; and
- The Digital Personal Data Protection Rules of 2025.

The relevant academic literature on neurorights, mental privacy, cognitive liberty and neurotechnology is also examined.

B. Comparative Legal Analysis

Chile has been chosen as the main country for comparison since its constitution recognises protection in relation to brain activity and information obtained from it.

The study looks at Chile's Law No. 21.383 and the later Supreme Court case concerning the Emotiv Insight EEG headset, and it compares the Chilean situation with India's constitutional privacy case law and its general data-protection framework.

The comparison is not intended to indicate that the Indian legal system should directly adopt the Chilean model; rather, it is being made in order to find principles which may be adapted to India's constitutional and technological situation.

C. Technology Analysis

The technical component focuses on technologies capable of generating or processing neurodata, including:

- Electroencephalography (EEG);
- Brain-Computer Interfaces (BCIs);
- neuroimaging;
- neurofeedback systems;
- neural sensors; and
- AI/ML-based neural-signal analysis.

The study looks at the general process by which neural signals can be gathered, processed and turned into useful or inferred information.

A simplified technical model is:

Neural Activity → Sensor/EEG Device → Signal Acquisition → Signal Processing → Feature Extraction → AI/ML Analysis → Classification or Inference

The importance of this technical analysis lies in the fact that the legal risks connected with neurodata in part depend on the information that can be obtained from the original neural signals.

D. An analysis of privacy and cybersecurity risks

The study points out the potential risks that occur at various stages of the neurodata lifecycle.

These include:

- The neural information is being collected without authorization.
- Unauthorized access to stored brain data.
- Secondary use of neurodata.

- Commercial exploitation.
- AI-based profiling and inference.
- Algorithmic discrimination.
- Workplace and institutional surveillance.
- Incidents involving data breaches and cyber attacks.
- Sharing it with other parties without authorization.
- Possible interference with thinking processes.

E. Framework Development

A study has developed a proposed framework for India as a result of a legal comparison and a technological risk analysis.

The proposed framework focuses on:

- enhanced classification of neurodata;
- mental privacy;
- informed and purpose-specific consent;
- data minimisation;
- purpose limitation;
- restrictions on high-risk uses;
- algorithmic accountability;
- enhanced cybersecurity;
- independent oversight; and
- The safeguarding of legitimate scientific and medical research.

The study is based on concepts and includes no human participants, no experimental EEG data, and no development of a functional neurotechnology system.

IV. IMPLEMENTATION

The neurorights framework suggested could be put into practice by combining technological, legal and organizational actions. Technologically, neurotechnology devices such as those based on EEG and Brain-Computer Interfaces must include privacy and security features from the very beginning of their design, such as encryption, secure authentication, access control, data minimisation and limited data retention. The neurodata gathered by means of sensors should be sent securely to the processing systems, where AI and Machine Learning algorithms can be used for signal processing, feature extraction and pattern analysis. As these AI-based processes might lead to sensitive inferences from neural signals, organisations must be transparent about the reason for the processing and must avoid using the neurodata for any unauthorized profiling or for making discriminatory decisions. On a legal level, organisations which collect neurodata should secure specific, informed and revocable consent and should clearly state the purpose for which the information is being collected. Neurodata gathered for medical treatment or research should not be automatically used for commercial advertising, employment monitoring or any other unrelated purposes. Moreover, organisations should set up procedures covering data access, data correction, deletion, the reporting of breaches and sharing with third parties. In the case of high-risk applications, such as monitoring in the workplace, insurance assessments, education or use by law-enforcement agencies, independent ethical and regulatory review should be mandatory. The framework may therefore be implemented by means of ****privacy-by-design, AI accountability, cybersecurity controls, informed consent and regulatory oversight****, in order to ensure that neurotechnology can advance while at the same time protecting mental privacy, cognitive liberty, human dignity and individual autonomy.

V. FUTURE ENHANCEMENT

The future development of the proposed neurorights framework should include the adaptation of legal and technological safeguards to advances in neurotechnology and Artificial Intelligence. As EEG devices, brain-computer interfaces, neural implants, and AI-based brain-signal analysis proliferate, stronger measures will be needed to secure neurodata. We should explore technologies for privacy preservation such as federated learning, differential privacy, homomorphic encryption and secure multi-party computation. India should also consider specific regulations for high-risk neurotechnology in healthcare, employment, education, insurance and criminal investigations. Future research should look at cross-border data transfers, retention, ownership, algorithmic bias and cognitive manipulation. Cross-disciplinary collaboration will be crucial to safeguarding privacy, autonomy, dignity and fundamental rights.

VI. CONCLUSION

Neurotechnology and AI are opening up new opportunities in healthcare, research and human-computer interaction, but also present serious risks to mental privacy, autonomy and human dignity. Neurodata can potentially reveal sensitive information about cognitive and neurological states which is different from ordinary personal data. Chile is a key example of constitutional protection for brain functioning and India's privacy jurisprudence under Article 21 provides a basis for future protection of neurorights. But there is currently no exclusive neurodata framework in India. Thus, a balanced approach of strong consent, data minimization, cybersecurity, AI accountability and regulatory oversight is needed to protect individuals while supporting responsible neurotechnology innovation.

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