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**NEURAL SIGNAL OUTPUT AS
“ORIGINAL WORK” —
AUTHORSHIP AND OWNERSHIP
UNDER THE INDIAN COPYRIGHT
ACT, 1957, WHEN A BCI MEDIATES
CREATIVE EXPRESSION**

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Abstract

Brain-Computer Interface (BCI) technology has advanced to a point where neural signals can be decoded and translated into creative outputs — ranging from written text to visual art and musical composition. This paper examines whether such neural signal-mediated outputs qualify as “original works” under the Indian Copyright Act, 1957, and, if so, who holds authorship and ownership over them. The Indian copyright framework, designed for human authorship, does not contemplate the complex triadic relationship between the human user, the BCI system, and the technology developer. Drawing upon the doctrine of originality as interpreted in *Eastern Book Company v. D.B. Modak* (2008) 1 S.C.R. 1, and analogising from global debates on AI-generated works, this paper argues that BCI-mediated creative outputs can, under specific conditions, attract copyright protection, with authorship vest in the human operator whose mental effort drives the creative process. The paper identifies critical gaps in the existing legislative framework and proposes doctrinal and statutory reforms to address the emerging challenges of neuro-authorship in India.

Keywords: Brain-Computer Interface, Copyright Act 1957, Authorship, Originality, Neural Signal, Neuro-Authorship

I. INTRODUCTION

The rapid convergence of neuroscience and digital technology has given birth to Brain-Computer Interface (BCI) systems capable of translating human neural activity directly into external outputs, including creative works. As BCIs transition from clinical rehabilitation tools to consumer-grade creative instruments, they raise fundamental questions about the nature of authorship, the locus of creativity, and the legal ownership of expressive outputs (Mudgal & Sharma, 2022). The Indian Copyright Act, 1957 (“the Act”; Indian Copyright Act, 1957) remains the primary legislative instrument governing creative ownership in India. Yet its provisions were designed in an era when human beings were unambiguously the sole creators of protectable works. The emergence of BCI-mediated creativity challenges every foundational assumption of this framework.

BCIs such as BrainGate, Neuralink’s N1 implant, and non-invasive EEG-based systems enable individuals — including those with severe motor disabilities — to produce text, music, and visual art through neural signals alone (Birbaumer et al., 2019). When a paralysed artist “paints” by imagining brush strokes, and a BCI decodes and renders those strokes on a digital canvas, a profound legal question arises: who is the author of that painting? Is it the artist, the software developer, the device manufacturer, or no one at all? This paper seeks to answer that question within the specific context of Indian copyright law.

II. MEANING AND DEFINITIONS

A. Brain-Computer Interface (BCI)

A Brain-Computer Interface is a system that acquires brain signals, analyses them, and translates them into commands that are relayed to an output device to carry out a desired action (Wolpaw et al., 2002, p. 767). BCIs may be invasive (surgically implanted electrodes), partially invasive (electrocorticography grids), or non-invasive (EEG headsets). For creative applications, BCIs record neural patterns associated



with imagined motor movements, mental imagery, or cognitive states and decode them into actionable creative instructions.

B. “Original Work” Under the Copyright Act, 1957

Section 13 of the Copyright Act, 1957 grants copyright protection to “original literary, dramatic, musical and artistic works.” The term “original” is not defined in the Act. In *Eastern Book Company v. D.B. Modak* (2008) 1 SCC 1, the Supreme Court of India adopted a modified “skill and judgment” standard, departing from the mere “labour and effort” (sweat of the brow) doctrine, and holding that a work must reflect the author’s exercise of skill, judgment, and intellectual creativity to merit protection. This standard forms the cornerstone of any analysis of BCI-generated works.

C. Authorship

Under Section 2(d) of the Act, the “author” in relation to a work is the person who creates it. For computer-generated works, Section 2(d)(vi) designates the “person who causes the work to be created” as the author — a provision that, as will be argued below, may be partially applicable to BCI-mediated outputs.

III. STATEMENT OF PROBLEM

The Indian Copyright Act, 1957 was enacted to govern human creativity expressed through conventional means. The statute does not contemplate: (i) works whose creative impulse originates in neural signals; (ii) the role of algorithmic intermediaries in translating intention into expression; or (iii) the multi-party relationships inherent in BCI-mediated creation. As BCIs become more sophisticated, the gap between the legislative framework and technological reality widens. Courts and practitioners face the prospect of adjudicating authorship claims without adequate statutory guidance, creating legal uncertainty that may simultaneously stifle innovation and leave vulnerable creators (particularly persons with disabilities who

rely on BCIs) without recourse against infringement of their BCI-generated works (Samuelson, 2023).

IV. HYPOTHESIS

It is hypothesised that BCI-mediated creative outputs can satisfy the originality threshold under the Indian Copyright Act, 1957, when the human operator’s neural signals constitute the primary generative force behind the expressive choices embodied in the work, and that authorship should vest in such human operator, subject to contractual arrangements that may affect ownership, but that the existing statutory framework requires significant doctrinal clarification and legislative amendment to adequately address the full range of BCI-creative scenarios.

V. OBJECTIVES OF THE RESEARCH

This paper pursues the following objectives: (i) to examine whether BCI-mediated creative outputs satisfy the originality requirement under Indian copyright law; (ii) to identify who among the various actors in the BCI creative process qualifies as the “author” under the Act; (iii) to analyse ownership implications including employer-employee dynamics and commissioned works; (iv) to compare the Indian position with international approaches to AI-assisted creativity; and (v) to propose doctrinal and legislative reforms for a coherent neuro-authorship framework under Indian law.

VI. THE MAIN BODY OF ARGUMENTS

A. The Originality Threshold: Can Neural Signals Constitute Creative Expression?

The foundational question is whether the neural signal output of a BCI user embodies the kind of “skill and judgment” demanded by *Eastern Book Company v. D.B. Modak* (2008) 1 SCC 1. The answer requires understanding the architecture of modern creative BCIs. In a typical creative BCI workflow, the user forms a deliberate mental intention (e.g., imagining a specific melody), the BCI records the resulting neural



patterns, a decoding algorithm translates those patterns into a digital signal, and an output device renders the creative work (Shenoy & Carmena, 2014). The creative choices — what to imagine, how to modulate the imagined experience, which outputs to retain — are made entirely by the human operator. The BCI is, in this schema, an instrument of transcription rather than an instrument of creation, analogous to a word processor that renders a writer's thoughts or a camera that captures a photographer's compositional vision (Grimmelmann, 2016).

The Supreme Court in *R.G. Anand v. Delux Films* AIR 1978 SC 1613 emphasised that it is the “original thought and expression” of the author that attracts protection. Neural signals are the most direct possible expression of thought: they are the electrophysiological correlate of mental intention. If a human author's pen strokes attract copyright because they express the human mind, there is a compelling doctrinal argument that neural signal outputs — being even more proximate to mental intention — should attract at least equivalent protection. The skill and judgment lie not in the physical movement of the hand but in the cognitive and imaginative activity of the mind (Boden, 2010, p. 43). A BCI simply removes the manual intermediary.

However, the analysis is complicated by the role of the decoding algorithm. BCIs do not passively record; they actively interpret, classify, and reconstruct. Where the algorithm exercises discretion in mapping ambiguous neural patterns to specific expressive outputs, the human operator's creative control may be attenuated (Dehaene, 2020). This suggests a spectrum: at one end, highly accurate invasive BCIs with minimal algorithmic interpolation; at the other, probabilistic non-invasive systems that substantially reconstruct the intended output. The degree to which originality vests in the human operator will vary accordingly. Courts will need to assess, as a matter of fact, whether the algorithmic contribution was merely ministerial or substantively creative in the particular case.

B. Authorship: Who Is the Author of a BCI-Mediated Work?

Section 2(d) of the Copyright Act, 1957 defines the author as the person who “creates” the work. The Act provides a specific provision for computer-generated works under Section 2(d)(vi): in such cases, the author is “the person who causes the work to be created.” This provision, introduced by the Copyright (Amendment) Act, 1994, was intended to address software-generated outputs and arguably extends to BCI-mediated works (Narayanan, 2015).

Three competing claims to authorship arise in the BCI context. First, the human BCI user who provides the neural signals. Second, the BCI developer who designed the decoding algorithm. Third, corporations or institutions that own the BCI system and enable the creative process.

The most defensible position, consistent with the Act's structure and constitutional values, is that authorship vests in the human BCI user (Bently & Sherman, 2014, p. 117). Article 19(1)(a) of the Constitution of India, as interpreted in *Tata Sons Ltd. v. Greenpeace International* (2011) 178 DLT 705, recognises creative expression as a component of freedom of expression. Denying authorship to a BCI user whose neural activity is the direct generative source of the work would effectively deprive persons with disabilities of a fundamental right to recognise their creative personhood. Courts in common law jurisdictions have generally declined to vest authorship in non-human entities absent clear legislative mandate (*Thaler v. Vidal*, 43 F.4th 1207, Fed. Cir. 2022; *Acohs Pty Ltd v. Ucorp Pty Ltd* [2012] FCAFC 16).

The BCI developer's claim is weaker. The developer contributes the technical platform but does not exercise creative judgment at the moment of creation. The analogy is to a camera manufacturer: Nikon does not claim authorship over photographs taken with its cameras (Ginsburg, 2018, p. 131). The developer's contribution is protectable separately as a computer



program under Section 2(o) of the Act, read with the Software-in-Copyright protection scheme, but does not override the user's authorship of the creative output.

The employer/institutional claim arises under Section 17 of the Act, which vests first ownership of a work made in the course of employment in the employer, unless a contract to the contrary exists. Where a BCI user creates works as part of employment duties — for instance, a journalist using a BCI to file reports — the employer may claim ownership. However, authorship and ownership are conceptually distinct in Indian copyright law (Manupatra IP Report, 2021), and moral rights under Section 57, including the right of paternity and integrity, remain personal to the human author irrespective of ownership.

C. The “Computer-Generated Work” Provision and Its Limitations

Section 2(d)(vi) of the Act recognises computer-generated works and vests authorship in the person who “causes” the work to be created. BCI-mediated works are, in one sense, computer-generated: the digital output is produced by a computational process. Yet this characterisation is analytically misleading. In paradigmatic computer-generated works — such as algorithmically composed music or procedurally generated art — there is no identifiable human creative agent at the moment of generation (Perry & Margoni, 2010). The computer's algorithm is the primary generative force. In BCI-mediated works, by contrast, the human neural signal is the primary input, and the computer's role is interpretive rather than generative.

This distinction matters enormously. Applying the computer-generated work provision to BCI outputs would produce the anomalous result that a BCI-using artist who imagines every brushstroke is treated legally identically to an algorithm that generates art without any human creative input. Such an outcome would be neither doctrinally sound nor equitable (Guadamuz, 2017). The preferable analysis is that

BCI-mediated works with dominant human neural authorship are simply human-authored works produced through a technological instrument, governed by the general authorship provisions of Section 2(d) rather than Section 2(d)(vi). The computer-generated provision should apply only where the algorithm's contribution dominates and the human input is *de minimis*.

D. Ownership, Contracts, and the Triadic Relationship

Even where authorship vests in the human BCI user, ownership may be affected by contractual arrangements. BCI device manufacturers routinely include extensive terms of service that purport to assign intellectual property rights in outputs generated using the device (Yuste et al., 2021). Under Section 19 of the Copyright Act, 1957, an assignment of copyright must be in writing and signed by the assignor. Courts have held that unilateral terms of service may not satisfy the requirement of a valid written assignment (Rupendra Kashyap v. Jiwan Publishing House (1996) PTC 439 Del). However, users who affirmatively accept such terms may be found to have assigned or licensed output rights to the manufacturer.

This creates a concerning power asymmetry, particularly for persons with disabilities who depend on BCIs for all communication and creative expression. If device manufacturers can extract creative ownership through mandatory terms of service, BCI-dependent creators may find themselves in a position where their own neural outputs — the most intimate form of expression — are owned by corporations (Georgieva, 2017). This is a human rights concern that Indian law must address, potentially through analogous provisions to the “unfair contract terms” doctrine emerging in consumer protection jurisprudence under the Consumer Protection Act, 2019.

E. Comparative Perspectives

A comparative analysis reveals that no jurisdiction has definitively resolved the authorship question for BCI-



mediated works. The United Kingdom's Copyright, Designs and Patents Act 1988, Section 9(3), like India's Act, designates the "person who makes the necessary arrangements" as author of computer-generated works, which would point to the BCI user (Bently & Sherman, 2014, p. 120). The United States Copyright Office has declined to register works produced without human authorship (U.S. Copyright Office, 2023), but this does not address works where human neural input is the dominant creative force. The European Union's approach to AI-generated works, as reflected in the 2024 AI Act recitals and ongoing revision of the InfoSoc Directive, emphasises the need for "human oversight" in the creative process as a prerequisite for copyright eligibility (European Parliament, 2024).

What emerges from comparative analysis is a clear trend: jurisdictions seek to preserve human-centred authorship while acknowledging computational mediation. India's modified skill-and-judgment standard from Eastern Book Company is, in this respect, well-positioned to accommodate BCI creativity, provided courts are willing to locate the relevant "skill and judgment" in the neural activity of the human operator rather than in the physical act of inscription.

VII. CONCLUSION AND SUGGESTIONS

A. Conclusion

This paper has established that BCI-mediated creative outputs can, under appropriate conditions, qualify as "original works" under the Indian Copyright Act, 1957, when the dominant generative force is the human operator's neural activity. Authorship should vest in the human BCI user, consistent with the Act's human-centred authorship model and constitutional values of expressive freedom. The computer-generated work provision under Section 2(d)(vi) should be reserved for outputs where the algorithm's contribution dominates and human creative input is negligible. While ownership may be affected by employment relationships and contractual terms,

moral rights under Section 57 remain personal to the human author. The existing framework, though not designed for BCI-mediated creativity, is capable of principled extension to accommodate it, though legislative intervention is ultimately necessary for certainty and equity.

B. Suggestions

First, the Copyright Act, 1957 should be amended to introduce a definition of "neural-assisted work," distinguishing it from both conventional human-authored works and purely computer-generated works. The amendment should clarify that the human BCI operator is the author of any work in which neural signals constitute the primary generative input, irrespective of algorithmic processing.

Second, the Act should be amended to render void, as against public policy, any contractual clause in a BCI device agreement that purports to vest copyright in the device manufacturer or developer in respect of works whose primary generative input is the user's neural signals. This would protect vulnerable BCI-dependent creators from exploitative intellectual property transfers.

Third, the Copyright Office should issue administrative guidance on the registration of BCI-mediated works, including a framework for documenting the nature and degree of human neural input, to assist courts and parties in assessing the originality and authorship of such works on a case-by-case basis.

Fourth, India should engage with the WIPO Standing Committee on Copyright and Related Rights to advocate for international standards on neuro-authorship, given the cross-border nature of both BCI technology deployment and creative markets.

Fifth, the judiciary should, pending legislative reform, adopt a purposive interpretation of Section 2(d) and the originality doctrine that centres the human neural operator as author, consistent with the values of



dignity, disability rights, and the Act's underlying purpose of incentivising human creativity.

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