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"AI-POWERED BRAIN MAPPING AS ELECTRONIC EVIDENCE: IT'S ADMISSIBILITY UNDER SEC. 63 OF BSA."

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Introduction:

In today's world, where technology is rapidly advancing, even the criminal justice system is looking into new ways to uncover the truth. One such method is brain mapping, a scientific technique for studying brain activity and determining whether a person has firsthand knowledge of a crime. However, with the advancement of artificial intelligence, brain mapping has entered a new era.

The integration of Artificial Intelligence (AI) into neuroscience has revolutionized brain mapping, a scientific method that records and interprets brain activity to determine an individual's knowledge or memories related to a specific event. Techniques like EEG and Brain Electrical Oscillation Signature (BEOS) profiling have already been used in India for investigative purposes. AI-powered brain mapping uses machine learning algorithms to analyze neurological data with greater speed, accuracy, and predictive ability, claiming to detect signs of deception, recognition, or intent by examining patterns in the brain's electrical signals.

The admissibility of AI-based brain data in courts remains a highly debated issue. Under the Bharatiya Sakshya Adhiniyam (BSA), 2023,[1] electronic records are admissible, but whether AI-analyzed brain data qualifies as reliable electronic record is still unclear. Ethical and legal

[1] Bharatiya Sakshya Adhiniyam, No. 47 of 2023.

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concerns arise regarding the use of involuntary tests, potential misuse of data, and violation of the right against self-incrimination under Article 20(3)[2] and the right to mental privacy under Article 21[3] of the Constitution.

This paper aims to determine if AI-based brain data can be accepted as electronic evidence under Section 63[4] of the BSA, 2023, and explores legal and ethical concerns related to the use of this evidence in court. By analyzing legal precedents, comparing global standards, and addressing ethical dilemmas. The study aims to bridge the gap between technology and the law, ensuring that justice embraces innovation without compromising fairness or fundamental rights.

Chapterization:

1. Understanding Brain Mapping and AI-powered Brain Mapping

Brain mapping technology tries to read an individual's mind by analyzing brain activity. The traditional techniques like EEG (electroencephalography) uses electrodes applied on the scalp to identify electrical signals of the brain. BEOS (Brain Electrical Oscillation Signature) profiling that originated in India takes it a step ahead by examining if the brain of a suspect indicates recognition of crime information. More advanced techniques like fMRI (functional Magnetic Resonance Imaging) track blood flow in the brain to see which areas become active during specific thoughts.

The advent of artificial intelligence has revolutionized these methods. Lying is a brain-challenging activity. It requires more mental effort than being truthful because the individual must produce a fabricated tale, recall it, and conceal the truth simultaneously. Brain mapping with AI uses this mental effort. Artificial intelligence brain mapping employs machine learning algorithms to sort through huge quantities of neurological data at much quicker rates than expert human brains. These machines are able to recognize subtle patterns of brain activity that could suggest lying, identification of crime scenes, or repressed memories.[5] The technology promises to be more precise than existing methods since it can work with intricate data points that may elude humans. But this also poses serious questions about validity brain activity can

[2] The Constitution of India, art. 20(3).
[3] The Constitution of India, art. 21.
[4] Bharatiya Sakshya Adhiniyam, 2023, § 63, No. 47, Acts of Parliament, 2023 (India).
[5] Sucheta, Admissibility of Electronic Evidence, SCC Online Blog (June 30, 2016).

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be influenced by stress, mental illness, or even the testing environment itself, and therefore lead to incorrect conclusions.

The major difference between common brain mapping and AI is just how deep they probe the brain. Common techniques simply register brain signals, whereas AI attempts to decipher them and even foretell mental states. Advocates are convinced that this can render criminal investigations more precise. But there are also objections. AI is trained from data, and if said data is corrupted or biased, it might yield incorrect results. Also, AI doesn't comprehend things such as human emotions or context in the same way that people do, which makes its conclusions less trustworthy in a legal context.

Various nations are applying this technology differently. India has experimented with BEOS in criminal cases. Judges in the U.S. are less willing to rely on brain-mapping evidence. China has used brain tools enabled by AI in surveillance, which has produced serious ethical issues. A major concern is that brain activity can be impacted by stress or mental illness, and thereby applying them as concrete legal evidence can be risky.[6]

With the increased prevalence of AI aids in investigations, the law should be amended to ensure they are applied responsibly and equitably. The courts ought to be sensitive when they entertain such evidence, particularly if it is going to influence an individual's liberty. In the absence of proper regulation, this tremendous technology will not only fail but actually do harm. Overall, AI brain mapping can be instrumental in solving crime, but this is also bringing many challenges with it. Policymakers have to weigh technological progress against ethical guidelines to avoid abuse and safeguard individual liberties in a world where "mind-reading" technology makes science fiction a reality.

2. Legal framework for Electronic Evidence in India

An “electronic record” is any information that is generated, stored, received, or transmitted in electronic form. These are documents, emails, CCTV footage, audio or video tapes, computer output, and data from digital devices like mobile phones or AI devices. In Section 2(1)(d)[7] of the Bharatiya Sakshya Adhiniyam, 2023,[8] an electronic record is treated just like traditional

[6] Kavya Sanjay Singha, The Transformative Potential of Artificial Intelligence and Its Impact on M&A Transactions, 3 JCLJ 249 (2023).
[7] Bharatiya Sakshya Adhiniyam, 2023, § 2(1)(d), No. 47, Acts of Parliament, 2023 (India).
[8] Supra 1.

ISSN: 2582-6433

documents, provided it meets certain conditions for authenticity. This means that electronic records, if properly verified, can be presented as valid evidence in a court of law, making them crucial in today's technology-driven investigations and trials.

With all such advancements in technology, such as computerized brain mapping on the basis of Artificial Intelligence, the topic assumes a particular importance in relation to Indian law. The Bharatiya Sakshya Adhiniyam, 2023 (BSA)[9] which came in place of the Indian Evidence Act provides the legal framework concerning the admissibility of electronic records as evidence. Section 63[10] of the BSA is one such important provision and occupies the focal position in this argument. Section 63[11] categorically defines what an electronic record is and under what conditions such records can be admitted as evidence.

It states that data maintained, recorded, or transmitted in electronic form such as documents, photographs, sound, or biometric information shall be construed to be electronic evidence. The section further makes it clear that such records should be accompanied by a certificate of authenticity. This attestation is given to verify that the electronic record has not been tampered with and was created, received, or stored in the ordinary course of business. This is aimed at maintaining the integrity of the evidence and establishing its reliability before a court. For brain mapping using AI, the results of the brain scan and their AI-based analysis constitute electronic records.[12]

However, as AI introduces an analytical aspect to the raw data, concerns are raised regarding whether the results are objective facts or subjective predictions from a machine. This raises the genuineness and credibility of such evidence under Section 63[13]. Origin of data, software utilized, and the manner in which the interpretation is prepared all must be documented and certified well in fulfilling the requirements of admissibility. Indian courts have, slowly, accepted forensic evidence such as DNA analysis and fingerprinting, provided they are scientifically valid and legally obtained. The Supreme Court was prudent in accepting brain-mapping evidence in *Selvi v. State of Karnataka (2010),*[14] especially when not obtained with

[9] Supra 1.
[10] Bharatiya Sakshya Adhiniyam, 2023, § 63, No. 47, Acts of Parliament, 2023 (India).
[11] Supra 10.
[12] Divyansha Goswami, Electronic Evidence in Focus: Navigating Legal Shifts in the Law on Electronic Evidence under the BSA, 2023, SCC Online Blog (Oct. 23, 2024).
[13] Supra 10.
[14] Selvi v. State of Karnataka, (2010) 7 SCC 263.

ISSN: 2582-6433

the consent of the test subject. The ruling stressed voluntary consent and that such evidence would be corroborative only, not independent evidence of culpability.[15] Neuro-evidence rooted in artificial intelligence requires judges to take into account the transparency, unbiased training, and precision of the algorithms used in interpreting brain data.

This is particularly important for uses such as brain mapping, where small errors can render wrong conclusions. Internationally, the standards are different. For example, in the United States, the Daubert standard requires scientific evidence to be pertinent and trustworthy before it can be presented in court. This includes testing, peer review, known error rates, and widespread scientific acceptance. European nations have similar safeguards that place high value on human rights and informed consent, especially where mental privacy is concerned.[16] These safeguards are a lesson that India can apply as it establishes its legal strategy to AI-based technologies in court. Section 63 of the BSA creates a regulatory framework for the admission of electronic records, including AI-generated ones. Yet courts need to be on the lookout for the peculiar challenges posed by such evidence. Science evolves and so should the legal systems that underpin the administration of justice. The use of AI-driven brain mapping within criminal trials has to be done with caution, stringent certification practices, and a stalwart defense of the rights of the accused.

3. Constitutional and Ethical concerns

Use of AI-based brain mapping in criminal cases presents several important constitutional as well as ethical concerns. As much as technology can logically serve criminal investigations, it must be examined thoroughly keeping in view the Indian Constitution, particularly Article 20(3)[17] and Article 21[18]. These provisions guarantee basic rights such as protection from self-incrimination and the right to privacy, both of which are directly related to the use of brain mapping within the legal system.

Article 20(3)[19] of the Indian Constitution protects an accused person from being forced to incriminate themselves. This is a cornerstone of criminal law in democratic states. In the landmark case of *Selvi v. State of Karnataka (2010)*[20], the Supreme Court ruled that techniques

[15] Supra Note 5.
[16] Supra Note 6.
[17] The Constitution of India, art. 20(3).
[18] The Constitution of India, art. 21.
[19] Supra 17.
[20] Supra Note 12.

ISSN: 2582-6433

such as narco-analysis, polygraph tests, and brain-mapping cannot be conducted without the subject's consent. The Court ruled that such techniques amount to testimonial compulsion if applied forcibly, thus violating Article 20(3)[21]. This decision is directly relevant today when brain mapping via AI becomes all the more intimate potentially reading intentions or thoughts out of brain function. If it is done absent free and informed consent, perhaps it would be unconstitutional.

Article 21[22] safeguarding the right to life and personal liberty has been judicially interpreted to cover the right of privacy. In Justice *K.S. Puttaswamy v. Union of India (2017),*[23] the Supreme Court recognized privacy as a fundamental right. Mental privacy one's innermost thoughts and brain data forms the most personal layer of this right. When AI systems are used to decode brainwaves, it raises serious issues of invasion into a person's mental space. Even if brain mapping is consented to, the depth of intrusion and lack of clear boundaries regarding data use may violate Article 21[24].

Apart from issues of constitution, there are several ethical issues that must be addressed. What if someone is forced to have this done without their knowledge? What if the AI misreads off their brain waves? What if the outcome gets misused? These are serious threats. Consent, for example, must be informed and voluntary. In custodial contexts, the power asymmetry between the suspect and the investigating agency can result in coerced consent.[25] Additionally, AI systems are inclined to make judgments based on the data that were entered into them at the time of training. If the training data are faulty or biased, the system can produce incorrect or discriminatory conclusions. This is all the more extreme in a criminal trial, in which the consequences of an error are disastrous.

Another ethical issue is information abuse. Brain-mapping data could leak, be misused, or be used for purposes other than the investigation, such as profiling or surveillance.[26] False positives, where the system incorrectly detects guilt or intent, also pose a threat. In the absence of strong legal protection, these outcomes could lead to wrongful convictions and undermine

[21] Supra 17.
[22] Supra 18.
[23] K.S. Puttaswamy (Aadhar-5J.) v. Union of India, (2018) 1 SCC 809.
[24] Supra 18.
[25] Supra Note 5.
[26] Suresh Bada Math, Supreme Court Judgment on Polygraph, Narco-Analysis & Brain-Mapping: A Boon or a Bane, 134 Indian J. Med. Res. 4, 4–7 (2011).

ISSN: 2582-6433

the integrity of the justice system.[27]

Whereas other legal jurisdictions like the U.S. operate under stricter norms for the acceptance of scientific evidence, India continues to evolve. The courts shall need to be cautious in as far as considering the benefits of this technology vis-a-vis violating individual rights. In the final analysis, no technological advancement must come at the cost of constitutional values and human dignity.

4. Judicial Perspective

When applying scientific evidence in criminal trials, such as brain mapping, the Indian courts have to be extremely cautious. Courts must ensure justice is delivered, and in most instances, this means applying new technology to assist investigations. But this must be done without infringing on the rights of the accused or the dignity of the trial. A number of landmark judgments have shaped the way Indian courts perceive brain mapping over the years, and new technologies such as AI-based neurotechnology have created new challenges. One of the most significant cases in this regard is *Selvi v. State of Karnataka (2010)*[28]. In this case, the Supreme Court of India considered the application of narco-analysis, polygraph tests, and brain electrical oscillation signature (BEOS) profiling. The Court held that compelling individuals to submit to these tests against their will violates Article 20(3)[29] (right against self-incrimination) and Article 21[30] (right to personal liberty and privacy). It held that even if these tests are scientific, they constitute testimonial responses, and therefore no one can be compelled to submit to them. This judgment formed the legal foundation for the way courts in India perceive brain mapping.

Subsequently, courts have been careful about forensic evidence, including brain mapping. In *State of Maharashtra v. Suresh (2000),*[31] the Supreme Court held that scientific evidence can support other evidence but cannot be solely depended upon unless it is absolutely trustworthy. Likewise, in *Rajesh Talwar & Nupur Talwar v. CBI*,[32] brain mapping was used in the *Aarushi-Hemraj* murder case, but the court did not solely depend on these results, understanding that there can be mistakes or wrong interpretations.

[27] Supra Note 6.
[28] Supra Note 12.
[29] Supra Note 17.
[30] Supra Note 18.
[31] State of Maharashtra v. Suresh, (2000) 1 SCC 471.
[32] Nupur Talwar v. CBI, (2012) 11 SCC 465.

ISSN: 2582-6433

India is yet to begin the use of AI tools to image the brain within its justice system. There is, however, a few examples worth noting from other nations. In the US, the courts have weighed allowing fMRI to determine whether one is lying or concealing facts. In the United States of *America v. Lorne Allan Semrau (2012)*,[33] the court in Tennessee rejected the application of fMRI for detecting lies as it was not sufficiently accepted by science under the Daubert standard.[34]

Conventional brain mapping has been applied in certain Indian trials, such as in *Abdul Karim Telgi*[35] case. Yet, its evidentiary character always required corroboration by other facts. AI-based brain mapping poses more difficult questions. Judges now must determine whether the algorithms employed to decipher brain information are scientifically valid enough to be admitted as evidence.

Countries like China are now using AI to recognize emotions and thoughts in surveillance and law enforcement applications, which has opened significant debates on ethics and laws. China has been reported to use AI to read faces and brainwaves to recognize suspicious behavior, which has drawn criticism from human rights groups. These examples illustrate that it can be misused if not controlled. They also show the risks of overdependence on context-less algorithms, which are insensitive to culture and mental health effects.[36]

Indian courts are slowly coming to realize the need to ensure if new forensic equipment is scientifically sound, reliable, and ethically developed. Indian courts are also increasingly careful about bias in AI equipment and are ready to scrutinize the evidence closely before accepting it. Scientific and AI-based tools can certainly add to the efficacy of criminal justice, but courts must still be a filter, admitting evidence only when it is scientifically sound, ethically derived, and does not violate constitutional rights. The future of AI in criminal law will largely be based on how sensitively and cautiously the courts handle this evidence, always putting justice and human rights first.

[33] United States v. Semrau, 693 F.3d 510 (6th Cir. 2012).
[34] Tortora L, Meynen G, Bijlsma J, Tronci E and Ferracuti S (2020) Neuroprediction and A.I. in Forensic Psychiatry and Criminal Justice: A Neurolaw Perspective.
[35] Sri Abdul Kareem Telgi v. State of Karnataka, (2017) 14 SCC 648 (India).
[36] Suresh Bada Math, Supreme Court Judgment on Polygraph, Narco-Analysis & Brain-Mapping: A Boon or a Bane, 134 Indian J. Med. Res. 4, 4–7 (2011).

ISSN: 2582-6433

5. Findings and Suggestions

The use of AI-powered brain mapping in criminal investigations is growing, and it brings both hope and concern. On the one hand, this technology can help police and investigators find out whether a person remembers something related to a crime or is hiding the truth. Instead of using harsh methods like force or pressure during questioning, AI brain mapping offers a more scientific and less painful way to understand a person's mental responses. But while it may sound exciting, it also raises serious questions about how fair, safe, and private it is to use such tools in legal cases.

Right now, Indian law recognizes electronic records as valid evidence under Section 63[37] of the Bharatiya Sakshya Adhiniyam, 2023[38]. But this law doesn't fully explain how advanced tools like AI-based brain mapping should be handled in criminal trials. Since this kind of evidence can greatly affect a person's future possibly leading to jail or freedom it is important that we have strong and clear legal rules to control how it is used.

First and most importantly, there must be proper consent. No one should be forced to go through brain mapping, especially when AI is used to study their brain activity. The person must clearly understand what the test is, how it works, and what it could mean for their case. Consent should be given freely, without fear or pressure.

Second, we need neutral experts to guide the courts. These should be people who understand both brain science and technology so that judges and lawyers don't blindly trust the machine's results. AI systems can sometimes make mistakes, especially if they are trained on biased or incomplete data. A person's freedom should not depend on a computer's prediction.

AI tools could also help reduce custodial torture, which has been a problem in some police investigations. In the case of *D.K. Basu v. State of West Bengal (1997)*[39], the Supreme Court said that torture in custody must stop, and that scientific methods should be used instead. If AI tools are used with proper checks, they could offer a more humane way to investigate crimes.

To make this possible, India needs a proper policy or law for using AI in criminal investigations. This should include clear rules for consent, proper testing and approval of AI

[37] Supra Note 10.
[38] Supra 1.
[39] Dilip K. Basu v. State of W.B., (1997) 6 SCC 642.

ISSN: 2582-6433

tools, and regular checks to make sure the technology is fair and reliable. India can also look at how the European Union is dealing with these issues. They treat AI in criminal justice as a "high-risk"[40] area and have strict rules to make sure it is used safely.

India should also set up an AI authority for the criminal justice system. This authority could help make rules, test AI tools, and guide courts in using this kind of evidence. Judges, lawyers, and police officers also need training so they understand how these tools work and what their limits are.

In the end, the use of AI in criminal cases must be handled carefully. The rights to privacy, freedom, and a fair trial must always come first. AI can be a helpful tool but only if it is used with proper legal protection, ethical checks, and public awareness. If we handle it right, AI brain mapping can help the truth come out without harming justice.

Conclusion:

The emergence of AI-powered brain mapping in the field of forensic science marks a major turning point in how criminal investigations are conducted. This technology combines neuroscience with artificial intelligence to interpret patterns in brain activity and detect whether a person recognizes certain information related to a crime. Unlike traditional methods like EEG or BEOS profiling, which rely heavily on human interpretation of brain signals, AI has the capacity to independently process vast amounts of data, identify subtle patterns, and make predictive analyses about memory recall or deceptive behavior. While these advancements show promise in improving the accuracy and efficiency of criminal investigations, their introduction into the courtroom raises important legal, constitutional, and ethical concerns.

This research paper aimed to study how AI-powered brain mapping fits within the framework of Indian evidence law, particularly under Section 63[41] of the Bharatiya Sakshya Adhiniyam, 2023. Section 63 addresses electronic records and outlines the requirements for such evidence to be admissible. While the law does recognize electronically generated evidence, its admissibility still hinges on the authenticity, reliability, and proper collection of the data. In the case of AI brain mapping, these conditions are not always easily met, especially when the science is still evolving and the technology may be prone to errors or misinterpretations due to

[40] Supra Note 25.
[41] Supra Note 6.

ISSN: 2582-6433

biased training data or algorithmic limitations.[42]

Furthermore, the constitutional protections under Articles 20(3)[43] and Article 21[44] of the Indian Constitution play a critical role in evaluating the legality of such evidence. Article 20(3)[45] provides the right against self-incrimination, which could be compromised if individuals are compelled to undergo brain-mapping tests. At the same time, Article 21[46] protects the right to privacy, which includes mental privacy. AI brain mapping, being a technology that potentially reveals a person's thoughts or memories, raises deep concerns about intrusion into the most personal parts of a person's mind. The Supreme Court's decision in *Selvi v. State of Karnataka*[47] has firmly established that involuntary use of such techniques is unconstitutional, stressing the importance of consent and the protection of individual dignity.

The ethical concerns are equally important. The potential misuse of AI brain mapping such as obtaining results without proper consent, the risk of misinterpretation, or the reliance on flawed data could lead to wrongful convictions or violations of human rights. While some countries like China have aggressively adopted AI in surveillance and policing, others like the United States remain cautious, highlighting the global uncertainty around the ethical and legal standards needed to govern such technologies.

It is clear that, while AI-powered brain mapping has the potential to be a powerful tool in the justice system, it must be used with caution. Clear legal guidelines, procedural safeguards, and judicial training are urgently required for responsible evidence assessment. Policymakers, courts, and forensic experts must work together to ensure that technology enhances rather than undermines justice.

AI brain mapping exists at the intersection of science, law, and human rights. Its success in criminal trials will be determined not only by its technological capabilities, but also by how well the legal system adapts to ensure fairness, transparency, and accountability. With the proper safeguards, it could become an asset. Without them, it risks setting an adverse precedent.

[42] Supra Note 26.
[43] Supra 17.
[44] Supra 18.
[45] Supra 17.
[46] Supra 18.
[47] Supra Note 12.

ISSN: 2582-6433

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