

The renaissance of neurolaw – basic conditions for successful human rights protection

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Abstract: It is now widely recognised that neurotechnological methods and applications have human rights implications from various perspectives and can lead to conflicts with such rights as privacy, freedom of thought, non-discrimination, but also with the prohibition of torture and human dignity. In this context, it is rightly pointed out that the intersections and possible links between various neurotechnologies and AI systems, which are developing at hypersonic speed, represent a completely new dimension of the issue. This makes it all the more important not to reduce the necessary protection of human rights to general promises and guarantees, but rather to place it on a basis that also works in real-world environments. In fact, all human rights documents contain comprehensive justification mechanisms that mean that (even massive) state intervention is not ultimately considered a violation of the relevant human rights guarantees. As a result, legal protection against the corresponding state measures is then also ineffective. Against this background, it is time to methodically design existing and future human rights guarantees in such a way that premature justification of state measures can be ruled out not only in theory but also in practice.

Keywords: Human rights, Neurotechnologies, AI, Real-world-environments, State interventions, Privacy

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Neurolaw, i.e. the legal examination of the specific challenges posed by neuroscientific research and its application, can now look back on a history spanning a good 20 years. While the prevailing view at the outset was that neurotechnologies did not have any specific characteristics that would justify separate legal consideration¹, the prevailing assessment changed rather quickly. Numerous scientific initiatives², projects and publications³ have identified relevant areas of tension, open questions and unique selling points that make legal consideration of neurotechnologies appear worthwhile and necessary. Nevertheless, the legal discussion in this area has levelled off somewhat in the meantime. At the latest, UNESCO's initiatives in the field of 'ethics of neurotechnology'⁴ have led to a noticeable and sustained revival of the discussion. With the publication of the report 'Ethical Issues of Neurotechnology' by the International Bioethics Committee at the end of 2021 and the subsequent work on a corresponding recommendation as a global standard-setting instrument, neurolaw has also arrived in international law. The possible links between neurotechnological applications and AI systems also play a special role in this context. UNESCO rightly points out the risks that are currently only beginning to emerge: 'Neurotechnology and artificial intelligence (AI) have become increasingly intertwined. This presents new challenges. Ethical and human rights implications are amplified further by this rapid convergence. In addition, the worldwide lack of solid governance and regulation in this area is worrisome.'⁵

Other actors from the field of international organisations are now also increasingly addressing this issue. In October 2025, for example, the United Nations Office on Drugs and Crime (UNODC) and INTERPOL published a

¹ Morse SJ, 2004, New neuroscience, old problems, in: Garland B, ed. Neuroscience and the law – Brain, mind, and the scales of justice, New York/Washington, DC: Dana Press, p. 157–198.

² MacArthur Foundation, 2007-2021, Research Network on Law and Neuroscience, <https://www.macfound.org/programs/pastwork/research-networks/research-network-on-law-and-neuroscience/>.

³ Schlemm S, Spranger TM, Walter H, eds., 2009, From Neuroethics to Neurolaw, Göttingen: Vandenhoeck & Ruprecht GmbH & Co. KG;

⁴ Antosuosso A, 2009, Le Neuroscienze e il diritto. Como–Pavia: Ibis;

⁵ Spranger TM, ed., 2012, International Neurolaw – A Comparative Analysis, Berlin/Heidelberg: Springer.

⁴ UNESCO, n.d., Ethics of Neurotechnology, <https://www.unesco.org/en/ethics-neurotech> (accessed October 22.2025).

⁵ UNESCO, n.d. Ethics of Neurotechnology, <https://www.unesco.org/en/ethics-neurotech> (accessed October 22.2025).

joint background paper on “Neurotechnology, Law Enforcement, and Criminal Justice: Uses, Risks, and Human Rights Safeguards”⁶, which is to be evaluated by stakeholders as part of a public consultation. Referring to a 2024 report by the UN Human Rights Council Advisory Committee⁷, the background paper also addresses key human rights challenges that may arise from neuroscientific findings and their application in specific cases: ‘To ensure compliance with international human rights law, law enforcement and criminal justice institutions will need to ensure individuals’ rights to privacy, freedom of thought, bodily integrity, non-discrimination, and the prohibition of torture, inhuman and degrading treatment.’⁸

Against the backdrop of these developments and concerns, a number of improvements are needed that are essential for effective and, above all, substantial human rights protection in the field of neurotechnology research and applications. First of all, it is essential that all assessments of the use of neurotechnologies take into account (international) AI legislation and, above all, the purely technological options for use that may arise from the combination with AI systems. From a human rights perspective, AI can act as a ‘fire accelerant’, so a separate analysis is required here. So far, however, it can be said that although there is an awareness in the neuroethical debate that AI systems are of paramount relevance to neuroethical issues, conversely, the relevant actors in the AI discourse regularly lack knowledge about the (critical) potential that AI systems can develop in the field of neurotechnologies.

There are likely to be two reasons for this: Firstly, at least the European Union’s AI Act⁹ pursues a risk-based approach¹⁰, which means that the allocation of a particular technology to a specific risk class triggers different legal obligations for the various actors (such as manufacturers and operators).

⁶ United Nations Office on Drugs and Crime (UNODC) & INTERPOL, 2025, Background Paper: Neurotechnology, Law Enforcement and Criminal Justice, https://www.unodc.org/documents/justice-and-prison-reform/technology/UNODC_INTERPOL_Background_Paper_Neurotechnology_Law_Enforcement_and_Criminal_Justice.pdf.

⁷ United Nations Human Rights Council Advisory Committee, 2024, Impact, opportunities and challenges of neurotechnology, with regard to the promotion and protection of all human rights, Report A/HRC/57/61, <https://docs.un.org/en/A/HRC/57/61>.

⁸ UNODC & INTERPOL, 2025, Background Paper: Neurotechnology, Law Enforcement and Criminal Justice, https://www.unodc.org/documents/justice-and-prison-reform/technology/UNODC_INTERPOL_Background_Paper_Neurotechnology_Law_Enforcement_and_Criminal_Justice.pdf, (accessed October 22, 2025), p. 4.

⁹ Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act), OJ L, 2024/1689.

¹⁰ See recitals 26 and 27 of the Artificial Intelligence Act.

These processes regularly cover entire areas of life or products (such as all medical devices for instance) without further differentiation. As a result, the risk-based approach sometimes proves to be too unspecific. Secondly, due to the incomprehensible range of possible fields of application, the discourse in AI law is very often characterised by extremely general or, conversely, extremely specific assessments, without the neurosciences having found sufficient resonance here so far. It is therefore important to sensitise the actors and stakeholders who shape the debate on AI law to the particular challenges that can arise from linking neuroscientific findings with AI systems. Neuroethics is predestined to enable this bridge to be built.

In addition to the indispensable link between neurolaw and AI law, there is another aspect that deserves even greater attention. There is likely to be near-universal consensus that human rights are an indispensable component of international law, that they play a particularly important role in the context of new technological developments, and that they must therefore be given special emphasis in this area. Hence, corresponding references to the applicable human rights framework can be found (with thematically varying names for the relevant rights) in all components of international law dedicated to technological progress, but these alone do not mitigate the risks inherent in the respective technologies. In other words, the fact that it is regularly pointed out that certain technologies may affect certain human rights does not remove the need to actively and specifically protect those rights. The real core of the problem therefore lies in the practical enforcement and implementation of legal frameworks.

Despite their prominent position in the hierarchy of norms, human rights are never guaranteed without restriction: the right to physical integrity reaches its limits when the police have to overpower a criminal and inevitably injure them in the process; freedom of movement may be restricted as a result of court convictions, among other things; academic freedom does not protect medical experiments on people who have not given their informed consent, etc. The conditions under which rights can be restricted and by whom depend primarily on the respective human rights document. While some constitutions, such as the German Basic Law, stipulate very different justification requirements for different fundamental rights, the Charter of Fundamental Rights of the European Union¹¹ in Art. 52 (1) and (2) specifies uniform standards for all human rights guarantees: ‘1. Any limitation on the exercise of the rights and freedoms recognised by this Charter must be provided for by law and respect the essence of those rights and freedoms. Subject to the principle of proportionality, limitations may be made only if

¹¹ Charter of Fundamental Rights of the European Union, OJ C 326, October 26, 2012, p. 391.

they are necessary and genuinely meet objectives of general interest recognised by the Union or the need to protect the rights and freedoms of others. 2. Rights recognised by this Charter for which provision is made in the Treaties shall be exercised under the conditions and within the limits defined by those Treaties.’

Every human rights system therefore recognises justifications that permit infringements of human rights. Depending on the area of life or field of law affected, it can be said that the protection of human rights does not always extend as far as one might assume. For instance, in the areas of law enforcement and criminal justice, there is considerable and, fundamentally, entirely justified interest on the part of the state and authorities in the use of technologies which – as the UNODC/INTERPOL background paper mentioned above rightly emphasises¹² – must also function accurately, reliably and securely in a real-world environment. The use of these technologies not only ensures a ‘level playing field’ in areas such as crime fighting, but also serves to protect the safety of the population, which is also enshrined in human rights. However, practical (and, incidentally, empirically well-documented) experience shows that technical options that are ‘interesting’ from an authority perspective are sometimes used far beyond their originally intended purpose and scope of application once they have been introduced. One example of this is the use of technical surveillance capabilities that were introduced for the purpose of combating terrorism, but which over the years have also been used in completely different contexts to prosecute minor offences, without being questioned further. In these cases of potentially excessive use of technology, there is a risk of significant human rights violations in terms of both quantity and quality.

Against this backdrop, genuine human rights protection must above all address aspects of the principle of proportionality, which must not be vague but sufficiently specific. New approaches and mechanisms should also be considered in international and domestic law that effectively counteract the excessive use of certain technologies in the medium term. In other words, with regard to law enforcement and criminal justice, not every offence justifies the use of the entire theoretical technical arsenal at our disposal.

However, even beyond this specific example, effective human rights protection can only be guaranteed if mechanisms are developed and utilised to counteract the excessive use of state justifications and thus the erosion of

¹² UNODC & INTERPOL, 2025, Background Paper: Neurotechnology, Law Enforcement and Criminal Justice, https://www.unodc.org/documents/justice-and-prison-reform/technology/UNODC_INTERPOL_Background_Paper_Neurotechnology_Law_Enforcement_and_Criminal_Justice.pdf, (accessed October 22, 2025), p. 4.

human rights protection. It would go far beyond the scope of this paper to go into detail here. Anyone who works on human rights not only in theory but also in practice knows that, despite their independence, state courts sometimes show a clear tendency to justify state interference with human rights. The case law of the European Court of Human Rights (ECHR) impressively illustrates that this is a relevant challenge for the protection of human rights: The possibility of individual complaints provided for in the European Convention on Human Rights enables those affected to sue their own state before an international court for human rights violations.¹³ In the case law of the ECHR, it is commonplace for plaintiffs to win their cases there – even though the national courts had denied the existence of a human rights violation up to the highest instance.

Against this backdrop, when developing specific human rights in the field of neuroscience, but also when applying existing rights and guarantees to areas of conflict in neuroscience, care should be taken to ensure that state interests cannot be too quickly and uncritically invoked as justification for any interventions. This can be achieved, for example, by defining justifications more specifically, using specific rather than general regulatory requirements. Here as an example: When Article 52(1) of the Charter of Fundamental Rights of the European Union states that interference with the human rights guarantees granted therein is possible and permissible ‘if they are necessary and genuinely meet objectives of general interest recognised by the Union or the need to protect the rights and freedoms of others’, then it is certainly possible to define the terms “necessary” or ‘general interest’ more precisely. This can be achieved either through more detailed definitions or through illustrative lists that provide guidance on the conditions under which these criteria are met – and which, conversely, indicate when these criteria are not satisfied.

All legal systems around the world, including international law and European Union law, are familiar with these and other methods that make the scope of application of provisions more specific. Such an approach is particularly appropriate for neurolaw if the protection of human rights, which is currently being discussed with great enthusiasm, is to be effectively guaranteed and not simply come to nothing. Whether this is the case or not is, of course, no longer a legal question, but a political one.

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¹³ Art. 34. ECHR.

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