

# Neurorights on Youtube: Investigating Ethical Considerations of Neurotechnology in Public Discourse

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Amidst the rapid advancements in neurotechnology, there has been an intensified discourse on the ethical implications they entail (1). Our research shifts the focus to public discourse on neuroethics, a topic not extensively covered in recent literature. While existing work predominantly centers on traditional survey methods (e.g., 2), this paper addresses a critical gap by employing computational social science methods to investigate public attitudes toward neurotechnology.

Our study uses neurotechnology-related YouTube videos, extracting video transcripts and users' comments. With a wide-ranging search string encompassing expressions such as 'brain implant,' 'BCI,' and 'brain chip,' we assemble a dataset of over 1,700 videos with more than 900,000 connected comments. We ask: What are the general public's prevailing ethical concerns and sentiments concerning neurotechnology? Informed by methodologies akin to previous studies on emerging technologies (e.g., autonomous vehicles or CRISPR; 3; 4), we leverage the taxonomy of neurorights, conceptualized by (5; 6; 7), to construct word groupings representing freedom of thought, the right to privacy, and the right to mental integrity, later serving as top-down filters in our analysis. Here, we employ word embeddings, a computational text analysis method (8). This approach allows us to discern the semantic relationships between words, thus unveiling the contextual associations that emerge when neurorights-related terms like 'privacy' are mentioned in our sample. In examining the ethical considerations of neurotechnology, our study adopts an enhanced anticipatory ethics approach (9), emphasizing the significance of public narratives and lay perspectives. Furthermore, by analyzing the "language games" apparent in discourse, our study aims to bridge the gap between ethical theories and the lived experiences of the general population (10). Our analysis, therefore, contributes not just to the field of neuroethics but also enriches philosophical discussions on the role of public discourse in shaping the trajectory of emerging technologies.

## References

- (1) Müller, O., & Rotter, S. (2017). Neurotechnology: Current developments and ethical issues. *Frontiers in systems neuroscience*, 11, 93;
- (2) MacDuffie, K. E., Ransom, S., & Klein, E. (2022). Neuroethics inside and out: A comparative survey of neural device industry representatives and the general public on ethical issues and principles in neurotechnology. *AJOB neuroscience*, 13(1), 44-54;
- (3) Li, T., Lin, L., Choi, M., Fu, K., Gong, S., & Wang, J. (2018, November). Youtube av 50k: an annotated corpus for comments in autonomous vehicles. In *2018 International Joint Symposium on Artificial Intelligence and Natural Language Processing (iSAI-NLP)* (pp. 1-5). IEEE;
- (4) Calabrese, C., Ding, J., Millam, B., & Barnett, G. A. (2020). The uproar over gene-edited babies: A semantic network analysis of CRISPR on Twitter. *Environmental Communication*, 14(7), 954-970.
- (5) Ienca, M. (2021a). On neurorights. *Frontiers in Human Neuroscience*, 15, 701258;
- (6) Ienca, M. (2021b). Common human rights challenges raised by different applications of neurotechnologies in the biomedical field. Report commissioned by the Committee on Bioethics of COE [www.rm.coe.int/report](http://www.rm.coe.int/report);
- (7) Giatsoglou, M., Vozalis, M. G., Diamantaras, K., Vakali, A., Sarigiannidis, G., & Chatzisavvas, K. C. (2017). Sentiment analysis leveraging emotions and word embeddings. *Expert Systems with Applications*, 69, 214-224;
- (8) Ienca, M., & Andorno, R. (2017). Towards new human rights in the age of neuroscience and neurotechnology. *Life sciences, society and policy*, 13(1), 1-27;
- (9) Umbrello, S., Bernstein, M. J., Vermaas, P. E., Resseguier, A., Gonzalez, G., Porcari, A., ... & Adomaitis, L. (2023). From speculation to reality: Enhancing anticipatory ethics for emerging technologies (ATE) in practice. *Technology in Society*, 74, 102325;
- (10) Coeckelbergh, M. (2018). Technology games: Using Wittgenstein for understanding and evaluating technology. *Science and Engineering Ethics*, 24(5), 1503-1519.