

Neurodata and neurotechnology: privacy and protection of personal data

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Recent advances in neuro-technology and artificial intelligence are enabling the emergence of a growing number of connected devices that monitor brain activity for different purposes. These devices, already available on the market, and which are used as wearable accessories for entertainment purposes or control of other devices, are part of the so-called Internet of Bodies (IoB) . Braindata or neurodata could identify individuals, infer emotional states, thoughts, or feelings, and reveal other special categories of data.



Brain-computer interfaces or BCI, are devices that enable direct interaction between the brain and a computer. BCIs allow interaction with the physical and virtual world using the mind. To achieve this, they collect and measure brain signals and activity, and with the appropriate capture and processing software, they are able to extract features of interest related to the user's intention and mental state and execute actions accordingly.

Although it may seem futuristic, we are talking about technologies that are already in the consumer market. Large companies (Snap, Valve, Meta, Apple, Samsung) are incorporating technologies and devices for neurodata capture into their products.

Early BCI applications aimed to provide an alternative communication channel for users with mobility or speech problems. However, several neuro-technological applications have made their way into the market and have been integrated into a range of consumer devices for healthy users for various non-clinical purposes. These applications seek more immersive and complete experiences in different uses (smart home, education, neuromarketing, games and entertainment, internet, metaverse, security and authentication, military engineering, etc.).

Emotiv, Neurosky, Nextmind, OpenBCI, NexTem, Unicorn-bi, Brainattach, etc., offer, at already very affordable prices, a range of wireless headsets for use in games and other forms of entertainment, marketing, monitoring or communication applications. Software development environments are also commercially available (including free and open-source options) that facilitate the acquisition of data collected by the BCI for application development.

The development of video games and entertainment applications with BCI is based on collecting information from brain activity that reveals the cognitive state of the user, and on developing applications where the information derived from brain activity allows various elements - such as an avatar in the metaverse - to be controlled with the mind, which responds to and reflects the user's emotions. This real-time data collection of the player's experiences and emotions leads to a whole new level of adaptive gaming, where bio-feedback is used to enhance performance by synchronizing the player's emotions and mood with events on the screen.

Of course, a significant part of the target audience for the development of video games and entertainment applications are children, from whom brain activity data will be collected and stored on cloud servers and could be reused for other purposes.

Brain information is unique and personal, each human brain is unique and allows personal identification through its anatomy (similar to a fingerprint). Brain data or *neurodata* could also be used to infer emotional and cognitive states, processes associated with personality, thoughts or feelings. It could even reveal significantly more information than is necessary for the purpose for which it is supposed to have been collected.

Together with artificial intelligence, Big Data, virtual reality, nanotechnology and miniaturization of implants and sensors, and the combined use with other neural and biometric signal collection techniques (hybrid BCIs), neural identifiers allow the collection of information that can be of different nature in processing: biometrics for identification, health data, very personal data (emotions and thoughts), profiling information, automated decisions or other types of special categories of data.

More information related to this topic can be found on the AEPD Innovation and Technology website at:

- [IoT \(II\): from the internet of things to the internet of bodies](#)
- [A Guide to Privacy by Design](#)
- [GDPR compliance of processings that embed Artificial Intelligence. An introduction](#)
- [Risk Management and Impact Assessment in the Processing of Personal Data](#)

