



TECHETHOS

FUTURE ○ TECHNOLOGY ○ ETHICS





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VOTE CARD







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NEUROTECHNOLOGY

Neurotechnologies represent a group of technologies used to monitor, stimulate, manipulate and emulate the structure and the functions of the human brain and the nervous system.





TECH FAMILY





SOCIAL FACTORS

DATA CONTROL



NO FREE WILL



INEQUALITY





WORLD CARD

NORMAL





SOCIAL FACTORS

DATA CONTROL



NO FREE WILL



INEQUALITY





WORLD CARD

EASY





SOCIAL FACTORS

DATA CONTROL



NO FREE WILL



INEQUALITY





WORLD CARD

HARD





COUNCIL RESPONSE CARD

TECH AGE CARD ID:

ISSUE TO SOLVE:

ETHICS PROPOSITION:





COUNCIL RESPONSE CARD





COUNCIL RESPONSE CARD

TECH AGE CARD ID:

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COUNCIL RESPONSE CARD





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COUNCIL RESPONSE CARD





NEUROSTIMULATION



Neurostimulation uses devices such as electrodes to simulate parts of the human nervous system and produce a certain behaviour. This can be used to help treat pathologies and reduce pain.





TECH AGE 1

NT - I - 1





NEUROIMAGING



Neuroimaging technologies measure and monitor neurological activities and identify neuron circuits that are involved, for example, when people react to fear. Once identified, an intervention can target specific areas.





TECH AGE 1

NT - I - 2





BRAIN-COMPUTER INTERFACE (BCI)



Brain-Computer Interfaces first read and collect brain activity data and signals related to thought and action. Then, they transform it into a desired result, such as moving a prosthetic limb, or a computer cursor.





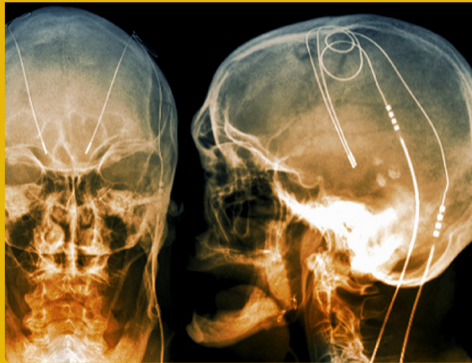
TECH AGE 1

NT - I - 3





MEDICINE



Neurotechnologies can better prevent and treat brain disorders, both neurological diseases like Parkinson's disease and epilepsy, and mental disorders like depression.

BENEFIT

Patients' quality of life is improved

ETHICAL CHALLENGE

Significant changes in personality





NEUROSTIMULATION

TECH AGE 2

NT - II - 1





CRIMINAL JUSTICE



Neurotechnologies are used to identify the biological factors that contributed to somebody committing crime and determine the most appropriate punishment.

BENEFIT

Reducing the risk that people reoffend

ETHICAL CHALLENGE

Human traits like values, history and intentions stop mattering





NEUROIMAGING

TECH AGE 2

NT - II - 2





HUMAN ENHANCEMENT



Users can improve their physical and psychological conditions. Using BCI and neuroprosthetics, people can control body parts, but also things like drones and automobiles.

BENEFIT

Body functions can be restored or improved

ETHICAL CHALLENGE

Going beyond one's normal healthy state





TECH AGE 2

NT - II - 3





NEUROSURVEILLANCE



Neurodata can be used by state security agencies to understand the population's psychological state, or by employers to monitor employees' productivity.

BENEFITS

Greater focus in fields like medical surgery

ETHICAL CHALLENGE

Discrimination on the basis of brain profile





**NEUROIMAGING
NEUROSTIMULATION**

TECH AGE 2

NT - II - 4





MARKETING



Neurotechnologies are used to better understand consumers' behaviour and preferences. Using that knowledge, marketing strategies can be personalised and targeted.

BENEFIT

More accurate insights about unconscious and emotional responses

ETHICAL CHALLENGE

Violation of privacy and data protection





**NEUROIMAGING
NEUROSTIMULATION**

TECH AGE 2

NT - II - 5





MILITARY USE



Neurotechnologies are used to improve combatant's equipment and augment their cognitive, physical, and psychological capacities. BCIs can also help restore functions lost in combat.

BENEFIT

Combatants are more effective on the battlefield

ETHICAL CHALLENGE

Military conflict becomes more radical





**NEUROSTIMULATION
BCI**

TECH AGE 2

NT - II - 6





ENTERTAINMENT



Neurotechnologies help users feel more immersed in entertainment content by stimulating their nervous system and giving them control over hardware and software.

BENEFITS

People can play games or do sports beyond their own capacities

ETHICAL CHALLENGE

Stimulation can cause addiction





**NEUROSTIMULATION
BCI**

TECH AGE 2

NT - II - 7





PREDICTIVE DIAGNOSTICS



Early diagnostics allows the identification of signs that people might be predisposed to neurological diseases. This helps to prevent diseases or decrease their impact.

BENEFITS

Reduction of the incidence and costs of diseases

ETHICAL CHALLENGE

Knowing in advance changes how people see themselves





**NEUROIMAGING
BCI**

TECH AGE 2

NT - II - 8





EDUCATION



Students' brain activity linked to curiosity, attention or stress is used to personalise learning. Devices can help with learning difficulties such as dyslexia.

BENEFITS

Better educational practices and greater autonomy

ETHICAL CHALLENGE

Less cognitive diversity and fewer points of view





**NEUROIMAGING
BCI**

TECH AGE 2

NT - II - 9





How to preserve people' autonomy?

Neurotechnologies are often used for patients with physical or psychological disabilities, who might have limited autonomy to give consent. Furthermore, patients' autonomy can be negatively impacted if neurotechnology devices have more control over decision-making than themselves.

AUTONOMY





MEDICINE

TECH AGE 3

NT - III - 1





How can we ensure that human dignity is respected?

The capacities of neurotechnologies can strengthen the belief that human actions are determined by neurobiology. People might not be treated with the human dignity they deserve, in the name of preventing crimes and reducing reoffending.

HUMAN DIGNITY





CRIMINAL JUSTICE

TECH AGE 3

NT - III - 2





How can physical and digital safety be ensured?

In non-medical settings, users might decide to undergo enhancement procedures with the desire to feel or perform “better”. These procedures are highly invasive and entail known as well as unknown risks.

RISK REDUCTION





HUMAN ENHANCEMENT

TECH AGE 3

NT - III - 3





Who gets access to neurological data and on what terms?

Usually, people know for which data they give consent. The potential to extract mental imagery is unlimited. As a result, people might consent to handling data that they do not understand at that moment.

INFORMED CONSENT





NEUROSURVEILLANCE

TECH AGE 3

NT - III - 4





How do we deal with the privacy concerns raised by neurotechnologies?

Mental privacy is the idea that people should have control over the data produced by their neurological activity. In certain cases, this data could be used for mental manipulation to influence the behaviour of specific target groups.

PRIVACY





MARKETING

TECH AGE 3

NT - III - 5





Who should be considered responsible when neurotechnologies are misused?

Neurotechnologies can limit the freedom of the individual to act. For example, a BCI user could be made to act in a certain way by the BCI manufacturer or operator. Such cases raise questions on how the responsibility can or should be shared.

RESPONSIBILITY





MILITARY USE

TECH AGE 3

NT - III - 6





How do we ensure the quality of hardware and software and avoid obsolescence?

As tech companies come and go, the prospect of consumers' neurotech devices becoming obsolete becomes real. If a company goes bankrupt, for example, users might not be able to use or even to remove their device.

SUSTAINABILITY





ENTERTAINMENT

TECH AGE 3

NT - III - 7





How do we ensure that we minimise inequality??

The use of brain images to predict and diagnose brain conditions could lead to discrimination. People diagnosed with neurological disease years ahead of their first symptoms might face discrimination at work or in relationships.

INEQUALITY





PREDICTIVE DIAGNOSTICS

TECH AGE 3

NT - III - 8





How do we respect and support neurodiverse individuals?

If mental conditions can be changed by neurotechnology, the diversity of individuals' unique mental features risks being reduced to "normal" development. Children might be directed to reach a similar level of mental capacity through neuro-education.

NEURODIVERSITY





EDUCATION

TECH AGE 3

XR - III - 9



MEDICINE



CRIMINAL
JUSTICE



HUMAN
ENHANCEMENT



NEURO-
SURVEILLANCE



MARKETING



MILITARY
USE



ENTERTAINMENT



PREDICTIVE
DIAGNOSTICS



EDUCATION





AUTONOMY —



HUMAN DIGNITY —



**RISK
REDUCTION** —



**INFORMED
CONSENT** —



PRIVACY —



RESPONSIBILITY —



SUSTAINABILITY —



INEQUALITY —



NEURODIVERSITY —







NEURO-
STIMULATION

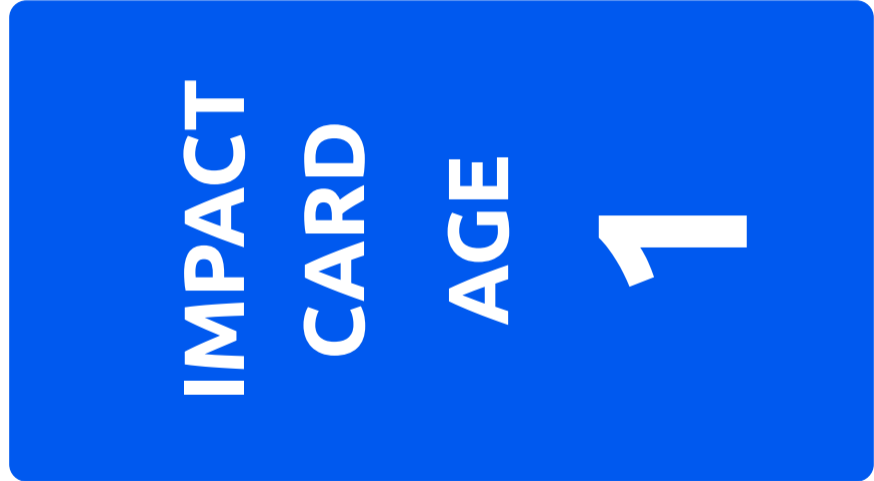


NEUROIMAGING



BRAIN-
COMPUTER
INTERFACE





TURN SUMMARY

I. PLAYER ROUND

1. TECHNOLOGY FAMILY)
2. TECH AGE EVOLUTION
3. OPEN DEBATE
4. CITIZEN WORLD
COUNCIL DECISION

II. WORLD ROUND

1. IMPACTS
2. ETHICAL ISSUES
3. CITIZEN WORLD
COUNCIL RESPONSE
4. TECHNOLOGY TREE
5. END OF GAME?



TURN CARD



CREDITS

THIS GAME WAS DEVELOPED BY THE EU-FUNDED PROJECT TECHETHOS, BASED ON NEW RESEARCH CARRIED OUT BY ITS PARTNERS.

FOR MORE INFORMATION, VISIT:

WWW.TECHETHOS.EU

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CREDITS

