Shaping future technologies

TechEthos' newly selected technology families and how the project plans to support their ethical design

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Based on a wide-ranging horizon scan of new and emerging technologies, TechEthos selected three families of technologies expected to have disruptive socio-economic and ethical implications: **Climate Engineering**, **Digital Extended Reality**, and **Neurotechnologies**.

New and emerging technologies are often critically observed in how they will affect the wider society in a way that balances potential benefits and harms. Increasingly with new technologies, this balance seems especially tenuous, with the scales seeming more and more to tilt towards harm. The fragility of this balance calls for impact analysis especially for future technologies that have the capacity to cause significant economic and societal impacts. Over the past six months TechEthos has identified 150 technologies and clustered these into 35 "technology families". From this, the consortium behind TechEthos has selected three technology families – Climate Engineering, Extended Digital Reality, and Neurotechnologies – which will fuel the project's work on ethical guideline development.

Arriving at this set of three technology families entailed an in-depth technology horizon scanning exercise. TechEthos' efforts were informed by extensive literature review of authoritative technology assessments from governments, research organisations, and think tanks, as well as surveys, interviews, and workshops with natural, physical, social scientific experts, philosophers and ethicists.

"Our research clearly shows there are a number of technologies that could profoundly impact our society, in the short to medium time horizon, and in which all major economies are investing significantly. Having the capacity to understand, anticipate and steer the development of these technologies toward "our" needs as a society, is a priority, and yet an often-unmet demand, for many research, industry, policy and civil society players."

Andrea Porcari , Italian Association for Industrial Research

The technology families selected provide a view into a collection of technologies that we anticipate will have impactful shifts in society. In short:

o **Climate engineering**: represents a branch of technologies that could mitigate human induced climate change – from carbon capture to solar geoengineering. Key ethical concerns include irreversibility, social inequality and transparency for example, the imposition on some communities/countries who may not choose them and responsibility to future generations.

o **Digital extended reality**: a cluster of technologies that could change how people connect with each other and their surroundings in physical and virtual settings. Ethical concerns surround cybersecurity and how these technologies may impact human behavioural and social dynamics, for example technology mimicking human responses may give rise to responses as though it

were actually human, while developments in Extended Reality may lead to undue influence from 'nudging' techniques.

- o **Neurotechnologies**: a set of technologies that directly involve the human brain in monitoring, assessing, emulating, and manipulating its function, for example, brain computer interfaces that can support more intuitive control of prosthetic devices and relay sensory information back to users. Ethical concerns include how we can ensure humans retain their free will/autonomy, and retain privacy issues on sensitive data. These technologies create further issues around what we call "neurodeterminism" in which people assume our minds are our brains whereas we are the product of so much more, including a lifetime of experiences.

TechEthos is now working to better understand expert and broader stakeholder and public perceptions of the potential ways these new technologies might develop. Based on this future-oriented perspective, the project seeks to inform the development of ethical guidelines and legal frameworks to ensure a robust balance is created between potential societal harms and benefits.

About TechEthos: TechEthos is funded by the Europeans Union's Horizon 2020 research and innovation programme under grant agreement no. 101006249. The project is coordinated by the AIT Austrian Institute of Technology and will run for three years, ending in December 2023.

CONNECT WITH US: TechEthos can be found on Twitter and LinkedIn and via our newsletter. By joining our online community, individuals will become a contributor in shaping technologies of the future. To find out more about these technologies visit our technology corner on the website.

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