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CYBERNETIC AVATARS, ROBOTS, AND SUSTAINABILITY

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The growth in Artificial Intelligence (AI) is rapid, and every day brings new developments to the world. Apart from all the good that comes from this process, the fast progress in AI is accompanied by threats related to scams, deep fakes, and cybercrimes. These urge the need for a regulatory framework that can tackle AI-related problems. However, the global community cannot solely focus on the safety and security of AI use; another crucial aspect must be taken into account: sustainability. This arises from the fact that while AI has great power in solving problems relevant to Sustainable Development Goals, it can also pose challenges to sustainability itself. Therefore, establishing a framework for green AI, including elements like cybernetic avatars and robots, may be essential. In this context, I call for "sustainAIbility" – sustainable AI that meets the test of sustainability established under the global framework.

1. Introduction

Artificial Intelligence (AI) is nowadays a phrase that appears in everyday discussions, ranging from industry and politics to academia and research. It emerges during conferences, seminars, and business meetings, but also reaches far beyond these circles. Even individuals with no prior exposure to AI are now noticing or using (often unconsciously) AI-powered applications and everyday solutions. It is a consequence of a recent AI boom that brings a variety of applications enabling human – technology interactions.

Due to the scale and pace of the development of AI is followed by threats related to scams, deep fakes, and more and more advanced cybercrimes. This poses questions related to ethical use of AI that has resulted in AI being a topic of a regulatory debate, with different approaches offered. One can distinguish here at least three standard ways: strict, state-driven, as in China, free, market-oriented as in the USA, or middle, as in the EU, where a regulatory framework has been proposed [see 2; 10].

2. Regulating sustainability of AI: The Artificial Intelligence Act

Regardless of their scope and depth, the base of this debate has been privacy and data protection, to make use of AI safe and secure. The regulatory regimes, like the one proposed by the EU, add to this system elements like human-centrism and trustworthiness as ground rules for the development of AI. These principles are accompanied by other tenets like "protection of health, safety, fundamental rights enshrined in the Charter of Fundamental Rights, including democracy, the rule of law and environmental protection", as introduced in the Artificial Intelligence Act approved by the European Parliament in March 2024 (AI Act) [1].[a] Apart from protection of environment, the regulatory framework proposed by the EU, addresses sustainability, as one of its key-elements. As highlighted in the Recital 4 of Preamble of the AI Act:

[a] In May 2024, the Act was adopted by the Council, and then will enter into force twenty days after its publication in the Official Journal. The Act will be fully applicable 24 months after its entry into force, with some exceptions.

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> AI is a fast evolving family of technologies that contributes to a wide array of economic, environmental and societal benefits across the entire spectrum of industries and social activities. By improving prediction, optimising operations and resource allocation, and personalising digital solutions available for individuals and organisations, the use of AI can provide key competitive advantages to undertakings and support socially and environmentally beneficial outcomes, for example in […] education and training, […] infrastructure management, energy, transport and logistics, public services, security, […] resource and energy efficiency, environmental monitoring, the conservation and restoration of biodiversity and ecosystems and climate change mitigation and adaptation.

The list excerpted from the AI Act provides a variety of examples related to sustainability, illustrating how AI is currently utilized and can be further employed. This includes climate education at different levels [see 3], management of energy infrastructure in smart energy communities [see 22], or electric transportation in smart city systems [see 8], as well as dozens of other activities related to reduction of greenhouse gas emissions, enhancing energy efficiency, and promotion of renewable energy sources [see 19].

What is crucial in this development is how AI technologies and solutions address sustainability-related problems, as well as their own sustainability. This stems from the fact that although AI has significant power in solving issues related to sustainable development goals, it can also be a significant challenge to sustainability. Intensive-energy AI systems, robots incorporating environmentally harmful components or non-recyclable batteries, and cybernetic avatars disseminating climate and environment-related misinformation in the digital world represent only a fraction of the anti-sustainable agenda. Seen in this light, advancements in AI must be carried out in accordance with Sustainable Development Goals [13, p. 75].

3. Framework for green AI: SustainAIbility is needed!

AI has great potential to support energy transformation and climate action. However, it remains an open question which legal regime – state-driven, market-oriented, or regulatory-based – will be most effective in making this happen. Experience shows that regimes that achieve a balance between common and private interests yield the most promising long-term results [see 16 – 18].

This is particularly important in the context of the development AI and robotics, as well as creation of a cyberspace with avatars as its elements. The world that has been trying to tackle climate change and environmental problems should not create new problems to this agenda but be focused on solutions. Hence, the AI revolution must align with sustainability by all possible means – *sustainAIbility is needed*. Rather than merely developing AI, our focus should be on green AI, as discussed in the Special Issue "Green Artificial Intelligence: Regulatory Road to Sustainable AI" [7], covering interdependence between AI and environmental sustainability [12], environmental challenges of AI in relation to law [11], as well as sustainable city planning and public administration assisted by green AI [9].

In this light, it is crucial to establish clear criteria and stringent standards for energy efficiency in AI and robotics, while aligning the expansion of renewable energy sources with advancements in these fields [4]. To achieve its effectiveness, global cooperation and international standardization are essential. Introducing a sustainability test based on dynamic standards could be a helpful solution. Following this, a certification mechanism for sustainable AI systems that successfully pass the sustainability test, aligned with the global framework of Sustainable Development Goals, could be implemented. Institutions like the United Nations and its agencies, such as the Intergovernmental Panel on Climate Change (IPCC), could play a

pivotal role in this process. However, ensuring greater inclusivity of experts from diverse backgrounds and regions who participate in these initiatives is crucial.[b]

The new European regulatory framework offers some benchmark solutions. For instance, the European Commission will be entitled to issue standardization requests covering requirements set out in the AI Act. This concerns, for example, establishment and implementation of the risk management tools that are documented and maintained in relation to high-risk AI systems,[c] or the need for these management mechanisms to have the technical documentation drawn up before they AI systems are placed on the market or put into service.[d] According to Article 40(2) or the AI Act the European Commission's standardization request "shall also ask for deliverables on reporting and documentation processes to improve AI systems' resource performance, such as reducing the high-risk AI system's consumption of energy and other resources consumption during its lifecycle, and on the energy-efficient development of general-purpose AI models".

4. Best Available Techniques for sustainable AI

For the sustainability in AI (*sustainAIbility*) framework to transition from theoretical grounding to practical application, at least four conditions must be fulfilled. These conditions, which can be understood as a cascading process similar to other emerging theories [see 21], encompass: definition, recognition, enhancement, and supervision. The first step towards recognizing sustainable AI necessitates establishing a clear and comprehensive definition of *sustainAIbility*. While research can pave the way for such a discussion, legal recognition plays a critical role. In this context, both elements are interrelated: the definition of sustainable AI would likely be one of the first issues requiring legal coverage within any legal act addressing it [see 21].

Having established a clear definition and achieved legal recognition, the framework for *sustainAIbility* would require tools to ensure its effectiveness. This necessitates the development of legal criteria for classifying AI systems as sustainable. In contrast to the European Commission's individual focus on standardization, this approach could emphasize more general rules applicable across diverse AI technologies and solutions. Nevertheless, these rules should be dynamic to adapt to changing technological environment. That is why the Best Available Techniques (BAT) framework, employed within the European Union's regulatory regime on industrial emissions – Industrial Emissions Directive (IED), offers a compelling benchmark for a regulatory system governing sustainable AI.

Under the IED, the BAT reference document, generated through information exchange, addresses specific activities, applicable techniques, current emission and consumption levels, and methodologies for determining BAT conclusions and emerging techniques (Sokołowski, 2018). In practice, BATs determine permit conditions, and adhering to these techniques is an obligation for Member States [15]. According to Article 3(10) of the IED, "best available techniques":

> means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

[b] The first major test for this will be the upcoming Special Report on Climate Change and Cities by the IPCC (scheduled for release in early 2027). Much relies on the Report's scope, particularly whether it will include AI-city related solutions.

[c] Article 9(1) of the AI Act.

[d] Article 11(1) of the AI Act.

(a) ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

(b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

(c) ‘best’ means most effective in achieving a high general level of protection of the environment as a whole;

The above-mentioned definition of “best available techniques” could be readily adapted to the context of *sustAInability*, with minimal modifications. Particularly, the term “decommissioned” could be replaced with a more encompassing term like “retired”, and the concept of “permits” would not be directly applicable. However, a stronger emphasis on AI systems, rather than installations, would be necessary. Following these adjustments, a definition of *best available techniques for sustainable AI* could be formulated as follows:

the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other ~~permit~~ conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

(a) ‘techniques’ includes both the technology used and the way in which the system is designed, built, maintained, operated and retired;

(b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

(c) ‘best’ means most effective in achieving a high general level of protection of the environment as a whole;

Assuming the proposed idea undergoes further development, by incorporating elements similar to those under the European legislation on industrial emissions (while addressing IED’s limitations),[e] the effectiveness of the *sustAInability* framework could be significantly enhanced. This is particularly true with regard to the enforceability of the framework through legal action for non-compliance.

However, such a system necessitates the establishment of a dedicated supervisory entity [see 20]. Drawing upon experiences in various regulated sectors, a model that avoids both active state participation and complete regulatory abdication appears most promising. In this context, a *day-watchman* approach, where a vigilant observer provides market participants with information while enforcing rules through sanctions, could offer a well-balanced solution [see 14, p. 89].

5. Conclusion

The implementation of the AI Act, once formally introduced, will reveal the extent, depth, and, importantly, enforceability of the regulatory tools proposed by the EU. Moreover, the matter of how other regulatory regimes (such as the USA and China) will evolve, as well as the direction taken by other countries active in the development of new technologies and AI-driven solutions (such as Japan and India), remains far from insignificant.

[e] There are then different types of situations for which reference documents (BREFs) are incomplete or non-existent, and industrial plants involved in these activities without reference are not exempt from implementing BATs; however, the lack of reference technologies “officially” considered as BATs may lead operators to skip their installations concerned in their BAT analysis and/or the competent authority not to fully check BAT compliance [see 5]. Nevertheless, the proposed framework, by referring to experience related to BAT under IED, could eliminate these problems.

What is, however, even more crucial is how the global community will respond to regulating use of AI for the needs of sustainability, tackling climate change, and conducting energy transition. Establishing a framework for green AI which encompasses elements like cybernetic avatars and robots, may be essential. In this context, I advocate for "sustainAIbility" – sustainable AI that meets the test of sustainability established under the global framework.

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