Climate Change AI

Feedback on the proposed

Harmonised Rules on Artificial Intelligence

Climate Change AI
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Key recommendations

- Explicitly involve **climate change mitigation and adaptation in the classification rules** for high-risk AI systems.
- Expand reporting requirements for high-risk AI systems to **collect data on greenhouse gas impacts**, including impacts through both computational energy use and the applications for which these systems are used.

Introduction

Climate change is one of the most urgent challenges of our time, and addressing it will require rapid and concerted action across many sectors of the economy. As AI has increasingly transformational effects on society, it is therefore critical to holistically account for the effects — both positive and negative — that AI may have on climate change.

AI has a multi-faceted relationship with climate change (Kaack et al., 2020; Stein, 2020), as it can be used to help with climate change mitigation and adaptation (Rolnick et al., 2019); can be deployed in ways that counteract such efforts (Greenpeace, 2019), thereby potentially increasing greenhouse gas emissions; and can directly emit greenhouse gases through computational energy consumption (Schwartz et al., 2019; Strubell et al., 2019). As a fast-developing new group of technologies with system-level effects, AI can add considerable uncertainty to the ability to reach climate targets.

Climate Change AI welcomes that this nuanced perspective is reflected in the proposed regulation, which both recognizes the potential for using AI to address climate change, as well as “the speed of technological change and possible challenges,” and states that “the EU is committed to strive for a balanced approach.”

The proposed regulation affects the intersection of AI and climate change in different ways. Notably, climate change is mentioned prominently as an area where AI can support "socially

and environmentally beneficial outcomes." Climate Change AI welcomes these provisions that are key steps towards enabling deployment of AI technologies that are beneficial to climate change mitigation and adaptation.

We would like to suggest in addition, however, that the proposed regulation more explicitly account for potential risks of AI systems to increase greenhouse gas emissions or vulnerability to climate change. In addition, we believe that the legislation provides an opportunity to collect much-needed information for assessing the greenhouse gas emissions impacts of AI. Climate Change AI proposes two additions that would be central to appropriately accounting for and shaping the relationship of AI and climate change.

1. More explicitly involving climate change mitigation and adaptation in the classification rules for high-risk AI systems. In particular, more explicitly acknowledging environmental protection — including reduction of greenhouse gas emissions to mitigate climate change — as one of the fundamental rights that, if affected negatively by the AI system, trigger a high-risk classification.
2. Expanding reporting requirements for high-risk AI systems to collect data on greenhouse gas impacts, including impacts through both computational energy use and the applications for which these systems are used. This approach would leverage the opportunity of reporting requirements for high-risk AI systems to collect much-needed data for decision-making on decarbonization strategies.

1. Classification rules for high-risk AI systems

Some AI systems may, now or in the future, significantly contribute to increasing greenhouse gas emissions or vulnerability to climate change. For instance, they may be used to reinforce the use of fossil fuels,[1] or induce economy-scale changes with negative[2] or uncertain[3] climate impacts that can be shaped by policy choices. The classification rules for high-risk AI systems, as they currently stand, do not sufficiently account for such risks. We propose this gap be addressed by adapting the criteria laid out in Article 7.

The heart of this proposal rightly focuses on ensuring fundamental rights are protected when using AI. The proposal acknowledges environmental protection as one of the fundamental rights that affect whether an AI application should be considered high risk in Recital 28. However, the language as written mentions environmental protection mainly in reference to the immediate

[1] For instance, some uses of AI can change the economic viability and resource availability of fossil fuels (Greenpeace, 2019).
[2] For instance, uses of AI for advertising may cause increases in consumption and resource use.
[3] Some applications of AI may have uncertain but potentially significant impacts on climate change, depending on how exactly these applications are executed. For instance, autonomous vehicles can be used to facilitate the use of low-carbon, public transportation, but depending on implementation choices, may equally serve to “lock in” individualized modes of transportation in a way that increases overall energy consumption (Wadud et al., 2016). Policy and regulation can play a significant role in shaping these potential impacts.

health and safety of individuals, and fails to explicitly mention some of the most pressing examples where AI could negatively infringe on the fundamental right to environmental protection: greenhouse gas emissions and the vulnerability to climate change. We argue here that climate change mitigation and adaptation should be named more explicitly.

The Commission could employ wording in the proposal to emphasize this point, for example by amending the sentence to read:

> "The fundamental right to a high level of environmental protection enshrined in the Charter and implemented in Union policies should also be considered when assessing the severity of the harm that an AI system can cause, including in relation to the health and safety of persons ***and the ability to appropriately address climate change***."

We propose that other portions of Article 7 also be updated to more explicitly acknowledge the right for environmental protection, including protection against significant emission increases or other systemic effects resulting from AI that counteract decarbonization efforts. The most obvious example relates to impacts that are not easily reversible, where wording could be amended as follows:

> “the extent to which the outcome produced with an AI system is easily reversible, whereby outcomes having an impact on the health or safety of persons**, *or an environmental impact such as the ability of meeting greenhouse gas emission targets,*** shall not be considered as easily reversible;”

Including wording that explicitly accounts for potential adverse effects of AI systems on climate change can lower the barriers to regulating and monitoring AI systems on the basis of such concerns.

2. Transparency and reporting of climate-relevant data

To date, estimating AI’s impact on greenhouse gas emissions has been difficult, and reliable aggregate numbers are scarce. Better impact assessment requires not just innovations in measurement methodologies, but also access to relevant information. This means key data on climate impacts of AI will need to be released and systematically gathered. The reporting requirements for high-risk AI systems can be a unique opportunity in making this information available at scale.

While it is relatively straightforward to estimate the compute-related greenhouse gas emissions resulting from individual runs of AI systems, the usage patterns in practice (e.g., how often a machine learning model is used or re-trained) are largely opaque. In addition, data center operators currently do not publish the shares of AI loads on their servers. These issues make it very hard to obtain aggregate numbers on the emissions associated with the computational energy requirements of AI.

The need for better data also extends far beyond compute-related emissions: it will be crucial to understand the broader effects of AI applications, whose impacts on their respective sectors could be large but are often highly uncertain (as described in footnote above). Knowledge about such impacts currently exists in the form of limited case studies, which points at a need to estimate impacts more broadly and systematically.

The proposal contains provisions for reporting of high-risk AI systems: as stated in the explanatory memorandum at 5.1, “AI providers will be obliged to provide meaningful information about their systems.” We propose to include the following data points in the scope of information that is requested:

- At a minimum, specifics on computing power needed for system development, training/fine-tuning, and inference at appropriate time resolutions, and information about the type, time, and location of computing infrastructure used. Informative are also specifics about the model architecture and size, training requirements for system development (or pre-trained systems used), frequency of training/retraining/fine-tuning, and as well as average number of inference uses per unit of time.
- An assessment of how the system affects or may affect climate change mitigation or adaptation more broadly, including of the greenhouse gas emissions resulting from the applications of the AI system. The assessment should be as quantitative as possible, and should describe the methodology and assumptions used.

Other considerations and recommendations

Below we will provide short feedback on other aspects of how the proposed legislation addresses the intersection of AI and climate change, and where proposed rules intersect with climate-relevant areas (even if not explicitly addressed).

- Climate Change AI welcomes the provisions on the establishment of regulatory sandboxes. Research, development and demonstration (RD&D) support is key to driving innovation of AI systems, and to enable their meaningful application to climate change mitigation and adaptation. In particular, we welcome that climate change is identified as a priority area, and that relevant actions for promoting RD&D are discussed in detail in Section 11 of COM(2021) 205 final ANNEX.
- AI applications in critical infrastructure are considered high-risk AI systems; however, those sectors often hold great potential for applying AI to help with climate change mitigation and adaptation (e.g. transportation, water, gas, heating and electricity; Creutzig et al., 2019; Rolnick et al., 2019; The Royal Society, 2020). Barriers resulting from the legislation in these sectors must be appropriately addressed to ensure they do not slow climate change mitigation and adaptation efforts that can benefit from AI.
- We welcome that “the Commission and the Board shall encourage and facilitate the drawing up of codes of conduct intended to foster the voluntary application to AI systems of requirements related for example to environmental sustainability, [...] on the basis of clear objectives and key performance indicators to measure the achievement of those objectives.” We recommend that such codes of conduct on environmental sustainability

not only focus on the “direct” impact of AI systems resulting from their computational energy and resource consumption, but also center the “indirect” impacts resulting from the use of the AI system.

About Climate Change AI

Climate Change AI (CCAI) is a volunteer-driven organization of researchers and professionals with the mission to catalyze impactful work at the intersection of climate change and machine learning. Since it was founded in June 2019, CCAI has led the creation of a global movement in climate change and machine learning, encompassing researchers, engineers, entrepreneurs, investors, policymakers, companies, and NGOs. Our activities include a foundational report detailing where machine learning can have high leverage in addressing climate change, conferences and events at top machine learning venues and the UN Climate Change Conference, and various activities and resources developed together with partners from government and industry. Planned upcoming initiatives include grants programs, summer schools, and programs to bridge the gap between academic research and deployment.

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