

Exploring the materialities of AI: Geographies, infrastructures, numbers

A one-day conference in Paris organized by the Center for Internet and Society.

Friday, January 31, 9:30 am - 4:30 pm
CNRS, site Pouchet
59-61 rue Pouchet, 75017 Paris, FRANCE



The consequences of artificial intelligence (AI) on the environment have garnered attention in public discourse after several publications estimating the water consumption, energy usage and resource depletion caused by the training and operating of AI and large language models (LLMs). Quantification plays an important role in making the materiality of AI perceptible but they do not exhaust the representations of AI's consequences on the planet. In this conference, we explore the materialities of artificial AI from a wider variety of epistemic perspectives that deepen the comprehension of the multiple facets of AI's material presence in the world and its consequences.

Programme

09:30 am: Welcome coffee

10 am - 12:50 pm: A critical perspective on the quantification of AI's environmental footprint.

10 am - 10:30 am: **Loup Cellard** (Dataactivist, medialab Sciences-Po, ADM+S Centre) "Beyond AI as an environmental pharmakon: Principles for reopening the

problem-space of machine learning's carbon footprint," currently in review in *Environment & Planning E* (with Christine Parker and Fiona Haines - University of Melbourne)

10:30 am - 10:50 am: Q&A

10:50 am - 11:20 am: **Anne-Laure Ligozat** (ENSIIE) & **Aurélie Bugeau** (Bordeaux University), "Can AI's environmental damage be controlled?"

11:20 am - 11:40 am: Q&A

11:40 am - 12 pm : Break

12 pm - 12:30 pm: **Théophile Lenoir** (University of Milan), "Evaluating the environmental consequences of AI: Tensions around quantification", currently in review in *Digital Society* (with Christine Parker - Melbourne Law School)

12:30 pm - 12:50 pm: Q&A

12:50 pm - 2 pm: Lunch

2 pm - 4:50 pm : Beyond numbers - accounting for the materialities of AI through its geography and infrastructure

2 pm - 2:30 pm: **Ana Valdivia** (Oxford) "The supply chain capitalism of AI: a call to (re)think algorithmic harms and resistance through environmental lens"

2:30 pm - 2:50 pm: Q&A

2:50 pm - 3:20 pm: **Valentin Goujon** (médialab, Sciences-Po Paris), "Big Compute as Big Science: (super)computing infrastructures and the "greening" of French AI research".

3:20 pm - 3:40 pm: Q&A

3:40 am - 4 pm : Break

4 pm - 4:30 pm: **Ludovico Rella** (Durham, UK), "Between Dark and Green Silicon. Geographies of Cloud and Edge AI"

4:30 pm - 4:50 pm: Q&A

4:50 pm - 5 pm: Concluding remarks

Abstracts
(Alphabetical order)

Loup Cellard (Dataactivist, Sciences Po) **“Beyond AI as an environmental pharmakon: Principles for reopening the problem-space of machine learning’s carbon footprint”**, currently in review in *Environment & Planning E* (with Christine Parker - Melbourne Law School)

Abstract : In this paper, we critique a pervasive discourse about the environmental implications of artificial intelligence as witnessed in news media, public policy analysis and computer science literature. In this discourse, AI is seen through a paradoxical lens: as essential to reducing the damaging effects of the climate crisis, and also at the same time as a looming threat to both the climate and broader ecological crises. This seemingly contradictory framing of AI as both ‘remedy’ and ‘poison’ resonates with the concept of pharmakon, a heuristic device used extensively in the philosophy of technology. In this paper we show how the policy discourses of leading actors such as the OECD, Green Software Foundation and Microsoft’s data scientists are of resolving the pharmacological nature of AI’s environmental impact by narrowing the scope of its toxic properties and hence the solutions required in order to enable the technology’s continued use and expansion. We argue that these discourses are reducing and over simplifying the problem at stake to a simple proposition: we need more AI for climate tech applications but less energy thirsty AI. We show how this framing of the problem arose from a particular recent political history of the ‘techlash’, which in turn led to considerable efforts to quantify AI’s carbon footprint. We suggest a different problematisation inspired by Science & Technology Studies scholar Andrew Barry’s methodological approach, one that can re-open the problem-space of AI’s environmental impact. This approach is sketch through four methodological starting points: unpacking the material entanglements between AI and ecologies; being sensible to geohistory – the specific locally situated nature of data centers and energy grids sustaining AI training, tuning and deployment; envisioning the multiplicity of solutions to the climate crisis (beyond carbon accounting of the AI footprint); and finally, de-centering AI (by acknowledging the heterogeneity of actors and interests along AI supply chains)

Valentin Goujon (médialab Sciences Po), **“Big Compute as Big Science: (super)computing and the “greening” of French AI research”**.

Abstract to come

Théophile Lenoir (University of Milan), **“Evaluating the environmental consequences of AI : Tensions around quantification”**, currently in review in *Digital Society* (with Christine Parker - Melbourne Law School)

Abstract: With mounting concern regarding the environmental footprint of AI systems, the number and diversity of actors engaged in evaluating the sustainability of machine learning (ML) and artificial intelligence (AI) more broadly is growing. Based on eight semi-structured interviews with key experts, this paper investigates the dilemmas active participants in this global project face and the strategies they

employ to overcome them. Our analysis shows that experts question the extent to which quantification fosters a radical enough version of change. Some evaluators want to make AI systems more “efficient” by reducing the amount of resources needed to develop AI models and infrastructures. Others critique this approach for failing to limit overall carbon emissions. Instead they insist on making AI “frugal”, an approach which expands the range of actions to mitigate AI’s environmental impacts. It includes consideration of whether AI is needed at all in different contexts and the transformation of business models. The extent to which experts are able to successfully defend “frugal AI” at technology companies structures this nascent field of research. Some experts build communities and foster change from within companies, others prefer to leave industry and act from the outside. Whether notions of “frugality” are taken into account in national and transnational standardization discussions will determine who will participate in this quantification exercise in the future.

Anne-Laure Ligozat (ENSIIE) & **Aurélie Bugeau** (Bordeaux University), “Can AI's environmental damage be controlled?”

Abstract: Artificial Intelligence (AI) is frequently promoted for its potential environmental benefits, often overshadowing the possible environmental harms it may cause. Even when these negative impacts are considered, mitigation strategies typically focus solely on enhancing efficiency. In this talk, we will present existing methodologies for calculating the environmental impacts of AI, as well as an analysis of how these impacts have evolved over the past several years.

Ludovico Rella (University of Durham, UK), “Between Dark and Green Silicon. Geographies of Cloud and Edge AI”

Abstract : Recently, Artificial Intelligence algorithms have been increasingly often deployed outside datacenters and in the so-called Edge, i.e., on end devices like self-driving cars, smartphones, sensors, and drones. This paper situates this movement of AI away from Data Centres within broader concerns around energy consumption of computation at a micro level and at a macro level. At a micro level, the industry’s obsession with scaling and Moore’s law is increasingly hitting a hard wall represented by “dark silicon”, that is the need to switch off larger and larger portions of the chip to avoid overheating. At a macro level, the accumulation of the need for cooling and energy is producing skyrocketing energy consumption represented by episodes like the reopening of Three Miles Island’s nuclear reactor to power Microsoft’s datacentres. Silicon is increasingly “mobile”, as represented by other computationally intensive industries like crypto mining, with datacenters moving to wherever the energy is cheaper and regulation welcoming. Indeed, crypto mining and AI training infrastructures are increasingly overlapping, given diminishing returns from mining and increase in hype around AI. Between “dark” and “mobile” silicon, Edge AI represents an attempt at “green silicon” that is predicated on application-specific architectures and intensive compression of AI models. This paper uses energy consumption to trace the material political economy of Edge and Cloud AI in terms of distributional effects, centralizing v. decentralizing tensions, and

epistemological tradeoffs that are produced by different hardware configurations for machine cognition. The tension between centralization and decentralization of energy costs intersects problematically with tensions between universality and particularity of the knowledge produced by algorithms.

Ana Valdivia (University of Oxford) “The supply chain capitalism of AI: a call to (re)think algorithmic harms and resistance through environmental lens.”

Abstract: Artificial Intelligence (AI) is woven into a supply chain of capital, commodities and human labour that has been neglected in critical debates. Given the current surge in generative AI – which is estimated to drive up the extraction of natural resources such as minerals, fossil fuels or water – it is vital to investigate its entire production line from a critical infrastructural perspective. Drawing on the supply chain capitalism, a concept coined by Anna L. Tsing in 2009, this paper contributes to critical AI studies by investigating the structure of AI supply chains, taking into account the mining, electronics, digital and e-waste industry. This paper illustrates how the supply chain capitalism of AI is precipitating geographical asymmetries connected to contested struggles in México by focusing on a key element of these chains: data centres. In times of climate emergency, this paper calls to reconsider algorithmic harms and resistance by investigating the entire capitalist production line of the AI industry from critical and environmental lens.

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Organisation team: Loup Cellard (Dataactivist, médialab Sciences-Po, ADM+S Centre), Valentin Goujon (médialab, Sciences Po), Hugo Estecahandy (IFG Lab, université Paris 8), Théophile Lenoir (University of Milan, médialab, Sciences Po), Adrien Tournier (HT2S, Cnam).