

Post-doc

Modeling the evolution of the environmental impacts of data centers and electrical infrastructures related to artificial intelligence

Starting date : As soon as possible

Length : 1 year renewable.

Location : LaBRI, (Bordeaux) ou LISN (Saclay) en fonction du profil du candidat

Supervision

Anne-Laure Ligozat (LISN, ENSIIE), Aurélie Bugeau (LaBRI, Université de Bordeaux), Gaël Guennebaud (Inria)

How to apply : Send a resume and letter of motivation to Aurélie Bugeau (aurelie.bugeau@u-bordeaux.fr) and Anne-Laure Ligozat (anne-laure.ligozat@lisn.upsaclay.fr)

Context

The growing use of artificial intelligence involves an increase in digital hardware infrastructures [Morand et al., 2024; de Vries, 2023], particularly data centers that host both storage platforms and high-performance computing infrastructures. Numerous reports highlight the rising energy consumption of these data centers (e.g., the IEA report [IEA, 2024]) and offer consumption projections for the coming years. These estimates depend on various assumptions (e.g., the number of data centers, the quantity of GPUs sold, the efficiency of data centers, etc.), the scope considered (e.g., only hyperscalers), and data provided by industries.

These estimates are already highly informative. However, they need to be supplemented to better understand the full range of environmental impacts associated with the development of AI and to identify relevant mitigation strategies.

Activities

The objective of the postdoctoral research will be to propose predictive models [Guennebaud & Bugeau, 2024] that allow for the variation of variables such as the rate and speed of digital equipment renewal, energy efficiency gains, the end-of-life management of equipment [Wang et al., 2024], the quantities and types of data required for training and inference, among others. The scope will also be extended to include dedicated energy production infrastructures and to analyze questions of resilience.

Skills

- PhD in Data Science, Computer Science, Applied Mathematics, Electronics, or Industrial Engineering
- Good level in computer programming
- Knowledge of the environmental impacts of digital technologies, life cycle analysis, and the functioning of artificial intelligence would be appreciated

Working conditions

The candidate will join either the SEME team at LISN or the NeS (Digital and Sustainability) team at LaBRI. Regular travel between LaBRI and LISN will be required.

The position is in a sector subject to the Protection of Scientific and Technical Potential (PPST). Therefore, in accordance with regulations, your appointment must be authorized by the competent authority of the Ministry of Higher Education and Research (MESR).

References

IEA, World Energy Outlook 2024,

G. Guennebaud, A. Bugeau. *Energy consumption of data transfer: Intensity indicators versus absolute estimates*. Journal of Industrial Ecology, 2024,

C. Morand, A.-L. Ligozat, A. Névéol. *How Green Can AI Be? A Study of Trends in Machine Learning Environmental Impacts*. 2024.

A. de Vries, *The growing energy footprint of artificial intelligence*, Joule, Volume 7, Issue 10, 18 October 2023, Pages 2191-2194

P. Wang, LY. Zhang, A. Tzachor et al. *E-waste challenges of generative artificial intelligence*. Nat Comput Sci 4, 818–823 , 2024