Sustainability and Ethics Perspectives on Creative-Ai

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Abstract

The recent developments of artificial intelligence increase its capabilities for artistic creation in both autonomous and collaborative contexts. Ai has a potential to transform how artists work, how the creative work is perceived in society and culture, and what kind of societal structures emerge around Creative-Ai (e.g. the NFT ecosystem, communities, institutions). These changes will have a sustainability impact and they also raise ethical concerns. In my PhD research, I investigate Creative-Ai practices from sustainability and ethical perspectives to inform the emerging field of Creative-Ai. The two current focus areas of my research are 1) understanding the material and practice-oriented environmental sustainability aspects in the context of artistic processes that involve Creative-Ai, and 2) how Creative-Ai practitioners (researchers, artists, developers) and technologies situate in socio-cultural, ethical, and material ways, and what implications that has on sustainability. This paper provides an outline of our ongoing research in these two directions, as well as future research directions.

Introduction

Recent development in artificial intelligence (Ai[1]) have expanded the possibilities for artistic creation. These developments have major implications for artistic practices - and society in general. Among these considerations are concerns of the environmental impact of Ai technologies and more widely ethical concerns regarding various aspects of the design, development, and use of these technologies. My PhD is part of a wider research project that focuses on studying these implications through questions, such as how creative-Ai currently used by creative practitioners, and what could guide ethically informed Creative-Ai practices? In this research project, we study these questions through mixed-methods research that combines, for example, ethnography, sustainability assessment, RtD-approaches, and speculative methods. These studies have the aim to motivate alternative approaches for the development of sustainable Creative-Ai technologies and practices; to form ethical guidelines, theoretical knowledge, and material prototypes.

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[1]The "i" is lowercase in Ai to emphasize the fact that the intelligence of current systems is quite different from human intelligence and has not yet reached a level of HLAI (human level artificial intelligence)

Material and practice-oriented perspectives on the environmental sustainability of Creative-Ai

Having started my PhD last September (2021), I have firstly focused on understanding the materiality of Creative-Ai (ontologies of various technologies and tools) and reviewing existing sustainability assessment methods that could be applied in the analysis of Creative-Ai (LCA and energy assessment), as well research on sustainability and AI.

Our recent paper "On the environmental impact of Ai Art(s)" (0) introduces the study of environmental sustainability of Creative-Ai and argues for the importance of further research in the domain. In this paper, we situate the sustainability matters of Creative-Ai in the context of wider sustainability research, particularly in the computing within limits community and perspective (that focuses on planetary resource limits and strategies and approaches for staying within these limits, such as; de-growth, slow design). Furthermore, we propose an approach towards analysing the environmental impact of Creative-Ai, that has two dimensions; practice and material. In this paper, we have also started empirical work aimed to understand how artists use Ai in their artworks. We aim to continue this empirical work through interviews (currently on-going) and workshops. These ongoing interview studies aim to answer questions regarding the use of materials, knowledge and attitudes of artists, and other fundamental questions that are of essence to understand at the early stages of this research project. We have also published a poster in ICT4S (International Conference on ICT for Sustainability) that is related to this work, but focuses more on discussing the challenges that need to be addressed in drawing boundaries in assessing environmental impact of Creative-Ai (**?**).

So far, I have identified several further research directions within the material and practice perspective on Creative-Ai, which will be discussed in the sections below.

Environmental sustainability of Creative-Ai in the context of creative practice

The environmental impact of Creative-Ai technologies should not be studied solely without the contextualization of creative processes. The research efforts in quantifying the environmental impact of Ai (0; **?**; **?**; **?**; **?**) have mainly aimed at providing quantitative and comparable es-

timates. While these are currently missing for Creative-Ai and there is a need to develop such measurements that artists can use to compare various Creative-Ai technologies in terms of their environmental impact, we would also like to point out that such measurements are not situated in the context of use, and there is a need to understand the practices of the Creative-Ai artists. Our early results indicate, that there is a wide variation in which technologies artists use, what kind of data and how much data they use, as well as how long their creative processes are. Ai technologies can have a varying environmental impact depending on these factors, as well as other factors described in our research paper (0). One of these factors, for example, is which parts of the creative process the Ai technologies are used in. Some artists use them in ideation, actualization, and some in display phases (0) of the creative processes. In our paper, we measured energy usage of VQGAN+Clip (0; ?), a popular Ai art tool, in different kinds of running environments. Our preliminary results indicate, that the energy cost of running the models is quite low (equal to running a table fan). However, this also contrasts other studies that focus on training Ai algorithms (0; ?; ?; ?; ?). We argue, that 1) further studies will be essential on understanding the energy consumption of various different technologies used by Creative-Ai practitioners and 2) the technologies should be studied in the context of use of the creative practitioners.

Design implications on Creative-Ai systems; architecture and user experience

Sustainability factors can be taken into account in the design of the architecture of the Creative-Ai systems, such as the design of the latent spaces and aiming towards small-scale models for creative practitioners. However, the user needs of the creative practitioners are essential in order to be able to design these systems in an informed manner. Creative practitioners may, potentially, have less rigorous needs in terms of accuracy of the Ai technologies than those used by some other domains. Furthermore, it is of interest to study the user experience of creative practitioners in terms of the sustainability of their practice. Some providers (such as Google cloud) have started providing information on the server usage of their cloud service. In of our future research directions will explore, how creative practitioners could be supported during their work by providing information on the environmental impact of their practice. Interesting questions in this context are if a system can guide the users in terms of energy consumption and potentially influence the creative process to reduce energy consumption. In either case, these design studies need to be rooted in the needs of the creative practitioners and artists, which is why in the beginning phases of the research we focus particularly on understanding these current practices and engaging in collaboration and discussions with creative practitioners.

Ethically informed perspectives on the sustainability of Creative-Ai

Another direction that I've so far pursued in my research has been to explore ethics perspectives from feminist environmental post-humanities. The motivation for these studies has been to seek for ethically informed perspectives that could be used as a lense in approaching sustainability of Creative-Ai. A recent study in this domain has centered around exploring the values and practices historically embedded in Creative-Ai phenomena (artifacts, agents) through the critical lense of feminist care ethics and using speculative design. In this paper, we have discussed various kinds of slow violence that takes place (the overtly consumption of environment resource, exploiting humans in the process) and contrasted it to the approach of slow care, that has been discussed in feminist environmental post-humanities. We have identified factors of violence that are historically present in Creative-Ai systems, and engaged in speculative explorations of embedding 'care' into the technologies. I am interested in continuing such studies that are aimed towards understanding the ethical aspects of Creative-Ai, and Creative-Ai technologies in their social, cultural, and historical contexts.

Conclusion

As described in previous sections, my aim is to work with the sustainability of Creative-Ai on various different levels such as material, sociocultural, ethical - as they are fundamentally interconnected.

Here, I have covered the recent directions of my ongoing research, as well as expected future research directions. These have included empirical studies of Creative-Ai practices, quantifying the energy impact of the technologies used by creative practitioners, potential user-centered design implications for the system architecture and the user experience, and ethically informed perspectives on the sustainability of Creative-Ai. The main challenge for me, at this point, is to bring these various directions together in my PhD research. I have currently completed one tenth of my dissertation in terms of time, so I am at the very early stages of this research project. I believe, that the ICCC Doctoral consortium can provide valuable feedback, which can contribute towards framing of my studies further in the coming months.

References

P. Jääskeläinen, D. Pargman, and A. Holzapfel, "On the environmental impact of ai art(s)," *Computing Within Limits*.

R. Schwartz, J. Dodge, N. A. Smith, and O. Etzioni, "Green AI," in *Communications of the ACM*, vol. 63, Nov. 2020, pp. 54–63. [Online]. Available: https://doi.org/10.1145/3381831

E. Strubell, A. Ganesh, and A. McCallum, "Energy and Policy Considerations for Deep Learning in NLP," in *arXiv:1906.02243 [cs]*, Jun. 2019, arXiv: 1906.02243. [Online]. Available: http://arxiv.org/abs/1906.02243

A. Lacoste, A. Luccioni, V. Schmidt, and T. Dandres, "Quantifying the Carbon Emissions of Machine Learning," in *arXiv:1910.09700 [cs]*, Nov. 2019, arXiv: 1910.09700. [Online]. Available: http://arxiv.org/abs/1910.09700

P. Dhar, "The carbon impact of artificial intelligence," in *Nature Machine Intelligence*, vol. 2, Aug. 2020, pp. 423–425. [Online]. Available: https://www.nature.com/articles/s42256-020-0219-9

A.-L. Ligozat, J. Lefèvre, A. Bugeau, and J. Combaz, "Unraveling the hidden environmental impacts of AI solutions for environment," in *arXiv:2110.11822 [cs]*, Oct. 2021, arXiv: 2110.11822. [Online]. Available: http://arxiv.org/abs/2110.11822

M. Botella, F. Zenasni, and T. Lubart, "What are the stages of the creative process? what visual art students are saying." vol. 9, p. 2266. [Online]. Available: https://www.frontiersin.org/article/10.3389/fpsyg.2018.02266

P. Esser, R. Rombach, and B. Ommer, "Taming transformers for high-resolution image synthesis," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2021.

A. Radford, J. W. Kim, C. Hallacy, A. Ramesh, G. Goh, S. Agarwal, G. Sastry, A. Askell, P. Mishkin, J. Clark *et al.*, "Learning transferable visual models from natural language supervision," *arXiv preprint arXiv:2103.00020*, 2021.