Performative Metacreation:
An Artist-Centred Exploration of Artificial Intelligence

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Significant developments in machine learning and artificial intelligence provide new means and media to be used in the arts. At the intersection of new intelligent systems and the performing arts, this project proposes an artist-centred and performance-based research, aiming to develop a theoretical framework that will enable the understanding of metacreative practices and allow the analysis of artworks made with and from such systems. In parallel it is proposed the development of a system capable of integrating the various practices raised as well as a series of performances as artistic exploration. Promoting a greater understanding about the performative event, this project addresses questions such as how are the artefacts generated, which new practices exist and how these systems transform contemporary performance in unprecedented ways.

1. State of the Art

Computers are able to imitate creativity and artistic expression. Current developments in artificial intelligence and machine learning allow not only the exploration of these systems as generative media, but also promote drastic changes in artistic practice. They are revolutionizing multiple aspects of performance art (Baalman 2020), electronic music (Briot et al. 2019) and visual art (Akten 2018), raising questions regarding perception and meaning of artistic artefacts (Hong and Curran 2019). Simultaneously, the audience's understanding of the artworks is less and less clear, as is the very collaboration of artists and systems (Mazzone and Elgammal 2019). This has led us to a state in which all practices in this field have to be thought of in an increasingly adaptive and multifaceted way.

Alan Kay observed that computers are representation machines that can emulate any medium (in Carvalhais 2016), that they are therefore the first *metamedium*, and have degrees of freedom for representation and expression never before encountered. With this, aspects of *metacreation* (Eigenfeldt et al. 2014; Gorlée 1996) become more common as artists start "endowing machines with creative behaviour" (Whitelaw 2008). In fact, musical and visual metacreation (Bodily and Ventura 2018; Eigenfeldt et al. 2014) are already established areas of research that explore various forms of computational creativity (Zhang and Yang, 2015; Colton and Wiggins 2012) where we can find novel systems for performance (Tatar and Pasquier 2017).

Artistic explorations using machine learning and artificial intelligence have been adopted widely. Important venues such as Ars Electronica, ZKM and the CTM Festival provide not only performative spaces but also opportunities for discussion and dissemination. These are accompanied by laboratories such as *European ARTificial Intelligence Lab* and festivals such as *AIxMusic*. In the programming of venues such as these, several meaningful performances for this research were presented, exploring various types of systems and interactions. Examples are *A-MINT* by Alex Braga (2019), *Ultrachunk* by Jennifer Walshe and Memo Akten (2019), and *REVIVE* by Tatar et al. (2018), three projects of stage-based improvisation *alongside* artificial intelligence, where programmed agents perform in a role *similar* to the human. They are programmed with the ability to generate content and adapt during the performance. Also, *Alia: Zu Tài* a performance by Marco Donnarumma (2018) combines dance theater and artificial intelligence, promoting important criticism for the questions raised in this research such as, which kinds of identities artificial intelligence and robotics produce? How do those technologies influence the way we understand and discriminate human bodies? Which objectively lead us to questions such as, what is my performative role?

2. Objectives

This research is developed at the intersection of performing arts and metacreation, studying the use of artificial intelligence in artistic performance through a design-based research methodology (Barab and Squire 2004). Building on the contemporary digital performance (Dixon 2007) and its technologies (Broadhurst and Machon 2006) the main goal is to develop a taxonomy of metacreation and its practices within contemporary performing arts.

This goal will be achieved by analyzing existing references and identifying emerging patterns in the various performative practices such as: performance presentation, the type of interaction that exists between the artist and the system and the characteristics of the latter such as agency, awareness and types of content it generates. From here follow two secondary goals: i) Develop and present a series of performances that help to clarify and explore the taxonomy and that contribute to the dissemination of results within artistic and scientific communities. ii) Develop a fully functional software agent capable of integrating the different types of performances raised. Given the importance of the system's processes and the way they condition the artist's freedom, we propose to develop all the necessary technological solutions, building prototypes, software and multimedia systems for the performance series, seeking to bundle the various technological results into a single instance.

These objectives represent interdisciplinary contributions and help to answer questions such as: i) what are the models of metacreation? ii) how can these help to reveal the audience's understanding and perception of artistic phenomena? iii) how can these newly introduced systems generate entirely new performative practices? iv) how can intelligent technologies change the reflection and responsibility of performers in the moment of creation and presentation? v) considering the pursuit of computational creativity, what are the affordances of these systems, how can they be used in novel and unique ways?

3. Description and Contributions

Already in the process of development during this first year of the doctoral programme, the first step of this research is a thorough review of the literature covering metacreation and performance art. This project starts from frameworks of analysis such as that of Geraint Wiggins (2006) and taxonomies such as that of Eigenfeldt et al. (2013). This review will also reveal artworks, projects and publications relevant to classification that will be documented for future study and work.

The second phase of research will be a systematic survey of the state of the art. In order to develop a sufficiently robust taxonomy we need to study how artists are using these systems today (Visi and Aqaxa 2020; Wærstad 2020), how they used them in the past, and to answer questions as: How is

performative practice combined with the massive development of areas like deep learning and computer hardware? How are the new performative proposals different from the previous ones raised in the literature review and what really made that difference?

From this point we will also begin developing a series of performances. These will provide feedback that will not only allow a continuous adjustment of the taxonomy but also represent artistic results that will validate the work in progress and give space to phenomenological discussions. Before their public presentation we will carry out tests in controlled contexts, assessing aspects such as audience perception, and gathering relevant qualitative information through questionnaires and by critical observation of participants (Blain and Minors 2020; Smith and Dean 2009).

The use of artificial intelligence in performance requires the understanding of sophisticated systems and algorithms. We propose to develop the necessary technologies for the performances, providing the infrastructure as well as correlating new contributions with the technical references of taxonomy. It is a clear objective of this project to produce a system diverse enough to integrate the various types of performances raised as well as tackle different fields of the proposed taxonomy. It is also here that themes such as cognition, awareness and automation are explored intensively.

In order to clarify why such systems and their characteristics are used (Linkola et al. 2017) when necessary, interviews can be conducted with the referred authors in order to promote a better understanding of the cited performance. This will be done in a way sensitive to the context in which intelligent systems are used, the position of the authors in the face of their use and the modern definitions of artificial intelligence (Chollet 2019).

4. Progress Towards Goals

This research is currently in a process of systematic literature and performance review, the doctoral programme in which it is based began in October 2019 (Digital Media PhD University of Porto). At the same time as the review, digital technologies that might be considered relevant to this project in areas such as automatic improvisation, generative art, cognition and deep learning are currently being surveyed and studied.

References

Akten, Memo, Rebecca Fiebrink and Grierson, Mick.
2018. "Deep Meditations: Controlled navigation of latent space". In: NeurIPS 2018 Workshop on Machine Learning for Creativity and Design. Montreal, Canada.

Baalman, Marije.
2020. "the machine is learning". Proceedings of the International Conference on Live Interfaces. Trondheim, Norway.

Barab, S., and Kurt Squire.
2004. "Design-based research: Putting a stake in the ground" *The journal of the learning sciences* , *13* (1), 1–14.

Blain, Martin and Helen Minors.
2020. "Artistic research in performance through collaboration.".

Bodily, Paul and Dan Ventura.
2018. *"*Musical metacreation: Past, present, and future. *" Proceedings of the sixth international workshop on musical metacreation.*

Briot, Jean-Pierre, Gaëtan Hadjeres, and François Pachet.
2017. "Deep learning techniques for music generation – a survey." *arXiv preprint arXiv:1709.01620.*

Broadhurst, Susan and Josephine Machon.
2006. "Performance and technology." *Practice of Virtual Embodiment and Interactivity*.

Carvalhais, Miguel.
2016. *Artificial Aesthetics: Creative Practices in Computational Art and Design.* U. Porto Edições.

Chollet, François.
2019. "The Measure of Intelligence." *arXiv preprint arXiv:1911.01547.*

Colton, Simon and Geraint Wiggins.
2012. "Computational creativity: The final frontier?." In *Ecai*, vol. 12, pp. 21–26.

Dixon, Steve.
2007. *Digital performance: a history of new media in theater, dance, performance art, and installation* . MIT press.

Eigenfeldt, Arne, Miles Thorogood, Jim Bizzocchi, and Philippe Pasquier.
2014. "MediaScape: Towards a video, music, and sound metacreation." *Journal of Science and Technology of the Arts* 6, no. 1: 61–73.

Eigenfeldt, Arne, Oliver Bown, Philippe Pasquier, and Aengus Martin.
2013. "Towards a taxonomy of musical metacreation: Reflections on the first musical metacreation weekend." In *Ninth Artificial Intelligence and Interactive Digital Entertainment Conference.*

Gorlée, Dinda.
2010. "Metacreations." Applied Semiotics/ Semiotique appliqué 24.

Hong, Joo-Wha, and Nathaniel Ming Curran. "Artificial Intelligence, Artists, and Art."
2019. *ACM Transactions on Multimedia Computing, Communications, and Applications* 1 5, no. 2s.

Linkola, S., Anna Kantosalo, Tomi Männistö, and Hannu Toivonen.
2017. "Aspects of Self-awareness: An Anatomy of Metacreative Systems." In *International Conference on Computational Creativity* (pp. 189–196).

Mazzone, Marian and Ahmed Elgammal.
2019. "Art, creativity, and the potential of Artificial Intelligence." *Arts* Vol. 8. No. 1..

Smith, Hazel, and Roger Dean.
2009. *Practice-led research, research-led practice in the creative arts.* Edinburgh University Press.

Tatar, Kıvanç, Philippe Pasquier, and Remy Siu.
2018. "REVIVE: An Audio-Visual Performance with Musical and Visual AI Agents." *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems.* ACM.

Tatar, Kıvanç and Philippe Pasquier.
2017. "MASOM: A musical agent architecture based on self-organizing maps, affective computing, and variable Markov models." *Proceedings of the 5th International Workshop on Musical Metacreation (MUME 2017). Atlanta, Georgia, USA.*

Visi, Federico and Aqaxa.
2020. "You have a new memory." *Proceedings of the International Conference on Live Interfaces - Trondheim Norway.*

Wærstad, Bernt.
2020. "Ghost Doctor Duplicate." *Proceedings of the International Conference on Live Interfaces - Trondheim Norway.*

Whitelaw, Mitchell.
2004. *"Metacreation: art and artificial life"* M IT Press.

Wiggins, Geraint A.
2006. "A preliminary framework for description, analysis and comparison of creative systems." *Knowledge-Based Systems* 19, no. 7: 449–458.

Zhang, Lu, and Hongji Yang.
2015. "Knowledge discovery in Creative Computing for creative tasks." Creativity in Intelligent Technologies and Data Science: First Conference, Volgograd, Russia, September 15–17. Proceedings. Vol. 535. Springer.

Performances

Alex Braga
2019. *A-MINT. Retrieved from the STARTS prize website* https://starts-prize.aec.at/en/.

Jennifer Walshe and Memo Akten
2019. *Ultrachunk. Retrieved from the website of one of the authors* https://www.memo.tv/ portfolio/ultrachunk/.

Marco Donnarumma
2018. *Alia : Zu Tài. Retrieved from author's website* https://marcodonnarumma.com/ works/alia-zu-tai/.