On creative practice and generative AI

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ON CREATIVE PRACTICE AND GENERATIVE AI

Co-shaping the development of emerging artistic technologies

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Abstract

In recent years, advances in artificial intelligence (AI) and machine learning have given rise to powerful new tools and methods for creative practitioners. 2022–2023 in particular saw an explosion in generative AI tools, models and use cases. Noting the long history of critical arts engaging with AI, this chapter considers both the application of generative AI in the creative industries, and ways in which artists co-shape the development of these emerging technologies. After reviewing the landscape of generative AI in visual arts, music and games, we propose four areas of critical interest for the future co-shaping of generative AI and creative practice in the areas of communities and open source, deeper engagement with AI, beyond the human and cultural feedbacks.

Introduction

The last half a century has seen advances across a range of technological domains, including artificial intelligence (AI), as well as in new imaging and immersive techniques. The last decade in particular has seen major breakthroughs in machine learning, and recent developments in diffusion models and large language models have given rise to powerful and widely accessible generative AI tools. In 2022–2023 AI-powered image generators and chatbot assistants have exploded into the mainstream and the public consciousness, with some declaring a "golden age for AI art" (Faber, 2022). This has led to unprecedented opportunities for artistic creation but also profound concerns about the implications for professional artists and society at large.

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These AI capabilities can underpin new forms of creative practice and fuel transformative experiences for audiences across the creative industries, including performing arts, visual arts, music, museums and heritage, games, film/TV, digital media, advertising and creative design. A comprehensive review of some of the key creative AI technologies and their uses can be found in Anantrasirichai and Bull (2022). Extending to "(i) content creation, (ii) information analysis, (iii) content enhancement and post production workflows, (iv) information extraction and enhancement, and (v) data compression" (Anantrasirichai and Bull, 2022, p. 589), the wide-reaching scope of these technologies is challenging to engage with, both for creators as well as their audiences.

While we are wary of hype cycles, this is a moment in which many creators are exploring the implications of AI for their own practice (Cremer et al., 2023) and voicing their perspectives on the profound upheavals that these developments bring (Hemment et al., 2023a). We see important changes in human–computer creativity. Authorship and audience experiences are becoming ever more digital, networked, algorithmic and complex. Conversational agents, virtual characters, interactive robots and other autonomous technologies are increasingly becoming part of creative content. This transition goes beyond the simple adoption of new formats or technologies: we are entering into a whole new context for making, sharing, learning, connecting and consuming.

With new capabilities come new challenges. The complex algorithms of AI are often black-boxed, with their operations and assumptions not accessible to human understanding. The outputs of the new generation of platform-based tools, such as recently released text-to-image generators, appear like 'magic', with little scope for human intervention or creative control. Often, the only creative input is through a text prompt, and the generative models that underpin the current tools are largely trained on massive datasets scraped from the internet without permission or fair pay for the original content creators (Wu, 2020). Other urgent concerns include excessive energy use, harmful bias and misinformation. With the release of ever more powerful generative AI tools, issues that were previously considered niche concerns within data science have become increasingly mainstream ethical minefields.

At times of social and economic upheaval, artists are often at the forefront, helping to illuminate the ways emerging technologies impact on life at a profound level (*Ibid.*). A specific interest in this chapter is critical arts, or critical AI arts, where creative practitioners directly engage in the politics, ethics and philosophy of AI, and in its capacity to challenge and inform as well as to delight audiences (Hemment et al., 2022). Artists expose and explore the sublime, the indefinable, what we can't put into words (Ingram, 2023), and the outputs of the statistical lens of AI are often uncanny and

preternatural, beyond what is normal or natural (Hemment et al., 2019). Artists are currently pushing at the boundaries of human–machine creativity to generate works that combine machine learning methods with human intuition and embodied experience.

In this chapter we provide a brief overview of creative practice concerning generative AI, with a focus on practical examples in visual art, music and games to highlight some priorities for emergent areas of study. This chapter argues that it is necessary to equip cultural producers and artists to negotiate political, legal, security, ethical and environmental controversies and challenges in emerging technologies and formats and to develop best practices.

The case study associated with this chapter offers more examples of how this can be done in practice. In it we describe the work of the research group and creative community The New Real,[1] a joint initiative of the University of Edinburgh and the Alan Turing Institute, in which some of the authors of this chapter are involved and which is intimately concerned with the previous challenges and themes. The New Real has the twin ambitions of supporting the creation of significant new art and inspiring new concepts and paradigms for fair and inclusive AI, which it advances through its novel research theme, experiential AI (Hemment et al., 2019).

A brief history and current landscape of creative use of generative AI

The current explosion in creative practice using AI has been fuelled by recent developments in generative AI systems that can generate new data that is similar to existing data. This is used to generate synthetic media, which can be used in the creation of new and unique works of art. Looking further back, artists have experimented with AI since the very early days of the field (see Taylor, 2014; Victoria & Albert Museum, n.d.). During the late 1960s, Harold Cohen developed AARON at the University of California at San Diego, marking an early milestone in the realm of AI art. AARON utilised a symbolic rule-based approach to generate technical images with the aim of automating the process of drawing. Initially producing basic black and white drawings, AARON evolved to the point where, by 1995, it could also paint using chosen brushes and dyes without Cohen's intervention (Garcia, 2016). Since then, AI has been of specific interest to a variety of artists internationally (see Cetinic and She, 2022 for an excellent overview).

Over the last decade, many artists have begun experimenting with generative adversarial networks (GANs), which emerged in 2014 (Ridler, 2017). These algorithms feature two 'adversarial' networks competing with one another: a generator creates images that could pass as real, whilst the discriminator ('adversary') attempts to distinguish real images from fakes, creating a feedback loop that produces increasingly realistic images. Google introduced DeepDream in 2015, utilising convolutional neural networks

within a generative process to enhance patterns in images and create exaggerated visuals (Mordvintsev et al., 2015). This release sparked the development of various apps that transform photos into art-like images resembling famous paintings.

With a degree of open source access to advanced machine learning systems and, with many smaller-scale neural network architectures and models also becoming available, creative coding communities were able to adjust existing machine learning protocols, pre-trained systems and publicly available datasets (e.g. ImageNet)[2] to their individual needs and begin to incorporate them into their creative workflows. For instance, ArtBreeder,[3] launched in 2018, employs models like StyleGAN and BigGAN to allow users to generate and modify images ranging from faces to landscapes and paintings (CV Notes, 2019). Increasingly we have seen multi-modal models that can incorporate text, images, keywords and configurable parameters such as artistic style. With the release of cloud-based text-to-image models such as DALL-E 2,[4] Midjourney,[5] and Stable Diffusion[6] and the Large Language Model-based ChatGPT,[7] which is capable of creating humanlike conversational dialogue, generative AI has become preeminent in the public perception of this emerging technology. Through these generative AI tools, the text prompt has become established as the dominant user interface, which has limitations such as reproducing biases inherent in language and a tendency to use English as default but has also inspired creative exploration.

However, widely applied deep learning algorithms are increasingly complex and difficult for a human to understand (Sarker, 2021), and they encode knowledge in ways that even experts may not be able to explain (Xiang, 2022; Yalçın, 2021). Many of the current generative models are trained on data scraped from the public internet without attribution or fair pay for the original creators (Blackman, 2020). By extracting existing features in historic data – a set of observations in the present day or the past – these systems inherit biases from the data they are trained on and so can reproduce and further entrench inequality and discrimination against certain groups of people (Kundi et al., 2022). Indeed, most AI design fails to incorporate concerns around fairness, social justice or intersectionality (age, gender, ability, ethnicity) as factors in the designs of technical systems (Crawford, 2021). In addition to these ethical concerns are dire environmental consequences. Operating AI currently requires a vast amount of energy, and the Information and communications technology (ICT) sector overall is estimated to generate around the same level of greenhouse gas emissions as international aviation (Trueman, 2019). Moreover, the massive server farms required for data processing are often located in some of the most fragile parts of the world and require rare minerals; this can be ecologically destructive (Monserrate, 2022).

In addition to these very real concerns, there are complex combinations of conceptual, technical and social issues that challenge public interpretation of the 'intelligence' of these tools. Salles et al. offer grave misrepresentations

that portray these technologies as if they were people (2020), and Elish and boyd critique the use of magical language to sell the potentials of AI systems (2018). But AI does not possess intent independent of its functionality, it does not have ideas beyond responding to queries and it does not have a personality to express: it generates outputs based on statistical reasoning. It is important to note that the current state of the art AI/machine learning models are still based on stylistic rather than conceptual reasoning. These are not knowledge models, but image/music style models or language models. Though portrayed as autonomous, current AI systems also depend on 'ghost workers', hidden human hands, who annotate and moderate content, knowingly (Wakefield, 2021) or even unknowingly (Morreale et al., 2023). This creates a new underclass of people to do this very low-paid work, who have to find and mark for deletion sometimes traumatic content, which is often outsourced to developing countries. This leads to further centralisation, with more control and money channelled to a small number of companies large enough to make the investments, amplifying the most corrosive aspects of capitalism (Moore and Woodcock, 2021; Prug and Bilić, 2021; Kwet, 2019).

Today there exist numerous generative AI platforms, ranging from consumer-facing mobile apps to Jupyter notebooks that leverage powerful graphics processing units (GPUs) for effective execution. For example, Stable Diffusion is free to use on personal hardware as well as extendable by third parties. This has been built on through the development of applications and extensions, including plugins for popular software like Krita,[8] Photoshop,[9] Blender[10] and GIMP.[11] Tools that help artists to create using AI/machine learning technology are particularly interesting. At the time of writing, there is a relentless stream of new possibilities for engaging with large models: ChatGPT returns text that is increasingly accurate based on text prompts; Stable Diffusion, Midjourney and DALL-E are competing to see who can generate the most appealing images while tackling current flaws such as representing human fingers; RunwayML[12] is demonstrating incredible text-to-video-editing possibilities; and, as discussed subsequently, four different large models that carry out some form of text to music have been released (OpenAI's Jukebox, Boomy, Loudly, Google's MusicLM). However, there are more creatively interesting questions around tools that expose rather than hide, provide conceptual analysis rather than simply generate images and in particular help creative practitioners get to grips with the unique and quirky parts of working with AI/machine learning.

In contrast to these emergent generative AI tools, creative production has been supported by frameworks and communities that provide insight into how to make use of these new technologies. For example, libraries and toolkits that bring together components in a relatively easy-to-use form have supported a profusion of audio/visual interactive pieces[13] and have started many people on their creative coding journeys[14] in areas like facial recognition.[15]

Making use of these tools is becoming more fluid – where in the 2010s playing with a model would involve an afternoon of solving software version conflicts to install it locally, ml5.js allows models to be seamlessly loaded into a web browser for immediate exploration. The latest round of prompt-based models clearly offers the lowest barrier to entry – simply typing in a textbox or joining a Discord chat allows one to ask a model to generate something.

However, these tools limit not just what can be done, as users are limited to a given setup and way of working, but also conceptually how we understand creativity. In the middle ground, where the user retains a connection to the code, there are collaborative notebooks (e.g., Google Colabs),[16] which were initially created for data science and programming tasks, that run code on other people's servers, meaning that even large models can be explored and demoed without installation. As an example, Gene Kogan's ML4Artists[17] offered a collection of artistically useful models with code that could be run on Google's servers allowing quick and easy exploration of technical possibilities. Now, new models appear on Hugging Face[18] and other model sharing platforms, allowing immediate access to the possibilities of transforming, classifying, modifying and generating material. Although openness of access to these tools and resources is welcomed by artists, significant investment of time and high levels of existing technical skill and scientific literacy are still required.

Use of generative AI in creative practice

AI in visual arts

The arts have historically served as a site where marginality and transgression can challenge or expose dominant structures in society. In the last decade, a vibrant community of artistic practice has developed around the use of AI (Grba, 2022; du Sautoy, 2019; Miller, 2019). In the visual arts in particular, there has been widespread critical engagement, with artists working with AI to address topics such as bias in machine learning datasets or exploitative labour practices, exposing their harms and reimagining these systems in more ethical and just ways. Over this period, the large number[19] of recent exhibitions dealing directly or obliquely with AI and machine learning are a strong indicator of the increasing focus placed on AI technologies among artists, curators, and audiences alike. Media attention has been drawn to AI generated images sold for high value at auction[20] and the ease with which even a discerning eye can be tricked (Glynn, 2023). However, the truly groundbreaking applications of AI by artists are not always so high profile.

In cultural contexts, AI technologies can find many different uses, with artists often building their own tools and datasets. Examples include relatively simple tools designed to augment human creativity (e.g. ArtBreeder;

Zeilinger, 2021a); more complex systems capable of creating quasi-creative expressions autonomously (e.g. Adam Basanta's AI-driven art factory *All We'd Ever Need Is One Another*;[21] Zeilinger, 2021b); and purpose-built, generative AI systems through which individual artists express themselves creatively (e.g. Helen Sarin's 'neural bricolage'[22] and Matthew Plummer-Fernandez' 'cave paintings').[23]

For many artists working with machine learning algorithms, the interest is rarely only in optimising prediction accuracy. Instead, their work often focuses on the mistakes, 'glitches', the unknowability of the black-boxed process of AI systems and the poetry (Grba, 2022) that can result from these. Art enables humans to experience the surface effects of underlying structures and reveals them as variously delightful, poetic, troubling and extraordinary (Hemment, 2019). This is especially so in art forms that work with highly complex emerging technologies such as AI. In effect, creative practice using generative AI often looks for the technology to express that which is most human: intuition, provocation and imagination.

Artists address complex and multi-dimensional societal issues alongside aesthetic and technical themes when working with creative applications of AI. There is a long tradition of artists doing more than using AI as a tool by questioning and challenging problematic aspects of its implementation through critical practice on emerging digital technologies. This has given rise to an established and vibrant international community of artists developing creative work with AI that seeks to address intractable controversies and problems in the digital economy and which responds to ethical, political and environmental concerns relating to the widespread implementation of AI and data systems across all sectors of society (cf. Coeckelbergh, 2020; Sinders, 2019; Hemment et al., 2022).

AI in music

Just as in visual art, there is a long history of composers, musicians and sound artists making use of technologies under the broad banner of AI in their practice. This is accompanied by an exploration of the possibilities of computational mechanics more generally, for example, the compositional approaches of Max Matthews MUSIC systems[24] and Lejaren Hillier's Illiac suite,[25] which used algorithmic rules to create musical pieces (Irvine and Rafikian, 2019). Increasing computational capacity paved the way for increasing interactivity, for example, in George Lewis's Voyager system (Lewis, 2000), Blackwell's swarm music (Blackwell, 2007) or work in multi-agent musical systems (Tatar and Pasquier, 2019), which explored how agents might adjust to improvisational structures (Murray-Rust and Smaill, 2011) or the evolution of melody in societies (Miranda, 2003). Other examples of AI in music can be found in Pachet's 'Continuator' (2003), which carried out fluid musical exchanges with various kinds of musicians by learning short term models

of their playing and carrying on in the same vein, and 'Musical Metacreation' (Pasquier et al., 2017), which explored the agencies between musicians and algorithmic systems both in composition and live – and observed the emergence of Algoraves at the intersection of coding and clubbing. A fuller investigation of the creation of machines that make art and music can be found in Bown (2021).

There has been a long and fruitful connection between musicians and algorithms of various sorts, as part of an expansion of musical practice. This can be seen in the development of various tools and communities. Fiebrink's Wekinator package (Fiebrink et al., 2009) places the interactional affordances of pattern matching within reach of musicians. The FluCoMa project packages fundamental algorithms in deployable forms (Tremblay et al., 2021) allowing composers and improvisers to engage with the technical affordances of mapping and exploring large corpora of sounds. RAVE, the Realtime Audio Variational autoEncoder (Caillon and Esling, 2021), encodes the sonic characteristics of one source, which can then be used to reconstruct other audio – a kind of sonic style transfer – with space for creative manipulation along the way. Machine listening can help even without making a sound: Rawlinson's UNISSON (Rawlinson and Pietruszewski, 2019) creates a graphic score to make sense of what is happening when people play live to guide players and listeners alike.

At the time of writing, the explosion of generative algorithms is already established within music creation. Google's Magenta[26] labs initially created a set of tools that would generate note-based melodies and has since expanded into creating neural net models of timbre and musical surface. OpenAI's Jukebox[27] has managed to generate somewhat coherent complete musical excerpts – including almost intelligible vocals – from scratch. This capability to generate 'sui generis' has the potential to change the nature of musicking,[28] just as generative models have altered the practice of creating visual art. AI music startups, such as Boomy[29] and Loudly,[30] as well as established players, such as Google's MusicLM,[31] generate pieces of music in response to text prompts, creating relatively generic, genre-based music in seconds. The possibility for appropriation and deepfakery is ever present, as vocal models moved from the /r/VocalSynthesis subreddit to make headlines with cloned versions of Drake and The Weeknd, which some fans prefer to their current work (Paul and Millman, 2023). This question of authenticity and voice in the face of generative AI will be returned to at the end of the chapter.

AI in games

The games industry is driving the development of intensely immersive, personalised and large-scale experiences and infrastructures in which the use of generative AI will only increase. However, it should be noted that there is a fuzziness around the term 'artificial intelligence' when it comes to video

games with multiple overlapping technologies (such as procedural generation) coming under that umbrella; we are reminded that fully realised AI games are not widespread at time of writing (Bedingfield, 2023), although the industry is moving very quickly.

One step on from the use of procedurally-generated gameplay elements that are long-established in videogames is the harnessing of generative AI tools like ChatGPT, Stable Diffusion, Dall-E and Midjourney to generate dialogue, story and visuals (Farias, 2023). For example, the text-based adventure AI Dungeon[32] mimics a traditional text adventure interface but has used successive versions of GPT to generate the game text. Integrating AI-generated text with text-to-speech is the 2023 murder mystery game Vaudeville,[33] which uses ChatGPT to generate dialogue that responds to player actions and choices in real time, with the aim of creating a more dynamic and engaging narrative experience. Meanwhile, Midjourney has been used to generate 3D environmental and character assets (Seavon, 2023).

For many, the aim of AI in games is individualisation and customisation where generative AI could be used to personalise gameplay experiences for individual players by learning from their gameplay data and creating customised game content that caters to their preferences and play style (Powell, 2023; Zhao, 2020), a technology that is being developed by UK company Charisma.ai.[34] This commitment to virtual production in the screen industries can also be seen in the UK Research and Innovation's Convergent Screen Technologies and performance in Realtime (CoSTAR) programme, which is supported by government and industry investment.[35] While game developers are leveraging the power of AI to create games that are more engaging, personalised, and immersive, there are a number of games that reflect the dystopian threats conjured by AI, such as Cyberpunk 2077[36] (2020).

Discussion: the future of AI through art, the future of art through AI

Here we discuss some of the emerging themes that we see across artistic use of generative AI technologies, and then present some promising directions and priorities for practitioners and researchers, that are central to our ongoing research (Hemment et al, 2023b).

The rise of the packaged, 'black-boxed' tools described earlier creates new spaces and possibilities but can also displace existing practices and ways of thinking. These collaborations can play out in different ways: algorithmic tools become part of the repertoire of practice that creators can draw on. Practitioners create in concert with their tools, and this in itself can provide new creative opportunities. For example, generative tools such as Boomy or Midjourney shift a lot of agency towards the platform. While they allow many people to create via a series of textual prompts, resulting in a level of surface finish that would otherwise take extensive practice to develop, a large bulk

of the creative decisions and interpretations are taken over by the tool itself, blurring the agency of creation (Anantrasirichai and Bull, 2022). With such generative AI tools, the work has already been done – to create the artworks used as training data, to curate training datasets and to train the models – so that the creative engagement of the end user is limited to being narrowly textual. At the other end of the spectrum, within the musicking of one of the author's bands – Raw Green Rust[37] – there is an ongoing question of how to manage this assortment of agencies through which decisions are handed over to algorithms: does the AI get to decide which parts of created music are 'interesting' and should be kept as material to work with?[38] Does it decide who is allowed to be heard at a given moment, to manage meso-structure in the music? Or does it develop its own voices through matching and regurgitating fragments of previous playing in response to current activity?

Both of these approaches highlight new ways of working whereby generative systems produce more complexity and detail than is given to them. However, they have a different relation to the practitioners – both in their aesthetics as well as the practice of the AI's presentation to audiences. There are key questions to keep in mind as generative technologies are brought into readiness within more accessible tools: when interacting with systems to create work, what are the parts of the process that are shared? Which qualities do people keep hold of and which are passed over to the system? Which part of the final output does one feel responsible for, and how does that relate to what we value about creative practice?

Critical art plays with these aspects of AI in what has been termed a "generative turn" in the creative industries (Crawford cited in Cowan, 2023). Much creative practice is to some extent a social process, and

> To arrange pixels or notes in such a way as to achieve individual social goals, as humans do through processes deeply ingrained in our biology and culture . . . cannot be achieved merely by training a neural network to generate patterns, even if those resulting patterns may pass as something a human would have made.
>
> *(Bown, 2021, p. 9)*

Critical AI recognises that technologies are not separate from their circumstances of creation, effects on the world or place in society, and raises questions about the configurations of agency at play within the creative process or creative practice.

Finally, there is the question of what relation the work itself has to the AI that is used. This can be almost incidental: the 'interactional affordances' of AI (Murray-Rust et al., 2023). An AI platform's ability to recognise faces, derive posture from video, identify sounds and so on can be deployed as a standard part of a creative practitioner's toolbox without it being particularly 'about AI.' However, a strong strand of work – of particular interest to The

New Real group (as explored in the associated case study) – uses creative practice to explore and communicate the functioning and implications of AI. Works such as Memo Akten's *Learning to See* (2017)[39] highlight the compositional, synthetic nature of generative models by resynthesising a live camera feed based on natural images. Jake Elwes' *Machine Learning Porn* (2016)[40] articulates the way that content filters implicitly contain the things that they are filtering out. Vera van der Burg's work (discussed in the following), as well as Rafael Lozano-Hemmer's *Zoom Pavillion* (2016)[41] and Trevor Paglen and Kate Crawford's *ImageNet Roulette* (2019),[42] all engage with the practice of labelling, and how the choice of labels affects experience in different ways. Lozano-Hemmer offers a stark articulation of the process of surveillance, Paglen and Crawford highlight issues with fundamental datasets used to build multitudes of models and van der Burg makes labelling a creative practice through labelling objects not with nouns but abstract qualities and other semantically disjointed concepts. The experiences created through AI can be deployments of the technology in the service of other experiential goals, explorations of the spaces of the new possibilities, critiques of the ways the systems work or are created.

Taking into consideration both our understanding of the field of creative use of generative AI and the lessons learned from the creative practices of The New Real (see case study), we highlight what we see as priorities for contemporary and future developments and research. We have termed these areas: (a) communities and open source, (b) deeper engagement with AI, (c) beyond the human and (d) cultural feedback. These priorities provide signposts and a set of pertinent questions for practitioners and researchers to consider in their co-shaping of intelligent systems.

a. Communities and open source

Artists have been driving community-centred approaches to machine learning, and we see the beginnings of an open-source movement around generative models in general (Spirling, 2023). Moreover, Sarah Ciston argues that we should move away from harvesting ever more data indiscriminately and building larger, generalised, centralised models and instead move toward more equitable, purposeful and community-led approaches: namely, conscientious dataset stewardship, small dataset curation, data sovereignty and reimagining machine learning models from scratch (Ciston, 2023). In an echo of remix and sample culture (Rostama, 2015), some artists are building communities around open data and tools and embracing the ability for others to generate new instances based on their own prior work. Holly Herndon has created a digital twin, Holly+,[43] a custom voice instrument and website that allows anyone to upload an audio file and receive a download of that music sung in Herndon's own distinctive voice. This same idea has been picked up

by Canadian singer Grimes, who invites other musicians to create new songs with her voice using AI (Cain, 2023).

b. Deeper engagement with AI

With creative practice it is often necessary to develop more intimacy with the technology – to go beyond crafting prompts and into the deep structures where code and culture collide. The New Real Observatory, for example, enables artists to probe and explore a model, to ask questions of AI and to generate meaningful art. Rebecca Fiebrink's Machine Learning for Musicians and Artists course (Fiebrink, 2019), as well as the Wekinator[44] package (Fiebrink and Cook, 2010), both set out to give creative practitioners the tools to understand the ways in which machine learning operates, supporting the fluency needed to appropriate the tools for their own use. Practices need embedding, and the FluCoMa[45] project seeks to do exactly that by building a community of artists through creating the tools and uncovering the practices needed to allow 'techno-fluent' musicians to relate data-mining and musicking (Tremblay et al., 2021). On the more critical end of the spectrum, Parag Mital's *Cultural Appropriation with Machine Learning* (Mital, 2021) teaches key concepts and techniques in machine learning with a constant eye to how it interferes with the cultural sphere.

c. Beyond the human

A rich source of opportunities for creative practice is through developing the decentralised perspective of AI systems into a more-than-human way of thinking (Coulton and Lindley, 2019; Giaccardi and Redström, 2020). For example, moving from robots that can be read as active agents to more specifically engage with AI through a more-than-human lens, Lauren Lee McCarthy's '*LAUREN*'[46] has the author playing the part of a decentralised AI assistant with views into people's houses and living situations, providing voice assistance and surveillance in equal measure. This decentralised viewpoint is taken even further in Stross's *Rule 34* (2012), a novel written (spoilers) from the point of view of a disembodied AI that takes on the pathologies of whoever is its locus of interest. Here, the idea of AI provides a rich playground for creative possibilities.

In the other direction, particularly drawing on emerging trends in design and the use of metaphors to engage with AI technology (Murray-Rust et al., 2022), Nicenboim explicitly uses more-than-human ideas to re-think relations between humans and generative AI systems – for example, what would happen if you grew a conversational agent like kombucha? While speculative, this creatively rethinks what it is to train, live with and co-perform (Kuijer and Giaccardi, 2018) with a generative AI system (Nicenboim et al.,

2023). In a related vein, van den Burg's *Strange Labelling* questions how the labels applied in image recognition generate relations with the world by using a collection of unexpected, whimsical, conceptual labels superimposed on everyday objects. This creatively reinterprets both the successes and failures of machine vision algorithms to create a poetic space constructed from the algorithmic viewpoint (van der Burg et al., 2022). Creative practice with generative AI allows us to explore these viewpoints, to provide alternative ways of interpreting the world or play with different standpoints to create from.

d. Cultural feedback

As a final point, there is now a mixing between machine generated and human generated work. The prospect of training on 'clean' data recedes as previously AI-generated text and images seep into the public sphere. As the agencies of creation blur, and the products of creative practice entangle with the development of next year's models, feedback is created in an increasingly complex space. The notion of feedback between creators and algorithms is not new: content distribution and recommender algorithms responded to material that was in turn tuned to the algorithmic gaze (Möller et al., 2020). Genres and styles serve both for human navigation and machinic classification. The current change is around the intimacy of the feedback: once the same kind of thing is being produced and consumed, the loop tightens. As Alvin Lucier (1981) or any guitarist knows, with tight feedback, the qualities of the space come to dominate the structure of the material. Working in this generative paradigm, we can ask: what are the fixed points and attractors of this new space? Where does the feedback cycle settle down? Does it push towards and support an infinite drabness of relentless generation or do we find again the value in human vibrancy? How is generative AI evolved with practice in a respectful, inclusive and ethical way? And how do we ride this wave creatively and joyfully?

Conclusion

This chapter has introduced technical, creative and conceptual factors in the use of generative AI in creative practice. We looked at the long history of critical arts engaging with AI, and the current landscape of generative AI use in visual arts, music and games, to understand both the possibilities for artistic production and critiques of dominant tools and models. By reflecting on the current creative use of generative AI, we identified four priorities and future avenues of research and practice combining human and algorithmic concerns. In light of the contemporary prominence of generative AI tools, these four dimensions are already shaping and, we predict, will continue to shape creative work and its interpretation. In such a fast-moving field we

can only ever present a snapshot of the present and surmise which areas of concern will become prominent. But attention to these concerns – and related political, legal, security, ethical, environmental and social concerns – will allow us to redefine how we understand art, creativity, originality and humanity itself in the context of these emerging technologies.

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Notes

1 www.newreal.cc
2 https://www.image-net.org/
3 https://www.artbreeder.com/
4 https://openai.com/dall-e-2
5 https://www.midjourney.com/
6 https://stability.ai/stablediffusion
7 https://chat.openai.com/
8 https://krita.org/en/
9 https://www.adobe.com/products/photoshop.html
10 https://www.blender.org/
11 https://www.gimp.org/
12 https://runwayml.com/
13 https://forum.openframeworks.cc/; https://opencv.org/
14 https://processing.org/; https://p5js.org/
15 https://ml5js.org/
16 https://colab.research.google.com
17 https://ml4a.net/
18 https://huggingface.co/datasets
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CASE STUDY

Experiments in building experiential AI systems: The New Real

We write this case study as practitioners involved in a research group and creative community called The New Real,[1] a joint initiative of the University of Edinburgh and the Alan Turing Institute,[2] which is intimately concerned with exploring the ways artists can push creative boundaries with AI and how AI can be enriched or challenged by critical art. In our work, we have the twin ambitions of supporting the creation of significant new art and inspiring new concepts and paradigms for fair and inclusive AI. Our research framework, experiential AI, in which AI is made tangible and explicit, to fuel cultural experiences and to make AI systems more accessible to human understanding (Hemment et al., 2019, 2023), seeks to transform how people engage with different types of content in individualised and also shared intelligent experiences. Crucially, this work identifies both transformative applications of AI in the creative sector as well as ways in which critical arts can help society navigate profound transformations brought about by new technologies.[3] As a research group, we develop technologies, commission artists, publish design tools and advance new thinking.

The Zizi Show – an AI art commission

In our first collaboration with an artist, in 2019 we started working with London-based visual artist Jake Elwes to support them to develop a new body of artistic work and to deepen our understanding of the strategies used by artists to develop critical understanding and literacies of AI.[4] The artistic outcomes include *Zizi – Queering the Dataset*,[5] which premiered at Preternatural at the Edinburgh Festival Fringe in 2019,[6] and *The Zizi Show*,[7] which was commissioned in 2020 by The New Real, and presented at Edinburgh International Festival in 2021, with a major new multi-channel video installation edition of *The Zizi Show* commissioned by V&A in 2023.

Of these, *The Zizi Show* (The New Real, 2020) is an online interactive artwork in which a generative adversarial network (GAN) has been trained on digital video footage of 13 diverse drag performers, filmed at a London cabaret venue during the COVID-19 lockdown. This work exposes the latent space of the machine learning model and highlights the way the model outputs are shaped by the training data. Where many generative works have been trained on opportunistically collected data, the purposeful curation of Zizi's dataset explores the question of how human identity is represented within complex models. *The Zizi Show* develops this through digital avatars that have been created from a model trained on video of real performers to create an interactive

work that allows user control. It connects low level technology to high level social, cultural and political aspects of AI, such as ideas of cultural appropriation and machine bodies. It exposes the limits of machine intelligence and inverts what is otherwise a deficiency in the technology through a positive use of deep fake technology, in which a marginal identity is celebrated and embellished rather than obscured or misrepresented. The work has the power "to influence, to educate, and to entertain" (Parry, 2021) and is a unique output of the collaboration between artist and AI. *The Zizi Show* highlights the ways data and design choices shape what machine learning does. It specifically targets anthropomorphised misrepresentation of AI by constructing an AI persona, and then deconstructing it, exposing its construction in software by the human artist.

The New Real Observatory: an experiential AI platform

In a later project, we brought together artists and scientists to address limitations of contemporary generative AI applications. Collectively we tested methods to give artists increased access and control over an AI model and to creatively explore a machine learning dataset. The outcome is The New Real Observatory,[8] an experiential AI platform developed with and for creatives. Using our platform, artists can iteratively curate data by training an AI model and creatively exploring the results. They define the dimensions they want the algorithm to explore and use simple tools to probe the latent space. The first release of the platform in 2022 worked with images and generative adversarial networks. We have developed bespoke tools such as including a slider visualisation tool as an accessible interface to explore the latent space without the need for users to run their own code.

In its first phase, three artists – Inés Cámara Leret,[9] Keziah MacNeill[10] and Lex Fefegha[11] – used this web-based platform to create artworks that challenge audiences to develop new environmental sensibilities.

Three artworks were presented at The New Real Pavilion at Ars Electronica 2022,[12] and the second iteration of the platform is being tested through five artist development awards and an artist commission in 2023, funded by the Scottish AI Alliance.[13] In the early results, we are seeing how more granular control of the model can contribute to transformative experiences for audiences and open new thinking on key challenges such as authorship, consent, harmful bias or energy use.

We believe it is essential to adopt a more ecological approach to AI, one based on care for the planet and each other. We have seen highly imaginative artistic forms and novel modalities of experience in the work of our collaborating AI artists. The range of projects offers a glimpse of diverse practices,

aesthetics, and strategies that are being used by AI and data arts practitioners. They reveal the extraordinary potential of artificially intelligent technologies used in creative and artistic contexts, and enable us to see different configurations of artistic, technological, societal and environmental work and themes.

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Case study notes

1 https://www.newreal.cc
2 https://www.turing.ac.uk/
3 https://www.newreal.cc/publications/illuminating-the-new-real
4 See https://www.newreal.cc/artworks/the-zizi-project

5 https://www.jakeelwes.com/project-zizi-2019.html
6 https://inspace.ed.ac.uk/preternatural-data-lates/
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10 https://www.newreal.cc/artworks/photographic-cues
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12 See https://www.newreal.cc/events/arselectronica2022
13 https://www.scottishai.com/
14 See https://www.newreal.cc/community