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Artificial creativity and tools for understanding

Music, creative labour and AI

1 INTRODUCTION

This chapter focuses on artificial intelligence's relationship with human intelligence and how we might think about that relationship in the context of music. The term 'Artificial Creativity' is used as a means to focus on whether – in the context of creativity – we should see AI as simply modelling human intelligence or if AI is asking us more searching questions about the nature of intelligence itself and thereby offering valuable perspectives on musical creativity.

To begin, it is worth reflecting briefly on the inception of artificial intelligence at the Dartmouth Summer Research Project on Artificial Intelligence in 1956. Central to the project was the contention that,

Every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.

(McCarthy et al., 1955)

Two fundamental ideas emerge in this passage. Firstly, the idea that human intelligence can be mapped and simulated with machine technology. Secondly, the defining characteristic of human intelligence – which here is taken to be synonymous with intelligence per se – is that it is capable of modifying (improving) itself. More recently, IBM has developed this position, describing AI as 'the broadest term used to classify machines that mimic human intelligence', listing speech and facial recognition, decision making and translation as examples of the human tasks that AI has been used to predict, automate and optimise (Kavlakoglu, 2020).

An important distinction, however, appears in the Oxford English Dictionary. Here, Artificial Intelligence is defined as 'the capacity of computers or other machines to exhibit or simulate intelligent behaviour' (OED, 2022). This subtle shift to engaging with intelligence as something that exists in its own right, separate from its instantiation as human intelligence, is hugely important. It is a shift that enables us to examine the many different forms that intelligence might take – human, machine or otherwise – but also consider that human intelligence may not necessarily be the blueprint for intelligence, or at least the

standard against which other forms of intelligence are measured. In this sense, it may be that human intelligence may be no less artificial than so-called artificial intelligence.

The following analysis explores the relationship between artificial intelligence and human intelligence, what this might tell us about the nature of creativity, and how that might play out in the context of music. While the chapter engages with a variety of AI-music use cases in order to explore and illustrate these themes, it is not designed to provide an exhaustive account of AI in music. Instead, it engages with narratives concerning the threat posed by machines to human workers, identifies key vectors in how AI is being implemented in the context of music and work, and offers emergent perspectives on music and creativity.

2 AI AND MUSIC

The history of AI in music is peppered with hyperbolic claims about its significance and its capacity to shape the future of music, where a growing awareness of AI's increased presence in music speaks of an appreciable rise in the number of companies developing AI projects for music-related activities. In 2017, Stuart Dredge's article for the Guardian posed the question, 'AI and music: will we be slaves to the algorithm', describing how a 'burgeoning sector', consisting of start-ups and subsidiaries of major firms such as Google (Alphabet) and Sony, were developing AI systems for music creation and transformation (Dredge, 2017). By 2019, Scott Cohen, who was about to be appointed as Chief Innovation Officer at Warner Music Group, likened AI's potential to transform the music industry to the consequential impacts of hip hop and MTV in the 1980s, highlighting the central role that AI was playing in terms of organization, recommendation and search on music streaming platforms (Dredge, 2019).

These kinds of claims about the increasingly central role that AI could – or would – take in the music industry have been fuelled by relentless innovation and increased usage of AI tools across a wide range of music ecosystems. Companies such as LANDR (2022) and iZotope (2022) have long been working with AI to innovate in production and mastering, and the likes of Amper (2020), Boomy (2020), Loudly (2021) and AIVA (2022) have been developing tools for music creation, particularly aligned to the needs of creators working across non-musical forms (for example, games, film and social media). Launched in 2014 to offer AI-powered mastering services for musicians, LANDR now encompasses music distribution services, music sample libraries, virtual instruments (VSTs) and plug-ins for music processing. Similarly, music

creation services, including Boomy and AIVA, complement their creative toolkits with licensing packages that reflect the AI's creative contribution to a finished track, offering a variety of payment and royalties models. In March 2022, the audio streaming platform SoundCloud acquired Musiio, an AI start-up launched in 2018, that produces audio tools that are able to 'tag, search and playlist large catalogues' (Musiio, 2022) and which have been described as having the capacity to "listen" to music faster than any human possibly could' (Silberling, 2022). Other companies working in music and sound include Never Before Heard Sounds, who, since 2020, have been making 'cutting-edge technology expressive and useful for musicians [and building] machine learning instruments and create powerful audio tools' (Never Before Heard Sounds, 2022). LALAL.AI (OmniSale GMBH, 2022) specialises in separating and extracting instrumental and vocal components from audio files, and MatchMySound (2022) is an education service that listens to learners as they practice playing music and compares the performance to a score of the original piece, providing tips on how to improve.

3 VECTORS IN ARTIFICIAL INTELLIGENCE

While these examples are not a definitive list of the state of play as regards AI-for-music in 2022, even this brief snapshot allows us to observe important differences in how it is being used and what the consequences may be. The work of the economist Daniel Susskind enables us to articulate these differences in terms of AI's impact on music in the context of creative production and distribution. Susskind draws on a history of technological disruption to labour markets and examines how today 's industrial machines, in the form of AI systems, are threatening to replace human labour across a wide range of commercial and industrial sectors. By offering cheaper, more convenient and, controversially, more effective services than their human counterparts, he sees that intelligent machines look set to operate as an increasingly 'substituting force' (Susskind, 2020).

In this sense, we can see such a substituting tendency in the design and implementation of the likes of LANDR, Amper, MatchMySound and Musiio, as these companies offer to outsource a range of established and emergent services (the likes of mastering, music education and playlist curation) to AI-powered automation. At the same time, a company such as Never Before Heard Sounds, in seeking to deploy AI as a tool to enhance human creativity and productivity, offers what Susskind describes as a 'complementing force' (Susskind, 2020). Here, technological systems are designed to enhance, rather than replace, human performance at a given task, thereby offering new opportunities for

innovation and employment to balance the substituting force of technology. Susskind discusses the step-change brought about by AI systems over the past decade in problem-solving and decision-making processes. Rather than focusing on how a given task is performed, the neural networks and machine learning processes that operationalise AI are designed to operate pragmatically and focus instead on how well that task is performed; in other words, it is the outcome that matters, rather than the route taken. This has led to a situation where AI systems are not being built to do things in the way that humans do but better; instead, they are built to complete a task in the most optimal way. By invoking the concepts of ‘complementing’ and ‘substituting’ forces, Susskind is referencing a history of the impact of technology on the workplace, which has been characterised by technology’s capacity to create new roles for human workers at the same time as it has made workers redundant in established roles. Susskind’s view is that artificial intelligence has destabilised this balance; that the proliferation of substituting technologies now threatens to permanently outstrip the capacity of complementing technologies to create new forms of employment.

Susskind goes on to suggest that in the context of contemporary labour markets, AI systems are increasingly replacing humans via a process he calls ‘task encroachment’ (Susskind, 2020). Susskind’s analysis suggests that machines are not competing for humans’ jobs in a straightforward manner or simply replacing their human counterparts. Instead, he suggests that the change is occurring at the level of the individual tasks that come together to constitute a job that a human would be employed to do. He maps task encroachment across three domains of work: manual (for example, operating machinery, driving vehicles, repairing appliances), cognitive (secretarial work, bookkeeping and accounting, bank and post office clerks) and affective (customer service roles in hospitality and call centres, but also, in the context of music, affective labour can be characterised as work that is intended to create an emotional response in others), suggesting that machine labour is now encroaching into each of these areas. Ultimately, Susskind’s concern is that technological task encroachment could lead to ‘structural technological unemployment’, a phrase he uses to denote a future scenario where there are too few jobs available that require humans (Susskind, 2020).

4 HOLLY+ AND THE CENTAUR

As already mentioned, the AI start-up Never Before Heard Sounds (NBHS) has made use of machine learning to create audio tools for musicians. In 2021, they collaborated with the musician Holly Herndon and the technologist Mat

Dryhurst to launch Holly+, a project that transformed participant-generated audio into a new piece of music that had been ‘sung’ in Herndon’s voice (Herndon, 2021). NBHS describes how models can be trained on an instrument or an ensemble to capture particular sonic characteristics but can also be trained to ‘capture playing styles and articulation which is unique to an individual, place, time or culture’ (Never Before Heard Sounds, 2022). Trained on an extensive set of Herndon’s vocal recordings, the Holly+ model combines the textural and timbral qualities of this training set with the pitches and rhythms of up to five minutes of user-generated audio content (uploaded to the Holly+ website) to create a new piece of audio which, in the words of NBHS themselves, ‘is imperfect and idiosyncratic’, and which can produce ‘unexpected (and sometimes bizarre) combinations of the model ’s training dataset and the input performance’ (Never Before Heard Sounds, 2022).

In its quest to harness human and machine creativity so as to create music that neither could have produced alone, the Holly+ project reflects the ambitions of Garry Kasparov in his vision for what he referred to as ‘advanced chess’ (Chessgames.com, 2021). Having been beaten in 1997 by the chess computer Deep Blue, the then-chess grandmaster developed advanced chess as an approach to playing the game that paired humans with computer programmes in order to achieve results that exceeded the capabilities of either humans or machines playing alone. Kasparov went on to compete alongside the chess programme Fritz 5 in the first Advanced Chess event in 1998 (Chessgames.com, 2021), and for a time, interest in this style of gameplay – also known as ‘centaur chess’ and ‘freestyle chess’ (Cassidy, 2014), (Nilsen, 2013) – grew.

As with advanced chess, so too with Holly+. Never Before Heard Sounds, by partnering AI technology with the genetic, cultural, social and creative contributions of human participants, is a musical centaur. While these innovations are compelling, and NBHS’s ambition to harness technology within an ethically-informed production framework is laudable, Susskind’s view is that it is only a matter of time before human-machine centaurs are outperformed by machines alone. Centaurs will only offer optimum possible performance across a range of domains – either in chess, the economy or, indeed, music – as long as the computer half of the centaur is not able to bring to the partnership what the human half can. As with his rationalisation for the relentless progression of task encroachment, where roles are incrementally eroded rather than being displaced wholesale, for Susskind, since computers are increasingly able to replicate human performance across a number of domains, the opportunity for human contribution diminishes. While we may be accustomed to think- ing about different types of tasks across different domains – for example, manual,

cognitive or interpersonal – these distinctions only hold insofar as they require ‘manual, cognitive or personal capabilities when performed by human beings’ (Susskind, 2020). Essentially, developments in artificial intelligence have made these distinctions redundant, and it is a serious underestimation of a machine’s capacity to encroach into the domain of human labour to assume that the *human* approach to fulfilling a task is the *only* way to fulfil that task.

There are clearly differences between completing a work-related task and creating music, although the outcomes as far as a listener might be concerned – in other words, the production of something that is pleasing and/or interesting to listen to – may not be that different. While it remains to be seen whether Susskind’s misgivings about the time-limited nature of human-machine performance will be borne out in the context of music creation, his articulation of the collapse of manual and cognitive domains nonetheless challenges us to reconsider what we think musical creativity might be, and how the processes of making music operate.

5 REPLACEMENT ANXIETY

Susskind’s sense is that the complementing force of technology – the force that creates new roles for human employment in the wake of technological disruption – will, in the last instance, not withstand the relentless and all-encompassing power of its opposite, the substituting force.

In discussing their products, the likes of LANDR and iZotope, another sector-leading specialist in AI-driven audio production technology, communicate carefully constructed messages that both promote the virtues of intelligent production tools whilst at the same time celebrating and re-affirming the important roles that humans play in the audio production process.

LANDR ’s Product Director emphasises that the software does not think of ‘AI-mastering as a question of OR, but rather as an AND that assists creators when needed’ (Bourget, in Price, 2022) and positions the LANDR toolset as a tool for producing feedback during the production process, rather than producing a finished product to professional standards, ready for public consumption. iZotope offer a range of AI-driven ‘Assisted Audio Technology’ tools that use machine learning to offer a range of editing and production services. In a similar vein, Melissa Misicka, Director of Brand Marketing at iZotope, positions the Assisted Audio Technology tools as a studio assistant. Whilst Misicka draws the analogy of the assistive tools functioning as ‘a studio assistant who can take that first pass at repairs or a mix for you while you go get a coffee’ and who can enable a seasoned audio professional to ‘[get] to a starting point more quickly’

(Misicka, in Price, 2022), it is clear that, whilst the mastering engineer's role may not be threatened, at least not yet, human roles are being replaced: the studio assistant.

iZotope's segmenting of the production workflow into creative activity and 'time-consuming' production tasks is precisely what task encroachment describes: the fragmentation of holistic processes into a set of sequential tasks that can be accomplished – often more efficiently – by automated systems. In this sense, iZotope, LANDR and their ilk are transforming the world of audio production, not by replacing human jobs wholesale, but by altering the nature of the work involved in the production work-flow that takes music creation from inception to distribution and public consumption.

In 2016, *Sound On Sound* ran an article in which a number of prominent mastering engineers voiced their opinions on LANDR and similar automated services. The general response was that – for various reasons – human mastering engineers would continue to outperform their disruptive AI counterparts. As Justin Evans, one of LANDR's co-founders asked, 'In the '40s, mastering was part of the job of a transferring engineer. Then vinyl and radio changed that. Now we are living in a streaming world. What should mastering be now?' (Evans, in Inglis, 2016). Such questions of what mastering 'should be' and the changing nature of the environment in which mastering exists and operates are very much giving shape to the question that AI is increasingly asking us about music and its associated practices.

6 UNDER CONSTRUCTION

The history of AI concerns the quest to understand intelligence, and whilst the Dartmouth Summer Research Project was originally focused on modelling and replicating human intelligence, models of intelligence have emerged that have enabled us to think more broadly about what intelligence is and how it works. Indeed, Susskind's work on outcome optimisation demonstrates that, in a practical sense, intelligence – human or otherwise – is not necessarily what we think it is. Just as we might want to consider the changing nature of music-related labour, we can also pause to consider the extent to which our understanding of intelligence itself is evolving.

The philosopher Reza Negarestani defines what is 'human' not as an evolutionary animal but as an idea that is historically constructed. He says, 'we can never elide the distinction between the totality of the human idea – that is the totality of its history – with what we appear to ourselves to be in any specific historical moment' (Negarestani, 2020 , p. 127).

Negarestani's point is that what we might think of as some kind of perpetual human essence that exists for all time is, in fact, something that is entirely tethered to its historical moment. He goes further to say that whilst humans are rational lifeforms, rationality in itself is not something that is exclusive to humans, proposing that rationality can be associated with any lifeform 'that satisfies its criteria (the power of judgement, and theoretical and practical reason) or falls under its concept' (Negarestani, 2020, p. 132). Rather than being something that is a necessarily human faculty, rationality – in Negarestani's reading – instead becomes a means to take apart an anthropocentric view of intelligence and our conceptions of the world more widely. What is more, he proposes that the human is 'historically collective and is under construction' (Negarestani, 2020, pp. 127–128). 'Historically collective' means that although we might think about and experience intelligence at the level of the individual, it is, in fact, the expression of a collective history, and his assertion that the human is 'under construction' means just that: humans are not finished. We are merely a snapshot, at any given moment, of a process-in-motion through time, a snapshot that is entirely located within its temporal moment. Such snapshots do not present a view of the human as a completely finished and evolved entity, and neither are they an expression of the entire history of humanness, resolved into one fragmented moment. What we take to be 'human' is simply a momentary expression of a set of histories that have led up to a moment of consideration; an appraisal of a process, rather than a distillation of an essence.

Taking the idea of the collective further, Negarestani suggests that the 'mind is ultimately understood as the dimension of structure, or a configuring factor; something which can only be approached via an essentially deprivatised account of discursive (linguistic) apperceptive intelligence' (Negarestani, 2018, p. 3). This is absolutely central for Negarestani; that the mind, which we think of as an individual, isolated thing, is, in fact, formed via its use of language, something that is shared. He conceptualises this as 'the intrinsic social frame' of intelligence, which refers to a wider arc in Negarestani's work; his view that – given that we are only able to think because our thoughts are mediated through language, and that language by its very nature is a shared, social construct – then intelligence must, by definition, operate as a shared, social phenomenon.

All of this adds up to suggest that, no matter what we might think it is that we are modelling artificial intelligence on – leaving aside the question of whether it is actually possible to emulate that model or not – it is highly likely that we shall be mistaken in our understanding and apprehension of what human intelligence even is.

7 CONCLUSIONS . . . ARTIFICIAL CREATIVITY

Artificial musical creativity – a zenith of AI research and development – has continued to evolve, both in terms of the approach taken to facilitating AI-enhanced creativity as well as how the resultant pieces can be used. AIVA (2022) offers users the opportunity to compose using preset styles (including modern cinematic, tango, fantasy, sea-shanty and many more besides) or in the style of a pre-existing track. The latter reflects an approach often used by directors, where a temporary piece of already-existing music is placed alongside a film sequence to convey a sense of the desired mood or atmosphere that they are trying to achieve or even the genre of music they would like a composer to create. Shortcutting this process, AIVA's 'compose with influences' function enables visual creators to upload a template track from which the AI can generate an original piece of music that can be used without the complications of either paying for permission to use an already-existing piece of music or having to negotiate with a composer to commission a score that meets a director's requirements. To accompany its dynamic approach to music creation, AIVA also offers users a suite of rights packages that allow for a variety of access and ownership of its AI-generated music, enabling free but limited access through a monthly subscription that gives subscribers full ownership of any music they create using AIVA, and extensive (although still not complete) access to their content.

Boomy, whose landing page offers users the chance to 'create original songs in seconds, even if you've never made music before', is clearly more overtly focused on servicing a market concerned with creating content for social media platforms such as TikTok and YouTube (Boomy Corporation, 2020). The website also offers visitors a glossary of musical terms, providing simple explainers for key terms such as composition, production, mixing and tempo, provides simple tutorials to enable creators to sing over the AI-generated tracks, and offers a pricing system that enables royalty payments to be shared between Boomy and content creators themselves. While AIVA and Boomy are embracing the social media environment, it is worth reflecting on Taryn Southern's comments from 2018 who – when asked whether she felt that using AI to create music was 'cheating' – responded, 'if music is concretely defined as this one process that everyone must adhere to in order to get to some sort of end goal, then, yes, I 'm cheating [however], the music creation process can 't be so narrowly defined' (Southern, in Deahl, 2018). What is interesting about these three examples of AI-powered music creation is that they each speak to the way in which the roles traditionally played by composers and songwriters are indeed being eroded by AI. However, each of these scenarios also suggests that there is

more happening here than simple task encroachment or worker displacement. Although – as may be expected – Amper co-founder Michael Hobe was keen to stress Amper’s emphasis on empowering creatives rather than replacing musicians’ jobs – saying that his interest lay in enabling ‘more people to be creative and [allowing creatives to] further themselves’ (Hobe, in Deahl, 2018). Southern’s remark about how we might define creativity may be more to the point.

Dadabots, an AI-music project, described by its creators CJ Carr and Zack Zukowski as ‘a cross between a band, a hackathon team, and an ephemeral research lab’ is focused on creating music and collaborating with other musicians (Dadabots, 2022). Clearly framed as a set of experiments and explorations into the capabilities of AI to produce music – rather than a commercial offering in the vein of LANDR and iZotope – Dadabots has created a number of short-form musical artefacts along with a series of projects that span more extended timeframes. Human Extinction Party was a 100-day-long livestream of ‘Neural Death Metal’ in the style of the band Cannibal Corpse. Outerhelios was a ‘Neural Free Jazz’ livestream. For this project, the neural network was trained on Coltrane’s *Interstellar Space*, which it listened to sixteen times, enabling it to continuously produce music in the style of the saxophonist-drums partnership of Coltrane alongside Rashid Ali. Excerpts from the Human Extinction Party and Outerhelios livestreams are now archived as ten-hour videos on YouTube (Dadabots, 2022). Also from 2019, the Relentless Doppelgänger project, described as ‘Neural Technical Death Metal’, is an infinitely evolving and continuous livestream of music inspired by the Canadian death metal band Archspire.

Of all the Dadabots projects, the extended play livestreams and the indefinitely enduring Relentless Doppelgänger most concretely reflect the questions raised by LANDR and iZotope. We cannot ignore Susskind’s challenge to think about how such systems are fracturing and fragmenting once-familiar and trusted job roles and creative labour activities. However, just as Dadabots’ infinite stream of music and Musiio are listening to and categorising music faster than any human can comprehend, what we think music is, and what we think it is for is readily changing. The question may not be so much will this or that music production tool put humans out of work, but instead, will music survive AI in any way that we will still recognise it?

To conclude. Reflecting on Susskind’s theory of task encroachment, while it is compelling, these music-based developments in AI suggest that maybe his ideas could be taken further. AI does not simply atomise jobs into tasks, replace the

task, then incrementally replace the job. Instead, AI is impacting the entire creative process. AI does the making so that humans don't have to; it identifies the audience, it does the listening and, because of this, AI sets the framework for what is made in the first place. At the same time, however, it is becoming increasingly clear that we must recognise that the human intelligence, which is often the recipient of the music produced by the machines carrying out these various tasks may not be fixed either; in other words, the human creativity that AI is seemingly technologically displacing may be no less 'artificial' itself. If humans and machines are equally artificial – which is to say that both are intelligences under construction and that neither can lay claim to having an originary provenance over the nature of intelligence – this would suggest that music itself is no more fixed than its human or machine makers or listeners. Music has always moved and evolved in relation to the way that makers (musicians), tools (for example, instruments, studios) and institutions (for example, states, corporations, legal governance frameworks, rights agencies) have changed. AI may be accelerating change at the moment, but in many ways, its lasting legacy may be that it has helped us to see more clearly the artificial creative processes that fundamentally underpin music. Creativity under construction. Humans as activators of intelligence, rather than the sole source of intelligence. The human is a construction and a coming-together of a set of vectors, and in that sense, we are ourselves artificial, the product of a non-human set of processes. In this sense, the history of music is the history of artificial intelligences artificially creating music, no more or less artificially than any number of manufactured intelligent machines.

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