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The Problem of Musical Creativity and its Relevance for Ethical and Legal Decisions towards Musical AI

Abstract
Today, AI and technology are no longer simple tools in music production, but active collaborators of human musicians. This raises complex questions about the nature of artificial musical creativity and its ethical and legal implications. This paper addresses such questions by considering a study case, the problem of artificial music authorship. It is argued that attributions of a moral and legal status to Musical AI technologies are closely tied to the theoretical understanding of musical creativity implicitly or explicitly presupposed, and that such attributions are necessary and desirable in present-day society because of pragmatic reasons.

Keywords
Musical AI; Ethics of Artificial Intelligence and Music; Copyright; Computational Creativity; Music Legislation

1. Introduction. Artificial Music: Historical and Conceptual Notes

Making music without musicians has been possible since far before than one may expect (Collins 2018): After some experiments in Classical Antiquity and Middle Ages, the first system for composing music automatically, the *musarithmica mirifica*, was developed by Athanasius Kircher (1650); Games based on dices and cards were introduced in the 18th century for automatizing and randomizing the process of music composition (Gardner 1974; Hedges 1978); Automata and mechanical musical instruments capable of performing music without human intervention were still built during the 20th century (Buchner 1960).

But of course, the field of automatic music composition and performance underwent radical changes with the development of computers

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and, later, Artificial Intelligence (AI). In 1957, the first musical work entirely composed by a computer, the *Illiac Suite*, was performed (Hiller and Isaacson 1959). Several software have been developed since the '60s with the ability to analyze and encode the style of famous composers and to reproduce it in new compositions – e.g. (Cope 1992). Machine Learning (ML) techniques have made computers able to compose original music even in their own style (Downie 2003; Typke, et al. 2005; Sánchez et al. 2013; Civit et al. 2022). Innovative electronic instruments have been introduced able to synthesize existing and new sounds, making possible to musicians what was unimaginable in the past (Casini and Roccetti 2018; Miranda 2021).

Yet, while at the beginning algorithmic techniques, computers and AI were nothing but *passive tools* in the hands of composers and performers, today they are becoming *active collaborators* of musicians (Ferry et al. 2019; Miranda 2021). Compositions by computers are regularly performed by prestigious orchestras around the world – that is the case of IAMUS' music performed by the London Symphony Orchestra in 2012 (Sánchez et al. 2013). Music composition and music writing software, sound sampling techniques, audio editing and manipulation software (e.g. Auto-Tune), MIDI sequencers, synthesizers, electronic or digital musical instruments, and various kinds of (AI-powered) music technologies have today taken up a large part of the creative work carried out by musicians in concert halls, stages and recording studios (Katz 2004, 64; Collins 2011, 35; Sturm et al. 2019, 15; Anantrasirichai and Bull 2022).

For this reason, computational musical creativity (CMC) has gained growing attention among AI scientists, musicians and philosophers, with a great number of specialized international conferences and journals dedicating spaces to it and trying to investigate its problems and potential. Besides the theoretical issues concerning CMC, however, scientists and philosophers are reflecting on moral and legal concerns related to the use of artificial music technologies.

The present paper aims to examine the consequences of Musical AI (MAI) on such ethical and legal issues, with a particular focus on the problem of artificial music authorship (Section 2.2.1). The central claim of the paper is that answering questions about the ethics of MAI necessarily requires taking a preliminary stance on the nature of musical creativity in general (Section 2.1). Decisions about considering MAI systems as moral and legal subjects, in fact, depend on the systematic conception of musical creativity one has. In (Section 3) I claim that, from a pragmatic point of view, a computational view of musical creativity should be preferred to a phenomenological one, as this better allows for attributing to MAI technologies a moral and legal status, considered the urgent weight such technologies already have in present-day music industry and society.

2. Theoretical and Ethical Problems of Musical AI

2.1 Philosophy of Music and Musical Creativity

Facing moral and legal issues concerning MAI is impossible without having a previous understanding of musical creativity. Such an understanding can be more easily achieved by considering the following four questions, closely related to each other:

(Q1) Can an artificial system act creatively as humans do?
(Q2) Is intentionality a necessary condition for creativity?
(Q3) Is there something to understand in music?
(Q4) What does it mean for a machine to be a musician?

Often, creativity is conceived as a "wonder" (Gardner 1974, 135), something which cannot be explained, let alone reproduced artificially (Lovelace 1843). Against this phenomenological conception of creativity, which sees it as somehthing subjective, private, "mystic" and exclusively human, cognitive science – since e.g. (Turing 1950, 450) – has tried to analyze it in more objective terms. In this respect, the ideas of Margaret Boden (2004) have proven to be particularly fruitful.

As a first thing, explaining the "mystery" of creativity does not reduce its significance. Yet, verbal (phenomenological) discourses around it do not add very much to our understanding of the phenomenon, and remain vague about it. For this reason a different approach should be preferred, namely a functionalist and computational one (Boden 2004, 283-284).

According to this view, creative processes can be defined as processes bringing about "products – ideas or artifacts – that are new, surprising, and of value" (Boden 2004, 1). There are three ways (often combined) in which this can be accomplished: by combining familiar ideas (*combinatorial creativity*); searching for new solutions and ideas within a *conceptual space* – a finite system of rules and propositions (*exploratory creativity*); or transforming conceptual spaces themselves (*transformational creativity*). These are the mechanisms underlying creativity[1], and increasing our understanding of creativity amounts to constructing ever more accurate computational models of how they work. Being such, nothing theoretically prevents these mechanisms from being implemented in hardware different from human brains: Creativity emerges merely from the ability of combining, exploring or transforming systems of rules, symbols, etc.

[1] These mechanisms have been also formalized (Wiggins 2006a 2006b; Schmidhuber 2010; Mogensen 2018; Franceschelli and Musolesi 2024).

and is not the result of a some (subjective, phenomenological or divine) inspiration only humans are capable of.

Accepting a computational account of creativity thus answers positively (Q1). However, attributing a quality of an output (creativity) to what produces it (machine), in a sort of behaviorism, may be problematic. The fact that machines can produce something we could regard as creative, in fact, is not enough: Something more is needed in order to consider machines as creative subjects. After all, a creative output may be the result of some stochastic process working in the machine, which would make it creative only in an accidental sense (Casini and Roccetti 2018, 128-129).

What distinguishes an *accidentally* creative subject, or one which just *acts* creatively, form a truly creative one is namely *intentionality*. Searle (1983, 1; 1998, 85) defines intentionality as the property of a mind to be "directed at, or about, or of, objects and states of affairs in the world" – in other words, the property to have semantic content. In this sense, a subject – human or not – can be said to be (truly) creative if the creative outputs it produces amount to an experienceable representation of the *content* of its mental states – whatever having a mind means for this subject. If so, creativity is not only a formal process in which knowledge is syntactically combined or transformed (a necessary, but not sufficient definition of creativity), but also a process in which, *necessarily* (Q2), formal combinations show semantics and intentionality, acknowledged as such by other subjects (provided with intentionality too)[2].

Of course, whether machines have (intentional) mental states, and can therefore not only *act* creatively, but *be truly* creative is still not clear (Searle 1980; Boden 2004, 7, 21, 277-304; Gräbe and Kleeman 2022). Thus, the attribution of creativity to machines can occur just in a weak sense. However, if this claim is generally true for the most creative activities, it faces some problems in the case of music.

In fact, according to one of the most widespread philosophies of music, *musical formalism*, music is devoid of meanings in the common sense. It cannot represent external "objects and states of affairs in the world", and its meaning coincides with its formal structure (Hanslick 1854; Helmholz 1863; Scruton 1976; Alperson 2004). In music, meanings cannot be represented in the sense that a particular external reference or sense can be matched to each particular syntactic musical symbol. If music represents something, this is only its syntax (harmonies, chords, scales, etc.).

According to this view, hence, if there is something to understand in music, this is not, in traditional sense, a semantic, representational meaning beyond its syntax, but only the functional and causal role of every

[2] Further to this, Casini and Roccetti (2018, 128-129) claim that the creative output should be also the result of a deliberate act of will, which is however controversial.

syntactic element within the specific musical system, form or genre considered (Q3). As a consequence of this, intentionality cannot be considered a necessary condition for musical creativity in particular (Wimsatt and Beardsley 1946; Zimmerman 1966; Carroll 1999; Soldier 2002; Ariza 2009). In fact, if semantics is excluded from music – if, in other words, music cannot express meanings and be "directed at, or about, or of, objects and states of affairs in the world" – creative musical subjects (composers or performers) cannot put in musical outputs the experienceable expression of the intentional content of their ideas and mental states[3]. Musical creativity, as a result, just derives from a combinatorial game on syntactic musical forms and structures. This game is then supposed to bring about some products to which creativity can be attributed – something carried out generally by listeners, which give music external (mostly emotional) meanings.

The abstractness, self-referentiality and "meaninglessness" of music and musical creativity lead to important consequences for (Q4) and, as it will be noticed, to the ethical (and legal) discourse around MAI. If intentionality is not a necessary condition for musical creativity, in fact, there is no problem in accepting that artificial systems too, which, as mentioned, are supposedly able to *act* creatively, could produce musical outputs that can be regarded as creative. In this sense, they would be creative in music in the same way humans are: If musical creativity develops as a process of syntactic manipulation of musical symbols – which cannot be otherwise, since music has no intentional content – and if artificial systems can act creatively exactly by manipulating syntax, it follows that the latter can potentially[4] produce creative music as humans are capable to do.

2.2 The Ethics of Musical AI

Today, musicians are delegating increasing portions of music creative processes to MAI (Section 1). Nevertheless, a difference between human and artificial music is still drawn, and resistance exists to accept MAI technologies as autonomous creative subjects – despite their substantial involvement in music creative processes. Just a philosophical justification of the comparability of humans and computers in music creativity on the technical level (Section 2.1) cannot suffice. Something

[3] By "ideas", I mean here the *non-musical ideas*. These latter are ideas which do not regard the syntactic dimension of music and lie beyond it, expressing a sort representational meaning which has to do with things in the world. On the contrary, the only expressible ideas in music can be related to its syntax (forms, structures, musical figures, tones, etc.), i.e. the *musical ideas* (Hanslick 1854; Scruton 1976).

[4] This means, once they would reach the sufficient level of technical complexity and "manipulative power".

more is needed for making computers really acceptable as autonomous creative subjects in the field of music, and this is namely a specific *moral (and political) decision of individuals and institutions favoring this acceptance* (Boden 2004, 21), an acceptance indeed required on the ground of the weight MAI technologies already have in current music industry (Section 1; Section 3).

Today, however, even if machines are able to produce music that is "creative" in a very human sense (Section 1; Section 1.2), decisions are rather taken in the opposite direction in order to avoid puzzling moral and legal situations. Yet, are moral and legal decisions depriving machines of an autonomous creative status really necessary and desirable in our society? In the following, I shall investigate this question on the basis of a case study: the problem artificial music authorship.

2.2.1 The Problem of Artificial Music Authorship

The authorship of artificially composed or performed music is one of the most urgent ethical and legal issues deriving from the use MAI technologies.

In 2010, a group of singers (Hatsune Miku, Kagamine Rin and Len, and Utatane Pik) reached the top of music charts and achieved great sales reports in Japan. Interestingly, the group was composed by virtual human-like characters, who performed music entirely composed by a software, Vocaloid, developed and distributed by the Japanese corporation Yamaha. Vocaloid is a singing voice synthesizer software that allows to synthetize songs for fictional singers virtually embodied by anime and manga avatars (just like Hatsune Miku and her colleagues). The original voices implemented in the software, which can be then modified, altered, adapted to certain lyrics and melodies etc. derive from the sampled voice of real human singers, and the fictional avatars are also created by human designers.

This means, a musical product created by means of Vocaloid has a multiple authorship since the subjects concurring in the creation process are many: the singer whose voice was sampled, the designer of the avatars, the programmer of the software, the company which distributes it, the "composer" who sets up, triggers and uses the program she paid for, expressing in this way her musical ideas, and possibly, if different from that composer herself, the author of the lyrics and the melody (or, still, the programmer who produced some algorithms and software for producing them). For this reason, apportioning appropriately credits, authorship and rights to the final product of Vocaloid between these subjects is something extremely challenging, especially for institutions and lawgivers (Collins 2011, 36).

The same condition applies, for example, to another automatic music generation software, FolkRNN, an open source software available online (https://folkrnn.org/) which uses recurrent neural networks and AI for analyzing great quantities of folk music transcriptions in internet and producing new folk tunes from that.

Regulating the issue of the authorship of the music produced by software such as those mentioned above is a task that has been undertaken by several countries around the world (Sturm et al. 2019). On the one hand, countries like UK, Hong Kong, South Africa, India, Ireland and New Zealand adopted copyright laws envisaging the operator of the given computer program as the owner of the rights to the musical works generated by it (Sturm et al. 2019, 4). This is evidently an effect of a moral and political decision which does acknowledge an active role within the artificial creative process both to the software – thus not solely to the creators and programmers of it (see EMI's case below) – *and* to the human subject operating it and making all "the arrangements necessary for the creation of the work" (Sturm et al. 2019, 4). This means that the artificial system is generally considered a creative co-author of the work, whilst, however, it is always the human subject to bear entirely the *legal* responsibility for uses and misuses of its products. That artificial systems for music generation are, in these countries, at the center of a moral and political decision which acknowledges them from the moral point of view as (at least partly) autonomous creative subjects appears clearer and even more emphasized particularly in the British copyright law, that defines computer-generated works as works "generated by computer in circumstances such that *there is no human author of the work*" (Copyright, Designs and Patents Act 1988, I(X), S. 178, my italics). For what concerns the legal point of view, such legislations do not allow however to regulate the matter in a homogeneous, univocal and unambiguous way and are therefore insufficient (Sturm et al. 2019, 4). For example, it remains unclear what the precise legal responsibilities of the programmer and the user are, or in which terms the software itself could be considered legally relevant.

On the other hand, there are countries like the USA or most of Europe, in which an opposite moral and legal decision is taken towards software of automatic music generation (Sturm et al. 2019). In these countries artificial systems capable of creative products certainly gain a form of aesthetic acknowledgment, which does not however have moral and legal effects: Creativity is a category belonging only to humans and as such it has to be understood and treated by institutions and legal systems. If any at all, provisions regulating the authorship of computer-generated music basically apply the same legal categories of "normal" copyright laws resting on "human-centered concepts, both with regards to the beneficiary

of protection (i.e. the author), the conditions for protection (e.g. originality), and the rights granted (economic, but also moral rights)" (Sturm et al. 2019, 4). The Court of Justice of the European Union (CJEU), for example, considers a work original or creative if it is expression of the author's free creative choices, personality, or personal touch[5] (Sturm et al. 2019, 4). In quite the same terms, taking another example, no credits are assigned to the program EMI itself by his creator, the American scientist and composer David Cope, who conversely owes all rights to the works generated by it: The program is considered incapable of autonomous creativity, "the hand of the composer is not absent from (its) finished product" (Cope 1991, 2).

In this way, however, every possibility to morally acknowledge creativity in machines is excluded a priori and, with it, every possibility to have a copyright law protecting machine authorship and AI-generated works (Guadamuz 2017; Ramalho 2017; Buning 2018; Michaux 2018; Deltorn and Macrez 2019; Lauber-Rönsberg and Hetmank 2019; Sturm et al. 2019, 4). Yet, on the basis of the theoretical premises from (Section 2.1), it is simple to see that this particular moral and thus legal *decision* regarding AI-systems involved in creative processes as incapable of autonomous creativity and originality eventually depends on a particular, *implicit* account of creativity which makes this latter dependent from phenomenological and subjective factors (the author's personal experiences, touch, will etc.). As we observed, this is, after all, only *one* account of creativity, and maybe also not the more accurate one, at least in the case of music. Especially with (Boden 2004), in fact, it has been pointed out in (Section 2.1) that such verbal theories of creativity are too naïve, and therefore insufficient, for giving a realistic account of how creative processes really work and what the necessary conditions for creativity – and musical creativity in particular – really are. Certainly – in the absence of an AGI – phenomenological factors are still important, for instance in triggering creative processes, but, at least for what concerns musical creativity from a technical point of view, they appear not to be so indispensable for the *intrinsic* functioning of musical creative processes, which have rather to do with syntax than semantics and phenomenology (Section 2.1; Ariza 2009, 65). Moreover, originality too results a vague notion in music. This concept cannot be simply taken from the everyday language and used, maybe in judgments and laws, without defining critically in advance a univocal and appropriate meaning of it. In which sense, for example, is

[5] Infopaq: C-5/08, Judgment of the Court (Fourth Chamber) of 16 July 2009; BSA: C-393/09, Judgment of the Court (Third Chamber) of 22 December 2010; Painer: C-145/10, Judgment of the Court (Third Chamber) of 1 December 2011; Dataco: C-604/10, Judgment of the Court (Third Chamber) of 1 March 2012.

Mozart's music original compared to Bach's, considering that the former spent years studying and assimilating the contrapuntal innovations of the latter? What piece of music, composed by humans, could be truly defined as something *completely* original and (syntactically[6]) irrelated with the rest of the contemporary and previous music compositions? (Casini and Roccetti 2018, 129).

It may be conceived, for example, of an AI-powered automatic music generation software which is able to compose some pieces of music in Mozart's style as a human composer too would also be capable to do. We admit that both internalized every composition of the Austrian composer (of course in qualitatively different ways). The software, due to its higher computational skills, could explore even more (and therefore more original) musical combinations formally coherent with Mozart's stile than a human would do. Now, regardless of the aesthetic significance of the outcomes of both, in what would the compositions by the software be less or more original than those by the human? And, in general, why is it (arbitrarily) presupposed that (subjective) aesthetic criteria can be used for judging the intrinsic originality (or creativity) of a musical piece? Does this not depend, *in music*, only on a matter of syntactic combinations? (Section 2.1). Furthermore, the (more elaborate) combinations found by the software could be, at the end, only indirectly and indeed very hardly brought back to the actual intentions, experiences, touch, will, etc. of its human programmer: They are actually so far, unimaginable and unpredictable for her that no direct "phenomenological" interdependence connection can be truly stated between the two. Yet, CJEU's judgments, for example, require such a connection as a necessary condition for the attribution to the latter of moral and legal rights to the authorship of the former. Even if the existence of this connection cannot be really detected, the attribution most of the times takes place anyway: This clearly shows a theoretical bias in such kind of legislations.

Thus, copyright laws which take the originality of a musical work as a necessary condition for the attribution of moral and legal rights to its creator are simply considering the problem from a perspective which is too narrow and not critical enough. Originality cannot be said to be a necessary condition for musical creativity, but only a sufficient one (Section 2.1), and a phenomenological account of musical creativity cannot serve as a basis for the attribution (or in this case non-attribution) of moral and legal rights to MAI technologies[7].

[6] Semantic relations between musical pieces are after all practically impossible to detect, since, as we know, music is not representational.

[7] I want to stress that this conclusion is valid only for what concerns music and MAI and not for other fields in artificial creativity.

It appears however reasonable that a more accurate and comprehensive legislation about machine authorship should be developed. Automatic systems for music composition and performance are becoming ever more autonomous, i.e. capable of truly original and creative products (Collins 2011, 37-38; Casini and Roccetti 2018, 127; Sturm et al. 2019, 4; Section 2.1), and, indeed, they already play a significant role in present-day music industry and society (Section 1). This means, consequently, that some kind of moral and legal responsibility should be acknowledged to them. However, finding a way in which this could concretely happen currently represents one of the most important and difficult challenges for many countries around the world, including EU (Sturm et al. 2019, 4). The possible perspectives in this sense are different. Perhaps "authorship recognition may require an analysis of the operation of the systems and the role of the different actors involved in the process (e.g., the developer, the trainer or the user)" (Sturm et al. 2019, 4). If MAI-systems will be able to replicate famous composers or even performers, changes in the definition itself of copyright and authorship may also be required: "[C]opyright will be perpetual […] or effectively lawless or, most likely, will remain somewhere complexly in-between" (Collins 2011, 38), "adjustments may be needed to the existing framework to either amend the existing copyright laws or to pass new *sui generis* rights targeting AI-generated products" (Sturm et al. 2019, 5, italics in original) – see also (Schafer et al. 2015). The owner of the copyrights on AI-generated music could no longer be determined by traditional categories like intellectual property, expression of personal creative choices, ideas, will, etc. but merely through economical ones – simply, who paid for the program has copyrights on its products (Sturm et al. 2019, 9). Or still, "machines", when powerful and intelligent enough in a probable future, "may at some point stand up for their own IP[8] rights as dynamic creators, whilst the existing big content companies will fight to retain power as long as they can by denying that AIs have reached sufficient independence" (Collins 2011, 38).

3. Conclusion

In the previous section I examined one of the most relevant and urgent ethical problems of MAI, namely artificial music authorship, considering advantages and shortcomings of the different ways in which countries legally regulate the attribution of authorship to artificial systems, as well as some possible future perspectives on the topic.

[8] IP: Intellectual Property.

Here, it has been noticed that beyond acknowledging the creativity of MAI technologies *at a mere aesthetic level* – this is eventually the reason why they are used by musicians – a *moral role* is explicitly or implicitly attributed to them, which is necessary because of the social relevance they already gained (they can intervene in music industry and interact with human musicians in working relationships, they are legally relevant subjects in the matter of the attribution of copyrights, etc.). A moral decision about MAI technologies is also necessary as a basis for issuing legal provisions defining their social role and regulating the relation between them and humans. This appears particularly clear with regard to the problem of machine musical authorship. Moreover, it has been pointed out that the kind of moral decision taken, i.e. the way in which the moral and social role of such artificial systems is acknowledged, essentially determines the legal provisions issued.

As emerged from the discussion of CJEU's judgments and of the problem of originality in (Section 2.2.1), every moral decision towards artificial systems of music production strictly depends on the theoretical account of music creativity explicitly or implicitly adopted. More in general, the way – and indeed the possibility itself – of solving the ethical problems of Musical AI depends on what is considered as characteristic of musical creativity. By accepting a formalistic, computational or syntactic theory of musical creativity, which explains human and artificial musical creative processes in the same computational terms (Section 2.1), the possibility is admitted to consider human and artificial creative subjects in music morally in the same way and at the same level. Conversely, defending a theory which takes phenomenological and aesthetic factors as necessary conditions for musical creativity (experiences, will, touch, etc. of the author, intrinsic aesthetic value of the musical work) leads to the impossibility of acknowledging artificial systems of music production (still in absence of a human-like AGI) as autonomous moral subjects.

Certainly, the adoption of a given theoretical account on musical creativity, and thus the moral decisions which derive from that, also depend on the particular technology considered, and on the specific ethical and social context in which such decisions have to be taken. This is the reason why these two perspectives on (artificial) musical creativity – the computational and phenomenological one – still remain not mutually exclusive. Beyond the issue of the theoretical and scientific suitability of each of them, however, from a merely pragmatic point of view, the computational perspective actually seems to be the most helpful one: Since artificial systems of music production are *already* part of the everyday life and everyday work of musicians, music industry operators and music consumers (Section 1), we *already* need to attribute to them a moral status, after which, by the way, a corresponding definition of their legal condition,

and a corresponding formulation of laws and provisions on their use, can only become possible.

It is inevitable, in general, that we will become more and more technology- and AI-entangled in the future, that technology and AI will gain ever larger importance in every aspect of our life. Accordingly, artificial systems of music production too will be considered as ever more autonomous agents, and AI-generated music as music in its own right. If so, the need of learning, in some way, to morally, socially and legally live and cope with this emerges with urgency (Collins 2011; Casini and Roccetti 2018; Sturm et al. 2019).

For this reason, moral decisions favoring the recognition of MAI systems as (moral) creative subjects, is today highly desirable. Nevertheless, it is necessary that the theoretical presuppositions on the basis of which such decisions are taken are always made explicit. Furthermore, no decision should be taken before discussing and defining sharply its alleged theoretical presuppositions. From this point of view, the importance of philosophy and science is obvious: Philosophy and aesthetics of music, philosophy of mind and AI, computer sciences, cognitive sciences, neurosciences, etc. help us a lot in understanding how music creative processes work, what musical creativity is, what we should regard as truly creative in music, etc. and, therefore, to appropriately attribute a moral and legal status to MAI technologies.

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