

A survey on the uptake of Music AI Software

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ABSTRACT

The recent proliferation of commercial software claiming ground in the field of music AI has provided opportunity to engage with AI in music making without the need to use libraries aimed at those with programming skills. Pre-packaged music AI software has the potential to broaden access to machine learning tools but it is unclear how widely these softwares are used by music technologists or how engagement affects attitudes towards AI in music making. To interrogate these questions the authors undertook a survey in October 2019, gaining 117 responses. The survey collected statistical information on the use of pre-packaged and self-written music AI software. Respondents reported a range of musical outputs including producing recordings, live performance and generative work across many genres of music making. The survey also gauged general attitudes towards AI in music and provided an open field for general comments. The responses to the survey suggested a forward-looking attitude to music AI with participants often pointing to the future potential of AI tools, rather than present utility. Optimism was partially related to programming skill with those with more experience showing higher skepticism towards the current state and future potential of AI.

Author Keywords

Music AI, survey, software, algorithmic composition, computer-aided composition

CCS Concepts

- Applied computing → Sound and music computing;
- General and reference → Surveys and overviews;

1. INTRODUCTION

In the last few years start ups and tech companies have ventured into music AI, releasing ‘intelligent’ software tools that promise to improve workflows and produce music content tailored to context. Associated press coverage has made dire predictions ¹ about how such software will impact future music consumption, and in turn the work of

¹For example: <https://techcrunch.com/2019/06/12/we-wont-be-listening-to-music-in-a-decade-according-to-vinod-khosla/>

musicians. A handful of pop musicians have been quick to piggyback the AI hype and produce records that adopt commercial music AI software, and others have explicitly named custom ‘AI collaborators’ as part of the production team. However, beyond these examples it’s not clear how keen music technologists are to incorporate commercial and custom AI software in their creative processes or how gloomy journalistic narratives effect the take up and attitude towards music AI tools. It’s also not clear if experience with music AI software is able to counteract the influence of external attitudes and prior biases.

While the authors are unaware of any survey in the field of music technology on use of, and attitudes to music AI amongst expert music software users, there is precedent in other fields of correlations between AI use and attitudes to AI. Schraffenberger et al [15] surveyed the effect of human-AI interactions on attitudes to AI. Participants were asked to ‘trick’ an AI photobooth that tried to tag human faces, into not recognizing them as human. They filled out a questionnaire about their feelings about AI before and after the interaction. The number of participants (25) was too low to draw significant conclusions but suggested that people felt more negative about AI after interacting with AI algorithms, but that if participants were successful in fooling the algorithm the negative effect was less. On the other hand Bartneck and Suzuki [3] studied the influence of prior experience with the Aibo robot on attitudes towards robots over a much larger number of participants (467) and found a positive correlation between experience and attitudes. These differing outcomes could lead us to surmise that the purpose of intelligent technology plays a role in attitudes: facial recognition is perceived as a more threatening technology with wider cultural impact than robot pet dogs.

In the creative domain other studies have looked at bias against AI produced artwork. Hong and Curran [8] compared evaluation of art made by humans with evaluation of art made by AI over 228 participants. Though the art made by AI was assessed as having lesser artistic merit than that of humans, knowing whether or not it was made by AI did not effect the evaluation scores. Moffat and Kelly [12] asked participants to evaluate music pieces, some of which were composed by AI. On revealing the authorship of the evaluated works, they did find a bias against computer-generated pieces and that bias was stronger in musicians than in non-musicians. Bias against AI produced artworks, particularly among experts, would suggest, among other factors, a perceived threat to human creativity, and perhaps an unwillingness amongst creative producers to adopt these technologies.

In this context we sought to find out if software companies are tempting experts away from established music software and permeating musical creation workflows with data fuelled ‘intelligent’ softwares. Amongst those who have used



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music AI software, we ask whether it is meeting their needs, changing their musical horizons and impacting music style and development. On the other hand, does the music tech community feel threatened by zealous companies keen to commodify creativity on the wave of AI hype with ‘independently creative’ tools? We aimed to obtain an overview of current attitudes to music AI, and take-up amongst tech savvy musicians of AI music tools, and conducted an online survey, whose results we report in this paper. Some of the results on software use also provide a complement to an earlier survey by Magnusson and Hurtado, carried out in 2007, on NIMEs more generally [9].

2. METHODOLOGY

2.1 Design of the Survey

An online questionnaire was conducted, made up of 15 questions. These fell broadly into 3 categories: participant background information; use of software; and attitudes to AI. These questions were designed to find out the level of uptake of music AI software within self-selecting music technology communities, where such background information might predict uptake of AI and related attitudes. The survey was posted online on social media channels including twitter, relevant social media groups and relevant online forums. It was also distributed via relevant music technology mailing lists. The participants were self-selecting and we received 117 responses.

The survey was designed to be short and quick to complete in order to gain as many responses as possible from a wide range of participants. An open text field at the end allowed longer elaboration from enthusiastic participants and resulted in some interesting responses on general attitudes to music AI. The full survey can be viewed at [urlhttps://forms.gle/eMtemo8uvf3YAjeY9](https://forms.gle/eMtemo8uvf3YAjeY9).

2.2 Data Analysis

The sections that follow describe the questionnaire and the results of the survey. The qualitative data in the final question was analysed for positive and negative attitudes to AI, topical content and overall word usage. We also utilised Mann-Whitney statistical tests to analyse the relationship between age, programming experience and software use with attitudes to AI.

3. RESULTS

3.1 Participants

In order to gauge differences in uptake between demographic groups age and gender we collected. ‘How long have you been creating music with software?’ was asked as a proxy for expertise and to avoid subjective classifications such as ‘novice’ and ‘expert’. To differentiate hobbyists and part time musicians from those whose main profession is music production, the respondents were asked what income they generate from music production. To gain broader insight into how music AI software is used respondents were asked the forms of music they produce: live, recorded, improvisation, generative, etc. An open-ended field was provided for listing areas of music the participants are active in to avoid music categorisation pitfalls such as strictly defining genres, missing the inevitable sub- and cross- genre categories and unintentionally creating a genre hierarchy.

The respondents were overwhelmingly male (83%). Though the survey was posted in a number of female specific electronic music groups this resulted in only 10 responses from women². 6 respondents preferred not to state their gender

²The authors suggest that this is fairly representative of the

and 4 identified as non-binary. Due to the large skew towards male respondents we were unable to do any statistical analysis by gender.

The respondents were aged between 23 and 73. The median age was 38; we used the median age to group respondents and compare attitudes to AI by age group.

The majority of respondents were expert music software users (≥ 10 years of experience = 71%), only 9 respondents had less than 3 years of experience in creating music with software. Although the majority (53%) make some of their income from music creation, this was the main income for very few of the respondents (7%). 30% of respondents generate no income through music production.

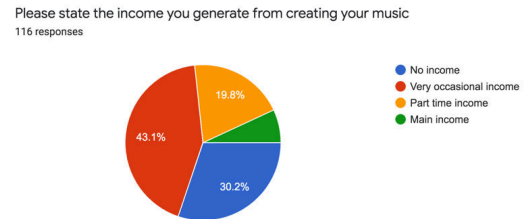


Figure 1: Income generated through music production.

The respondents produce a range of music formats with recordings (71%), improvisation with computer (61%) and generative work (53%) being common formats. 45% of respondents were live coders, reflecting the interests and networks of the authors, and a smaller percentage (16%) were DJs.

3.2 Use of Software

The use of software section held two main questions probing participants’ use of pre-packaged music AI software and programming tools used to self-build music AI system. The softwares listed followed the authors’ investigation into music software packages that make claims to using or providing AI capabilities, as well as widely used general music programming software that has AI libraries or potential for self-built AI tools. Each question had a sub-question for listing other software we did not list. A further two questions asked which software participants were most frequently using for live performance and making recordings.

The first question asked about the use of pre-packaged, largely commercial, AI software, but also included the free Wekinator and Magenta Studio. For this question respondents were asked how frequently they had used software on a 4-point scale: ‘Frequent user’; ‘Occasional user’; ‘Used once or twice’; ‘Never used’ (see Figure 2).

In the main, most respondents had not used the pre-packaged software. The least used softwares were Alysia (Never Used = 93) and Amper (Never Used = 92) with Jukedeck and Aiva close behind (Never Used = 90), perhaps unsurprisingly revealing a lack of appetite amongst music technologists for software aimed at generating whole songs and an unwillingness among independent creators to pay for expensive subscription plans. Jukedeck³ was the only one

gender balance of the computer music scene at large and more work would be needed on a systemic level to improve this gender skew.

³main site currently unavailable after recent acquisition by TikTok
<https://www.theverge.com/2019/7/23/20707371/tiktok-jukedeck-ai-music-startup-acquisition>

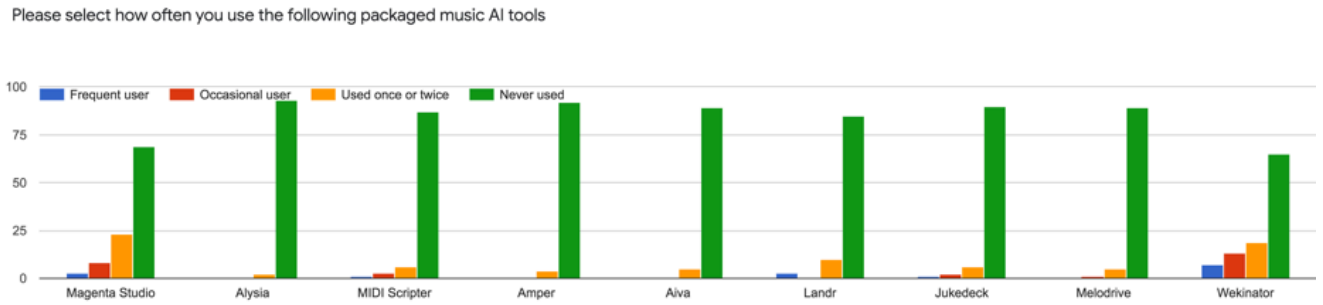


Figure 2: Frequency of use of pre-packaged music AI software.

of these softwares reporting occasional (2 respondents) and frequent (1 respondent) users.

The more comparatively frequently used softwares were those that took on specific tasks in music composition such as Landr (13 respondents had used this), and free and more flexible tools such as Magenta Studio and Wekinator, or Logic’s MIDIScripiter, which integrate more readily into existing workflows.

3 respondents mentioned iZotope’s ‘intelligent’ mastering tool in the sub-question for listing additional softwares, which like Landr uses a database of exemplar tracks to suggest balance.

The most frequently used languages for self-built music AI systems were SuperCollider, Max/MSP, and Python with 47, 48 and 48 users respectively; javascript accounted for only 22% of respondents and TensorFlow had been used by 19% of respondents (see Figure 3).

In the any other software question PyTorch (a machine learning library), Keras (a Python neural network library) and Lisp were frequently mentioned.

SuperCollider and Ableton were frequently cited as the most used softwares for both performance and recording. Reaper and Logic were also often used for recording.

3.3 Attitudes to Music AI

The attitudes to music AI section consisted of 3 questions, one asking for agreement levels to various statements about music AI, a provocation asking when a human level AI will be created, and an open ended comment box for further comments on music AI.

3.3.1 AI statements

The first question asked respondents to state their level of agreement with seven statements reflecting attitudes to AI relating to music production, quality and culture using a 5 point Likert scale (see Figure 4).

Many survey participants agreed with statements that Music AI has made making music easier and has influenced their musical style, but most disagreed that adverse effects such as loss of musicians’ jobs, homogenisation of music, and holding back music’s evolution will come to pass. Many agreed that AI is the future of music (47 respondents).

The authors hypothesised that participants in younger age groups may have more open attitudes to music AI, and that software/programming experience may effect attitudes. To test this hypothesis we carried out a statistical comparison splitting the participants into two groups according to four metrics. The groupings were as follows:

- by less than, or equal to or greater than the median age of 38 (48 participants, 55 participants)

- by less than, or equal to or greater than 10 years of ‘creating music with software’ (32, 83)
- by less than, or equal to or greater than 5 years of ‘creating music with software’ (17, 98)
- by whether participants had used any of Google Magenta Studio, Wekinator, or Logic MIDIScripiter (no=62, yes=55)

Participants were excluded from consideration if they did not rate a statement, or give their age or length of time working with music software in these relevant tests, so numbers included vary a little from the total of 117 respondents.

Over seven questions and four groupings, this led to 28 Mann-Whitney U-tests (data is assumed non-normal and participants are not paired; python’s scipy.stats.mannwhitneyu was used). At an original $p=0.05$ significance level, a Bonferroni correction places the threshold to reject the null hypothesis of no difference between groups at $0.05/28 = 0.0017857$ (to 7 d.p.). At this significance level, no grouping was significantly different in responses. Attitudes to AI were consistent across age groups with those above and below the median age showing the same distribution on all statements. Suggestive p-values were seen however on agreement level with two of the statements: ‘Music AI has reached a level indistinguishable from human music creation’ and ‘Music AI is making all music sound the same’ for three of the groups:

- 10 or more years of music software experience (first statement: Statistics=993.000, $p=0.015$)
- 5 or more years of music software experience (first statement: Statistics=582.500, $p=0.020$; second statement: Statistics=611.000, $p=0.033$)
- software use (first statement: Statistics=1294.500, $p=0.020$; second statement: Statistics=1327.500, $p=0.030$)

Though not statistically significant this does suggest that those with more experience using music software are more skeptical of its capability to change music making in positive ways.

3.3.2 Date of independent AI

Though clearly not the aim of most critically aware music AI software, a deliberately provocative question was included asking respondents ‘By which year do you think an independent musical AI of human level ability will be created?’. The question was motivated by much press and software company rhetoric that revolves around replacing the role of

Have you programmed any AI music systems yourself using the following software?

96 responses

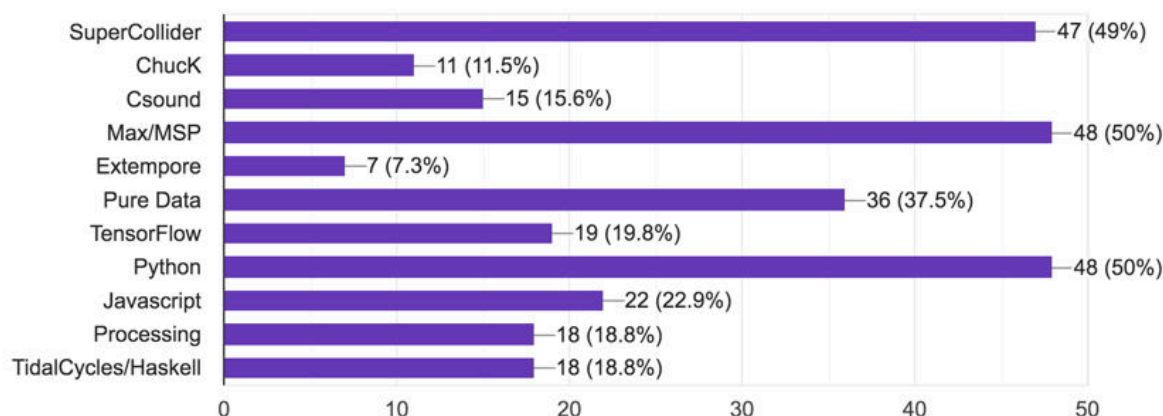


Figure 3: Use of programming languages to create music AI software.

To what extent do you agree with these statements

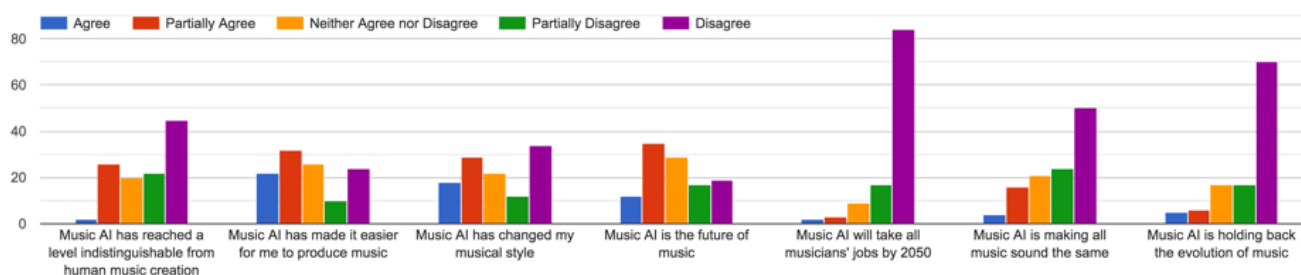


Figure 4: Attitudes to Music AI

composers and music makers with software. Just 59 respondents offered a date. Answers ranged from 1787 to never, with the majority of answers in the range of 2018-2030 (32 respondents). A few respondents answered 1957, the date of Max Mathews' first MUSIC experiments at Bell Labs, and the year after the *Illiad Suite* and *Push Button Bertha* [14, 1, 10, 6]. 8 respondents said 'never'. Many respondents reasonably commented that the answer would depend on stronger definitions of 'AI of human level ability'.

3.3.3 Other comments on music AI

The final question in the survey provided an open text box for 'any other comments about AI music software'. The responses to this question were surveyed for topic commonalities and positive and negative attitudes to music AI. In general the participant responses ranged from the apocalyptic ("AI cloud clusters are destroying the environment") to apathetic ("When it appears as a free musical tool, I will definitely try it. But I can't imagine there's much fun to be had."). In keeping with pragmatic applications for music AI, most saw AI as just another extension of available music technology tools, rather than as any fundamental shift in arts and culture.

A wordcloud analysis showed frequent use of 'will' and

'tool'. This suggested that respondents often talked about AI in the future tense and as something that fundamentally involves human interaction rather than autonomous machine creativity. This aligned with the manual topic analysis which is discussed further in the following paragraphs.

Themes that occurred across multiple respondents included:

- AI could be a useful tool in a music creator's toolbox. It's not fundamentally changing cultural production, just provides another direction for tools that help humans make creative products.
- Imitation and replication of human creativity is boring and not a desirable potential of music AI.
- Good uses of current AI tools are for generating a lot of ideas as the first step of a workflow, but that the outputs of e.g. Magenta Studio need to later be 'humanized' in the creative process.
- The current state of music AI is disappointing but there is hope that future developments could lead to something more interesting.

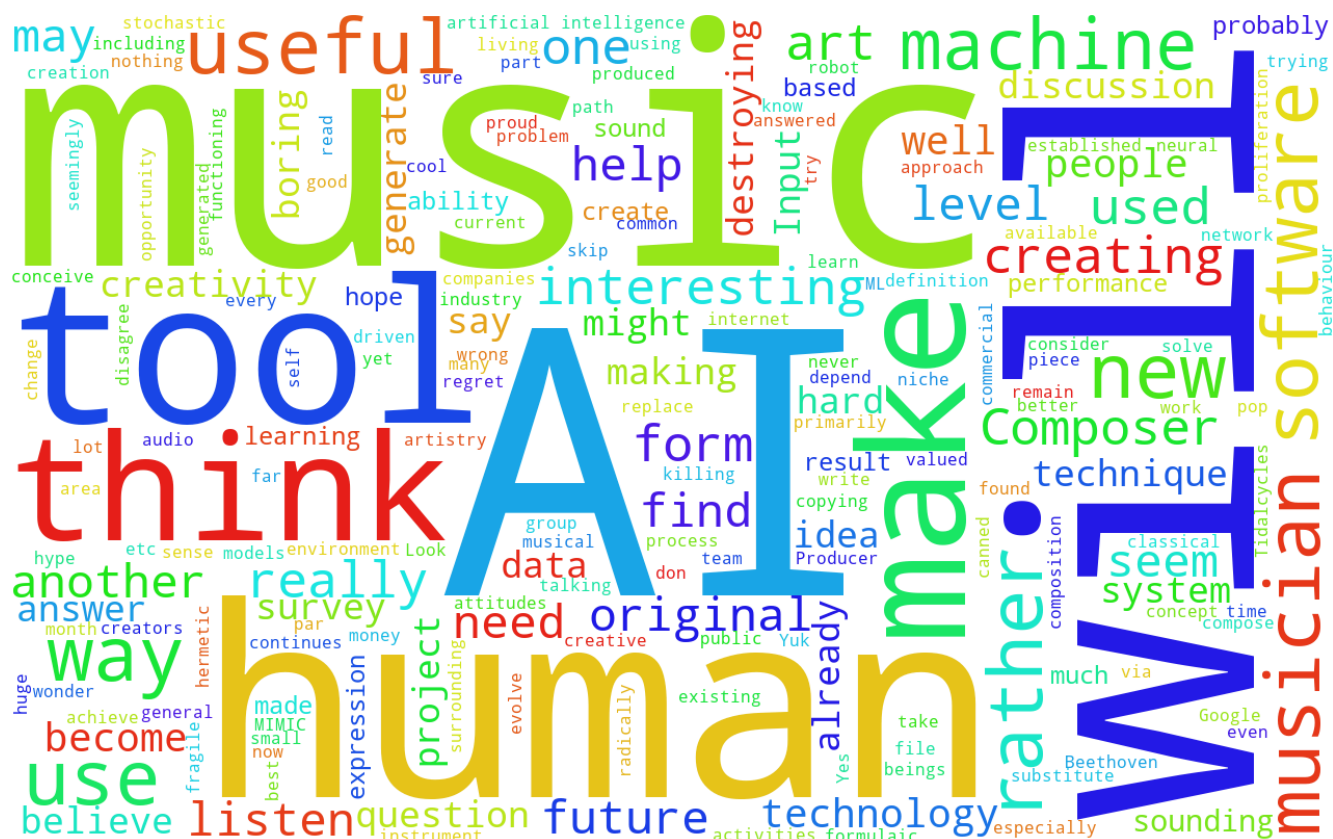


Figure 5: Wordcloud of responses to ‘Do you have any other comments about AI music software?’.

- Music AI hasn't and won't replace humans, as there are lots of human values and approaches to creativity that can't be quantified or programmed into a computer system.
- Some respondents were keen to replace human collaborators with AI: "I need a better copilot and one that will never skip practice".
- Lots of software companies are ready to make profit out of commodifying creativity.
- Music AI presents some dangers that require great reflection (such as environmental damage) or in worst case poses an existential threat.
- Some participants said they would like to try music AI software but for time or a 'way in' to learning.

The topic of music AI provoked strong responses in some respondents, though a simple count of positive and negative comments showed up an equal number of each, so a fairly balanced view of music AI was found across all participants. Some skepticism, however, was reflected in the number of negative comments about the current state of music AI – many of the more positive comments were about the future potential of music AI.

4. DISCUSSION

Though the online survey lacked the deep interrogation of music technologists that face to face interviews might have allowed, it reached a far wider net of respondents and gave a useful broad overview of attitudes. The lack of uptake of some commercial music AI software is not surprising in the survey population, as expert music creators are clearly not

the target market for such software companies (as Amper’s expensive subscription model would also suggest). Few respondents were seeking their own replacements: Musicians usually craved collaborators and assistants who would help with creative workflow, not rival authors, in line with the notion of computer-aided composition [11, 13].

Hong [8] expresses that ‘Advances in AI artwork thus necessarily complicate contemporary understandings of creativity and aesthetic beauty in art’. In the field of art music, often still clinging to Romantic ideals of solitary creative genius, overt and explicit uptake of ‘intelligent’ software may pose a greater threat to artists, than in the field of pop music where song writers already work in teams to generate pop hits (diluting the attribution problem). In this context acceptance of AI is likely easier, and even provides a marketing angle to increasingly algorithmically aware audiences.

As AIs are incorporated into music technology’s daily apparatus, opportunities for novel interactions with AI may be explored. Respondents were less interested in AIs that replicate and imitate human creativity and more interested in AIs that expand human creativity. If we do tread further down the path of independently creative AIs, Ariza’s musical Turing test [2] would require greater social involvement from our computer collaborators. An AI that can engage in a two way creative negotiation is infinitely more interesting than one which statistically generates music according to human generated datasets. We look forward to the AI music that has the agency to describe the machine experience; an AI should be able to justify their decisions to claim a stake in creativity [4].

What Conlon Nancarrow started, with his attempts to automate the imperfection out of music performance by mechanising complex musical structure [5], music AI com-

panies continue with writing the imperfection out of music creation with large data sets and extreme quantification of musical parameters. If everyone has access to the ‘perfect’ mastering algorithm there is a trade off of democratisation for homogenisation; ubiquity is boring and leaves little room for innovation.

For designing NIMes this survey suggests that tools that take-over or control the creative process are of less interest to music creators than open ended tools with many possibilities. Libraries for existing well-used music softwares such as SuperCollider and Max and tools such as Wekinator which assist with laborious mapping processes but do not define creative parameters may have greater appeal to professionals than black box software. There is also still much appetite for musical collaborators which do not intervene in the creative process but provide sounding boards in the way a human collaborator might. Though self-built software of this type abounds, no pre-packaged commercial softwares have yet provided the creative fluency that professional musicians hope for, pointing to the complexity of creating a universal software that meets the needs of many musicians.

A future study may unpick attitudes to music AI further. The optimistic attitude to the future of music AI demonstrates an appetite for exploring creative interactions with data-driven algorithms, though some responses suggested that while there is enthusiasm for trying music AI software there are still barriers to access that may hold up creative development. For those concerned about tech company take-overs of creative processes there’s still room for critical and ethical reflection, and for artists to write new narratives about music AI. The ethical quandaries of automated composition [16] and powerful audio analysis tools over large databases [7] are part of a wider debate ongoing in AI about safety and sociopolitical impact [17].

5. CONCLUSIONS

A survey of use of music AI software which was distributed to music technology communities online. The survey had 117 responses from self-selecting participants. The survey collected statistical information regarding use of AI software and self-built music AI using programming languages and data on attitudes to music AI. The uptake of music AI from commercial companies was low, though many participants had built their own music AI systems using software including Python, SuperCollider and Max/MSP. No correlation was found between age and attitudes to AI, but some correlation between experience with music software and skepticism towards music AI, though this was not statistically significant. An analysis of qualitative data showed a general skepticism towards the current state of music AI but some positive forward looking views. The survey gave a snapshot of the current uptake among a particular subset of music technologists. There is further work to be done to interrogate more deeply attitudes to AI amongst music technologists and desirable creative interactions with AI systems.

6. ACKNOWLEDGMENTS

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7. ETHICAL STANDARDS

Before the survey was released online this research passed ethics review at Durham University. Participants were self-selecting and the survey began with an ethics and consent

statement which participants viewed before completing the survey. The survey was fully anonymous.

8. REFERENCES

- [1] C. Ames. Automated composition in retrospect: 1956-1986. *Leonardo*, 20(2):169–185, 1987.
- [2] C. Ariza. The interrogator as critic: The turing test and the evaluation of generative music systems. *Computer Music Journal*, 33(2):48–70, 2009.
- [3] C. Bartneck, T. Suzuki, T. Kanda, and T. Nomura. The influence of people’s culture and prior experiences with Aibo on their attitude towards robots. *AI and Society*, 21(1):217–230, 2007.
- [4] S. Colton, J. W. Charnley, and A. Pease. Computational creativity theory: The FACE and IDEA descriptive models. In *International Conference on Computational Creativity*, pages 90–95, 2011.
- [5] K. Gann. *The Music of Conlon Nancarrow*. Cambridge University Press, Cambridge, 1995.
- [6] L. Hiller and L. Isaacson. *Experimental Music: Composition with an Electronic Computer*. Greenwood Press, 1959.
- [7] A. Holzapfel, B. Sturm, and M. Coeckelbergh. Ethical dimensions of music information retrieval technology. *Transactions of the International Society for Music Information Retrieval*, 1(1):44–55, 2018.
- [8] J. W. Hong and N. M. Curran. Artificial intelligence, artists, and art: Attitudes toward artwork produced by humans vs. artificial intelligence. *ACM Transactions on Multimedia Computing, Communications and Applications*, 15(2s), 2019.
- [9] T. Magnusson and E. Hurtado. The acoustic, the digital and the body: A survey on musical instruments. New York, NY, June 2007.
- [10] M. V. Mathews. *The Technology of Computer Music*. MIT Press, Cambridge, MA, 1969.
- [11] E. R. Miranda. Aesthetic decisions in computer-aided composition. *Contemporary Music Review*, 28(2):129–132, 2009.
- [12] D. C. Moffat and M. Kelly. An investigation into people’s bias against computational creativity in music composition. *The Third Joint Workshop on Computational Creativity*, 2006.
- [13] M. Pearce, D. Meredith, and G. Wiggins. Motivations and methodologies for automation of the compositional process. *Musicae Scientiae*, 6(2):119–147, 2002.
- [14] C. Roads. *The Computer Music Tutorial*. MIT Press, Cambs, MA, 1996.
- [15] H. Schraffenberger, Y. Van De Sande, G. Schaap, and T. Bosse. Investigating people’s attitudes towards AI with a smart photo booth. *CEUR Workshop Proceedings*, 2491, 2019.
- [16] B. L. Sturm, M. Iglesias, O. Ben-Tal, M. Miron, and E. Gómez. Artificial intelligence and music: open questions of copyright law and engineering praxis. In *Arts*, volume 8, page 115. Multidisciplinary Digital Publishing Institute, 2019.
- [17] M. Tegmark. *Life 3.0: Being human in the age of artificial intelligence*. Penguin, London, 2018.