Explainable AI for the Arts: XAIxArts

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This first workshop on explainable AI for the Arts (XAIxArts) brings together a community of researchers and creative practitioners in Human-Computer Interaction (HCI), Interaction Design, AI, explainable AI (XAI), and Digital Arts to explore the role of XAI for the Arts. XAI is a core concern of Human-Centred AI and relies heavily on HCI techniques to explore how complex and difficult to understand AI models such as deep learning techniques can be made more understandable to people. However, XAI research has primarily focused on work-oriented and task-oriented explanations of AI and there has been little research on XAI for creative domains such as the Arts. This workshop will: i) build an XAIxArts research community; ii) map out the current and future possible landscapes of XAIxArts; iii) critically reflect on the potential of XAI for the Arts, forming the basis for an edited book on XAIxArts and an international network of researchers.

CCS Concepts: • **Human-centered computing → Human computer interaction (HCI)**; **Interaction design**; **Visualization**; • **Applied computing → Arts and humanities**; • **Computing methodologies → Artificial intelligence**.

Additional Key Words and Phrases: explainable AI (XAI), Artificial Intelligence (AI), arts, generative arts, Human-Computer Interaction (HCI), Interaction Design

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1 WORKSHOP TOPIC

The field of eXplainable AI (XAI) [15, 22] examines how complex and difficult to understand AI models such as neural networks and deep learning techniques can be made more understandable to people, and is a core concern of the wider Human-Centred AI field [34]. XAI has increasingly become a focus of Human-Computer Interaction (HCI) research as creating explanations of AI models fundamentally requires an understanding and appreciation of how humans perceive and interact with the world. For example, there are an increasing number of papers at HCI conferences (e.g. [29, 40] and

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the "Mistakes, Explainability" session at the ACM CHI 2022 conference) as well as a notable number of workshops (e.g. [11]) and courses on XAI at HCI conferences in the past few years, illustrating its growing research momentum. Such XAI research predominantly explores functional and task-oriented domains, for example explaining why an AI model made a particular medical diagnosis [30] or how AI models for self-driving cars work [10, 33]. This focus is reflected in Gunning's [15] seminal definition of the key aims of XAI which range from explaining "Why did the AI do that?" to "How does someone correct an error made by an AI?".

However, there is little research on how XAI is used or could be used in more creative activities and domains such as the Arts [3]. Notable examples in which the internal working of an AI model are explained in Arts domains include presenting visual cues between mappings in the latent space of an AI model [38], and visualising levels of mutual trust between an AI system and humans in music making [26]. However, the focus of such research is on exposing features of the AI model to humans rather than considering the nature of the explanation per se. This workshop provides the Creativity & Cognition community (C&C) with a timely opportunity to explore XAI for the Arts (XAIxArts) which offers a paradigm shift for how we understand and design XAI beyond its current task-orientated and functional explanation-based focus, leveraging the multi-disciplinary expertise of the C&C community.

Research on the use of AI in the arts has a long history, arguably dating back to the 1800s when Ada Lovelace noted that machines would one day generate "elaborate and scientific pieces of music of any degree of complexity and extent" [24]. Furthermore, the arts offer a complex domain in which to test and research new AI models and approaches to explainability. When compared to domains such as healthcare and the automotive industry, the Arts requires a similar level of robustness and reliability from their AI models, but have significantly fewer life-critical implications, making the Arts an ideal test-bed to understand, provoke and drive innovation in the context of AI. This is particularly important if we are to understand and be able to integrate Responsible Research and Innovation (RRI) into the design of XAI for practices relating to the creative industries. For example, real-time understandable feedback is critical for musicians when co-creating with digital instruments [20, 27]. In the context of XAI for the Arts, where an AI system's role may range from a tool which generates content overnight to an assistant which helps with creative production in-the-moment [25], the nature of explanations of AI systems may be very different to conventional XAI explanations as exemplified by Gunning's [15] and Guidotti et al.'s [14] concerns.

1.1 Workshop Objectives

In this workshop we will build a community of researchers and creative practitioners in AI, XAI, digital arts, HCI, and Interaction Design, to explore the role of XAI for the Arts and how XAI could be practically applied and studied within the Arts. The objectives of the workshop are to:

- Build an international community of researchers and practitioners who explore XAI for the Arts.
- Identify current uses of XAI for the Arts.
- Map out the landscape of uses and potential uses of XAI for the Arts.
- Critically reflect on current XAI discourses and the potential of XAI for the Arts. These would be used to build themes of XAIxArts research and identify open research questions to form the basis of future XAIxArts research projects.
- Identify challenges and opportunities for XAI for the Arts. These could be used to form the basis of future collaborations and funding applications.
- Develop an outline proposal for an edited book on XAIxArts.

We will explore these objectives in the workshop through the lens of themes outlined in Section 2 and activities described in Section 4.1.

2 WORKSHOP THEMES

We propose four main themes in this section for the workshop drawn from discussions with AI researchers, artists, and UX researchers about the potential of XAI for the Arts (e.g. [2, 3]). We use examples from AI and music to bring these open questions to life whilst considering the themes across the arts more generally in the workshop itself.

2.1 The Nature of Explanation

There are open questions about how much explanation is needed or even useful in XAIxArts. This is in some ways a philosophical question of what it might mean to actually understand an AI in a creative context i.e. how much explanation is useful versus the risk of over-explaining, and how can we design for both explanation *and* serendipitous interaction? For example, how do we strike a balance between explanation, exploration, and surprise? Being surprised, confused, and reflective [5, 12, 13] are often integral to creative practice but are in opposition to the more functional goals of XAI proposed by researchers such as Gunning [15] and Guidotti et al. [14]. Similarly, failure can be a resource for creative practice [16] which is in opposition of the core aims of XAI to clearly explain and reduce misunderstanding. What aspects of a co-creative process might usefully remain unexplained, offering opportunities for failure, mistakes, and serendipity?

What aspects of artistic and co-creative AI processes are most important to explain? How can these aspects be communicated to humans in intuitive ways that do not distract from the creative process? For example, when we look at research on group music improvisation we find that most of the human communication that holds the group together is non-verbal [26] – it may be gestures, or nods, or physical position, or eye contact, or even musical emphasis [17], but there is very little explicit verbal communication as would be offered by conventional approaches to XAI.

2.2 AI Models, Features, and Training Data

There are many generative AI models which create content across the arts from visual arts [9] to music [6]. However, there is very little research on how these AI models are actually used and appropriated in creative practice [21, 23, 36], and, in our research we have found no research on how XAI is used in artistic practice. There are open questions about: What kinds of AI models are most amenable to XAIxArts for different artistic domains such as music or visual arts; Which XAI models are more amenable for different artistic processes, for example from music composition to live ensemble performance; Which features of AI models offer the most useful explanations for different creative practices, for example music making or visual arts; and What kinds of training sets are more or less useful for creating XAIxArts?

2.3 User Centred Design of XAIxArts

A fundamental concern of XAI research is how AI can be made more understandable to humans. There is little research on how User Centred Design (UCD) can be used in the creation of XAI systems [41], and no current research on UCD for XAIxArts. There are open questions about how artists and creative practitioners can be involved in the co-design of generative AI systems involving data scientists and interaction designers [32, 39], for example, how to include musicians in the design of XAI generative music systems.

Similarly, there is no research on how XAI models are appropriated or embedded into artistic practice. This leaves open questions such as what the role of XAI in creative practice might be, and what potential use there is in different

forms of creative practice. Taking AI and music as an example, research has examined the use of AI in music making from composition (such as the Illiac Suite [18], Calliope [1], or experiments by the band Dadabots [42]) to improvisation (such as George Lewis's Voyager [35], Shimon the marimba playing robot [19] or Spire Muse [37]), but there are open questions about how XAI might be appropriated in these different creative practices, and how explanations and interaction could be co-designed with artists in these different practices and across different platforms.

2.4 Interaction Design

As XAIxArts is a nascent research area with no XAI models currently being used in practice there is little research on how to design the interaction with XAI for creative practice.This leaves open Interaction Design questions including: Which features of the AI model to expose to the user; How to visualise highly multi-dimensional data typical of AI models e.g. How to visualise latent spaces with 4 or more semantic dimensions; How to navigate and explore the spaces inside AI models; How to handle the entanglement between dimensions within a latent space; How to manage interaction with XAI in combination with the temporal and affective dimensions of artistic practice. A further challenge for designing understandable explanations of AI models is that in creative practices the interaction with the AI might not be the primary focus of the artistic activity. This opens design questions including how to design visualisation as part of a larger workflow where it is not the core focus of attention.

3 WORKSHOP AUDIENCE AND PROMOTION

Our primary audience are researchers and creative practitioners in AI, XAI, digital arts, HCI, and Interaction Design. As part of our community building we aim to reach out to the wider (digital) Arts community to invite submissions. We will collate and share accepted submissions prior to the workshop as a way to encourage researchers and artists to think about the different approaches to the use of AI and how explainability and related issues emerge as part of creative practice.

A call for participation will be distributed inviting the submission of 3-page position papers for review, emphasising the importance of reflecting on the workshops themes and XAIxArts landscape. The call will be sent to HCI email lists including ACM Creativity & Cognition, ACM SIGCHI, AI research lists especially XAI and AI and Arts lists, Digital Arts lists including specific artistic domains such as New Interfaces for Musical Expression (NIME), and user interface and interaction design lists. In addition, we will distribute the call through our closed industry and practitioner networks.

We plan to fund two artists to take part in the workshop, who would not not normally be able to attend the Creativity and Cognition conference, but would stimulate and inform discussions for the attendees and grow the C&C community. This would be supported via the UKRI TAS Hub (UK) where Dr Chamberlain leads the Artist in Residence program.

4 WORKSHOP ORGANISATION

The workshop organisers will review the submitted position papers and select up to a maximum of 30 participants for the workshop. The selected papers and any online demos and videos will be shared with participants via the workshop website prior the workshop to spark pre-event reflection across papers. In addition, we will use the online communication platform Slack to support communication between workshop organisers and participants prior to, during, and after the workshop.

Prior to the workshop we will have a virtual 'meet-up', so that people can get to know each other and start to think about and discuss the XAIxArts area. We want to maximise the potential that the conference affords us and encourage everyone to join in. The workshop will be supported by the UKRI TAS Hub, EXIoT Project (part of PETRAS II), the

Table 1. Provisional Indicative Workshop Schedule

Activity	Time (minutes)	Description
Welcome	9:00am (15)	Introduction and scene setting
Presentations (§ 4.1.1) and **Demos** (§ 4.1.2)	9:15am (90)	12 x Lightning presentations with optional demo and brief Q&A
Coffee break	10:45am (15)	Refreshment and inspiration
Presentations (§ 4.1.1) and **Demos** (§ 4.1.2)	11:00am (90)	13 x Lightning presentations with optional demo and brief Q&A
Lunch	12:30pm (60)	Networking and interacting with demos over lunch
Landscaping (§ 4.1.3)	1:30pm (45)	Place research and demos in the XAIxArts landscape
Themes (§ 4.1.4)	2:15pm (45)	Revise and expand XAIxArts themes and open research questions
Coffee break	3:00pm (15)	Refreshment and stamina building
Community Building (§ 4.1.5)	3:15pm (45)	Plans for edited book, network, future events, funding proposals
Close	4:00pm	Workshop closes with opportunities for convivial networking

AHRC Network nTAIL, and the Media and Arts Technology and AI+Music Centres for Doctoral Training at Queen Mary University of London. This offers us the opportunity to involve a wide range of researchers in the field, particularly Early Career Researchers and project partners from the Creative Industries, such as the BBC and National Gallery X.

4.1 Workshop Tentative Schedule

The focus of the workshop is primarily on knowledge sharing and community building. Emphasis will be placed on building a common landscape and taxonomy of XAI for the Arts. This XAIxArts landscape will be initially structured using the three dimensions identified in [3] which will be refined in the workshop:

(1) The *role of the XAI* - from XAI models which take care of generative tasks 'offline' without interacting with humans through to real-time co-creative AI models, based on [25].
(2) *Interaction with the XAI* – categorisation of the forms of interaction offered by the XAI ranging from static (no interaction) to dynamic-interactive as defined Cornock and Edmonds' classification of interaction [8].
(3) Form of *Explanation of the XAI* - based on Clark and Brennan's [7] work on grounding in human communication this ranges from low levels of XAI explanation where a person is only aware that some output has been made through to high levels of explanation where a person may be able to form an understanding of the explanation's meaning and possibly make an informed reaction to the output.

The indicative workshop schedule is summarised in Table 1 with each part detailed in the following sections. The suggested time of day is GMT to allow participation from both North America and China to be staggered across the schedule.

4.1.1 Lightning Presentations. Participants will each give a very short presentation of 5 minutes maximum about their use of, or interest in XAI for the Arts. Emphasis will be placed on the *uses* of XAI, which theme(s) their use of XAI relates to (Section 2), and participants will be asked to articulate where their use of XAI sits within the XAIxArts landscape outlined above.

4.1.2 Demos. Participants who have working XAIxArts demos will give short demonstrations of their system and, importantly, allow fellow participants to interact with their demo. Where possible the demos will allow online interaction

(e.g. web based demos) but we recognise that some demos may only function on specific hardware and software configurations in which case a short video demo would also be requested for sharing with participants online. The demos will then be located within the XAIxArts landscape.

4.1.3 Landscaping. The participants' demos and research will be laid out within the XAIxArts landscape using physical using Miro to allow online participation. Research and tools from beyond the workshop will also be located within the landscape to build a view of current research in the area and to help identify areas for future research. Participants will revise the landscape dimensions to better capture the range of research being undertaken. The revised XAIxArts landscape dimensions will be used to generate a taxonomy of XAIxArts which will be published on the workshop website. This landscape and taxonomy will act as the basis for future research strategies.

4.1.4 Themes. The workshops themes and open research questions (Section 2) will be revised by participants to ensure that they capture the key XAIxArts themes in this nascent field. This will be supported through use of Miro to allow participants to edit and add to the themes and their descriptions. This revised set of themes and associated open research questions will be published on the workshop website and form the basis for future research proposals and collaborations.

4.1.5 Community Building. Participants will consider and propose next steps for community building (see Section 5 for details of future plans) including proposal of an edited book on XAIxArts, future networking and artistic events, and identification of funding opportunities.

4.2 Tools for the Workshop in Virtual Space

The workshop itself will operate in online mode in keeping with the C&C 2023 format. Participants will live stream their presentations, demos, and question and answer sessions online using Zoom to support participation. The collaborative workshop activities of Landscaping (Section 4.1.1) and revision of workshop Themes (Section 4.1.4) will be supported using Miro to allow for online contributions, and Zoom and the workshop communication platform (Slack) to support communication. Online participation in Community building (Section 4.1.5) will be supported using both Zoom and Slack. Depending on both the nature and volume of demos submitted, Gather Town might also be used to facilitate discussion amongst our participants, in keeping with how participants will communicate at the main C&C conference. For example, demos could be placed in a virtual art gallery where each presenter is allocated their own space.

The live presentations will be recorded and auto-subtitled by Zoom and then made available on the workshop website to allow for asynchronous viewing, for example across multiple time-zones. We have workshop organisers from a wide range of time zones (Canada, USA, UK, China) and will be able to offer almost 24 hour asynchronous interaction from our students and colleagues.

We will explore the possibility of offering local meet-ups at the institutions of the workshop organisers to supplement the online workshop if there is sufficient interest from participants.

4.3 Provision of Required Tools

All software needed for the online workshop will be provided by the organisations of the workshop through institutional subscriptions to Zoom, Slack, and Miro.

5 DELIVERABLES AND OUTCOMES

Accepted position papers will be published on the workshop website alongside links to online demos and/ or videos of XAIxArts systems presented in the workshop. The refined XIAxArts landscape developed in the workshop will be used as the basis for an interdisciplinary conference paper potentially in the electronic arts to broaden the impact of the workshop (e.g. ISEA conference) or a short journal paper (e.g. Leonardo Transactions). Building on the position papers and revised XAIxArts landscape we will propose an edited book on XAIxArts (e.g. Springer's Cultural Computing series for which the first author Bryan-Kinns is an editorial board member).

The workshop will build a network of researchers and artists working in XAIxArts. After the workshop we plan to host further networking events online and also locally within our expanded network. We will also work with participants to propose engagement with artistic events such as plans for an exhibition of XAIxArts and/ or performances with XAIxArts (e.g. as part of the UK's Victoria & Albert Museum's Digital Design Weekend which Queen Mary University of London regularly exhibits interdisciplinary research at, and similar arts venues across the world). We also plan to build a case for support for networking funding and collaborative research funding addressing core research questions from the workshop.

6 WORKSHOP ORGANIZERS

Nick Bryan-Kinns (main contact person) is Professor of Interaction Design, Director of the EPSRC+AHRC Media and Arts Technology Centre for Doctoral Training, and a leader of the AI+Music Centre for Doctoral Training at Queen Mary University of London (QMUL), UK. Bryan-Kinns is a Fellow of the Royal Society of Arts, and leads the Sonic Interaction Design (SID) Lab in the Centre for Digital Music. Bryan-Kinns' research explores XAI+Music, Sonic Interaction Design, participatory design, interactive art, cross-modal interaction, and tangible interfaces. Bryan-Kinns has over 20 years experience of organizing and running academic conferences and workshops such as the 2021 ACM CHI Workshop "Remote XR Studies: Exploring Three Key Challenges of Remote XR Experimentation" [31] and the 2019 international series of workshops on AI for Music in the Creative Industries of China and the UK [4] funded by the UK AHRC, and is a recipient of both the ACM and British Computer Society (BCS) Recognition of Service Awards for his sustained contribution to conferences and supporting the academic community. He chaired the ACM Creativity and Cognition conference 2009, (re)Actor3, the Third International Conference on Digital Live Art 2008, and the BCS international HCI conference 2006. He was Chair of the Steering Committee for the ACM Creativity and Cognition Conference series and was the founding chair of the ACM Creativity, Cognition and Art Community.

Corey Ford is a PhD Student in the AI and Music Centre for Doctoral Training at Queen Mary University of London, UK, and a member of the Sonic Interaction Design Lab within the Centre for Digital Music. Ford's research explores XAI and Music, designing for reflection, creativity support tools, generative music and human-AI interaction. Ford also has previous experience supporting workshops at the New Instruments for Musical Expression (NIME) conference (see [28]). He has reviewed for NIME and the ACM Creativity and Cognition conference (C&C), acted as programme editor for the Digital Music Research Network Workshop 2021, and is on the Organizing Committee for ACM Creativity and Cognition conference 2023/2024 as Student Volunteer Co-Chair.

Alan Chamberlain is a Senior Research Fellow at the University of Nottingham, UK, and a member of the Mixed Reality Lab. He is the Creative Industries Sector Lead for the UKRI TAS Hub (Trustworthy Autonomous Systems), a Co-director of nTAIL - AHRC Network on Theatre, AI and Ludic Technologies, The Principle investigator of the TAS Responsibile Research and Innovation project and the EXIoT project - Experimental IoT: Explorations in Sound Art and

Technology. He is an interdisciplinary researcher with publications in top tier venues which range from qualitative studies 'in the wild' through to lab-based quantitative HCI-based research. He has run workshops at a range of ACM conferences including Audio Mostly, Mobile HCI, DIS, and CSCW, and has played a role in organising many conferences and events over the last 20 years. He has been a Visiting Academic at the University of Oxford, Swansea University and is a Visiting Professor Copenhagen Business School. He is a Honorary Fellow at the Department of Music - University of Nottingham. He has been awarded funding for both academic and arts-based activities (as a composer).

Steve Benford is the Dunford Professor of Computer Science at the University of Nottingham, UK, where he co-founded the Mixed Reality Laboratory. He is Director of the EPSRC-funded Horizon Centre for Doctoral Training and the Director of the University's Smart Products beacon of research excellence. He currently leads the Creative Programme for the UKRI Trustworthy Autonomous Systems Hub. He was previously an EPSRC Dream Fellow and a Visiting Professor at the BBC. His collaborations with artists have been recognised by the Award of the Prix Ars Electronica Golden Nica for Interactive Art, multiple BAFTA nominations, four Best Papers at the ACM's Computer-Human Interaction Conference and were documented in his book Performing Mixed Reality (MIT Press).

Helen W. Kennedy is Professor of Creative and Cultural Industries at the University of Nottingham, UK. Her research interests are feminist games culture and the wider diversification of access to creative practice; the ludification of cultural experience, innovations in experience design and the cultural evaluation of immersive experiences. Kennedy has published widely in game studies and the emergent field of live cinema where her work focuses on the intersections between performance, play and narrative in the experience design. She has led a number of national and international projects seeking to improve women's access to and experience within spaces of creative production – across screens, VR, and immersive technology more broadly. A key characteristic of these projects is collaboration and co-creation with individuals, grass roots organisations and sector advocacy groups. She has been organizing interdisciplinary games and play related conferences, symposia and workshops since the inaugural UK games conference – Game Culture – in 2002. More recently, since 2016, she has been co-convening the industry/academic/artist Live Cinema network events, including Live Xinema in 2022. She has also designed and delivered game jams and VR Hackjams with artists and researchers.

Zijin Li is a Professor with the Department of AI Music and Music Information Technology, Central Conservatory of Music, China. She was a Visiting Scholar with McGill University. Her current research interests include music acoustics, music creativity, new musical instrument design and Innovation theory of music technology. She was committee chair of New Interface Music Expressions (NIME2021), IEEE MIPR AI Art Workshop, China Sound and Music Technology Conference (CSMT), China Music AI Development Symposium, China Musical Instrument Symposium. She served as the judge of the New Music Device Invention Award of International "Danny awar", International Electronic Music Competition (IEMC) and NCDA Awards.

Wu Qiong is Professor in the Art & Design Academy, Tsinghua University, China. Wu Qiong has rich research and practice experience on interaction design, data visualization, and smart material application design. She published and presented over 40 papers in international seminars and core journals, over 20 of her design pieces have been on display at such important exhibitions as Ars Electronica, the Art and Science International Exhibition, and the China National Art Exhibition. She has also been invited to give presentations at major design seminars, including ACM UbiComp, IEEE DRC, HCI International, the First World Conference on Display Industry, and International Symposium on Cultural Heritage and Digitization. Qiong has rich experience of organizing and running academic conferences and workshops such as series workshops at Tsinghua International Conference on Art & Design Education "Re: Actor International Art & Design", and "Accessible Music Installation Design Workshop", "Wearable design workshop" held

by Tsinghua University. She was Chair of Art Program of the 8th and 9th China Visualization and Visual Analytics Conference (ChinaVis 2021 and ChinaVis 2022), Chair of the Program Committee, International Conference of Digital Media Education 2019, and Co-Chair of the Program Committee Design 3.0 International Forum, 2018.

Gus Xia is a Global Network Assistant Professor in Computer Science at New York University, Shanghai, China, now visiting MBZUAI. He also holds affiliations at Tandon, CILVR at the Center for Data Science, and MARL at Steinhardt at NYU. He received his PhD in the machine learning department at Carnegie Mellon University (CMU) in 2016. Gus is broadly interested in the design of interactive intelligent systems to extend human musical creation and expression. His work on controllable music generation and interpretable music representation is well recognized in the domain of Music AI. Xia is also a professional Di and Xiao (Chinese flute and vertical flute) player. In 2018, he was the music chair of MuMe (Music Metacreation) workshop at International Conference of Computational Creativity. In the same year, he co-chaired the music session of ISMIR 2018. In 2021, Gus chaired New Interface for Musical Expression, the first NIME ever held in China.

Jeba Rezwana is a PhD candidate and an instructor at the University of North Carolina at Charlotte, USA. Her research interest focuses on Human-Computer Interaction in the areas of Human-AI Co-Creation, Ethical Human-Centered AI, and Interaction Design. Her initial research was motivated by the limited research on interaction design in the co-creativity field, which is reflected in a lack of focus on interaction design in many existing co-creative systems. She devised a framework, COFI, for modeling interaction design that describes the broad scope of possibilities for interaction design in co-creative systems. She analyzed the interaction designs of 92 existing co-creative systems using COFI and identified that most existing co-creative AI can not communicate with users in any way. And this finding led her to investigate the impact of two-way communication in human-AI co-creativity. From the study, she learned that co-creative AI that can communicate is perceived as more trustworthy and personal and it raised a few ethical concerns. Currently, she is investigating the ethical issues in co-creative AI to devise human-centered ethical guidelines for co-creative AI.

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