



WHITE PAPER

Mastering the Art of AI a Workshop on Innovating Science Festival Organization with Cutting-Edge Trends

facilitated by
Prof Tracy Harwood & Dr Marieke Navin

content of this document is based on discussion
emanating from the workshop taking place
at the UK Science Festival Network Annual Conference
30 Jan 2024 @ SteamHouse, Birmingham

Workshop participants / contributors:

Jo Bodimeade	Dr Claire Malone
Hattie Charnley-Shaw	Dr Eleanore Mason
Dr Dane Comerford	Mimmi Martensson
Louise Cooke	Claire Mutimer
Julie Fooshee	Dr Praveen Paul
Annabelle Foot	Lucy Simpson
Dr Roderick Hebden	Rebecca Wilson
Charlotte Hodgson	

Contacts:

Prof Tracy Harwood, Director, Art AI Festival (De Montfort University) | tharwood@dmu.ac.uk
Dr Marieke Navin, Programme Manager, Cheltenham Science Festival | marieke.navin@cheltenhamfestivals.com



Conference Theme

Science Festivals in 2050

Workshop Aims and Objectives

- Discuss the roles of AI in future science festivals
- Evaluate emergent issues in the use of AIs in science festivals

Methodology Statement

Findings summarized in this paper are based on thematic seeded discussion of participants working in small groups. Key points were captured on a whiteboard and presented in a plenary session by groups. Notes were taken but discussion was not recorded nor systematically analysed. Specific comments are not attributed to individuals. There is no intention to hierarchically present findings in this document, the summary is therefore a list of key topics identified by participants as being those pertinent to the group discussion. AI was not used in the generation of the discussion topics within groups. In preparation for the workshop, we asked ChatGPT (v3.5) to identify key stages in the development of AI (see Appendix 1) and subsequently, the same questions facilitated in the workshop (see Appendix 2) by way of comparison. Verbatim responses captured on whiteboards from groups answering questions are listed at Appendix 3.

Theme 1: What future use cases can we identify for using AIs in science festival activities? (and over what timeframe)

Suggested prompts for discussions –

- What visions might we have of good use of AI over the next 30 years?
- Can the AI programme a science festival?
- Can the AI replace the director of a science festival?
- How do we keep people and places in the loop?

Groups identified a series of features and characteristics of generative AIs that support different types of activity. In turn, these affordances enabled groups to identify issues.

Affordances of AIs -

- programmability of interface for interaction including such as visualisation or aural representation of virtual agents
- real-time interaction capability, useful for conversational interactions whether text or voice activated
- conversational agency reflecting the verbal and non-verbal stylistic preferences of users, which could be related to language ability, automated translation into a preferred language (even one where the user has unique language because of disability), or presentation of information
- scale of data drawn upon e.g., internet scale, although recency of dataset and method of training LLMs needs to be understood and monitored
- bias and management of bias by LLMs, and black box nature of LLMs



Groups identified types of use case applications –

- ideation process - identifying and theming content around relevant or contemporary work, typically this work happens at festivals are being developed and could include the programme format itself
- content development – working with types of scientific and technical data and information to create interesting approaches to presentation, such as recreating historical figures as conversational agents for events and activities (e.g., using Unreal Engine’s Metahumans), to generating interesting questions for live participants
- content evaluation and improvement against key performance indicators and targets e.g., sustainability targets, climate modelling, audience and event impact plans, process management; the opportunity to evaluate ‘what ifs’ in more detail and depth at an earlier stage is also attractive
- operational planning and management e.g., event mapping, venue performance mapping, risk assessment, staff rota planning including management and evaluation in real-time based on skills of individuals
- content personalisation – specific for target audience needs including at individual levels of customisation, experience mapping based on user requirements (e.g., schedule and visit plan); rich insights also from previous festival visits may be integrated into customization experience
- accessibility - translation of content into different accessible formats using text to image, to video, to experience, and different language options
- event marketing and audience management – ticketing and real-time audience development and management, writing copy for social media, advertising promotionals and press releases including developing titles for activities and events
- communication and collaboration development – management of bias and representation, diversity and inclusion, breaking the echo chamber, and presentation or re-presentation of complex information to stakeholders based on preferences and needs eg., visualisation of impacts, transcripts of datasets
- evaluation – this could include real-time feedback to manage operations during events including the programme whilst the events are still live, to analysing audience feedback after the event and evaluating impacts, outcomes, strengths, weaknesses and future opportunities, to examining what, why and how particular events and activities worked given the festival context providing analyses for future planning, to a gap analysis exploring opportunities for new audiences not previously reached through festival activities

Timeframe was more challenging to identify. Many of the applications are already possible but it was the speed, complexity of datasets and accuracy of presentation with which aspects could be addressed that group participants felt would become more sophisticated over time, including the extent to which some aspects of interrogation could be automated and used in generative decision-making processes.

Theme 2: What key issues can you identify with configuring uses of AIs for science festival activities?

Suggested prompts for discussions –

- Production of festival
- In festival content
- Marketing and audience of outputs
- What key tools have you found to be useful / why or how are the used and integrated?
- Issues may relate to eg., ethics, bias, access, training, IP, user skills, etc



Groups identified issues related to affordances of AIs and human factors in the use of AIs and questioned the point of the wedge we are currently at in the development and use of AIs.

Risks and constraints –

- bias and misrepresentation of data, including implications that may arise from real-time censorship in relation to emergent issues, controls placed upon use of datasets, reinforcement learning of bias. It was highlighted that whilst accuracy may be increased over time, bias is an inherently human state embedded within everything we do and say
- misinformation and presentation of facts, including the extent to which AIs hallucinate based on predictions from datasets
- dementia of presented data, whereby AIs become 'bland' over time as more people ask it questions so predictions become averaged to a lower quality or common theme response
- accessibility – how diversity and inclusion is made transparent to users
- state of the art – the ability to keep up to date either with the use of models or means through which those models are accessed, highlighting the importance of equity of access to tools and equipment
- ethics and legal implications – transparency, IP management such as copyright and legals associated with training datasets used in models and computational processes e.g., removal of data from models upon death or request

Human factors –

- understanding the state of the art – as a technology in rapid advancement, with key issues related to access and transparency in use, it is difficult to users to appreciate the robustness and usefulness of the technology for its target application
- prompt engineering – an advancing science and art of how to use AIs through devising appropriate prompts based on the sophistication of the models being used and the way in which the interface has been configured for use. Over time, these are likely to become easier to generate, based on predictive analytics of ways in which people ask questions and types of outputs users demand of systems
- bias – an inherently human trait, it will be challenging to factor in and appreciate the nature of bias present in all individuals through which AIs will be used as a toolset, irrespective of how bias is managed by the AIs (see also risks above)
- laziness and memory degradation – related to the use of schemas and ease of use of AIs, to what extent should AIs be challenging to use, vs what are the consequences of humans allowing AIs to complete mundane tasks
- human-computer collaboration – a key issue relates to potential over-reliance on systems, whereby it will be important to ensure that humans remain in the loop and that knowledge generated is integrated at an appropriate level of decision-making
- trust and truth – to what extent and how is transparency, reliability and credibility maintained by systems in use by humans. Trust is core need for many users, therefore how this will be managed is critical because as complexity increases, so the ability of humans to assess quality and truth diminishes. There will be increased need for monitoring systems.
- communitas and relationships with the AIs – what is appropriate and inappropriate use of AIs in a festival context? These issues are still evolving and relate to previous points. Concerns were highlighted about the role of human-to-human contact and how its significance may diminish as AIs become more dominant in knowledge exchange activities
- imagination – learning, idea transfer and creativity are core human conditions, how can AIs facilitate and support human thought processes for generating new and interesting ideas?



- authenticity of engagement and societal norms – relate to the human condition, how can AIs support human intelligence without undermining social norms?
- festivals are ‘safe spaces’ for exploring new ideas – AIs need to support the process of engagement for learning and novelty seeking behaviour
- creativity – how are ideas generated between humans and computers and how is IP accounted for in those creative processes e.g., new vs derivative works? This is an area of current and future development as AIs advance and training datasets become more transparent as toolsets. It is useful to reflect on the work of Margaret Boden (see reference below), who differentiated between types of creativity and ways that AI can support it

Bibliography / Key Resources Identified

Art AI Festival website, www.art-ai.io and www.youtube.com/ArtAIFestival for examples of creative applications of AIs (Prof Tracy Harwood)

Cheltenham Science Festival AIDA bot (Dr Marieke Navin) –

AIDA 2019 Cheltenham Science Festival brochure:

https://issuu.com/cheltenhamfestivals/docs/science_festival_2019_brochure

AIDA 2020 Cheltenham Science Festival at home:

<https://www.youtube.com/watch?v=QmqRNya6Rxs>

AIDA 2021 poetry collaboration:

https://www.tiktok.com/@voicebox_/video/7108347049560575238

AIDA 2022 Cheltenham Science Festival:

<https://www.cheltenhamfestivals.com/science/news/culture-at-the-heart-of-cheltenham-science-festivals-20th-birthday-celebrations>

Cheltechne AI Summit 2023 report:

<https://www.cheltenhamfestivals.com/science/news/charity-report-finds-that-stories-around-artificial-intelligence-are-profoundly>

Margaret Boden, 2016, AI: Its Nature & Future, Oxford University Press (and her earlier work on The Creative Mind, 2004 Routledge, or later work with Ernest Edmonds, From Fingers to Digits, 2019 MIT Press)

Nick Bostrom, 2017, Superintelligence: Paths, Dangers, Strategies, Oxford University Press

Mark Coeckelbergh, 2020, AI Ethics, MIT Press

EU Artificial Intelligence Act, available online here <https://www.europarl.europa.eu/news/en/press-room/20231206IPR15699/artificial-intelligence-act-deal-on-comprehensive-rules-for-trustworthy-ai>

UK Government on AI, available online here <https://www.gov.uk/government/consultations/ai-regulation-a-pro-innovation-approach-policy-proposals>

Appendix 1

A chat with ChatGPT version 3.5, prompted by Prof Tracy Harwood, sought to identify the key stages in the emergence of AI as we recognize it today. The output of the chat is replicated below.

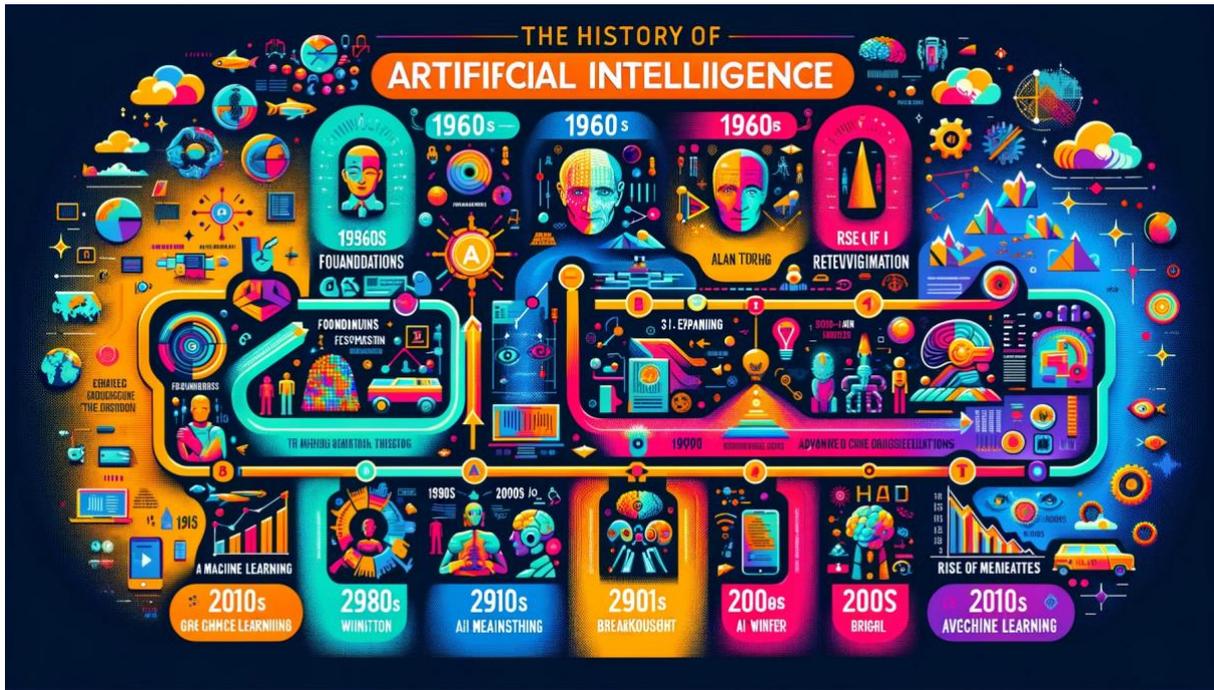
ChatGPT

Creating an accurate and detailed infographic of the key developments in AI requires a comprehensive understanding of its history and milestones. Here's a brief outline of what such a timeline might include:

- 1950s-1960s: The Foundations**
 - 1950: Alan Turing proposes the Turing Test.
 - 1956: The term "Artificial Intelligence" is coined at the Dartmouth Conference.
 - Late 1950s: Early AI programs like Samuel's checkers program.
- 1970s: Expansion and Early Challenges**
 - Development of expert systems.
 - Encounter with the AI winter due to limitations and inflated expectations.
- 1980s: AI Winter and Rejuvenation**
 - Introduction of machine learning.
 - Renewed interest in neural networks.
- 1990s: The Rise of Machine Learning**
 - Development of algorithms for decision trees, reinforcement learning.
 - Improvement in natural language processing and neural networks.
- 2000s: AI in the Mainstream**
 - The emergence of big data.
 - Increased computational power accelerates AI development.
 - AI begins to influence consumer technology.
- 2010s: Breakthroughs and Integration**
 - Advances in deep learning.
 - AI achieves superhuman performance in complex games (e.g., Go).
 - Integration of AI in various sectors like healthcare, finance, and autonomous vehicles.
- 2020s and Beyond: Advanced AI Tools and Ethical Considerations**
 - Emergence of GPT-3 and similar models.
 - Focus on ethical AI and addressing biases.
 - AI as a tool for creativity and problem-solving in everyday life.

Image Generation

ChatGPT was then asked to create an infographic based on the information in a colourful and accessible format, communicating the key concepts. It did this using its generative DALL-E tool. The following image was a second-generation image, illustrating a series of factual errors in the presentation of wording and dates not necessarily present in the text descriptions it had previously identified.



Appendix 2

We asked the same thematic questions of ChatGPT, answers below.

What future use cases can we identify for using AIs in science festival activities? (and over what timeframe)

ChatGPT

The use of AI in science festival activities presents a multitude of exciting possibilities, which can be explored over different timeframes. Here are some potential use cases categorized by short-term, medium-term, and long-term applications:

Short-Term (1-3 Years)

1. **Interactive Exhibits:** AI-powered interactive displays and kiosks that respond to visitor queries, providing personalized information about science exhibits.
2. **Virtual Assistants:** Chatbots and virtual assistants to guide visitors through the festival, offering schedules, exhibit details, and answering FAQs.
3. **Educational Games and Simulations:** Simple AI-driven games and simulations to engage younger audiences, making complex scientific concepts more accessible and fun.

Medium-Term (3-5 Years)

1. **Personalized Learning Experiences:** More advanced AI systems that track visitor interests and learning styles to suggest specific exhibits and activities.
2. **Augmented Reality (AR) Tours:** AI-enhanced AR experiences offering in-depth insights into scientific phenomena, history, or theoretical concepts.
3. **AI-driven Workshops:** Workshops where participants interact with AI to conduct experiments or solve scientific problems, enhancing their understanding of AI capabilities.

Long-Term (5+ Years)

1. **Fully Autonomous Exhibit Guides:** Robots or drones capable of providing guided tours, answering complex questions, and interacting with visitors in a more human-like manner.
2. **Virtual Reality (VR) Explorations:** Advanced VR experiences powered by AI, allowing visitors to explore different environments, such as space, deep ocean, or inside a human cell.
3. **Predictive Analytics for Event Management:** AI systems that analyze data from past events to predict attendance, manage resources, and personalize visitor experiences on a large scale.
4. **Collaborative AI and Human Research Projects:** Initiatives where festival-goers can participate in real-time research projects, contributing to data collection and analysis under the guidance of AI systems.
5. **AI as a Creative Partner:** Using AI to generate scientific art, music, or other creative exhibits, demonstrating the fusion of science, technology, and art.

These use cases represent a trajectory where AI initially enhances the visitor experience and educational aspects of science festivals and gradually becomes an integral part of how such events are planned, executed, and experienced. The timeline for these advancements will depend on technological progress, funding, public interest in science, and the adoption of AI in educational and public spaces.



Prompt: and how do you envisage it can be used in 30 years time?

In 30 years, the integration of AI in science festival activities could be profoundly transformative, leading to experiences and educational opportunities far beyond current capabilities. Here's how AI might be utilized in this context by 2054:

1. **Fully Immersive Learning Environments:** AI could create dynamic, immersive environments that adjust in real-time to individual learning styles and preferences. Visitors could experience customized educational journeys, where AI tailors content to their curiosity and knowledge level.
2. **Interactive, Holographic Displays:** Advanced holographic technology, combined with AI, could bring scientific phenomena to life, allowing visitors to interact with three-dimensional models of everything from molecules to galaxies.
3. **Real-Time Global Collaboration:** AI could facilitate live, interactive sessions between festival attendees and leading scientists worldwide. Language barriers would be non-existent, thanks to real-time, flawless translation and communication enhancements.
4. **AI as a Creative Co-Exhibitor:** AI might not just facilitate but actively participate in festivals by generating original scientific research, art, music, or literature, offering unique insights into the intersection of science and creativity.
5. **Personal AI Guides:** Each attendee could have a personal AI guide, accessible via wearable tech, providing a fully personalized experience. These guides could offer insights, answer questions, and even predict and suggest activities based on individual interest patterns.
6. **Virtual Attendance and Accessibility:** Advanced VR and AR could allow global attendance without physical presence, making science festivals accessible to anyone worldwide. This could also include interactive virtual labs and experiments, accessible from home or classrooms.
7. **Predictive Science and Scenario Exploration:** AI could use vast datasets to predict future scientific challenges and innovations, offering simulations and scenarios for attendees to explore, debate, and understand.
8. **Neuro-Interactive Experiences:** Advances in neurotechnology could allow visitors to engage with exhibits and learn through direct brain interfaces, possibly enhancing learning speed and retention.
9. **Ethical and Philosophical Debates Facilitated by AI:** With AI becoming an integral part of society, science festivals might include AI-facilitated discussions on ethics, philosophy, and the role of technology in human evolution.
10. **Participatory Science:** AI could enable visitors to participate in real-time, large-scale experiments or data collection initiatives, contributing to genuine scientific research during the festival.

In 30 years, AI's role in science festivals could be transformative, not just in enhancing learning and experience but in fundamentally redefining the nature of public engagement with science. The boundary between participant and exhibit, learner and teacher, could blur, leading to a more integrated, immersive, and personalized approach to scientific education and exploration.



Given your answers above, what key issues can you identify with configuring uses of AIs for science festival activities?

ChatGPT

Configuring AI for science festival activities presents several key issues and challenges that need to be addressed to ensure successful implementation. These include:

1. **Data Privacy and Security:** Collecting and analyzing data from festival attendees, especially for personalized experiences, raises significant privacy concerns. Ensuring data security and compliance with privacy laws like GDPR is crucial.
2. **Ethical Considerations:** AI systems should be designed to avoid biases, particularly in educational content. Ethical considerations around AI's influence on children and the general public are paramount.
3. **Accessibility and Inclusivity:** AI-driven experiences must be accessible to people of all ages, abilities, and backgrounds. This includes considerations for people with disabilities and non-native language speakers.
4. **Technical Limitations and Reliability:** AI systems can have limitations in understanding complex human interactions and may not always respond accurately. Ensuring reliability and dealing with technical glitches is essential for a positive visitor experience.
5. **Interdisciplinary Collaboration:** Creating meaningful AI experiences for science festivals requires collaboration between technologists, educators, scientists, and artists. Effective communication and integration of diverse perspectives are necessary.
6. **Cost and Resource Allocation:** Developing and implementing sophisticated AI systems can be costly. Festivals must balance the desire for high-tech features with budget constraints and resource allocation.
7. **User Acceptance and Engagement:** There's a need to gauge the level of comfort and engagement of festival-goers with AI technologies. Some attendees might prefer traditional learning experiences.
8. **AI Literacy:** Educating attendees about AI's capabilities and limitations is important. Misconceptions about AI can lead to unrealistic expectations or fears.
9. **Future-Proofing:** Technology evolves rapidly. Systems developed must be adaptable and scalable to incorporate future advancements in AI.
10. **Impact on Employment:** The use of AI in festivals might raise concerns about the displacement of human workers, particularly in roles like guides or educators.
11. **Legal and Regulatory Compliance:** Ensuring that AI applications comply with current laws and regulations, and are adaptable to future legal changes, is vital.
12. **Cultural Sensitivity:** AI-driven content should be culturally sensitive and not perpetuate stereotypes or cultural biases.
13. **Sustainability:** Consideration of the environmental impact of deploying high-tech AI systems, in terms of both energy consumption and electronic waste, is important.

Addressing these issues involves a balanced approach, integrating technology with human-centric design, ethical considerations, and a commitment to continuous learning and adaptation.

Appendix 3

White board (Verbatim) responses

Task 1

Whiteboard 1:

- Recreate scientists/historical figures
- Brainstorming new ideas
- Visitor journeys
- Engagement and attention of visitors
- Writing copy – promotion, event titles, press releases
- Processing feedback
- Visualisation of impact
- Rota of volunteers/managing tasks
- Risk assessments
- Transcripts/translation/transcribe videos
- Accessibility – multiple languages/countries
- Translating for diverse populations based on individual needs/personalisation

Whiteboard 2:

- Draft social media strategy
- How to generate prompts
- Questions for panels
- Programme evaluation – what do we not do?
- Gap analysis from past programmes
- How to make your Festival more sustainable – give it your plan – comes up with ways to reduce
- Target audience based on previous – from this what will attract X audience?

Whiteboard 3:

Uses:

- Cocktails!
- Data analysis
- Marketing
- Creative
- Brainstorming

Potential:

- Geographical mapping/directions
- Breaking echo chambers
- Ticketing
- Sustainable lifestyle options
- Communication with networks
- Answer the 'what ifs'
- Building personal, 'bespoke' programming
- Climate modelling

Extra notes:

- Feedback in real time, live AI analysis
- Things to try: plan of event, RAs.
- Meta humans and unreal engine



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Task 2

Dangers:

- Data/privacy
- Replicating racist structures
- Not being able to break the law (LOL)

Issues:

- Human connection
- Communitas
- Trust/credibility
- How dead is dead? Effects on descendants.
- How do you present in A/B/C spaces – persona – censorship
- Derivative of a derivative – new?
- Amplifies all human biases
- AI makes stuff up
- Does AI have an imagination
- Concentration of AI content leads to cascade
- Can't really monitor it
- Over relying on AI?
- Begins to become artificial and bland
- We humans become lazy
- Less community and human contact

Extra notes:

- look at bigger issues.
- AI dementia AI generated content on AI content...
- Margaret Boden genuinely innovative ideas
- Where is the IP on the creative output?
- Usa copyright cannot be attributed to AI...human process
- Human connection authenticity and trust
- Serotonin etc
- Neurodiversity. Societal norms. Narrowing?
- Derivative of Derivative etc etc
- Truth and trust
- What point on the wedge are we? Caves, 1995 etc?
- Festivals create a safe space