

**NIKITA BRAGUINSKI**

## AI Demonstrations as Phantasmagorias of the Early 21<sup>st</sup> Century

The phantasmagoria shows were a form of entertainment that involved, during the transition from the 18<sup>th</sup> to the 19<sup>th</sup> century, the projection of images with the help of a lamp and the staging of pretended apparitions of ghosts of deceased persons. As large, public events that brought together scientific advances and premodern supernatural beliefs, phantasmagorias have shaped public attitudes at a time when manufacturing and communication were deeply disrupted by new technologies. Similarly, in the works of E. T. A. Hoffmann such as *The Automata* (published in 1819) musical and other machines operate on the boundary between science and the supernatural, reflecting the author's fascination by and participation in comparable presentations of »techno-magics«.<sup>1</sup>

The current public engagement with the topic of artificial intelligence (AI) happens during a period of renewed disruption of work, communication, music production and consumption, and other areas of life due to the dissemination of new technologies.<sup>2</sup> Specifically, the newest advances in AI-enabled programming and the creation of high-quality textual content (GPT-3, ChatGPT, Github Copilot),<sup>3</sup> the creation of images from textual descriptions (Dall-E 2, Stable Diffusion),<sup>4</sup> and, recently, also the creation of music and audio effects from text (MusicLM, AudioLDM and others)<sup>5</sup> pose a challenge to the economic situation of programmers, text creators, illustrators and musicians.

In this article, I argue that the ongoing public interest in spectacular AI demonstrations can be better understood in the context of its two-hundred-year-old sibling phenomenon, the phantasmagoria. On the one hand, I propose parallels be-

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<sup>1</sup> Kati Röttger: »Techno-Logics and Techno-Magics: Phantasmagoria in the Age of Electricity«, in: *Forum Modernes Theater* 32, 2021, pp. 238–53, <https://doi.org/10.2357/FMTh-2021-0022>. <sup>2</sup> Silja Voeneky et al.: »Introduction«, in: *The Cambridge Handbook of Responsible Artificial Intelligence. Interdisciplinary Perspectives*, ed. by id., Cambridge, UK 2022 (Cambridge Law Handbooks), pp. 1–8, <https://doi.org/10.1017/9781009207898.001>; Rosario Girasa: *Artificial Intelligence as a Disruptive Technology*, Cham 2020. <sup>3</sup> Tom B. Brown et al.: »Language Models Are Few-Shot Learners«, arXiv, 22.7.2020, <https://doi.org/10.48550/arXiv.2005.14165>; »ChatGPT: Optimizing Language Models for Dialogue«, OpenAI, 30.11.2022, <https://openai.com/blog/chatgpt> [5.8.2025]; »GitHub Copilot. Your AI Pair Programmer«, GitHub, 2021, <https://github.com/features/copilot> [5.8.2025]. <sup>4</sup> »DALL-E 2«, OpenAI, 2022, <https://openai.com/dall-e-2> [5.8.2025]; »Stable Diffusion Online«, 2022, <https://stablediffusionweb.com> [5.8.2025]. <sup>5</sup> Andrea Agostinelli et al.: »MusicLM: Generating Music From Text«, arXiv, 26.1.2023, <https://doi.org/10.48550/arXiv.2301.11325>; Haohe Liu et al.: »AudioLDM: Text-to-Audio Generation with Latent Diffusion Models«, arXiv, 29.1.2023, <https://doi.org/10.48550/arXiv.2301.12503>.

tween the two kinds of public engagement, including the bringing together of science and perceived magic that has characterized the phantasmagorias of the past. On the other hand, however, I also point to contrasting features such as the difference between the former small-business kind of economics of the phantasmagoria shows and the current backing of the newest and most spectacular AI demonstrations by some of the biggest industrial entities that have a real interest in shaping public opinions on AI.<sup>6</sup> Finally, I connect this discussion to the reasons for current public attitudes towards recommendation engines, notably in the Spotify music streaming service.

## Introduction

The transition from 2022 to 2023 was marked by two events that catapulted the key-word of »AI« – however ill-defined this term may appear to the technical specialist – into the limelight of public interest. One event, the larger of the two, became a worldwide media sensation: The presentation by the industry research institution OpenAI of the text generating system ChatGPT.<sup>7</sup> In comparison to everything the public had seen before, the capabilities of ChatGPT seemed truly miraculous: The system could generate well-written answers to many questions that require the synthesis of disparate pieces of information found in online data on which ChatGPT was trained, and it was capable of creating and adapting programming code in response to instructions given in plain language, as well as of pointing out errors in existing programs, along with suggestions on how to correct them. Additionally, OpenAI emphasized their progress towards a better automatic content moderation system, meant to filter out biased, harmful, and misleading responses – a problem that, in previous years, has often led to disastrous media reactions and the disappearance of AI prototypes.<sup>8</sup> As a result, it became obvious to the public that in some areas of cognitive work, such as the creation of text based on existing information and programming, humans now had to contend with an unexpected, powerful and tireless competitor who was in possession of rapidly growing abilities.

Given that machine learning is a well-organized, worldwide area of active research, the capabilities of ChatGPT were impressive, but not entirely unprece-

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<sup>6</sup> J. Scott Brennan / Philip N. Howard / Rasmus Kleis Nielsen: »An Industry-Led Debate: How UK Media Cover Artificial Intelligence«, Reuters Institute for the Study of Journalism, University of Oxford, December 2018, <https://doi.org/10.60625/risj-v219-d676>. <sup>7</sup> »ChatGPT«, OpenAI (see note 3). <sup>8</sup> Art. »Tay (Chatbot)«, in: Wikipedia, 31.7.2025, [https://en.wikipedia.org/wiki/Tay\\_\(chatbot\)](https://en.wikipedia.org/wiki/Tay_(chatbot)) [5.8.2025]; Papers with Code [paperswithcode]: »Thank you everyone for trying the Galactica model demo. We appreciate the feedback we have received so far from the community, and have paused the demo for now. Our models are available for researchers who want to learn more about the work and reproduce results in the paper.« Tweet on Twitter (now X), 17.11.2022, <https://x.com/paperswithcode/status/1593259033787600896> [5.8.2025].



**Fig. 1** Google searches connected to the topic of AI, worldwide, 2004–early 2023  
(as percentages of the currently highest amount, the vertical lines indicate changes in Google's internal data collection system)

dented. The system GPT-3,<sup>9</sup> released by OpenAI in 2020, already demonstrated the generation of text based on knowledge and a palette of writing styles found online, and the GitHub Copilot automatic programming service from 2021,<sup>10</sup> again co-created by OpenAI, largely prefigured the programming part of ChatGPT. Still, the convenient packaging of these two working instruments in a unified chat-oriented interface transformed the awkwardness of the GPT-3 experience into something a potential employer might actually consider paying for instead of a human writer or entry-level programmer. Suddenly, the disruption – the favorite topos of both Silicon-Valley-style technology evangelists and critical media scholars – felt very real, prompting a peak in online searches for »AI« (see Fig. 1).<sup>11</sup>

The second event – smaller in scale because it »only« considered music and sound, but not less important – was the presentation in early 2023 of the text-to-music system MusicLM by the research group Magenta at Google. Given a simple textual description of the music to be created, MusicLM automatically generated music in various styles, additionally following instructions and hints concerning atmosphere, instrumentation, tempo, and other musical details – all without relying on specialist musical or technological knowledge. MusicLM was launched in the most inconspicuous way possible – by uploading to the enormous repository of scientific papers Arxiv.org a research publication full of specialist terms and catering exclusively to a computer science audience – not a musical one.<sup>12</sup> Still, the impact on social media discussions was remarkable. Especially the examples of text-to-audio pairs created by MusicLM (hidden behind a nondescript link below the paper's summary) must have made it painfully clear to any aspiring sound artist and music producer that writers of functional text and programmers were not alone in their new situation.<sup>13</sup>

**9** Brown et al.: »Language Models Are Few-Shot Learners« (see note 3). **10** »GitHub Copilot« (see note 3). **11** »Google Trends: AI [in German: »Künstliche Intelligenz«], worldwide, 2004–to-day«, Google Trends, <https://trends.google.de/trends/explore?date=all&q=%2Fm%2Fomkz> [5.8.2025]. **12** Agostinelli et al.: »MusicLM« (see note 5). **13** Id.: »MusicLM: Generating Music From Text [Examples]«, 2023, <https://google-research.github.io/seanet/musiclm/examples> [5.8.2025].

In the following sections, I discuss (1) the aspects of phantasmagoria shows that remain relevant for understanding today's public reactions to technical demonstrations of AI, (2) E.T.A. Hoffmann's related literary depictions of quasi-magical musical automata, and (3) the parallels and contrasting features between 19<sup>th</sup>-century phantasmagorias and recent spectacular AI demonstrations, augmented by the analysis of possible reasons for the lack of public interest in the culturally highly important topic of recommendation engines (used by streaming services such as Spotify), in comparison to the sensational status of AI used to generate new works.

## 1. Technological phantasmagorias

In 1801, Londoners were invited to attend the »phantasmagoria«, a show depicting specters and deceased celebrities with the help of a lamp projecting images on a screen. These shows followed a recipe that had already proven successful in Leipzig in the 1770s (with Johann Georg Schröpfer) and in the 1790s in Paris (with Paul Philidor, possibly the same person as the creator of shows in London, Paul de Philpsthall). The technology behind these shows is thought to have remained relatively stable through this period, with gradual improvements that allowed more spectacular tricks. At its core, the phantasmagoria relied on the so-called magic lantern, an early form of projector able to direct light at a slide and create an enlarged image on a screen, or even – for better effect – on smoke. The improvements introduced over time mainly concerned the ability to move the projector towards and away from the screen, creating the impression of the »ghost« rapidly approaching the audience, and then disappearing. The vivid impression these successful shows have had on the public seems to also derive from the use of darkness and the eerie sounds of the glass harmonica that contributed to the atmosphere of mystery, horror, and magic.<sup>14</sup>

Sometimes, phantasmagorias were extended to include other spectacular demonstrations that, despite being, like the magic lantern, grounded in contemporary technology and science, were basically used to simulate the presence of something supernatural, something grounded in long-discarded superstitions. One such use of technological innovation to connect to the public's most irrational imaginations was the practice of »Galvanism« – the inducement of movements in dead an-

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<sup>14</sup> Röttger: »Techno-Logics and Techno-Magics« (see note 1); id.: »Technologies of Spectacle and »The Birth of the Modern World«. A Proposal for an Interconnected Historiographic Approach to Spectacular Culture«, in: *Tijdschrift voor Mediageschiedenis* 20, 2017, No. 2, pp. 4–29, <https://hdl.handle.net/11245.1/f5b74f2c-2913-4e30-b727-298bc448b576> [5.8.2025]; Maximiliaan van Woudenberg: »Fantasmagoriana: The Cosmopolitan Gothic and Frankenstein«, in: *The Cambridge History of the Gothic*, Vol. 2: *Gothic in the Nineteenth Century*, ed. by Dale Townshend / Angela Wright, Cambridge 2020, pp. 41–64, <https://doi.org/10.1017/9781108561082.003>.

imals' body parts (such as frog legs) with the help of electricity.<sup>15</sup> The parallel envisioned by creators of phantasmagorias is clearly visible here: in both Galvanism and the staged apparitions of ghosts of past celebrities the dead appeared as if they were almost able to again cross the line separating life and death, playing on the feeling of uncanniness that stems from this deliberate blurring of boundaries.<sup>16</sup>

In a sense, early 19<sup>th</sup>-century Britain was a much more appropriate place for phantasmagorias than the continental Europe where these shows first emerged. Caught in the middle of a deep transformation that came to be known as the First Industrial Revolution, Britain of 1801 already epitomized many traits of later technological societies around the world, prefiguring the industrialized and globalized production of today. Between the mid-18<sup>th</sup> century and mid-19<sup>th</sup> century, Britain underwent a series of transformations that all combined to destroy earlier, local, handicraft-based modes of work and to install the new, industrial, global, coal-powered, and capital-based production. Being on the one hand inextricably intertwined with slavery (notably, in the making of raw cotton which British factories refined), the new regime of production also subjected British workers in the new industrialized factories – including children – to various measures aimed at raising the length and the intensity of their work. In this process, many traditional skills were devalued by the new technological and financial possibilities, lowering the value of labor and creating the impoverished misery of the slums in which the British factory employees of the early 19<sup>th</sup> century often lived.<sup>17</sup>

Against this background, it can be conjectured that the connection, in the phantasmagoria, between the technology that enables it and the generally horror-oriented contents of the show is not arbitrary. On the contrary, the horror stemming, in the phantasmagoria, from the blurring of the line between life and death seems to be directly connected to the emerging industrialization of British production in which inanimate machines started to produce goods for which a human worker was previously needed. Indeed, the new apparatuses of the industrial factory that not only replaced handiwork, but were also driven by the then-new steam engine, must have evoked in the British public mixed feelings of interest and pride (because of the technological breakthroughs), fear (of being replaced by a machine), and magic (due to the hidden and unclear functioning principle of the machinery). Playing on remnants of premodern superstitious thinking, and employing recent technological advances such as more powerful lamps, the London phantasmagorias of Paul de Philipsthal drew on the public's reactions to the upheavals of the First Industrial Revolution.

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<sup>15</sup> Röttger: »Techno-Logics and Techno-Magics« (see note 1). <sup>16</sup> Nikita Braguinski: *RANDOM. Die Archäologie der elektronischen Spielzeugklänge*, Bochum 2018 (Computerarchäologie 3), pp. 125–136 (Chapter 2.2 »Das Unheimliche«). <sup>17</sup> James Vernon: *Modern Britain. 1750 to the Present*, Cambridge 2017 (Cambridge History of Britain 4), pp. 75–110 (Chapter 3 »An Imperial Economy and the Great Transformation«); Paul Langford: *Eighteenth-Century Britain. A Very Short Introduction*, Oxford 2000; Phyllis Deane: *The First Industrial Revolution*, 2<sup>nd</sup> edition, Cambridge 1979.

## 2. The two types of Hoffmann's musical machines

The complicated cultural dynamics of the early 19<sup>th</sup> century which, on the one hand, could be understood as a competition between rationalism and romanticism, and, on the other hand, can be seen as a blend of the two conflicting tendencies, have been a topic of active research.<sup>18</sup> Notably, it has been argued that the technologies of the First Industrial Revolution such as the steam engine were seen by contemporaries as a different kind of apparatus than the earlier technologies such as clocks. Unlike the clock, the power-producing steam engine was understood by the romantically inclined public of its time as »flexible, active, and inextricably woven into circuits of both living and inanimate elements«.<sup>19</sup>

One of the most iconic depictions of this early-19<sup>th</sup>-century idea of the quasi-living machine that operates on the boundary between (potentially explainable) technology, (mysterious) human psyche, and the supernatural can be found in the works of the influential Romantic writer E. T. A. Hoffmann. A composer and a music journalist himself, Hoffmann has created literary portraits of mystical human-like automata that have enjoyed continuous popularity as the subject of literary, media-theoretical, and psychoanalytic studies.<sup>20</sup>

Hoffmann's story *The Automata* (*Die Automate*) contains a gripping description of a technology-driven traveling mystery show built around a fortune-telling automaton, as well as accounts of the disconcerting and disorientating impression that musical automata and self-sounding apparatuses make on the text's protagonists.<sup>21</sup> Among the various musical machines that populate *The Automata* two can be seen as representatives of different classes of musical devices: the orchestrion ([Fig. 2](#))<sup>22</sup> and the aeolian harp ([Fig. 3](#))<sup>23</sup>.

The orchestrion is a playback machine that unites in itself different kinds of sound-producing instruments, all governed by a mechanical representation of the musical piece in form of a paper roll with corresponding holes or of a barrel with pins. The location of the holes in the paper or of the pins on the rotating barrel indicate to the playback mechanism which sound is to be played at which moment.

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**18** John Tresch: *The Romantic Machine. Utopian Science and Technology after Napoleon*, Chicago / London 2012. **19** Ibid., p. xi. **20** Werner Keil: Art. »Hoffmann, Ernst Theodor Amadeus (Wilhelm)«, in: *MGG Online*, ed. by Laurenz Lütteken, New York et al. 2016ff., article published December 2018, <https://www.mgg-online.com/mgg/stable/48050> [5.8.2025]; Gerhard Allroggen: Art. »Hoffmann, E(rnst) T(heodor) A(madeus) [Ernst Theodor Wilhelm]«, in: *Grove Music Online*, ed. by Dean Root et al., Oxford 2001ff., Article published 2001, <https://doi.org/10.1093/gmo/9781561592630.article.51682>. **21** E. T. A. Hoffmann: *Die Automate*, in: id.: *Sämtliche Werke in sechs Bänden*, Bd. 4: *Die Serapions-Brüder*, ed. by Wulf Segebrecht with the collaboration of Ursula Segebrecht, Frankfurt a. M. 2001, S. 396–492; E. T. A. Hoffmann: *Automata*, in: *The Best Tales of Hoffmann*, ed. by E. F. Bleiler, New York 1967, pp. 71–103. **22** »Hupfeld-Sinfonie-Jazz-Orchestrion. Piano mit Selbstspiel-Einrichtung«, Staatliche Museen zu Berlin Preußischer Kulturbesitz, Collections online, <https://id.smb.museum/object/1108097> [5.8.2025]. **23** »Äolsharfe«, ibid., <https://id.smb.museum/object/1106762> [5.8.2025].



Fig. 2 A photograph of an early-20<sup>th</sup>-century orchestrion from the collection of the Staatliches Institut für Musikforschung Preußischer Kulturbesitz, Musikinstrumenten-Museum, Berlin, Cat. No. 5007. Photo: Jürgen Liepe, CC BY-SA 4.0

The musical performance of an orchestrion is predetermined and becomes entirely predictable once one has heard the piece.<sup>24</sup>

By contrast, the aeolian harp is a device in which the unpredictable gusts of wind put strings into motion, creating a continuous and constantly morphing howling tone.<sup>25</sup> Unlike the orchestrion, whose function is to play back the music as reliably as possible, the very popularity of the aeolian harp depends on the unpredictability and unreliability of its performance. Therefore, the orchestrion is in my view an example of *play-back* technology while the aeolian harp is a music-creating machine which, accordingly, belongs into the realm of *generation*.

It is true that, seen on the micro-level of details inaccessible to conscious perception, the musical instruments of the orchestrion also cannot be fully controlled. A triangle or drum arguably sound a little differently each time they are struck. But the overall macrostructure of the piece's timings of note-onsets and the general impression of the piece will be the same each time the orchestrion is operated. Compared to that, one has to cede a much bigger portion of control in the case of the aeolian harp. Admittedly, it is possible to choose different forms for the aeolian harp's frame, one can use strings of different thickness and tension, and one can include a resonator into the harp's design, but once the harp has been installed outside, the control over the instrument's sound is transferred to the wind and the forces of nature.

This is the reason why the protagonists of Hoffmann's story find the musical performance built around an orchestrion and other comparable machines merely unpleasant, but become deeply disorientated and disturbed by the sound of the aeolian harp: The mechanical playback of the orchestrion does not infringe upon the territory of creativity which Hoffmann and his First-Industrial-Revolution-era contemporaries continued to see as essentially human.



Fig. 3 A photograph of an aeolian harp built during the era of the phantasmagoria shows, from the collection of the Staatliches Institut für Musikforschung Preußischer Kulturbesitz, Musikinstrumenten-Museum, Berlin, Cat. No. 2642. Photo: Jürgen Liepe, CC BY-SA 4.0

<sup>24</sup> Barbara Owen / Arthur W. J. G. Ord-Hume: Art. »Orchestrion«, in: *Grove Music Online*, Article published 2001, <https://doi.org/10.1093/gmo/9781561592630.article.20409>. <sup>25</sup> Nikita Braguinski: *Mathematical Music. From Antiquity to Music AI*, London 2022, p. 9.

### 3. AI demonstrations and the case of the Spotify recommender system – a continuing legacy

Two hundred years on, the highly industrialized, globalised, transport- and capital-based societies of the 21<sup>st</sup> century again seem to be deeply captivated by the speed with which yet another Industrial Revolution unfolds before their eyes – one that is, according to some accounts, already the Fourth Revolution<sup>26</sup> in a succession of technological changes that occurred since the middle of the 18<sup>th</sup> century. This time, the technological breakthroughs are in the area of Artificial Intelligence (AI), and the kind of work that these breakthroughs seem to be able to automate is not manual or physical, but cognitive.<sup>27</sup>

The exact meaning of the term Artificial Intelligence has shifted constantly since its introduction in mid-20<sup>th</sup> century. A common observation is that once something becomes demonstrably automatable with a new generation of AI, it immediately loses its status as a distinctive part of human intelligence, and this role is assumed by another, more difficult task. Thus, at first, calculations were carried out by enormous teams of human calculators, or »computers«, as they were called then. But when the digital computer demonstrated its ability to do arithmetic, more complex activities such as chess became the focus of AI endeavors.<sup>28</sup> When this goal was achieved in the 1990s with the creation of the first computer chess system of super-human playing strength, the interest shifted to games that offered bigger technological challenges such as the game of Go, where super-human playing strength was not achieved until two decades later, when the newest generation of AI based on deep learning finally became technologically mature.<sup>29</sup> The initial work on transferring human knowledge into hand-coded instructions for the computer gradually gave way to a paradigm of artificial intelligence loosely modeled upon the interconnected structure of the biological brain, enabling the imitation of human work which was difficult to describe exactly.<sup>30</sup> In the process, less and less areas of cognitive activity remained where humans could still claim superiority over the tireless and selfless machine. One area where human judgement had traditionally outperformed machinic AI was the recognition of patterns despite them being

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**26** Art. »Fourth Industrial Revolution«, in: Wikipedia, 31.7.2025, [https://en.wikipedia.org/wiki/Fourth\\_Industrial\\_Revolution](https://en.wikipedia.org/wiki/Fourth_Industrial_Revolution) [5.8.2025]. **27** Songül Tolan et al.: »Measuring the Occupational Impact of AI: Tasks, Cognitive Abilities and AI Benchmarks«, in: *Journal of Artificial Intelligence Research*, Vol. 71, 2021, pp. 191–236, <https://doi.org/10.1613/jair.1.12647>.

**28** Nathan Ensmenger: »Is Chess the Drosophila of Artificial Intelligence? A Social History of an Algorithm«, in: *Social Studies of Science* 42, 2012, pp. 5–30, <https://doi.org/10.1177/0306312711424596>. **29** David Silver et al.: »Mastering the Game of Go with Deep Neural Networks and Tree Search«, in: *Nature*, Vol. 529, No. 7587 (January 2016), pp. 484–489, <https://doi.org/10.1038/nature16961>.

**30** John D. Kelleher: *Deep Learning*, Cambridge, MA 2019, pp. 101–158 (Chapter 4 »A Brief History of Deep Learning«).

distorted, blurred, or superimposed on each other. For a long time, a human observer was much better at this task, even as arithmetic, chess, and the storage of vast amounts of information all became trivial tasks for the computer.

This changed in the 2010s. Suddenly, industrial-scale recognition of objects in a photograph, automatic transcription of spoken content, translation, and many other tasks that until very recently seemed like an unsurmountable barrier for the steady advance of AI all became very normal, and manageable areas of AI activity. In the process, interest in research shifted more towards the so-called generative AI models (those able to create new content),<sup>31</sup> instead of the previous focus on discriminative models (those able to classify existing data and to perform similar tasks). Then, finally, text-generating AI built around the unimaginable amounts of knowledge available on the Internet, the so-called Large Language Models such as GPT-3 and ChatGPT, demonstrated that the creation of new texts based on a given task, and drawing on existing information, was also automatable.

In this situation, which is in certain aspects not unlike that of the British society during the First Industrial Revolution where machines steadily displaced earlier kinds of production, one specific kind of public performance continues to catch the public's attention: the demonstration of new AI systems. In a comparative perspective, the phantasmagorias of the past seem to be mirrored in today's spectacular AI demonstrations and the popular reactions to them.

The public interest in AI grew rapidly in late 2022 with the launch by OpenAI of the text-generating ChatGPT AI system.<sup>32</sup> Unlike previous AI-related releases by OpenAI like GPT-3 which were accompanied by a scientific paper detailing the inner workings of the system,<sup>33</sup> ChatGPT's initial release included only minimal technical explanations, and did not offer more detail than a brief blog post oriented towards the general audience.<sup>34</sup> Calling ChatGPT a »research preview« seemingly freed OpenAI from the need to give more detailed technical explanations for the apparently miraculous – and job-threatening – abilities of the system. In my view, this was a deliberate strategy. On the one hand, everybody of course knew – like in the case of the 19<sup>th</sup>-century phantasmagoria – that there is a very concrete science and technology behind the workings of the apparatus. On the other hand, however, the incomplete knowledge of the technology used (like in the case of the projector that was hidden behind the screen in the phantasmagoria), and the imitation of supernatural phenomena (raisings of the dead in 19<sup>th</sup> century; ostensibly conscious machines in the 21<sup>st</sup>) both arguably drew on premodern patterns of thinking and contributed to the scope of the sensation.

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**31** David Foster: *Generative Deep Learning. Teaching Machines to Paint, Write, Compose, and Play*, 1<sup>st</sup> edition, Sebastopol, CA 2019, pp. 1–30 (Chapter 1 »Generative Modeling«). **32** »Google Trends: AI« (see note 11). **33** Brown et al.: »Language Models Are Few-Shot Learners« (see note 3).

**34** »ChatGPT«, OpenAI (see note 3).

Research on the strategies of product presentation employed by technology corporations has contributed to a sharpened understanding of the notion of a technology presentation and to a better view on the parallels between a technology presentation and the inner logic of a stage magic theatrical show.

Rather than being singular, threshold-like events during which a technology suddenly appears in front of a stunned audience, technology presentations are gradual, long processes during which a technology is usually refined and redefined multiple times. Often, imitations or carefully choreographed presentations that avoid disclosing the current technology's many shortcomings are used. Audiences are also routinely pre-selected and pre-sorted, with early spectators having to sign non-disclosure agreements that prevent them from speaking about the technology, followed by spectators from government and academia who are deemed less harmful if they disclose the technology's problems, and only then followed by journalists whom the companies see as the most powerful communicators, but also the group that can potentially harm the new technology's image the most.<sup>35</sup> Thus, technology presentations have even been described as »pure illusion«, »mutually agreed upon fiction« and »technological dramas that [...] limit or disable the critical sense of spectators«.<sup>36</sup>

In a connected sense, parallels have been shown to exist between stage magic and science presentations. Historically, magic shows, especially during the first half of the 19<sup>th</sup> century, incorporated numerous techniques and technologies from the science of their time. Conversely, the scientific presentations of this period often employed show-like elements to convey novel knowledge and to impress the audience. Especially important for the understanding of the deep cultural underpinnings of AI demonstrations is that, historically, the concealed use of technologies, helpers, and carefully scripted performances was often used in stage magic shows to produce »the mental impression of supernatural agency at work«. Common strategies used to achieve this goal can be sorted into simulation (of a non-existing entity, in this case of a supernatural cause for the illusions presented on stage) and dissimulation (the hiding of the real cause). Interestingly and counter-intuitively, partial disclosure of the underlying technology has also been employed for many centuries to enlarge the effect of the show or presentation: Doing so can help direct the attention of the audience towards the aspects the presenter wishes to be perceived, constructing a »particular witnessing« of the technology or trick on display.<sup>37</sup> Overall, today's genre of AI demonstrations is a heir to a large group of historical predecessors not all of which foregrounded openness and transparency.

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**35** Elena Simakova: »RFID ›Theatre of the Proof‹: Product Launch and Technology Demonstration as Corporate Practices«, in: *Social Studies of Science* 40, 2010, pp. 549–576, <https://doi.org/10.1177/0306312710365587>.

**36** Claude Rosental: »Toward a Sociology of Public Demonstrations«, in: *Sociological Theory* 31, 2013, pp. 343–365, <https://doi.org/10.1177/0735275113513454>.

**37** Wally Smith: »Technologies of Stage Magic: Simulation and Dissimulation«, in: *Social Studies of Science* 45, 2015, pp. 319–343, <https://doi.org/10.1177/0306312715577461>.

Returning to the historical phantasmagoria, it can be assumed that, in 1801, Paul de Philipsthal probably only had short-term monetary goals for his shows. By contrast, the AI demonstrations staged by OpenAI and other industry-led research institutions do not generate any immediate income (they are free to use, at least during the initial period), and their development and deployment are very costly endeavors, with high salaries for the specialist researchers, and high hardware and energy costs for the technical infrastructure. Beyond them being advertisements for future uses of the AI technology owned by the respective company, the spectacular demonstrations also seem to be large PR enterprises aimed at disseminating the company's discourse on AI and its role in society. A study of journalistic coverage of AI-related topics in the UK conducted in 2018 found that as much as nearly 60 per cent of all such publications revolved around an industry product, initiative, or announcement, with a third of all sources being affiliated with the industry.<sup>38</sup> One figure that, according to this study, came to especially dominate reporting is Elon Musk,<sup>39</sup> head of various global businesses, one of the central initial supporters and organizers of OpenAI, and the richest person in the world in 2022. In this aspect, the AI demonstrations of the early 21<sup>st</sup> century are indeed much different from the small-business-like atmosphere of 19<sup>th</sup>-century phantasmagoria.

Yet, at the same time, there is one more striking parallel between 19<sup>th</sup>- and 21<sup>st</sup>-century sensational demonstrations: In both cases the public's interest seems fixed on technologies that do not yet have a major effect on society while at the same time mostly ignoring the large-scale introduction of other technologies that do exhibit an enormous influence on many aspects of life.

A case in point is the current lack of public interest in the ubiquitous use of AI in recommendation engines – the systems that online retailers, social media companies, and streaming services such as Spotify use to offer visitors a limited palette of options, optimized for the individual customer on the basis of earlier data collected about the customer, other customers, and the products.<sup>40</sup> As has been argued in research, AI-enabled recommendation engines have by now largely displaced previous modes of distribution and consumption of music such as radio, television, and retail stores, »shaping cultural literacies as well as medium- and long-term trends in consumption and taste«.<sup>41</sup> Cultural bias in the choice of recommendations and the potential of recommendation system to standardize musical consumption across different cultures, especially favoring globally operating commercial producers, have been perceived as alarming signs by different bodies such

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**38** Brennen / Howard / Nielsen: »An Industry-Led Debate« (see note 6). **39** Art. »Elon Musk«, in: Wikipedia, 2.8.2025, [https://en.wikipedia.org/wiki/Elon\\_Musk](https://en.wikipedia.org/wiki/Elon_Musk) [5.8.2025]. **40** *Recommender Systems Handbook*, 3<sup>rd</sup> edition, ed. by Francesco Ricci / Lior Rokach / Bracha Shapira, New York, NY 2022,

<https://doi.org/10.1007/978-1-0716-2197-4>; Hyeyoung Ko et al.: »A Survey of Recommendation Systems: Recommendation Models, Techniques, and Application Fields«, in: *Electronics* 11, 2022, No. 1,

Art. no. 141, <https://doi.org/10.3390/electronics11010141>. **41** Georgina Born et al.: »Artificial Intelligence, Music Recommendation, and the Curation of Culture. A White Paper«, Schwartz Reisman Institute for

Technology and Society, CIFAR, University of Toronto, 2021, [https://srinstitute.utoronto.ca/s/Born-Morris-et-al-AI\\_Music\\_Recommendation\\_Culture.pdf](https://srinstitute.utoronto.ca/s/Born-Morris-et-al-AI_Music_Recommendation_Culture.pdf) [5.8.2025].

as the UK government which has commissioned a detailed report on these problems.<sup>42</sup>

It is therefore notable that the percentage of online searches for »AI« mentioned above remained relatively constant while the recommendation engines revolutionized online businesses over the preceding years, and only rose significantly when the sensational demonstration of ChatGPT reached the masses. In a sense, this situation seems to follow the same pattern as in 19<sup>th</sup>-century Britain, where industrial-scale use of new power sources such as coal and of new production technology was already existing, and expanding, in certain areas of the country, but the public gathered to see not the steam engine in the factory, but the ghosts of the dead, dancing on a screen, created by a projector.

In my view, this behavior can be explained by the same difference that operates inside E.T.A. Hoffmann's *The Automata*: The technologies used ubiquitously by the industry do not cause the same level of interest because in the eyes of the public they seemingly »only« involve reproduction, or playback, and not the much more sensitive area of creativity. The orchestrion does not create anything new in the same sense that the aeolian harp does. Nor does the recommendation engine of Spotify create new works, unlike ChatGPT and similar systems.

Accordingly, the relation between social importance and the level of interest seems to be inverted in the case of industry-used and publicly-demonstrated AI: The systems that currently have the least real impact on production, consumption, economy, and culture (the demonstrations) receive the most interest while the systems that power some of the biggest industries like online retail and streaming remain relatively unseen. Hundreds of millions of people currently use the audio streaming service Spotify. Spotify offers, like its many competitors, access to a vast and constantly expanding library of recordings, primarily in exchange for a paid subscription<sup>43</sup> (although advertisement-based listening is also possible). Recommendation is at the core of user experience with Spotify: the system attempts to produce personally fitting recommendations whenever a user starts the Spotify application, searches for a name or title, or listens to a title, in exchange producing the very data that the system can use to optimize and personalize recommendations even more. A vast technical universe with numerous interdependent AI systems tailored for use in specific parts of the application, and serving and storing unimaginable amounts of audio and user input, Spotify's recommendation engine is arguably a much bigger and much more important actor in current society than any of the recent spectacular AI demonstrations.<sup>44</sup>

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**42** David Hesmondhalgh et al.: »The Impact of Algorithmically Driven Recommendation Systems on Music Consumption and Production – a Literature Review«, GOV.UK, 9.2.2023, <https://www.gov.uk/government/publications/research-into-the-impact-of-streaming-services-algorithms-on-music-consumption/the-impact-of-algorithmically-driven-recommendation-systems-on-music-consumption-and-production-a-literature-review> [5.8.2025]. **43** »Spotify Quarterly Results. Financial Statements. 2022 Q4«, Spotify Investors, n. d., <https://investors.spotify.com/financials> [5.8.2025]. **44** Maria Eriksson et al.: *Spotify Teardown: Inside the Black Box of Streaming Music*, Cambridge, MA 2019; Dmitry Pastukhov: »Inside Spotify's Recom-

## Outlook

There exists yet another sense in which Spotify's industrial-scale use of AI for recommendation is important for today's and tomorrow's culture – in addition to the ways in which the design choices made by the creators of this enormous system might impact cultural consumption around the world. Spotify and similar companies capture enormously detailed and broad data on the listeners' engagement with music – which pieces does a user listen to, in which succession, for how long, and at which time of day, which pieces get to be collected in the same playlist, and so on. This gigantic, and constantly growing, mount of data is additionally expanded by both manually-created descriptions such as titles and artist names and by computationally-derived analyses of audio, offering both low-level (like tempo) and high-level descriptors (like »positivity«).<sup>45</sup>

In the history of science, it is a widely influential, even if sometimes contested and adapted, idea that change in theoretical thinking comes in the shape of paradigm shifts: At some point, as new measurements can no longer be adequately explained by the existing theory, a new theory emerges, followed by a period of relative stability until a new shift is due because of new, contradicting data.<sup>46</sup> In my view, the large collections of data about user interaction with music that have now been created by music streaming services constitute just such a new kind of measurement that might lead to a paradigm shift in musical thinking and theory. This is both an opportunity, as it enables novel areas of research, and a problem<sup>47</sup> because of ethical issues of collecting and using listener's data and because of the disbalance in power that the ownership of this data creates between the company and the researcher who needs to ask the company for access.

For now, this unprecedented build-up of musical data and technical knowledge about working with music has been going on mostly uncontested by the general public. The service offered – the recommendation of new, and fitting, music and other types of audio for every imaginable user group and situation seems to justify the means by which it is created – the continuous aggregation and AI-based modelling of users and content. But what if a music-streaming company suddenly

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mender System: A Complete Guide to Spotify Recommendation Algorithms«, Music Tomorrow, 9.2.2022, <https://www.music-tomorrow.com/blog/how-spotify-recommendation-system-works-a-complete-guide-2022> [5.8.2025]. <sup>45</sup> Eriksson et al.: *Spotify Teardown* (see note 44); Pastukhov: »Inside Spotify's Recommender System« (see note 44); »Get Track's Audio Features«, Spotify for Developers. Web API References, 2023, <https://developer.spotify.com/documentation/web-api/reference/get-several-audio-features> [5.8.2025]. <sup>46</sup> Thomas S. Kuhn: *The Structure of Scientific Revolutions*, Chicago 1962; Rens Bod: *A New History of the Humanities. The Search for Principles and Patterns from Antiquity to the Present*, Oxford 2013. <sup>47</sup> Nikita Braguinski: »Steht die Musiktheorie vor einem End of Theory?«, in: *kontrovers. Debatten zur Musikwissenschaft* (Blog), 14.1.2023, <https://kontrovers.hypotheses.org/2164> [5.8.2025].

started to automatically generate not just playlists of similar recordings, but new works? What if it became able to generate, on a mass scale, individually tailored works (or variations of works) that reacted to the massive listening profiles of individuals, groups, and whole societies?<sup>48</sup> Would that violate the boundaries of human exclusivity, encroaching upon the territory of creativity? Would it turn the orchestrion of Spotify into an aeolian harp?

## Abstract

### *AI Demonstrations as Phantasmagorias of the Early 21<sup>st</sup> Century*

This article draws a historical parallel between the phantasmagoria shows of the late 18<sup>th</sup> and early 19<sup>th</sup> centuries and the contemporary public spectacle surrounding artificial intelligence demonstrations, especially in the sphere of music. Phantasmagorias – stage entertainments using magic lanterns to conjure ghostly images – thrived during a period of technological upheaval, mirroring today's fascination with AI technologies amidst another industrial shift. The article argues that both phenomena blend scientific advancement with elements of spectacle and perceived magic, obfuscating the technical mechanisms behind them to evoke a sense of awe.

Drawing on E.T.A. Hoffmann's literary depictions of automata, and particularly contrasting playback devices like the orchestrion with the more generation-oriented ones like the aeolian harp, the article explores how the boundary between reproduction and creativity continues to influence public perceptions of machine intelligence. The mass fascination with AI's generative capabilities – often perceived as creative and thus threatening the boundary around exclusively human abilities – is contrasted with the muted response to the societally much more relevant recommendation engines like those used by Spotify, despite their profound impact on cultural consumption and taste.

As a whole, the article critiques the asymmetry in public attention, suggesting that the theatricality of AI demonstrations serves industrial agendas while diverting attention away from less visible, yet socially transformative, applications of AI. In this sense, today's AI demonstrations, including those of musical technologies, continue the legacy of the phantasmagoria show: as spectacles that enchant, distract, and shape public narratives about music technology.

### *KI-Demonstrationen als Phantasmagorien des frühen 21. Jahrhunderts*

Dieser Artikel zieht eine historische Parallele zwischen den Phantasmagorie-Shows des späten 18. und frühen 19. Jahrhunderts und dem zeitgenössischen öffentlichen Spektakel rund um Demonstrationen künstlicher Intelligenz, insbesondere im Bereich der Musik. Phantasmagorien – Theateraufführungen, bei denen mit Hilfe einer Laterna magica Geisterbilder beschworen wurden – erlebten ihre Blütezeit in einer Zeit des technologischen Umbruchs und spiegeln die heutige Faszination für KI-Technologien in-

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**48** Braguinski: *Mathematical Music* (see note 25), pp. 93–102 (Chapter 12 »Mass-Produced and Still Individual«). Abstract: <https://www.taylorfrancis.com/chapters/mono/10.4324/9781003229254-15/mass-produced-still-individual-nikita-braguinski> [5.8.2025].

*The author would like to thank the anonymous reviewer for their careful reading of the text and for their suggestions.*

mitten eines weiteren industriellen Wandels wider. Der Artikel legt dar, dass beide Phänomene den wissenschaftlichen Fortschritt mit Elementen des Spektakels und der vermeintlichen Magie vermischen und die technischen Mechanismen dahinter verschleiern, um ein Gefühl der Ehrfurcht hervorzurufen.

Ausgehend von E. T. A. Hoffmanns literarischen Darstellungen von Automaten und insbesondere durch die Gegenüberstellung von Abspielautomaten wie dem Orchestrion und den eher auf Tonerzeugung orientierten Instrumenten wie der Äolsharfe untersucht der Artikel, wie die Grenze zwischen Reproduktion und Kreativität weiterhin die öffentliche Wahrnehmung von maschineller Intelligenz beeinflusst. Die massenhafte Faszination für die generativen Fähigkeiten der KI – die oft als kreativ wahrgenommen werden und somit eine Bedrohung der Grenze zu ausschließlich menschlichen Fähigkeiten darstellen – steht im Gegensatz zur verhaltenen Reaktion auf die gesellschaftlich viel relevanteren Empfehlungsmaschinen wie die von Spotify genutzten, trotz ihrer tiefgreifenden Auswirkungen auf den kulturellen Konsum und Geschmack.

Insgesamt kritisiert der Artikel die Asymmetrie der öffentlichen Aufmerksamkeit und legt den Schluss nahe, dass die Theatralik von KI-Demonstrationen der industriellen Agenda dient und die Aufmerksamkeit von weniger sichtbaren, aber gesellschaftlich transformativen Anwendungen der KI ablenkt. In diesem Sinne führen die heutigen KI-Demonstrationen, einschließlich derjenigen von Musiktechnologien, das Erbe der Phantasmagorie-Show fort: als Spektakel, das verzaubert, ablenkt und öffentliche Narrative über Musiktechnologie prägt.

## Autor

**Nikita Braguinski** is a musicologist and a media scholar. In his work he concentrates on the interplay of musical and technological factors in musical media – from the automata of the 19<sup>th</sup> century to the multimodal models of today's artificial intelligence. His second book *Mathematical Music. From Antiquity to Music AI* (Routledge, 2022) is an introduction to the history and current state of mathematics-inspired musical practice, including the use of AI. He was a 2023–24 fellow of the Käte Hamburger Kolleg »Cultures of Research« at RWTH Aachen University and has held postdoctoral positions at Harvard University and Humboldt University of Berlin, among other academic institutions. In 2023 he co-convened the ZIF Bielefeld research group »The Future of Musical Knowledge in the Age of Machine Learning«.

**Nikita Braguinski** ist Musikwissenschaftler und Medienwissenschaftler. In seiner Arbeit konzentriert er sich auf das Zusammenspiel von musikalischen und technologischen Faktoren in musikalischen Medien – von den Musikautomaten des 19. Jahrhunderts bis zu den multimodalen Modellen der heutigen künstlichen Intelligenz. Sein zweites Buch *Mathematical Music. From Antiquity to Music AI* (Routledge, 2022) ist eine Einführung in die Geschichte und den aktuellen Stand der mathematisch inspirierten Musikpraxis, einschließlich des Einsatzes von KI. Er war 2023–2024 Stipendiat des Käte Hamburger Kollegs »Kulturen der Forschung« an der RWTH Aachen und hatte unter anderem Postdoc-Stellen an der Harvard University und der Humboldt-Universität zu Berlin inne. Im Jahr 2023 war er Mitbegründer der ZIF-Forschungsgruppe »The Future of Musical Knowledge in the Age of Machine Learning« an der Universität Bielefeld.