

Research Reports

Harmonizing With Machines: A Quantitative Exploration of AI Coverage in German Music Magazines

Mit Maschinen harmonisieren: Eine quantitative Inhaltsanalyse zur Berichterstattung zu KI in deutschen Musikzeitschriften

Nicolas Ruth^{*1} , Kristin Marie Zickler¹

[1] Institute of Cultural Management and Media, University of Music and Theatre Munich, Munich, Germany.

Abstract

In the zeitgeist of the 21st century, artificial intelligence (AI) has emerged as a focal point of discussions across various domains, from its applications in everyday life to its implications in creative fields. Music culture and the music industry have not remained untouched. This empirical study examines the portrayal of AI in German music-focused print magazines between 2016 and 2022, a period marked by significant advancements in AI, including its foray into artistic creation. Through a quantitative content analysis of 10,344 articles from prominent music publications, a mere 0.67% were found to engage with the topic of AI. The data reveals a noticeable uptick in such articles from 2019 onward. This study elucidates the multifaceted perceptions and evaluations of AI with the help of framing theory and the technology acceptance model. The findings indicate a predominantly neutral stance, with variations across different magazines. Most magazines treat AI as a noteworthy topic, but not a central one. Thus, only a few articles address technology acceptance or relevant factors pertaining to it. Based on these findings, this article examines the implications for musicians and experts in the music media sector, along with future research approaches.

Keywords: artificial intelligence, music media, quantitative content analysis, technology acceptance model, framing

Zusammenfassung

Im Zeitgeist des 21. Jahrhunderts hat sich künstliche Intelligenz (KI) als zentraler Diskussionspunkt in verschiedenen Bereichen herauskristallisiert. Dabei werden Anwendungen im Alltag bis zu Auswirkungen in kreativen Feldern besprochen. Die Musikkultur und -industrie blieb davon nicht unberührt. Diese empirische Studie untersucht die Darstellung von KI in deutschen Musikfachzeitschriften zwischen 2016 und 2022, einer Zeit, die durch bedeutende Fortschritte in der KI gekennzeichnet ist, einschließlich ihres Einzugs in künstlerische Schöpfungen. Durch eine quantitative Inhaltsanalyse von 10.344 Artikeln aus prominenten Musikpublikationen wurde festgestellt, dass nur 0,67% das Thema KI thematisieren. Die Daten zeigen einen deutlichen Anstieg solcher Artikel ab dem Jahr 2019. Mit den Rahmenkonzepten der Framing-Theorie und dem Technology Acceptance Model beleuchtet diese Studie die vielschichtigen Wahrnehmungen und Bewertungen von KI. Die Ergebnisse deuten auf eine überwiegend neutrale Haltung hin, wobei es Unterschiede zwischen verschiedenen Magazinen gibt. Die meisten Zeitschriften behandeln KI als bemerkenswertes, jedoch nicht zentrales Thema. Daher gehen nur wenige Artikel auf die Technologieakzeptanz oder dafür relevante Faktoren ein. Basierend auf den Ergebnissen werden Implikationen für Musiker*innen und Expert*innen im Musikmediensektor sowie zukünftige Forschungsansätze diskutiert.

Schlüsselwörter: künstliche Intelligenz, Musikmedien, quantitative Inhaltsanalyse, Technologieakzeptanzmodell, Framing

Jahrbuch Musikpsychologie, 2024, Vol. 32, Artikel e177, <https://doi.org/10.5964/jbdgm.177>

Eingereicht: 2023-09-20. Akzeptiert: 2023-12-05. Publiziert (VoR): 2024-01-19.

Begutachtet von: Holger Schramm; Jörg Mühlhans.

*Korrespondenzanschrift: Institute of Cultural Management and Media, University of Music and Theatre Munich, Hans-Preißinger-Straße 6, 81379 München, Germany. E-mail: nicolas.ruth@hmtm.de



Dieser Open-Access-Artikel steht unter den Bedingungen einer Creative Commons Namensnennung 4.0 International Lizenz, CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/deed.de>). Diese erlaubt für beliebige Zwecke (auch kommerzielle) den Artikel zu verbreiten, in jedem Medium zu vervielfältigen, Abwandlungen und Bearbeitungen anzufertigen, unter der Voraussetzung, dass der Originalartikel angemessen zitiert wird.

In recent years the rise of artificial intelligence (AI) has been notable and significant. Beyond transforming industries and automating mundane tasks, AI's influence has permeated cultural domains, most notably the arts and entertainment sectors. This amalgamation of technology and creativity, two fields sometimes believed to exist almost in antithesis, has reshaped public discourse, provoking both admiration and apprehension.

A demonstration of the growing prominence of AI in the cultural milieu is the completion of Beethoven's unfinished 10th Symphony using machine learning. This somewhat controversial endeavor pushed the boundaries of AI's capabilities, triggering debates about authenticity, creativity, and the role of machines in artistic processes (see, e.g., Gaubert, 2021). Yet, it was neither an isolated incident nor the pinnacle of AI's musical ventures.

Music fans witnessed another stir when a song titled "Heart on My Sleeve" went viral on social media platforms, especially on TikTok (see, e.g., Coscarelli, 2023). Remarkably, this tune was not the product of chart-topping artists Drake and The Weeknd, as many believed, but was instead synthesized by an AI model imitating their styles. Such creations, blurring the lines between human artistry and computational prowess, underscore AI's growing influence in the musical landscape. Recently, AI has emerged as a focal point of discussions across various domains, including its rapidly expanding role in the realm of music. Despite this mounting interest, public understanding of AI and its implications, particularly in the creative fields, remains unclear. For the vast majority, media outlets serve as the primary source of information about AI, playing a pivotal role in shaping perceptions and responses to this evolving technology. As highlighted by Sun et al. (2020), the manner in which the media covers AI can significantly influence how the public, including those in the music industry, perceive and react to these technological advancements.

In the past, research has shown that media portrayals can sway the public in forming opinions or judgments about emerging technologies (Scheufele & Lewenstein, 2005). This may be especially true in the field of music, a sector traditionally characterized by the interplay of art and technology. Musicians, producers, and music enthusiasts often rely on specialized media to stay abreast of the latest trends and innovations, including those pertaining to AI. The music media's portrayal of AI, therefore, may not only inform but also affect the industry's collective approach to these technologies. Whether AI is depicted as a tool for groundbreaking creativity or as a disruptive force challenging the status quo, these narratives can impact the adoption of, utilization of, and public sentiment towards AI in music.

It seems, there is a pressing need to systematically explore how journalists and experts working in music media are covering the AI phenomenon, which in turn could impact the positive or negative way that the music-interested public views the technology. This study seeks to address this gap by focusing on German music print magazines between 2016

and 2022. As one of the key music media sectors, it offers empirical insights into the portrayal and perception of AI within the musical domain.

Theoretical Background

The intersection of technology and art, while not a novel concept, has garnered intensified scrutiny with the advent of AI. This heightened focus demands an exploration of the theoretical underpinnings and existing academic discourse surrounding AI's influence, especially within the realm of music. A review of the foundational texts and prevailing theories provides a framework for this study and context for the empirical findings that follow.

Media Discourse on AI and Its Implications in Music

As AI continues to integrate itself into various aspects of society, its reception and representation in the media offer valuable insights. Understanding the narratives surrounding AI facilitates the discernment of public perception, potential societal implications, and broader dialogues around the topic.

Sun et al.'s (2020) study explored the changing portrayal of AI in newspapers, indicating the evolving narrative and prominence of the subject matter over the years. A key study from 2012 (Cacciatore et al., 2012) cited by Sun et al. (2020) compared the coverage of emerging technologies across print and online media. This research serves as a foundational lens to understand the historical evolution of technology discourse in the media. Their study found that most media coverage emphasized the novelty of the technology and used terms like AI revolution, but in terms of framing they found there to be two sides, the negative and the positive. While the positive coverage outweighed the negative in numerical terms, the negative coverage sometimes used more sensational ideas like killer AI and AI bias to negatively frame the technology. The positive side, in their view, focused on the pragmatic and economically optimistic arguments. Using these gain and loss frames, the following literature review will show the positive and negative aspects of the technology that are discussed in general, and in particular with regard to AI in music.

Negative Implications

Bao et al. (2022) undertook a comprehensive examination of how diverse sections of the U.S. public perceived the risks and benefits associated with AI for society and democracy. Through latent class analysis of survey data, they identified five population segments (the negative, the ambivalent, the tepid, the ambiguous, and the indifferent) based on their AI-related perceptions. Notably, no segment was totally positive about the technology, but various segments saw both risks and benefits, while the one segment that saw many more risks than positives is the largest group, consisting of a third of the total sample. The risks mentioned in the survey were that AI will increase social inequality, give some people too much power, threaten personal liberties, change what it means to be human, and displace workers by automating their jobs.

In a more specific field, the increasing application of AI in journalism has been a focal point of discussions within the media industry. Moran and Shaikh's (2022) thematic analysis reveals a tension between the journalism industry and how AI tools and automation is used in newsrooms and the role of journalists in the age of digitalization. The main concern of people is that they will be replaced by AI because it can handle many tasks faster and more efficiently.

When it comes to the field of music, the nature of creativity itself is central to this discussion. It raises considerations about the true essence of creativity and whether machines can genuinely possess creativity or if they simply mimic patterns from existing data. Margaret Boden (2018), a renowned expert in the study of creativity and AI, offers an insightful classification of machine creativity. She divides it into three categories: combinational, exploratory, and trans-

formational. Combinational means creativity that involves combining familiar ideas in novel ways; exploratory stands for exploring the possibilities and variations within a defined conceptual space or set of rules; while transformational creativity is the most radical form, where AI changes the rules of the conceptual space itself. Each of these signifies distinct ways in which AI can manifest or mimic creativity. But the nature of AI creativity may differ from human creativity.

Cope's (1989) work provides an additional dimension to this narrative. His endeavors in employing AI to craft classical compositions have received both acclaim and critique, thereby spotlighting the ongoing debate surrounding AI's legitimate space in musical creativity. This reflects how people are particularly skeptical about the use of new technology in creative processes. This may be an area where the music media focuses on the negative implications.

Positive Implications

Looking at journalism again, Pavlik's research in 2023 (Pavlik, 2023) stands out as a pioneering endeavor, not just in its subject matter, but also in its methodology. The essay, co-authored by a seasoned journalism and media professor alongside ChatGPT, offers a first-hand experience and exploration of the possibilities and limitations of generative AI in journalism. While the creative process was still the task of the author, AI helped to streamline certain non-creative tasks.

When it comes to the musical domain, early studies have already explored the ways in which AI can be applied in the musical context. Roads (1980, 1985) delves deep into the convergence of AI and musical elements. This early exploration encompasses everything from the intricacies of composition and orchestration to the very act of performance, presenting a comprehensive understanding of AI's capabilities and how it can positively help in the musical process.

Moreover, as AI continues to craft its musical symphonies, the reception of these compositions by the audience becomes a critical point of discussion. The study, controversially titled "Are you ready for artificial Mozart and Skrillex?" by Hong and colleagues (2021) offers a fascinating insight using expectancy violation theory. Their study delves into listener reactions to AI-generated music and shows that, for example, participants who thought the given music surprisingly exceeded their expectations of AI-composed music gave more positive ratings than participants who expected AI-composed music to be of high quality. Furthermore, they found that people who tend to accept AI technology are more likely to enjoy AI-composed music. Although some people remain skeptical about AI in music, this research indicates that others feel positive or can even be swayed towards taking a positive view of AI.

Implications of Media Coverage on Perception

The impact of media coverage on public attitudes towards AI, as explored in Choi's (2023) study, highlights the significant role of framing in shaping public perception. As demonstrated in earlier sections, the representation of a transformative technology like AI in the media can manifest in various forms, oscillating between positive and negative portrayals. This variance is particularly pertinent in fields where AI has a profound impact, such as in music.

Given the influential role of the media in framing technological advancements, it becomes crucial to understand how music media experts navigate the narrative surrounding AI's integration into music. Do they perceive and report on AI as a positive force that drives innovation and creativity, or do they cast it in a more cautionary light, emphasizing the potential risks and ethical concerns?

This study seeks to unravel these narratives, aiming to discern whether the music media's coverage of AI leans towards optimism or skepticism. Such an inquiry is vital, as it sheds light on how music professionals, equipped with a blend of musical expertise and cultural context, influence the opinions of a music-interested public.

Thus, the central question guiding this study is: How do music media experts report and frame AI's foray into music?

Framing Theory and the Technology Acceptance Model (TAM)

Framing theory offers a compelling lens through which we can examine how topics, particularly those with significant societal implications like AI, are presented in the media. According to Entman (1993), to frame is to "select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation" (p. 52). In the context of AI and music, how journalists frame the conversation can significantly impact public perception and acceptance of this technological integration. Sun et al.'s (2020) study on newspaper coverage of AI underscores the potential of framing to paint AI in various lights, ranging from an innovative advantage to a societal threat. In this study, we will investigate the perceived orientation towards AI within the context of the music media. Our approach is anchored in the theoretical framework of framing, which will guide our analysis in discerning the overall sentiment toward the technology. Rather than compiling a comprehensive list of factors that contribute to the framing of AI, our focus will be on capturing the general tone and stance of the media coverage. This approach aims to provide a broad understanding of how AI is perceived in the realm of music, highlighting the prevailing attitudes rather than gathering framing components.

While framing provides insights into the narrative structures and tone, we also seek to delve deeper into the evaluative dimension of AI in music. To this end, we also use the TAM developed by Davis (1985, 1989, 1993). Rooted in the theory of reasoned action developed by Fishbein and Ajzen (1975, and also Ajzen & Fishbein, 1980), TAM suggests that perceived usefulness and perceived ease of use are determinants of technology acceptance. van der Heijden's (2004) extensions further enrich our understanding, suggesting that the hedonic quality of an innovation, meaning the ability of a technology to be enjoyed or used for enjoyment, especially in fields intertwined with creativity like music, can also influence acceptance. The TAM has previously been utilized in the context of music and technology, specifically in exploring the acceptance of music streaming software (Hampton-Sosa, 2017; Henning & Ruth, 2020). Together, framing theory and TAM provide a comprehensive toolkit to dissect the intricate ways music journalists navigate the confluence of AI and music.

AIMS (Pun Intended)

Drawing on our theoretical background, the media's coverage of AI has substantial implications on public perceptions, especially in a region with a variety of media and music traditions. We believe the unique juxtaposition of Germany's highly regarded musical tradition with its technological prowess provides a fertile ground for nuanced framings. Also, Germany presents a compelling case for such a study due to its rich musical history and its reputation as a hub for technological advancements (the musical history, variety of music cultures and overlaps between music with research, media and economy are described, for example, in the standard reference by Deutscher Musikrat, 2019). Furthermore, Germany's media landscape, like many others, is undergoing significant shifts due to the rise of digital technologies. Previous studies have highlighted the range of coverage and attitudes towards AI in different geographical contexts, such as the UK (Scott Brennen et al., 2018) and Spain (Albarrán Lozano et al., 2021). Given Germany's unique positioning in the global discourse on music and technology, understanding its media coverage will provide valuable insights. The focus of the study is on print music media, since print magazines and newspapers often offer longer, more in-depth coverage of topics, are trusted by their usually loyal readers and cater to specific interests (Nossek et al., 2015). It also follows the research approach of the key study by Sun et al. (2020). Thus, we propose the first research question:

1. How often has the German music print media reported on AI since 2016?

Moreover, our literature review underscores the central role of framing in shaping perceptions of AI, as well as the significance of technology acceptance in understanding its integration into fields like music. As such, examining the German music media's coverage and acceptance of AI is key to understanding the narratives, evaluations, and cultural sentiments that inform them. Therefore, our second research question is:

2. How has the technology been evaluated and accepted in the music print media?

Method

Quantifiable data from various outlets that cover many aspects of the music sector were needed and required investigation in order to analyze the trajectory of the discourse about AI in the music print media. A quantitative content analysis was chosen as the research method. Quantitative content analysis is a fertile research technique that is specifically tailored for the systematic, objective, and quantitative description of the manifest content of communication. One of the primary strengths of quantitative content analysis is the degree of objectivity it affords. The process relies on a predefined codebook, and by ensuring robust intercoder reliability it ensures that the findings from a study can be reproduced by other researchers when presented with the same set of data and coding instructions (see e.g., Rössler, 2017). Such a procedure becomes indispensable when investigating media texts, a domain where interpretations can often be subjective. The inherently quantitative nature of this method further enables comparative analyses, allowing media content to be compared across different time periods, types of publication, and other potential categorizations (Coe & Scacco, 2017). Such a comparative lens is vital for tracing the evolution of AI discourse in the music media over the years.

Aligning with a rich research tradition, the method of quantitative content analysis has been frequently deployed when investigating media coverage, a practice exemplified by studies like Sun et al. (2020). The choice of this method choice is thus not just methodological but also contextual, resonating with the broader scholarly efforts to understand media landscapes. Lastly, the insights derived from quantitative content analysis can serve as a foundation for more detailed qualitative analyses.

Data

The foundation of our analysis was built upon issues of music magazines spanning the years 2016 to 2022. This timeframe was selected to capture recent developments and shifts in the discourse around AI within the music realm. The year 2016 was selected as the commencement point due to the significant media attention surrounding the victory of Google's AI program AlphaGo over the European champion in the complex traditional Chinese board game Go (Borowiec, 2016). Drawing on a diverse range of publications ensured a holistic understanding of the topic across various niches and audiences in the music culture and industry. Our primary sources included notable German magazines that were chosen because they have the widest reach in their respective areas and therefore the highest potential for reaching and potentially affecting the largest audiences. The magazines selected were *Neue Musikzeitung*, which offers a newspaper-style discourse on contemporary music spanning classical, jazz, and pop genres, alongside discussions on cultural politics and the music business. We also consulted *Rondo*, renowned for its reviews and interviews centered on classical music and jazz, and *Musik & Bildung*, which emphasizes music education. Delving into the music industry's intricacies, we sourced insights from *Musikwoche*, while *Sound & Recording* provided a lens into the technical nuances of music recording. To ensure a rounded view, we also integrated perspectives from *Groove*, a magazine dedicated to electronic dance music, and *Backspin*, which specializes in hip hop content.

The magazines in this time span featured 10,344 articles. Groove and Backspin magazines both shifted to online-only versions during this time period and the number of online articles after the transition vastly exceeds the number of print articles. In order to avoid giving a false impression of article ratios between magazines, we did not incorporate every article from Groove and Backspin, but included relevant articles from both outlets in the analysis.

Our analytical focus was honed by examining the titles and subtitles of articles within these magazines. Only standard articles were assessed, excluding brief reviews and newflash-style short reports (often found in Musikwoche). We evaluated their relevance to the study by looking for specific keywords that denoted discussions related to AI and its associated technologies. The terms under scrutiny were "artificial intelligence", "AI", "neural networks", "machine learning", "algorithm" and their German equivalents. This keyword-based approach was augmented where possible by utilizing the online search functions for the whole texts provided by some of these magazines, ensuring that no relevant content was inadvertently overlooked.

In terms of context, the analysis was primarily concentrated on the specific content of each relevant article. However, to ensure a nuanced understanding, the broader context of the respective magazine was also taken into account. For instance, when analyzing a magazine's coverage of a concert or festival, it is crucial to consider the specific scope and focus of the magazine. This includes identifying whether the publication primarily caters to classical music, pop music, or another genre, as this context can significantly influence the nature and perspective of the coverage. This approach was vital in order to situate each article within the larger editorial direction and thematic thrust of the magazine, providing a layered understanding of how AI was framed and discussed in the domain of music.¹

Pilot Study

Prior to the main analysis, we conducted a pilot study with three coders to test and refine our coding procedure. This preparatory phase involved examining 20 articles specifically related to music and AI, sourced from three German news magazines: Spiegel, Focus, and Die Zeit. This process was vital to ensure consistent interpretation and application of our codebook across different coders. Throughout the pilot study, we performed reliability tests, which facilitated iterative modifications to the codebook. These adjustments were essential in guaranteeing precision and consistency in our final main content analysis.

Variables

To ensure a systematic and comprehensive analysis of the articles, we developed a detailed codebook based on insights from previous studies and the frameworks of the two primary theories discussed: framing theory and the TAM. The codebook outlined specific variables that encapsulated the formal, content and evaluative aspects of the articles. These variables were vital in deciphering the nuanced representations and evaluations of AI in the media coverage. The r_H values indicate Holsti's reliability coefficient for each category, showcasing the consistency of the coding process during the pilot study across different coders. A description of each variable is given below:

— Decision Category —

- *Relevance to AI topic*: Determines if the content is pertinent to the theme of AI.

1) All analysis scripts and data are accessible through the Github repository of the first author (see Supplementary Materials).

— Formal Categories —

- *Date*: The publication date of the article.
- *Magazine*: The specific magazine in which the article was published.
- *Section*: The section or category under which the article was categorized in the magazine.
- *Article Title*: The headline of the article.
- *Authors*: The names of individuals who authored the article.
- *Type of Article*: The specific format or style of the article (e.g., interview, feature, review).

— Content Categories —

- *AI Theme* ($r_H = 0.97$): The specific topic or angle of AI being discussed or addressed in the article.
- *General Reference Theme*: The broader context or subject that the article relates to, beyond just AI.
- *Actors*: Key persons or figures highlighted or mentioned in the article.
- *Involved Companies*: Companies or businesses that are a focus or are mentioned in the article.

— Evaluative Categories —

- *Orientation (Framing, $r_H = 0.87$)*: The positive or negative lens through which AI is presented or discussed was rated on a 5-point scale ranging from -2 to 2. The scale points were described as "rejecting", "negative", "neutral", "positive" and "favorable".
- *Perceived ease of use (TAM, $r_H = 0.87$)*: Assesses the perceived ease of use or accessibility of AI technology, coded on a scale from -1 (no ease of use) over 0 (neutral) to 1 (ease of use), based on the TAM.
- *Perceived usefulness (TAM, $r_H = 0.87$)*: The perceived value or advantage of using AI, ranging from -1 (not useful) over 0 (neutral) to 1 (useful), based on the TAM.
- *Perceived enjoyment (TAM, $r_H = 0.93$)*: The extent to which AI is portrayed as engaging or entertaining, coded from -1 (not enjoyable) over 0 (neutral) to 1 (enjoyable), based on the TAM.

Average Reliability ~ 0.9 : This indicates that the reliability of the categories, on average, is high, which means the variables are consistently and accurately measured.²

Procedure

Following the refinements made in the pilot study, our team embarked on the main coding phase. Each article identified as relevant for the study was independently reviewed and coded by a trained coder. Coders were provided with the revised codebook, which included detailed definitions of each variable, examples, and coding instructions. This ensured a consistent understanding of each category and promoted reliability across coders.

To mitigate potential subjectivity and bias, coders were instructed to adhere strictly to the codebook and refrain from making assumptions or interpretations beyond the content of the article. In instances of ambiguous or unclear content, coders were advised to consult with the team, ensuring collective decision-making for consistency.

2) The codebook (written in German) is available in the [Supplementary Materials](#).

At regular intervals, team meetings were held to discuss any emerging challenges or discrepancies in coding. These meetings were crucial in maintaining a high level of inter-coder reliability. Once the coding process was complete, data was collated and prepared for subsequent analysis.

Results

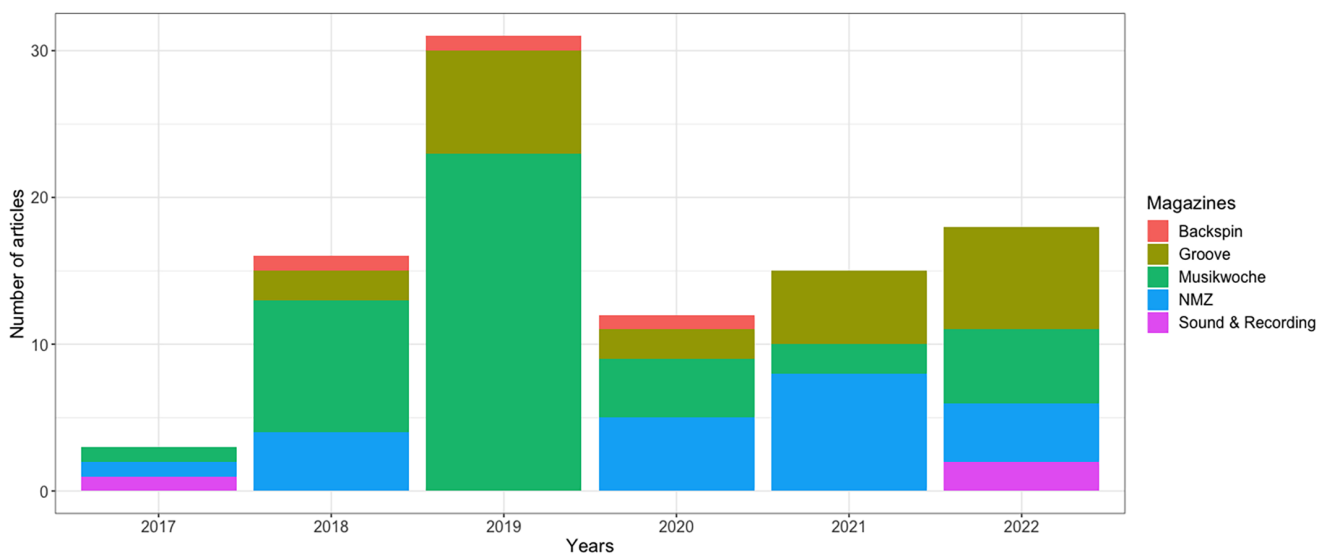
The quantitative content analysis of the selected German music publications from 2016 to 2022 yielded a dataset that sheds light on how AI has been covered in the realm of music. Over the six-year span, a total of 95 articles were identified that specifically discussed AI in the context of music. 34 articles (36%) focused directly on AI's impact and presence in music, while the remainder (64%) mentioned AI tangentially, typically within broader topics such as technological advancements in music production or industry trends.

Frequency of Reporting

The frequency with which AI was discussed in the context of music fluctuated throughout the years. It became evident that there was an uptrend in discussions about AI from 2016 to 2019 with a visible peak of publications in 2019 and a drop in 2020, followed by another smaller uptrend to 2022 (see Figure 1). There were no articles related to AI in 2016.

Figure 1

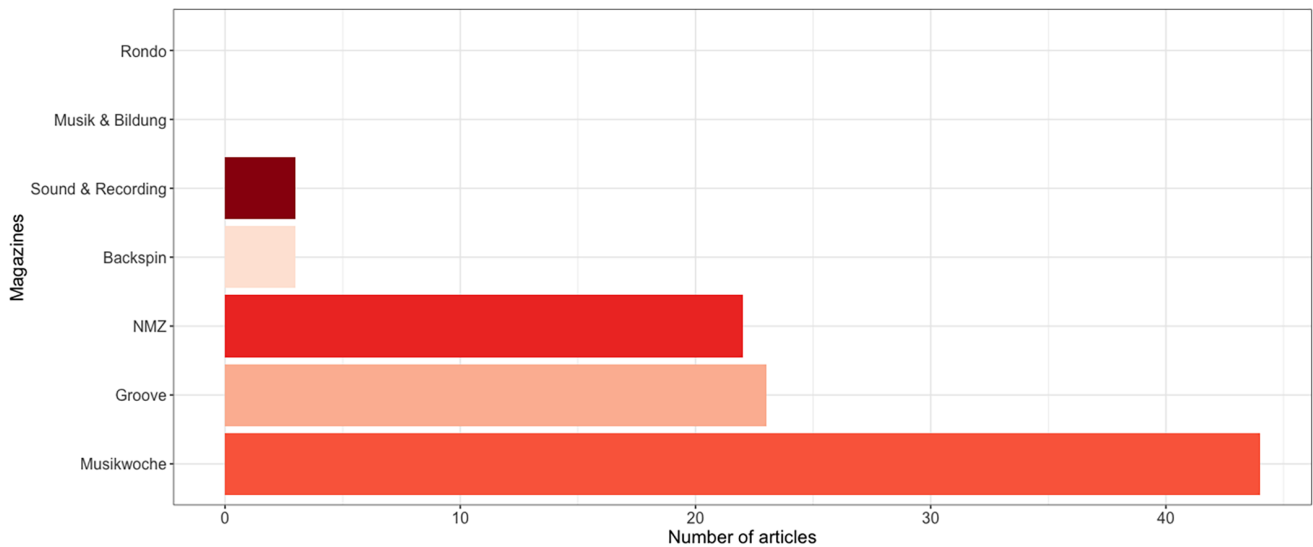
Number of AI-Related Articles Between 2016 and 2022, N = 95



Notably, differences emerged when comparing the various magazines, revealing distinct editorial focuses (see Figure 2). Two magazines had no articles on AI at all, while the music business-focused magazine Musikwoche featured the most articles related to AI. Relative to the number of total articles per magazine, Musikwoche is the magazine that covers AI most in terms of absolute and relative numbers, with 1.25% of articles about AI. 0.5% of Sound & Recording's articles covered AI, and Neue Musikzeitung had 0.45% of articles about AI. The total numbers of Groove and Backspin articles were not cumulated since both magazines shifted from print to online publications and there were disproportionately more articles online than previously in print.

Figure 2

Number of AI-Related Articles per Magazine, $N = 95$



General Reference Topic

When observing the broader contexts within which AI was discussed, a variety of themes emerged. Whether it was in the context of music production, music distribution, or research, the versatility of AI's role was evident (see Table 1).

Table 1

General Reference Topics in AI-Related Articles (Other Topics Only Had One Article Each), $N = 95$

General reference topic	Number of articles
Music production	27
Research	14
Conferences	11
Music festivals	9
Music distribution	6
Music management	5
Copyright	4
Ticket sales	4
Composing	3

Article Framing

The general sentiment or stance of the articles towards AI was another focal point. The spectrum ranged from articles that were dismissive or critical of AI's role in music, to those that were optimistic or outright supportive of AI's potential. Nevertheless, most articles were written in a neutral style (see Figure 3).

Figure 3

Overall Framing of AI Technology in Relevant Articles From Music Magazines Between 2016 and 2022, $N = 95$

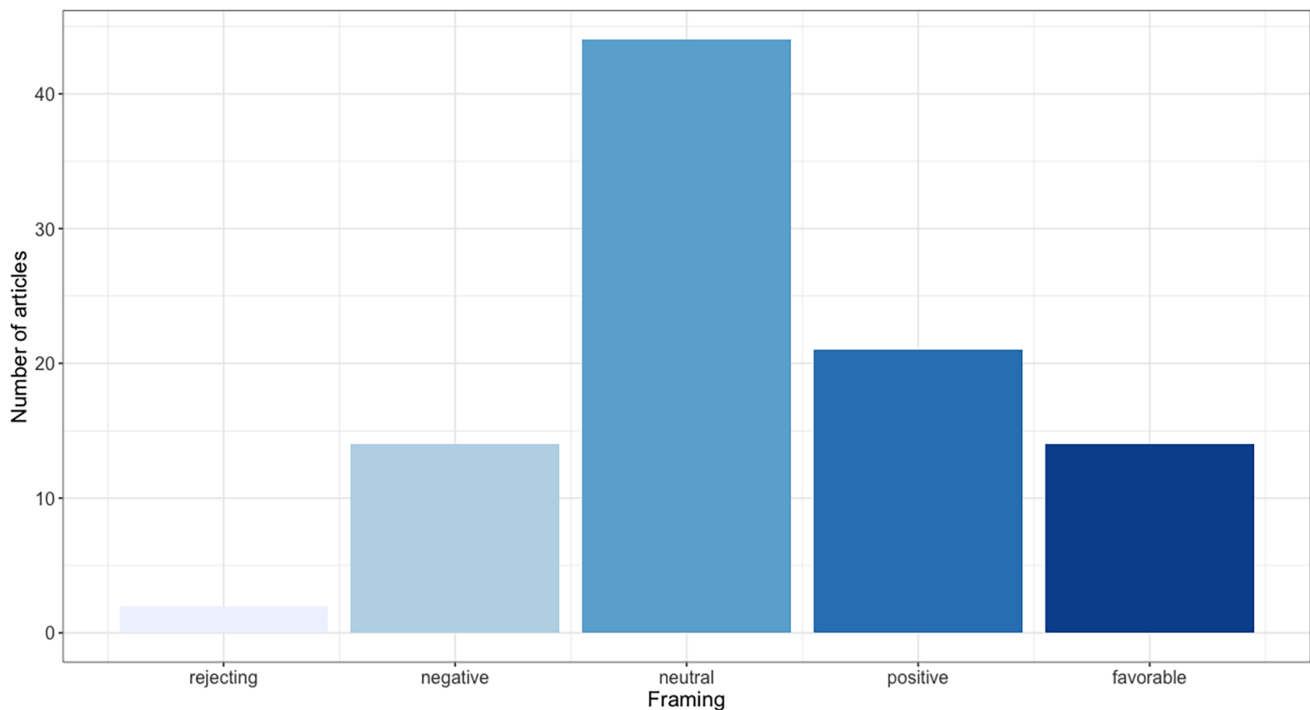


Table 2 highlights the magazines with the most positive framing towards AI and music topics (Musikwoche) compared to those with the most negative framing (Backspin). Three magazines were found to be tendentially positive about AI. Only Sound & Recording was neutral and Backspin slightly negative in their coverage.

Table 2

List of Magazines Ordered From Most Positive to Most Negative Framing, $N = 95$

Magazine	<i>M</i>	<i>SD</i>
Musikwoche	0.523	0.792
Groove	0.261	0.964
NMZ	0.136	1.28
Sound & Recording	0	1
Backspin	-0.333	0.577

Following the framing and the main topics, we wanted to investigate whether certain topics were framed more positively than others through the lens of AI. Table 3 shows that music production is the topic where we find the most negatively framed articles, whereas with topics about technical rather than creative processes, like music distribution or ticket sales, the sentiment is more positive about AI. Topics like conferences and music festivals are the most neutral. This can be explained by the nature of these articles, which tend to be descriptive reports on topics covered at conferences in the form of talks, workshops or keynote speeches.

Table 3

Framing of AI-Related Articles by Most Prominent Reference Topics, $n = 83$

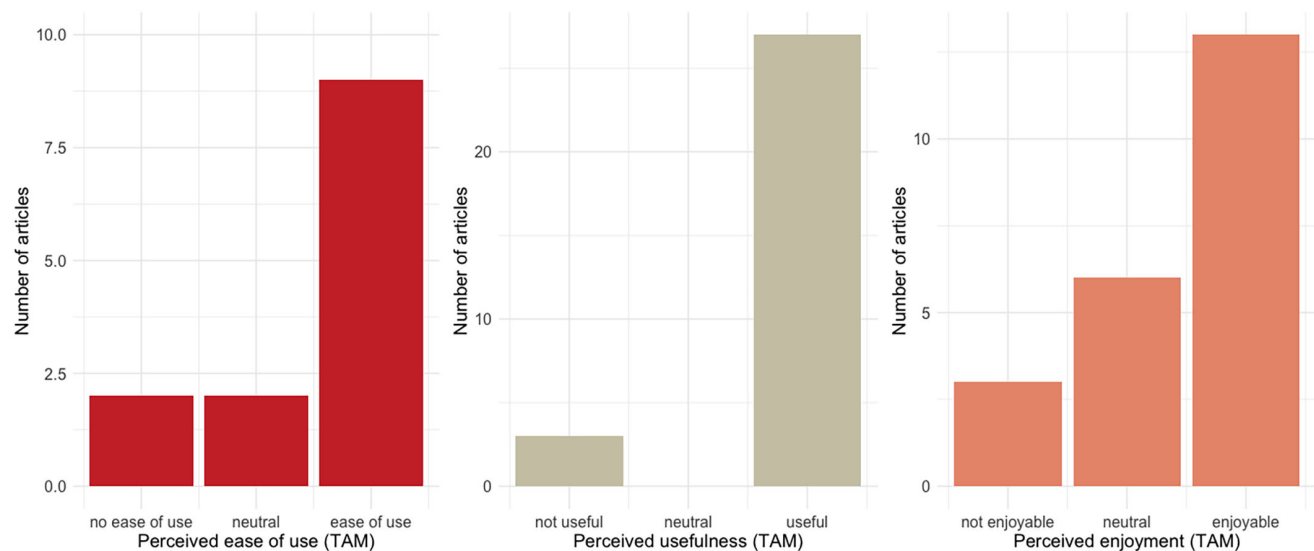
General reference topic	Framing				
	Rejecting	Negative	Neutral	Positive	Favorable
Music production	1 (3.7%)	8 (29.6%)	13 (48.1%)	4 (14.8%)	1 (3.7%)
Research	0	2 (14.3%)	1 (7.1%)	7 (50%)	4 (28.6%)
Conferences	0	0	10 (90.9%)	1 (9.1%)	0
Music festivals	0	1 (11.1%)	5 (55.6%)	1 (11.1%)	2 (22.2%)
Music distribution	0	0	2 (33.3%)	2 (33.3%)	2 (33.3%)
Music management	0	0	2 (40%)	3 (60%)	0
Copyright	1 (25%)	0	1 (25%)	0	2 (50%)
Ticket sales	0	0	1 (25%)	0	3 (75%)
Composing	0	1 (33.3%)	1 (33.3%)	1 (33.3%)	0

TAM Assessments

Lastly, the perspectives rooted in the TAM were probed. Using the TAM categories—perceived ease of use, perceived usefulness, and perceived enjoyment—we aimed to gain a comprehensive understanding of the media's evaluation of AI. However, during the coding process, it became evident that only a few articles reported on AI technology in sufficient detail to allow coding based on these TAM categories. The results based on the few remaining articles indicate that usefulness, ease of use and enjoyment were all talked about more positively (see Figure 4).

Figure 4

Distribution of Perceived Ease of Use ($n = 13$), Perceived Usefulness ($n = 30$), and Perceived Enjoyment ($n = 22$) in all AI-Related Articles



Discussion

The intersection of AI and music in the media landscape over the past six years reveals intriguing patterns and focal points. In the vast corpus of articles analyzed, a mere 69 out of 10,344, which equates to 0.67%, and additional 26

from the online magazines *Groove* and *Backspin*, directly or tangentially engaged with the topic of AI in music. This surprisingly low percentage suggests that while AI has undoubtedly garnered attention in certain musical and journalistic circles, it is yet to establish itself as a dominant topic in the broader media discourse on music.

Given the transformative potential of AI across various sectors, it is particularly striking that some magazines did not mention the topic at all. This absence highlights differing editorial priorities, with certain publications perhaps focusing on more traditional or human-centric aspects of music, while others like *Musikwoche* may be more attuned to the technological and business-oriented shifts in the industry. From a 2023 viewpoint, it is surprising that the topic was not as prevalent then as it is today.

The temporal patterns of AI discussions, showing an uptrend from 2016 to 2019 and a resurgence in 2022, can be contextualized with external events and trends. The extensive media attention after AlphaGo's 2016 win likely sparked a wider public curiosity in AI. However, the music media seemed to lag behind, or the gaming event was not as important to the music community as assumed, as evidenced by the absence of articles on the subject that year. The peak in 2019 suggests particular events or milestones, like the releases of OpenAI's GPT-2, DeepMind's AlphaStar, or Google's DeepMind, that further intensified the media's focus on AI in the context of music. The dip in 2020, on the other hand, may be reflective of the global preoccupation with the challenges of the COVID-19 pandemic.

A diverse array of contexts in which AI was mentioned, from music production and distribution to research, attests to AI's versatile implications for the music industry. This mirrors theoretical perspectives that view AI as a multifaceted tool capable of transforming various industry segments.

In terms of article framing, the predominant neutral stance, combined with both optimistic and critical perspectives, paints a picture of an industry and media that are still negotiating their relationship with AI, acknowledging its potential while also recognizing its challenges. In analyzing the results, it is evident that a significant proportion of the articles, particularly those covering conferences, adopted a neutral stance, primarily focusing on the mention of AI as a topic of discussion, often within the context of music business conferences. This neutrality underscores a journalistic approach that is more observational than evaluative, reflecting AI's emerging status within the music industry discourse. Interestingly, when the lens shifts to more creative domains such as music production, the framing becomes a little more negative. This trend suggests a sense of caution or skepticism among music experts, particularly when it comes to integrating AI into the heart of musical creativity. Music production, being a core aspect of the creative process in music, appears to be an area where experts exhibit the most critical views. This could be attributed to concerns about preserving the artistic integrity and the essential human element in music creation. Conversely, tasks like distribution or ticket sales that are deemed peripheral or auxiliary to the core creative process and are more amenable to automation, tend to be framed more positively in the context of AI. This positive framing may indicate a recognition of AI's potential to streamline operational aspects or enhance certain functionalities in music making, without impinging on the creative essence of the process. Such a differentiation in attitudes towards AI across various facets of music-making highlights the nuanced perspectives within the music industry, balancing between the adoption of new technology and the preservation of traditional, human-driven creativity. The findings from our analysis align with the themes and observations highlighted in the literature review on AI discourse. The literature underscores a general trend of cautious optimism and nuanced perspectives towards AI in various sectors, a pattern that is reflected in our study of music-focused media.

In the literature, AI is often portrayed as a double-edged sword—offering potential benefits and efficiencies on the one hand, while raising concerns about authenticity, ethics, and the impact on human skills on the other. This dichotomy is

mirrored in our study's results, where the integration of AI in music production—a core creative endeavor—is met with skepticism and negative framing, indicating apprehensions about AI's role in fundamental creative processes.

Conversely, the literature also points to a growing acceptance of AI in roles that complement or augment human capabilities, particularly in operational or supportive tasks. This is consistent with our finding that AI is positively framed when applied to areas of music-making that are not central to the creative process.

The initial objective of employing the TAM to investigate media perspectives in greater depth was met with limited success, given the scant number of articles that engaged with AI at the detailed level required by TAM categories. This observation echoes the findings of Sun and colleagues (2020), suggesting a media discourse that lacks technical depth and focuses more on the generalized implications of AI in music rather than nuanced reports on technological factors. However, those that did broach the subject exhibited a predominantly positive stance towards AI's usefulness, enjoyment and ease of use.

Limitations

A few critical boundaries warrant discussion, not to detract from the study's merits but to contextualize its findings and pave the way for future inquiries. First and foremost, the scope of the research was confined to German music magazines. While this decision allowed for a focused examination within a specific cultural and linguistic milieu, it also means that the findings may not be representative of global trends or sentiments. However, focusing on Germany—a nation with a rich musical history and a significant player in the global music industry—was a deliberate choice to capture a slice of the evolving discourse in a key market. Future studies could expand this geographical scope, comparing and contrasting findings across different countries and cultures.

Second, one notable limitation of our study is the scope of the media sample. Our focus on a select group of specialized music magazines, while providing in-depth insights into the specialized discourse on AI in music, may not fully capture the broader societal perspectives prevalent in mainstream media. This concentration potentially overlooks narratives and viewpoints present in more widely read publications or platforms. Future research could benefit from a more diverse media sample, including general news outlets and popular online platforms, to offer a more comprehensive societal view of AI's integration into music or a more comparative approach using various types of music media such as podcasts, radio broadcasts, social media, blogs, and vlogs to offer a more nuanced perspective on the music media landscape.

Third, our sample spanned articles from 2016 to 2022. Though this period marks significant advancements in AI and its intersection with music, it is conceivable that pivotal discussions or sentiments either preceded or will follow this timeframe. This temporal boundary was established primarily due to the transformative event of AlphaGo's victory in 2016, positing it as a starting point for intensified media interest. However, an extended timeframe in subsequent research could provide a more comprehensive picture of the evolving narrative.

Fourth, the use of framing theory was not extensive but rather served as a starting point to ascertain a general orientation towards AI in music journalism. This approach facilitated the identification of basic attitudes and perceptions regarding AI but did not delve deeply into more nuanced aspects of framing, such as assessing the opportunities and risks, identifying responsible parties/causes, or exploring the consequences of AI in music. A more comprehensive and in-depth framing analysis could significantly enrich the understanding of how AI is positioned in media narratives.

While this study represents a valuable initial foray into the subject, future research could expand on this groundwork to offer a more detailed and layered exploration of framing dynamics in the context of AI and music.

Another potential limitation pertains to the depth of technical engagement in the articles analyzed. As the results suggest, many discussions on AI within the chosen publications hovered at a more generalized level. This may be indicative of the magazines' target audience or the broader journalistic approach to complex technical topics. While it reveals an interesting insight into how AI is being broadly framed, it does leave room for more in-depth exploration of technically grounded discussions in perhaps more specialized publications or forums.

Lastly, the study's primary quantitative content analysis method, while robust and methodologically sound, may not capture the intricate nuances or subtleties of journalistic narratives. This approach was chosen in line with a rich research tradition investigating media coverage, as evidenced by studies like Sun and colleagues (2020). Yet, the marriage of this quantitative method with qualitative techniques in future research could yield even richer insights.

In sum, while these limitations frame the context of the current study's findings, they also underscore the vast terrain that remains to be explored.

Implications

The present study's findings, nestled within its specific context, offer various implications both for the trajectory of future research and for the realms of music media and music creation.

The scope of this study, focused on German music magazines, has laid the groundwork for broader investigations. Future studies could endeavor to compare the portrayal of AI across various international music markets, offering comparative insights into cultural variances in technological reception and narratives. Additionally, expanding the temporal range of analysis may help to chart the ebb and flow of AI's significance in music over extended periods, tracing its origin stories, periods of heightened interest, and possible phases of stagnation.

Moreover, while the current study has embraced a primarily quantitative approach, there is an avenue to complement these findings with qualitative explorations. Deep-dive analyses into individual articles, interviews, and opinion pieces could shed light on the intricate subtleties, rhetorical strategies, and the evolving lexicon surrounding AI in music journalism.

For researchers in music psychology, this study opens up several avenues for further exploration, particularly in the realm of experimental research incorporating technology acceptance measures. Given the preliminary findings on how AI in music is portrayed in media and its potential implications for audience perception, there is an opportunity for music psychology researchers to examine how these portrayals influence individual attitudes and behaviors.

One potential area of investigation could be conducting experiments that measure the acceptance of AI-driven music technologies among different audience segments. These experiments could assess factors such as perceived usefulness, ease of use, and enjoyment in the context of AI applications in music. Such research could help in understanding the psychological factors that drive the adoption and sustained use of AI in music consumption and creation.

Furthermore, music psychology researchers could explore the emotional and cognitive impacts of AI-generated music on listeners. This could involve comparing responses to AI-created music versus human-composed music, examining aspects such as emotional engagement, perceived authenticity, and creative appreciation.

By building upon this study's findings and employing experimental methodologies, music psychology researchers can significantly contribute to the understanding of the broader societal and psychological implications of AI's integration into the music world.

For music media, the findings underscore the need for informed and nuanced coverage of AI's role in the music landscape. Given that a considerable number of articles tend to mention AI tangentially, there is an opportunity for music journalists to craft more in-depth pieces that educate their readers about AI's capabilities, challenges, and potential pitfalls. It is crucial for music media outlets to bridge the knowledge gap, presenting complex technological concepts in an accessible manner without sacrificing accuracy.

Additionally, the discovery that certain magazines had no articles on AI suggests a potential underrepresentation or even a hesitancy to engage with the topic. Music media entities must recognize the growing significance of AI, ensuring it finds its rightful place in journalistic discussions, reviews, and critiques.

For musicians and creators, the research highlights AI's multifaceted role within the music ecosystem. From production to distribution, the omnipresence of AI tools signifies both opportunities and challenges. Musicians can harness AI's capabilities to enhance their creative processes, discover new soundscapes, and even optimize distribution strategies. However, an informed approach is essential. Embracing AI blindly, without understanding its limitations, could compromise artistic authenticity.

In conclusion, as AI continues to weave its narrative within the fabric of music, the interplay between research, media representation, and actual music-making will be pivotal. Each domain can inform the other, fostering a symbiotic relationship that, ideally, benefits the broader world of music.

Concluding Remarks

In our world where the cadence of music intertwines with the rhythm of technology, the role of AI in the realm of music has emerged as a topic of profound significance. From the outset, the overarching goal of this research was to uncover the narratives surrounding AI within the tapestry of German music media, offering a glimpse into the symphony of topics, insights, and representations.

Our journey through the pages of German music magazines from 2016 to 2022 revealed a tableau of varying engagements with AI. While some outlets echoed its potential loudly, others chose a softer, more muted tone or remained silent. The crescendo in discussions around 2019, the diversity in content types, and the general sentiment towards AI painted a landscape that is both vibrant and constantly evolving.

But as with any musical piece, there are always newer interpretations, additional verses, and future compositions awaiting discovery. This research is but one movement in a larger symphony of understanding. As the orchestra of AI continues to play its part in music, we, as audience members, researchers, journalists, and creators, have the unique privilege of being able to listen, analyze, and perhaps even shape its future melodies.

Funding

The authors have no funding to report.

Acknowledgments

The authors would like to thank their student assistant Lena Wecker for her work on data collection and coding.

Competing Interests

The authors have declared that no competing interests exist.

Ethics Statement

The present study was conducted in accordance with ethical principles and standards according to the guidelines of the German Communication Association (DGPK).

Data Availability

The content analysis data set and data analysis scripts for this article are available on Nicolas Ruth's GitHub repository (see Ruth, 2023).

Supplementary Materials

For this article, the following Supplementary Materials are available:

- Data, plots, codebook, and scripts (see Ruth, 2023)

Index of Supplementary Materials

Ruth, N. (2023). *analysis_ai* [Data, plots, codebook, scripts]. GitHub. https://github.com/NicolasRuth/analysis_ai

References

- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. Prentice-Hall.
- Albarrán Lozano, I., Molina, J. M., & Gijón, C. (2021). Perception of artificial intelligence in Spain. *Telematics and Informatics*, 63, Article 101672. <https://doi.org/10.1016/j.tele.2021.101672>
- Bao, L., Krause, N. M., Calice, M. N., Scheufele, D. A., Wirz, C. D., Brossard, D., Newman, T. P., & Xenos, M. A. (2022). Whose AI? How different publics think about AI and its social impacts. *Computers in Human Behavior*, 130, Article 107182. <https://doi.org/10.1016/j.chb.2022.107182>
- Boden, M. A. (2018). *Artificial intelligence: A very short introduction*. Oxford University Press.
- Borowiec, S. (2016, March 9). Google's AlphaGo AI defeats human in first game of Go contest. *The Guardian*. <https://www.theguardian.com/technology/2016/mar/09/google-deepmind-alphago-ai-defeats-human-lee-sedol-first-game-go-contest>
- Cacciatore, M. A., Anderson, A. A., Choi, D.-H., Brossard, D., Scheufele, D. A., Liang, X., Ladwig, P. J., Xenos, M., & Dudo, A. (2012). Coverage of emerging technologies: A comparison between print and online media. *New Media & Society*, 14(6), 1039–1059. <https://doi.org/10.1177/1461444812439061>

- Choi, S. (2023). Temporal framing in balanced news coverage of artificial intelligence and public attitudes. *Mass Communication and Society*. Advance online publication. <https://doi.org/10.1080/15205436.2023.2248974>
- Coe, K., & Scacco, J. M. (2017). Content analysis, quantitative. In J. Matthes (Ed.), *The international encyclopedia of communication research methods* (pp. 346–356). Wiley-Blackwell.
- Cope, D. (1989). Experiments in musical intelligence (EMI): Non-linear linguistic-based composition. *Journal of New Music Research*, 18(1–2), 117–139. <https://doi.org/10.1080/09298218908570541>
- Coscarelli, J. (2023, April 19). An A.I. hit of fake 'Drake' and 'The Weeknd' rattles the music world. *New York Times*. <https://www.nytimes.com/2023/04/19/arts/music/ai-drake-the-weeknd-fake.html>
- Davis, F. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. [Doctoral dissertation]. Massachusetts Institute of Technology.
- Davis, F. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Davis, F. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, 38(3), 475–487. <https://doi.org/10.1006/imms.1993.1022>
- Deutscher Musikrat. (2019). *Musikleben in Deutschland* [Musical life in Germany]. Deutsches Musikinformationszentrum.
- Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 51–58. <https://doi.org/10.1111/j.1460-2466.1993.tb01304.x>
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Addison-Wesley.
- Gaubert, J. (2021). After more than two centuries, Beethoven's 10th Symphony has been completed by an AI. *Euronews*. <https://www.euronews.com/next/2021/10/14/after-more-than-two-centuries-beethoven-s-10th-symphony-has-been-completed-by-an-ai>
- Hampton-Sosa, W. (2017). The impact of creativity and community facilitation on music streaming adoption and digital piracy. *Computers in Human Behavior*, 69, 444–453. <https://doi.org/10.1016/j.chb.2016.11.055>
- Henning, F., & Ruth, N. (2020). Save your artist! Der Einfluss moralischer Appelle von Musikschaaffenden auf die Akzeptanz von kostenpflichtigen Musikstreamingdiensten [Save your artist! The impact of musicians' moral appeal on acceptance of paid music streaming services]. *Jahrbuch Musikpsychologie*, 29, Article e48. <https://doi.org/10.5964/jbdgm.2019v29.48>
- Hong, J. W., Peng, Q., & Williams, D. (2021). Are you ready for artificial Mozart and Skrillex? An experiment testing expectancy violation theory and AI music. *New Media & Society*, 23(7), 1920–1935. <https://doi.org/10.1177/1461444820925798>
- Moran, R. E., & Shaikh, S. J. (2022). Robots in the news and newsrooms: Unpacking meta-journalistic discourse on the use of artificial intelligence in journalism. *Digital Journalism*, 10(10), 1756–1774. <https://doi.org/10.1080/21670811.2022.2085129>
- Nossek, H., Adoni, H., & Nimrod, G. (2015). Media audiences | is print really dying? The state of print media use in Europe. *International Journal of Communication*, 9, 365–385. <https://ijoc.org/index.php/ijoc/article/view/3549>
- Pavlik, J. V. (2023). Collaborating with ChatGPT: Considering the implications of generative artificial intelligence for journalism and media education. *Journalism & Mass Communication Educator*, 78(1), 84–93. <https://doi.org/10.1177/10776958221149577>

- Roads, C. (1980). Artificial intelligence and music. *Computer Music Journal*, 4(2), 13–25. <https://doi.org/10.2307/3680079>
- Roads, C. (1985). Research in music and artificial intelligence. *ACM Computing Surveys*, 17(2), 163–190. <https://doi.org/10.1145/4468.4469>
- Rössler, P. (2017). *Inhaltsanalyse* [Content analysis]. UTB.
- Scheufele, D. A., & Lewenstein, B. V. (2005). The public and nanotechnology: How citizens make sense of emerging technologies. *Journal of Nanoparticle Research*, 7, 659–667. <https://doi.org/10.1007/s11051-005-7526-2>
- Scott Brennen, J., Howard, P. N., & Kleis Nielsen, R. (2018). *An industry-led debate: How UK media cover artificial intelligence*. Oxford University Research Archive. <https://ora.ox.ac.uk/objects/uuid:02126b4c-f4f9-4582-83a0-f8a9d9a65079>
- Sun, S., Zhai, Y., Shen, B., & Chen, Y. (2020). Newspaper coverage of artificial intelligence: A perspective of emerging technologies. *Telematics and Informatics*, 53, Article 101433. <https://doi.org/10.1016/j.tele.2020.101433>
- van der Heijden, H. (2004). User acceptance of hedonic information systems. *Management Information Systems Quarterly*, 28(4), 695–704. <https://doi.org/10.2307/25148660>