Exhibit A

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN JOSE DIVISION

CONCORD MUSIC GROUP, INC. ET AL. Plaintiffs, v. ANTHROPIC PBC, Defendant.	CASE No. 5:24-cv-03811-EKL-SVK

Expert Report of Colin E. Stokes

December 19, 2025

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I. INTRODUCTION

A. Qualifications

1. I am a composer, cellist, and music technologist with a musical career spanning over two decades. I am also a researcher in generative artificial intelligence ("genAI") for audio and video systems. My academic focus lies in developing deep learning architectures for audio synthesis, systems for the generation of sheet music and MIDI (symbolic music), and multimodal AI systems that combine video, audio, and text, both in prompting and inferencing.

2. I hold a B.M. in Performance from the Eastman School of Music, where I studied with Steven Doane and Rosemary Elliott, and an M.M. in Performance from The Juilliard School, where I studied with Richard Aaron. I have more than 15 years of professional experience as a touring cellist and have performed in hundreds of live concerts. I have toured as a member of the German electro-classical group Symphoniacs and the American contemporary classical music ensemble Zohn Collective. During some years my live and televised performances have been seen and heard by as many as 25 million people. I have shared the stage with artists including Yo-Yo Ma, Claude Frank, John Williams, Chaka Khan, and Lady Gaga, and have undertaken additional studies with the Juilliard, Keller, Takacs, Tokyo, and Ying String Quartets, Eighth Blackbird, and Pamela Frank. My music can be heard on more than 20 albums, including records released by Universal Music/Polydor, Warner Music Japan, EMI, and Albany Records, and spans genres from classical, crossover, and jazz/world to popular music.

3. I have received grants and awards for my cello performances from the National Endowment for the Arts, Mid Atlantic Arts Foundation, USArtists International Foundation, and The Berlin Musikfond Stipendium, as well as the 2023 Presser Graduate Award for music composition.

4. I am currently pursuing a Ph.D. in Composition with a focus on Computer Music Media and a minor in Artificial Intelligence in Computer Music System Design at the University of North Texas ("UNT"). My research focuses on AI-integrated composition and deep learning computational music systems. My current and recent projects include compositions created using VEGA and LYRA, genAI models currently under development at the Center for Experimental Music and Intermedia ("CEMI") at UNT, as well as using commercially available genAI tools. My artistic practice is intermedial, which means that I combine audio, visuals, live performance, and technology to create interactive immersive performances. My dissertation, currently in its final stages, presents an hour-long work integrating 270-degree video projection, 42-channel spatialized audio, and text, lyrics, visuals, and audio generated in collaboration with both custom and commercial genAI tools.

5. As part of my Ph.D. studies, I have completed courses on composition and computer music with Dr. Panayiotis Kokoras, Dr. Andrew May, Dr. Marco Buongiorno Nardelli, Dr. Jon Nelson, and Professor David Stout. One of my recent works, *Understanding*, is an immersive

installation based on a library of real and fictional words created using a large language model ("LLM"). I created hundreds of audio clips of these words being spoken, both by humans and by text-to-speech genAI tools. I control the performance with a custom algorithm that allows me to blend visuals and audio to reflect the evolving emotional context of the environment. I have engaged extensively with consumer audio products, and I have also coded custom audio components using CSound, Python, C, C++, and JUCE.

6. I completed a master's level seminar in Songwriting at the Manhattan School of Music and a doctoral seminar on the analysis of lyrics, voices, vocal rhythms, and production techniques in popular music at UNT. This work resulted in a paper analyzing the use of lyrics in several songs by Ariana Grande and Billie Eilish. In my doctoral paper, I outline the methods I developed for audio source separation and computational stereo-field analysis in popular music. I then apply these methods to songs by Ariana Grande ("7 Rings" – a work-in-suit) and Billie Eilish ("Bury a Friend" and "Bad Guy") to examine how the producers and engineers behind these songs manipulate stereo-field placement of the recorded vocals to reinforce or change the meaning of the lyrics.

7. I have also worked in the field of popular music as a producer, arranger, engineer, and cellist, including on albums and singles by artists Petros Klampanis, Banda Magda, Lorelei Marcell, Amanda Brown, and Zia Victoria, among others. In 2021 I was hired by the Egyptian rock band Cairokee to do musical arrangements, contract with musicians, and produce and engineer recording sessions for strings, piano, synthesizers, and drums at Tritonus Studios in Berlin, Germany. I worked on six tracks from their album *Roma* which has found wide popularity.[1] As of the filing of this report, these songs have attracted more than 250 million streams on YouTube and Spotify alone.

8. My peer-reviewed work as a composer, performer, and researcher has appeared at festivals including Electric LaTex, the Society for Electro Acoustic Music in the United States ("SEAMUS"), Currents New Media Festival, and the Santa Fe Institute, and in The Journal SEAMUS. I serve as a reviewer for the Transformative Works and Cultures Journal and as a jury member for the 2026 SEAMUS conference. I currently also work as a Teaching Assistant at CEMI and at the Institute for Advanced Research in the Arts and Technology ("iARTA") and as a Teaching Fellow in Composition at UNT College of Music.

9. Further details on my academic background and qualifications and a list of my publications are provided in my curriculum vitae, attached as **Appendix A** to this report. I have not, during the previous four years, testified as an expert at trial or by deposition.

[1] The tracks I am credited on are "Matwhashneesh," "James Dean," "Tarantino," "Nefsy Ahbek," "Basrah w Atooh," and "Johnny Cash."

B. Allegations

10. Plaintiffs in this matter allege Defendant's infringement of copyrighted works in the development and use of its genAI product. Plaintiffs are entities that allege that they own or control copyrights to a large number of musical compositions, specifically Concord Music Group, Inc., various entities that are part of Universal Music Publishing Group, and ABKCO Music, Inc. ("ABKCO").[2] Defendant Anthropic PBC ("Anthropic") has developed a series of genAI models called "Claude," offered to individual consumers as a genAI assistant via a web interface or through an app and to enterprise customers as an API integration.[3] The Claude product, and its underlying models, are designed to provide assistance with a variety of tasks including: answering questions and assisting in research, proofreading, summarizing information, generating new text and other content,[4] generating and reviewing computer code, and translating from one language into another.[5]

11. The First Amended Complaint alleges, as relevant to my opinions below, that Anthropic unlawfully copied and disseminated Plaintiffs' copyrighted works including the text to lyrics to musical compositions owned by Plaintiffs.[6] Specifically, according to Plaintiffs, Anthropic incorporated text scraped from the internet, including from third-party training datasets, which allegedly include lyrics for which Plaintiffs control the copyright, as training material for its genAI models.[7] Plaintiffs also allege that, in turn, Anthropic's genAI models had generated outputs that included portions of the allegedly copyrighted lyrics,[8] infringing Plaintiffs' rights.[9]

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2 First Amended Complaint and Demand for Jury Trial, *Concord Music Group, Inc. et al. vs. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, April 25, 2025 ("First Amended Complaint"), ¶ 4.

3 Anthropic, "Introducing Claude," March 14, 2023, https://www.anthropic.com/news/introducing-claude.

4 Claude, "Claude Can Now Create and Edit Files," September 9, 2025, https://claude.com/blog/create-files ("Claude can now create and edit files. Describe what you need and get back ready-to-use spreadsheets, documents, presentations, and PDFs instead of just text responses.").

5 Anthropic, "Introducing Claude," March 14, 2023, https://www.anthropic.com/news/introducing-claude ("Claude can help with use cases including summarization, search, creative and collaborative writing, Q&A, coding, and more."); Belcic, Ivan and Cole Stryker, "What Is Claude AI?," *IBM*, December 2, 2025, https://www.ibm.com/think/topics/claude-ai ("In general, people can use Claude AI to help with a wide range of tasks, including: question-answering and research, proofreading and editing, document summarization, including PDFs and Word documents, text and content generation, language translation, business plan creating, image and audio processing, code snippet generation and review.").

6 First Amended Complaint, ¶ 1 ("In the process of building and operating AI models, Anthropic unlawfully copies and disseminates vast amounts of copyrighted works—including the lyrics to myriad musical compositions owned or controlled by Publishers.").

7 First Amended Complaint, ¶ 6.

8 Plaintiffs allege this can occur both when directly prompted for lyrics to a certain copyrighted song, as well as in response to prompts that are not directly asking for lyrics, such as "write 'a song about the death of Buddy Holly.'" See First Amended Complaint, ¶¶ 8, 9, 14.

9 First Amended Complaint, ¶ 16.

Plaintiffs further allege that Anthropic's AI output can omit copyright notices and omit or misstate copyright management information.[10]

12. Plaintiffs also make broad claims regarding the musical meaning of lyrics and express concern over the effects of genAI technology on artists. Specifically, Plaintiffs claim that lyrics are among "the most recognizable and memorable aspects of songs" and central to creating meaning in music.[11] Plaintiffs allege that Anthropic users frequently use Claude for the purpose of finding lyrics,[12] and that in addition to outputting lyrics, Claude creates other content that incorporates fragments of copyrighted works.[13] Finally, Plaintiffs voice "growing alarm" broadly over proliferation of genAI technology and its alleged impact on artists and the creation of new works.[14]

13. According to Plaintiffs, Anthropic's alleged infringement of copyrighted works was willful because Anthropic: i) allegedly scraped and ingested copyrighted works while developing its Claude genAI models; ii) allegedly intentionally stripped copyright notices and management information from ingested lyrics; and iii) allegedly used prompts that requested lyrics during training and finetuned its models to produce lyrics as output for certain prompts.[15]

C. Assignment

14. I have been engaged by counsel for Anthropic to provide an expert opinion in this matter. Specifically, I have been asked to apply my expertise in the area of musical composition, computer music, and genAI to offer an opinion on how lyrics relate to an overall musical composition and to analyze the benefits that LLMs, such as Claude, and other genAI technologies more generally provide to songwriters and composers.[16]

15. Counsel provided me with materials pertaining to this case, including certain court documents, deposition transcripts, and other relevant materials produced in discovery. A list of materials that I considered in preparing this report is attached as **Appendix B**. My opinions are based on information available to me as of the date of this report and I reserve the right to supplement

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[10] First Amended Complaint, ¶ 17.

[11] First Amended Complaint, ¶ 38 ("Those lyrics are essential to providing narrative, expressing emotion, and, ultimately, creating meaning in music. Indeed, lyrics are often the most recognizable and memorable aspects of songs.").

[12] First Amended Complaint, ¶¶ 10, 12, 90.

[13] First Amended Complaint, ¶¶ 91–94.

[14] First Amended Complaint, ¶ 148.

[15] First Amended Complaint, ¶¶ 6, 11, 17.

[16] In this report, I use the term "genAI" to broadly refer to AI systems that can generate new content, such as text, images, audio, video, computer code, or output in other modalities. I use the term "LLM" to refer to a specific subtype of genAI models trained on text and designed to process and generate text. Claude is one example of an LLM. Many genAI models are multimodal and can handle multiple modalities.

or amend my report should new information become available, or in response to other expert opinions offered by Plaintiffs. At trial, I may use demonstrative exhibits—such as documents, graphics, videos, charts, case material, or other visual aids—to explain my views.

16. I am being compensated for my services in this matter at an hourly rate of $850. My compensation in this matter is not dependent on my opinions or the outcome of this case. In preparing this report I have been assisted by certain employees of Analysis Group working at my direction. Any and all opinions expressed in this report are mine and mine alone.

II. SUMMARY OF CONCLUSIONS

17. Based on my professional experience as a composer, songwriter, cellist, and producer, and my expertise as a researcher in AI-integrated composition, combined with review of relevant documents and materials produced in this case, I have reached the following conclusions:

    a. Musical compositions consist of many individual elements, with lyrics sometimes being one of them. Lyrics can be a meaningful part of a composition but derive much of their value and expression from their setting within the rest of the musical composition and take on particular meaning when paired with melody, harmony, instrumentation, and other compositional elements. Without these additional components, lyrics cannot be equated to an entire musical composition; for example, a recorded album or a live performance are very different from the book of poems that may serve as the source of text for the songs recorded on the album or performed in the live show. Composers and songwriters differ in their music composition processes, with lyrics sometimes developed as the last component of a song, or even written by a separate lyricist collaborating with the composer, if lyrics are present at all. Even music compositions with identical or similar lyrics, such as cover songs, can result in compositions with very different emotional expressions. Differences in compositional techniques also mean that lyrics alone are not sufficient to convey the same expression as the overall musical composition, as I illustrate through analysis of some of the works-in-suit. See **Section III**.

    b. LLMs and genAI tools more broadly offer major benefits to creators in the music space. These technological tools are transforming composers' and songwriters' creative processes, but this is not a new phenomenon. There is a long history of advances in music technology that have enhanced and promoted the expansion of human creativity. The LLMs and genAI tools currently used by composers and songwriters across many genres, in creating new and original music, build on this rich history. These creators leverage genAI tools in many ways, including as brainstorm partner and collaborator, translator, vocalist, visual art partner, or as musical persona. Having large, heterogeneous sets of data for training genAI tools, including Claude, improves generalization and reduces bias. Similar to earlier technological advances in music,

genAI tools have the potential to enhance the creative potential of existing composers and songwriters but, furthermore, these technologies also have potential for reducing barriers to entry to creating musical compositions for new creators. See **Section IV**.

III. LYRICS ARE ONE OF MANY ELEMENTS OF A MUSICAL COMPOSITION

A. Musical Compositions Consist of Many Basic Elements, with Lyrics Sometimes Being One of Them

18. Plaintiffs claim that lyrics are among "the most recognizable and memorable aspects of songs" and central to creating meaning in music.[17] While that can be the case in certain instances, as I explain in this section, musical compositions consist of many individual elements besides lyrics and may not include lyrics at all. Many songs are recognizable and memorable for reasons apart from—or even without—lyrics.

19. My conclusion that lyrics derive much of their value from the other elements of the composition is grounded in the principles and methods of music theory. Music theory is the study of how musicians compose and perform music and is commonly used to analyze fundamental elements of musical compositions. In its simplest form, the study of music theory is the study of the key principles of music.[18] Music theory is tradition-dependent; for example, Western music theory rules and concepts are not directly applicable to traditional Chinese or Indian music.[19] The analytical methods of Western music theory come from the study of Western classical music. Popular music emerged from these classical traditions and shares

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[17] First Amended Complaint, ¶ 38 ("Those lyrics are essential to providing narrative, expressing emotion, and, ultimately, creating meaning in music. Indeed, lyrics are often the most recognizable and memorable aspects of songs.").

[18] See, e.g., Laitz, Steven G., *The Complete Musician: An Integrated Approach to Theory, Analysis, and Listening*, 1 Ed., Oxford University Press, 2003, pp. xvii–xix. See also Avid, "Music Theory: Basics and Fundamental Concepts," October 6, 2023, https://www.avid.com/resource-center/music-theory.

[19] Le, Bonnie and Francis Scully, "Music Around the World," *Music Appreciation*, edited by Bonnie Le, et al., LOUIS: The Louisiana Library Network ("Just as we have observed in the Western concert music that we've explored, musical cultures all across the globe have their own traditions, styles, practices, rules, and instruments that are often vastly different from the music many Americans are used to.").

many of the foundational theoretical rules and concepts.[20,21] Underpinning my analysis of both the lyrical and non-lyrical elements of music in this report is an area of research within music theory that focuses on applying and updating analytical methods to gain a deeper understanding of how popular forms of music are composed and performed.[22]

20. As illustrated in **Figure 1**, musical compositions consist of many individual elements, with lyrics sometimes included as one of these elements. Some elements considered central to any musical composition include pitch and melody, rhythm and meter, expression (tempo and dynamics), harmony, texture, form and duration, and timbre.[23]

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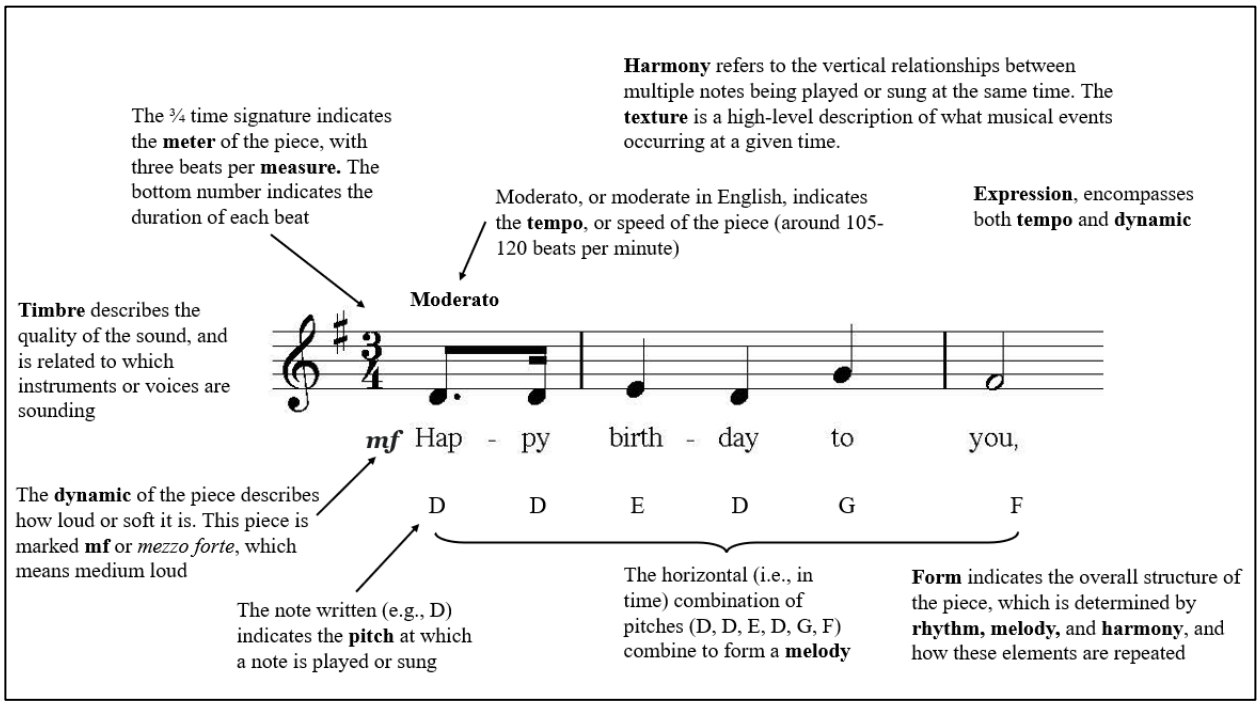
[20] See, e.g., Li, Ang, "The Historical Evolution of the Popularization of Classical Music and the Development of the Fusion of Multiple Music Styles," *Herança - History, Heritage and Culture Journal*, Vol. 7, No. 1, 2024, pp. 113–125 at p. 114 ("In the history of music, the period from the Baroque area to the early 20th century is traditionally referred to as classical music. However, as the 20th century unfolded, classical music gradually lost favor with those seeking individuality, and popular music took center stage. Concurrently, classical music began to meld into popular music […] the contemporary music landscape exhibits a phenomenon of interwoven classical and popular development.").

[21] In this report I consider popular music as a fluid, historically and culturally shifting category of music that is mass-disseminated, widely accessible to non-specialist audiences, and defined less by fixed musical traits than by its position within changing social, economic, and media systems. Popular music grew out of vaudeville and ragtime traditions and was strongly influenced by blues, jazz and other musical traditions developed within African American communities, developments that required classical music theory to expand beyond its original framework. Britannica Editors, "Popular Music," *Britannica*, https://www.britannica.com/art/popular-music, accessed December 17, 2025.

[22] See, e.g., Willson, Rachel Beckles, "Music Theory and Analysis," *Introduction to Music Studies*, edited by J. P. E. Harper-Scott and Jim Samson, Cambridge University Press, 2009.

[23] See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022. See also Pizà, Antoni, *Listening to the World*, New York, The City University of New York, 2023; Robertson, Claire, "The Elements of Music," https://www.hoffmanacademy.com/blog/elements-of-music, accessed December 5, 2025.

Figure 1: Elements of Musical Composition[24]



1. Non-Lyrical Elements of a Musical Composition

21. **Pitch (and the organization of pitches) and melody:** The pitch at which a note is played or sung is indicated by a musical note (e.g., D).[25] Musical pitches can then be organized into different collections (e.g., scales or modes) that have emotional and narrative connotations. A melody is a sequence of pitches, which can be within one scale or mode, or can move between multiple scales or modes. The term *melody* has the connotation that the sequence of notes is memorable, satisfying, and can function as the top layer of multiple musical parts.[26] Whistling a famous melody can recall in a broad array of listeners the source song. "Happy Birthday" is a good example of a composition that is memorable for its melody. While the original song's lyrics are in English, the melody itself has become so associated with birthday celebration that

[24] Hill, Mildred, "Happy Birthday to You," *IMSLP*, 1893, Edited by Supertchan, https://imslp.org/wiki/Happy_Birthday_to_You_(Hill,_Mildred)#IMSLP46139.

[25] Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 7.

[26] Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 7.

it is used in many countries, with different lyrics.[27] In fact, the melody was originally used as a song with different lyrics for school children called "Good Morning to All" and it was adapted to "Happy Birthday" thanks to its memorability.[28]

22. **Rhythm and meter:** Rhythm refers to the changing patterns of sounds and silences that make up a piece of music.[29] Beats, the component of rhythm that you tap your foot to, are organized into groupings, which constitute the meter. Each group of beats is called a measure, and each group of measures is called a phrase. The beats within each measure have varying levels of importance depending on the meter and each measure has varying levels of importance depending on its position in the phrase.[30] Western popular music is most often in 4/4,[31] which means that each measure has four beats in it, and the first and third beats are, generally, the most important. Composers and songwriters use metric expectations as a tool to give extra meaning to certain words and less weight to others, and to express emotional states.[32] For example, Ariana Grande in her song "7 Rings," a work-in-suit, uses changes in meter to indicate important shifts in structure and meaning. This song uses extensive musical quotations from "My Favorite Things," a song from Rodgers and Hammerstein's *The Sound of Music,* in which the actress Julie Andrews sings about the positive thoughts that can distract the children in her care from a thunderstorm.[33] Grande's "7 Rings," a song about financial independence

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27 Brauneis, Robert, "Copyright and the World's Most Popular Song," *GW Law Faculty Publications & Other Works*, 2010, pp. 1–68 at p. 17 ("A thread of postings about birthday songs on the website Wordreference.com reveals that some other countries to have traditional birthday songs of their own, but it also reveals that birthday lyrics for the 'Good Morning to All' melody have been written and sung in Arabic, Basque, Catalan, Dutch, Finnish, French, German, Hebrew, Indonesian, Irish, Italian, Korean, Lithuanian, Mandarin Chinese, Norwegian, Portuguese, Spanish, and Tagalog."). Link to "Good Morning to All": https://youtu.be/1WQHsk557f4.

28 Brauneis, Robert, "Copyright and the World's Most Popular Song," *GW Law Faculty Publications & Other Works*, 2010, pp. 1–68 at p. 10 ("[… S]ince Patty was the principal of a kindergarten, they could repeatedly try out drafts of a song on kindergarten students. One of their first efforts was the song 'Good Morning to All,' the melody of which became the melody of 'Happy Birthday to You.'").

29 Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 10; MasterClass, "Understanding Rhythm in Music: 7 Elements of Rhythm," June 7, 2021, https://www.masterclass.com/articles/understanding-rhythm-in-music.

30 Biamonte, Nicole, "Formal Functions of Metric Dissonance in Rock Music," *Society for Music Theory*, Vol. 20, No. 2, 2014, pp. 1–24.

31 Biamonte, Nicole, "Formal Functions of Metric Dissonance in Rock Music," *Society for Music Theory*, Vol. 20, No. 2, 2014, pp. 1–24.

32 Malin, Yonatan, "Metric Displacement Dissonance and Romantic Longing in the German Lied," *Music Analysis*, Vol. 25, No. 3, 2006, pp. 251–288; Witek, Maria A. et al., "Syncopation, Body-Movement and Pleasure in Groove Music," *PLoS ONE*, Vol. 9, No. 4, 2014, pp. 1–12.

33 Ahlgrim, Callie, "Ariana Grande Gets Less Than 10% of Royalties from '7 Rings,' Her Most Popular Single Ever – Here's Why," *Business Insider*, March 20, 2019, https://www.businessinsider.com/ariana-grande-7-rings-royalties-rodgers-and-hammerstein-my-favourite-things-sample-2019-3 ("'7 Rings' interpolates the melody of 'My Favourite Things,' an iconic song written by Richard Rodgers and Oscar Hammerstein II for 'The Sound of Music' in 1959."). Link to Rodgers & Hammerstein's "My Favorite Things": https://youtu.be/0IagRZBvLtw&t=47.

and empowerment after a public romantic breakup, starts each verse by echoing the core musical elements of "My Favorite Things," as a way of borrowing the narrative intention of the original. Without quoting the original lyrics, Grande uses those rhythmic and other musical references to suggest that she can use her financial power to distract herself from pain or discomfort. The pre-chorus and chorus then shift the metric and rhythmic elements and move to a more traditional hip-hop or trap feeling, establishing the narrative arrival at self-empowerment.[34]

23. **Expression (tempo and dynamics):** Tempo refers to the speed or pacing of the music. Starting in the mid-1600s, the standard practice for indicating tempo has been with words, typically in Italian.[35] These words often carry their own expressive connotations. For example, two common words for a fast tempo are *allegro*, which means "cheerful,"[36] and *furioso* which means "furiously."[37] While both indicate fast tempos, they indicate differences in musical expression. Dynamics describe how loud or soft a given section of music is. Dynamics are used by composers and songwriters as a musical tool to build and release musical tension, and to contribute to emotional states.[38] Adele's "Turning Tables," a work-in-suit, is a good example of the use of dynamics and tempo for musical expression. The first verse, with lyrics about fighting within a close relationship, starts at a quiet dynamic with minimal instrumentation, suggesting a fragile and defeated emotional state. As the song transitions from verse to chorus, the temporal pacing of the music comes to a near-stop on the word "breathe," and the dynamic decreases to silence as the musical elements together suggest an inability to breathe. This is followed by a dramatic change in dynamic and perceived tempo in the chorus, emphasizing the lyrical focus on defiance and empowerment.[39] The combination of these compositional elements creates an emotional effect beyond what is conveyed by the words alone.

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[34] Rodgers and Hammerstein's "My Favorite Things" is written in 3/4, with a hypermetric pattern giving the feel of 12/8. Ariana Grande's "7 Rings" switches between this hypermetric feeling of 12/8 while referencing "My Favorite Things" (notated as triplet subdivisions in 4/4) and a standard hip-hop 4/4 meter with duple subdivisions during the rapped chorus. Link to Ariana Grande's "7 Rings": https://youtu.be/QYh6mYIJG2Y&t=12.

[35] See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 30. See also Lumen Learning, "Tempo Measurement," https://courses.lumenlearning.com/suny-musicappreciationtheory/chapter/introduction-to-tempo, accessed December 9, 2025 ("In classical music it is customary to describe the tempo of a piece by one or more words. Most of these words are Italian, because many of the most important composers of the 17th century were Italian, and this period was when tempo indications were first used extensively and codified.").

[36] Oxford English Dictionary, "Allegro," https://www.oed.com/dictionary/allegro_n?tab=meaning_and_use, accessed December 15, 2025.

[37] Oxford English Dictionary, "Furioso," https://www.oed.com/dictionary/furioso_adj?tab=meaning_and_use, accessed December 15, 2025.

[38] See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 31.

[39] Link to Adele's "Turning Tables": https://youtu.be/bsFCO8-oCEQ.

24. **Harmony:** While melody is a linear organization of pitches, harmony is a vertical organization of pitches. Harmony deals with the simultaneous combination of pitches, which can create chords.[40] The organization of chords over time, called chord or harmonic progression, has narrative implications. For example, major chords are often associated with joy and happiness, minor chords are associated with sadness, and diminished chords are associated with fear or unease.[41] Eric Clapton's "Tears in Heaven" emphasizes a minor chord on important words like "name" and "heaven" in the first verse and at important structural events like the beginning of the chorus.[42] This, in combination with a descending bass line, known as a lament bass, conveys the emotional depth and sadness of the song in a way that the lyrics alone could not.

25. **Texture:** Texture is a high-level description of the musical events happening at a given time.[43] Texture can also be used to describe the specific collection of instruments and/or voices that are used during specific sections of a musical work. Music theorists group musical textures into four categories: monophony, homophony, polyphony and heterophony.[44] The textures that a composer or songwriter chooses to write with carry significance for the perceived meaning of the work. A good example of the power of textural differences to impact the meaning of a song can be seen by comparing Harry Styles' song "Sign of the Times," a work-in-suit, with a version of the same song arranged for string quartet by Steven Horner for the television show Bridgerton. The original, with lyrics about overcoming loss,[45] begins with a melody with chordal accompaniment in a slow, pulsing rhythm.[46] The song opens with heavy, pulsing piano chords and vocals sitting just behind the beat, suggesting emotional weight. The full band enters for the chorus, with a classic slow ballad drum pattern, which gives gravity to the lyrics. This contrasts with the texture in Horner's arrangement, without lyrics, but which uses active and rhythmic chordal accompaniment mirroring the minimalist style of Philip Glass and the

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[40] Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 13.

[41] Willimek, Bernd and Daniela Willimek, "Feelings Which Strike a Chord, and Chords Which Strike a Feeling," *Open Journal of Acoustics*, Vol. 7, 2017, pp. 10–17.

[42] Link to Eric Clapton's "Tears in Heaven": https://youtu.be/VVqXLXMch9g&t=12.

[43] Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 22.

[44] Monophony is music for a solo musical line. Homophony is polyphonic music in which all lines move together in rhythm. Polyphony is music for two or more independent musical lines. Heterophony is music that contains multiple versions of the same melodic line with variation. See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, pp. 22–23.

[45] Crowe, Cameron, "Harry Styles' New Direction," *Rolling Stone*, April 18, 2017, https://www.rollingstone.com/feature/harry-styles-new-direction-119432.

[46] Link to Harry Styles' "Sign of the Times": https://youtu.be/qN4ooNx77u0&t=16.

tintinnabular style of Arvo Pärt to give the music an upbeat feeling.[47] In this case, the textural choices made by the composers yield different emotional outcomes.

26. **Form and duration:** Form is the overall structure of a piece of music, and it describes how musical elements of a composition or song are organized in time.[48] Duration is often correlated with form and describes how long a piece of music lasts. There are common forms that composers and songwriters use to structure their music, and the relative popularity of a given form has changed over time.[49] Common forms of popular songs are verse-chorus, AABA, and strophic, though composers and songwriters have many ways of defying the conventions of these forms to fit their expressive intent.[50] For example, the rock band the Police blurs the distinction between strophic and AABA forms in the work-in-suit song "Wrapped Around Your Finger," contributing to a feeling of "instability and forward motion."[51]

27. **Timbre:** Timbre, or tone color, is the name for the sound quality of a musical instrument, voice, or other noise-making apparatus, such as a synthesizer, or the combination of any of these sound sources.[52] The timbre of a sound comes from its unique spectral content and envelope,[53] which allows a listener to discern a trumpet from a cello or the voice of one singer from another. Timbre also plays a role in musical expression and contributes to "both the

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47 Ho, Ang-Cheng Kris, "Calm or Tension? The Musical Demands in Strung Out (1967) and Spiegel im Spiegel (1978)," *International Journal of Social Sciences and Humanity*, Vol. 6, No. 7, 2016, pp. 557–560. Link to Steven Horner's "Sign of the Times": https://youtu.be/ROAEQWtWjC0&t=17.

48 See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, pp. 26-29.

49 See, e.g., Covach, John, "From 'Craft' to 'Art' Formal Structure in the Music of the Beatles," *Reading the Beatles: Cultural Studies, Literary Criticism, and the Fab Four*, edited by Kenneth Womack and Todd F. Davis, State University of New York Press, 2006. See also Summach, Jay, "The Structure, Function, and Genesis of the Prechorus," *Society for Music Theory*, Vol. 17, No. 3, 2011, pp. 1–13; Appen, Ralf von and Markus Frei-Hauenschild, "AABA, Refrain, Chorus, Bridge, Prechorus – Song Forms and Their Historical Development," *Black Box Pop: Analysen populärer Musik*, edited by Dietrich Helms and Thomas Phleps, 2012.

50 See, e.g., Clercq, Trevor de, "Embracing Ambiguity in the Analysis of Form in Pop/Rock Music, 1982–1991," *Society for Music Theory*, Vol. 23, No. 3, 2017. See also Osborn, Brad, "Subverting the Verse–Chorus Paradigm Terminally Climactic Forms in Recent Rock Music," *Music Theory Spectrum*, Vol. 35, No. 1, 2013, pp. 23–47.

51 Clercq, Trevor de, "Embracing Ambiguity in the Analysis of Form in Pop/Rock Music, 1982–1991," *Society for Music Theory*, Vol. 23, No. 3, 2017 ("The strong sense of closure found at the end of every other vocal phrase in earlier verse sections is now absent. As a result, the feeling of instability and forward motion is further increased. […] you would say that 'Wrapped Around Your Finger' is in strophic form; if you interpret this music as a bridge, however, you would say the song is in a compound AABA form."). Link to The Police's "Wrapped Around Your Finger": https://youtu.be/svWINSRhQU0&t=45.

52 See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 36.

53 Spectral content refers to which frequencies, or musical pitches, are present in a sound. Envelope describes how a sound changes in dynamic over time.

immediate pleasures and conceptual meanings" of a song.[54] Louis Armstrong is notable for his "growl," a vocal timbral technique caused by unpitched vibrations in the epilarynx.[55] This effect can be heard in the work-in-suit "What a Wonderful World," creating a deep sense of emotion that gives meaning to the song beyond its lyrical content.[56]

28. The combination of the non-textual musical elements described above contributes to why we can recognize a song even when it is played without vocals, with lyrics translated into a different language, or with entirely different lyrics. For some songs, the first few notes can be enough to trigger recognition and an emotional response. For example, one may not need to listen to the full eight minutes of "Stairway to Heaven" by Led Zeppelin (even without lyrics); indeed, the first few notes can be enough to recognize the song.[57] Work-in-suit "A Thousand Miles" by Vanessa Carlton is immediately recognizable from its opening piano riff.[58] Similarly, the recognizable beat and constant rhythm of "Stayin' Alive" by Bee Gees is used in CPR training; the text is used just as shorthand to remember the tempo.[59] Many of us can recognize the melody of "Happy Birthday" regardless of the language in which it is sung, and recognize compositions without lyrics like Beethoven's "Symphony No. 5" or "The Imperial March" from Star Wars.[60] Similarly, the listener is still able to identify the underlying reference to the well-known song "My Favorite Things" from the *Sound of Music* in Ariana Grande's song "7 Rings," a work-in-suit, even though Grande only uses the melody but none of the

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[54] Heidemann, Kate, "A System for Describing Vocal Timbre in Popular Song," *Journal of the Society for Music Theory*, Vol. 22, No. 1, 2016, pp. 1–17 at p. 1 ("Vocal timbres in popular song contribute significantly to both the immediate pleasures and conceptual meanings afforded by this music, but they resist description.").

[55] Heidemann, Kate, "A System for Describing Vocal Timbre in Popular Song," *Journal of the Society for Music Theory*, Vol. 22, No. 1, 2016, pp. 1–17, at p. 6.

[56] Link to Louis Armstrong's "What a Wonderful World": https://youtu.be/rBrd_3VMC3c&t=25.

[57] Edwards, Clayton, "On This Day in 2006, Jimmy Page's Solo From Led Zeppelin's 'Stairway to Heaven' Was Voted the Best of All Time," *American Songwriter*, March 26, 2025, https://americansongwriter.com/on-this-day-in-2006-jimmy-pages-solo-from-led-zeppelins-stairway-to-heaven-was-voted-the-best-of-all-time ("Page's solo in 'Stairway to Heaven' is some of the most recognizable guitar work in rock history."). Link to Led Zeppelin's "Stairway to Heaven": https://youtu.be/QkF3oxziUI4.

[58] Link to Vanessa Carlton's "A Thousand Miles": https://youtu.be/Cwkej79U3ek&t=19. This is the premise of the game show "Name That Tune" where in the segment, "bid a note" contestants guess the name of a song using only the first few notes and a clue about the song's title. See Reality Club, "Bid-A-Note With Katie & David | Season 1 Ep. 4 | Name That Tune," *YouTube*, January 28, 2021, https://www.youtube.com/watch?v=8znmCzp9uqk.

[59] Martin, Paul, "CPR to Stayin' Alive Beat Helps Keep Proper Rate," *ProCPR*, August 26, 2022, https://www.procpr.org/blog/training/cpr-stayin-alive-song. Link to the Bee Gees' "Stayin' Alive": https://youtu.be/fNFzfwLM72c&t=13.

[60] Link to Beethoven's "Symphony No 5.": https://youtu.be/n3EiRynr1Us&t=8. Link to John Williams' "Imperial March": https://youtu.be/u7HF4JG1pOg.

lyrics.[61] The non-lyrical elements of these songs are critical to how listeners remember them and derive meaning from hearing them.

2. Lyrical Elements of a Musical Composition

29. In addition to non-lyrical elements, composers can also use human voice as an instrument in its own right or they can use sung text to convey additional meaning or give their composition a narrative.

30. The human voice, when used to make music, is no different from a trumpet or a cello, because it works using the same three principle components of all musical instruments: (1) a source of vibration; (2) a resonator to amplify the vibration; and (3) a means of amplifying the resonance to be heard or recorded.[62] The voice relies on air from the lungs passing over vocal folds which create the initial vibrations, which passes through the resonant vocal tract, and is then transferred to "free air space" by the mouth and lips.

31. Several forms of non-text vocalizations and paralinguistic vocal techniques use the human voice without recognizable words to convey musical expression. There is a long tradition in both classical and popular music of using the voice without words called "vocalise."[63] For example, this technique can be heard in the backing vocals of Adele's work-in-suit "Rumour Has It," which vocalize on the syllable "ooh."[64] Another form of non-text vocalization is scat singing in jazz music. Scat singers develop a vocabulary of paralinguistic scat syllables that are used in live and recorded performances, such as in Louis Armstrong's "Heebie Jeebies."[65] Another paralinguistic technique called "vocables" is used in rap and hip-hop music both for musical expression and as a "sonic icon [of an artist's] persona."[66] This technique can be seen

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61 Bronson, Fred, "How Ariana Grande's '7 Rings' Took a 'Sound of Music' Classic to the Top," *Variety*, January 28, 2019, https://variety.com/2019/music/news/ariana-grande-things-7-rings-sound-of-music-1203121782. Link to Ariana Grande's "7 Rings": https://youtu.be/QYh6mYIJG2Y&t=12.

62 Titze, Ingo R., "The Human Instrument," *Scientific American*, January 2008, at p. 94 ("To make music, an instrument needs three basic components: a sound source that vibrates in the air to generate a frequency that we perceive as pitch, together with higher frequencies that define the timbre (sound color); one or more resonators that reinforce the fundamental frequency by increasing its vibration strength; and a radiating surface or orifice that transfers the sounds to free air space and, eventually, to a listener's ear.").

63 Oxford English Dictionary, "Vocalise," https://www.oed.com/dictionary/vocalise_n?tab=meaning_and_use, accessed December 15, 2025.

64 Link to Adele's "Rumour Has It": https://youtu.be/A8IRqCJVkOo&t=49.

65 Bauer, William R., "Scat Singing: A Timbral and Phonemic Analysis," *Current Musicology*, Vol. 71, No. 73, 2002, pp. 303–323 at p. 309 ("In 'Heebie Jeebies' […] Armstrong uses unusual scat vocables in measure 9 to draw attention to a key structural moment. […] This phonemic recapitulation reinforces the return of the opening rhythmic idea, helping to give the solo its memorable shape."). Link to Louis Armstrong's "Heebie Jeebies": https://youtu.be/LrvCxkL6Ims&t=113.

66 Wallmark, Zachary, "Analyzing Vocables in Rap: A Case Study of Megan Thee Stallion," *Society for Music Theory*, Vol. 28, No. 2, 2022, pp. 1–22 at p. 1.

in work-in-suit "Anaconda" by Nicki Minaj at the end of the pre-chorus on the text "Dun-d-d-dun-dun-d-d-dun-dun."[67]

32. Even when a composition includes sung text, such text may, by itself, have no narrative meaning. Lyrics can include nonsensical or made-up words or a simple collection of syllables. Examples of lyrics with nonsensical or made-up words include Rihanna's work-in-suit song "Disturbia" (using a made up word "Disturbia," as well as the collection of syllables "Bum bum be-dum, bum bum be-dum bum")[68] or Phil Collins' song "Sussudio,"[69] which he revealed is based around a nonsense word "Sussudio" that he intended as a placeholder while developing the lyrics.[70] Many songs contain sections repeating collections of syllables, such as Spice Girls' work-in-suit "Wannabe" ("zig-a-zig ah"),[71] The Beatles' song "Ob-la-di, Ob-la-da," repeating the phrase "ob-la-di, ob-la-da,"[72] The Police's work-in-suit "De Do Do Do, De Da Da Da" ("De-do-do-do, de-da-da-da"),[73] The Andrews Sisters' work-in-suit "Boogie Woogie Bugle Boy" ("Da-da, da-da, da-da, da-da, da-da, da-da" and "Too-too-too-toot, toodlie-a-da, toodlie-a-da, toot-toot"),[74] as well as Was (Not Was)'s work-in-suit "Walk the Dinosaur" ("Boom boom acka lacka lacka boom/boom boom acka lacka boom boom").[75] In other instances, the sung text in a composition may consist, in part, of simple commonplace words or phrases and those words may still convey some limited narrative meaning. Such examples include Justin Bieber's song "Baby"[76] or Joe Cocker's work-in-suit "You Are So Beautiful," in which the repetition of text over musical time, and with changes in dynamic and vocal timbre contribute to dramatic shifts in emotional meaning.[77]

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67 Link to Nicki Minaj's "Anaconda": https://www.youtube.com/watch?v=LDZX4ooRsWs&t=67s.

68 Link to Rihanna's "Disturbia": https://youtu.be/E1mU6h4Xdxc&t=85.

69 Link to Phil Collins' "Sussudio": https://youtu.be/r0qBaBb1Y-U&t=70.

70 Melchior, Al, "The Reverse-Engineering Behind the Meaning of Phil Collins' 'Sussudio'," *American Songwriter*, January 16, 2024, https://americansongwriter.com/the-reverse-engineered-meaning-behind-phil-collins-sussudio ("Everyone who enjoyed the song wasn't necessarily wowed by its lyrics. It was hardly a surprise when Collins revealed that 'Sussudio' was a nonsense word he created while improvising the lyrics. He intended to replace it with an actual word but never found one that fit the melody as well.").

71 Link to Spice Girls' "Wannabe": https://youtu.be/gJLIiF15wjQ&t=86.

72 Link to The Beatles' "Ob-la-di, Ob-la-da": https://youtu.be/9x5WY_jmsko&t=26.

73 Link to The Police's "De Do Do Do, De Da Da Da": https://youtu.be/7v2GDbEmjGE&t=65.

74 Link to The Andrews Sisters' "Boogie Woogie Bugle Boy": https://youtu.be/ivCcPZPZMtU&t=50.

75 Link to Was (Not Was)'s "Walk the Dinosaur": https://youtu.be/zYKupOsaJmk.

76 Lyrics include "Baby, baby, baby, oh // Like baby, baby, baby, no // Like baby, baby, baby, oh // I thought you'd always be mine, mine // Baby, baby, baby, oh // Like baby, baby, baby, no // Like baby, baby, baby, oh // I thought you'd always be mine, mine." Link to Justin Bieber's "Baby": https://youtu.be/kffacxfA7G4&t=100.

77 Lyrics include "You are so beautiful // to me // you are so beautiful // to me // can't you see." Link to Joe Cocker's "You Are So Beautiful": https://youtu.be/DhMnhIY1pE0&t=12.

33. Even when lyrics have meaning, the lyrical content may be less salient to listeners than other elements of the composition, or the lyrics may be adapted from other sources, as I discuss further in **Section III.B**. In fact, an experimental study comparing the role of lyrics and melodies in eliciting emotions has shown that the musical setting of a song, especially the melody, is more connected to the emotional response of a listener than the lyrical content.[78]

B. Compositional Practices Vary Among Composers and Songwriters

34. The variety in the compositional processes of composers and songwriters demonstrates why lyrics are only a part of the entire musical composition, if they are present at all. Composers and songwriters follow many different approaches to composing music and depending on the approach, lyrics—if they are included at all—may play a secondary role in the process. Composers may not use text as part of their composition at all, or may compose music before adding lyrics.[79] They may work collaboratively with lyricists or may work on all elements of their composition themselves. They may also use existing sources, such as poems or lyrics from existing songs, as the basis of their new composition.

35. Many forms of music do not use text at all. In classical music, a large part of the repertoire is purely instrumental, including symphonies (exceptions are notable for their scarcity, for example Beethoven's "Symphony No. 9"), chamber music, and solo instrumental repertoire.[80] Instrumental writing is also common in jazz, including canonic albums like Miles Davis's "Kind of Blue." Electronic music is also often composed without lyrics. This has been the case since early electronic music, like "Kontakte," which was composed and realized in the late 1950s by Karlheinz Stockhausen with early electronic equipment.[81] This practice continues to be common in current electronic music as well, including the ambient music written by Brian Eno[82] and popular club tracks from Paul van Dyk and Tiësto.[83]

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78 Ali, S. Omar and Zehra F. Peynircioglu, "Songs and Emotions: Are Lyrics and Melodies Equal Partners?," *Psychology of Music*, Vol. 34, No. 4, 2006, p. 511–534.

79 In one famous example, Paul McCartney composed the music for "Yesterday" using the placeholder lyrics, "Scrambled eggs, oh my baby, how I love your legs…" before writing the actual lyrics to the song. See McCartney, Paul, "Paul McCartney Reveals the Stories Behind His Greatest Hits," *The Times*, October 17, 2021, https://www.thetimes.com/culture/music/article/paul-mccartney-the-lyrics-book-beatles-0xhq8trnd.

80 Link to Beethoven's "Symphony No. 9": https://youtu.be/rOjHhS5MtvA&t=3563.

81 Stockhausen: Sounds in Space, "Kontakte – Planning & Design," https://stockhausenspace.blogspot.com/2015/11/kontakte-planning-design.html, accessed December 2, 2025. Link to Karlheinz Stockhausen's "Kontakte": https://youtu.be/nbdmzSeFy_Y.

82 See **Section IV.B.4**.

83 Link to Paul van Dyk's "For an Angel": https://youtu.be/sRvEwXDxz_I. Link to Tiësto's "Adagio For Strings": https://youtu.be/2EaE0_gQLw0.

36. Another common practice is to compose the music first before sending it to a team of people to add a melody and lyrics, a process known as "toplining."[84] The topline team can include multiple writers, lyricists, and producers. David Bowie, for example, would add lyrics and melody after receiving the music from the band.[85] The singer-songwriter Sia, in addition to having her own breakout hits such as "Chandelier," toplined for Rihanna's "Diamonds."[86]

37. Composers and songwriters can also work together with lyricists to create music and lyrics collaboratively. For example, George and Ira Gershwin worked together as a songwriting team, George as composer and Ira as lyricist. The duo contributed important works like the opera Porgy and Bess, which includes the song "Summertime," and jazz standards like "I've Got Rhythm" and "Embraceable You."[87] Another example of this type of collaboration can be found in the early work of Elton John and Bernie Taupin, which resulted in the works-in-suit "Tiny Dancer," "Candle in the Wind," "Your Song," and all the other Elton John works-in-suit.[88]

38. In the singer-songwriter tradition, artists often write both the music and the lyrics to their songs. Taylor Swift is one well-known example of this compositional workflow. She became famous with albums featuring lyrics about her personal life that allow her listeners to feel close to her personally.[89] The personal connection she has fostered with her listeners through her vulnerability allows her songs to have emotional reach beyond that of other artists composing songs involving similar themes.[90] Her work has found critical and popular success, with 14 Grammy awards and large-scale stadium tours.[91] An earlier example of this style of composition can be found in Joni Mitchell, a singer-songwriter who in the 1960s and 1970s

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84 See, e.g., Blume, Jason, "How to Write to a Music Track: The Art of Toplining," *BMI*, June 23, 2022, https://www.bmi.com/news/entry/how-to-write-to-a-music-track-the-art-of-toplining.

85 Blume, Jason, "How to Write to a Music Track: The Art of Toplining," *BMI*, June 23, 2022, https://www.bmi.com/news/entry/how-to-write-to-a-music-track-the-art-of-toplining.

86 St. Asaph, Katherine, "Sia is the 21st Century's Most Resilient Songwriter," *NPR*, November 6, 2018, https://www.npr.org/2018/11/06/664395501/sia-is-the-21st-centurys-most-resilient-songwriter. Link to Rihanna's "Diamonds": https://youtu.be/lWA2pjMjpBs&t=40.

87 The Society of Composers & Lyricists, "George & Ira Gershwin," October 23, 2009, https://thescl.com/hall-of-fame/george-ira-gershwin. Link to "Summertime": https://youtu.be/NghjBMn6ZJM. Link to "I've Got Rhythm": https://youtu.be/XVRHMyUe8RY. Link to "Embraceable You": https://youtu.be/jk2pwv69-xg&t=20.

88 Link to Elton John's "Tiny Dancer": https://youtu.be/yYcyacLRPNs&t=41; "Candle in the Wind": https://youtu.be/MYU3F8uUGiw; "Your Song": https://youtu.be/FT3D1Cu6g10.

89 Kendong, Faruq Ahmad, Afifah Sakinah Daud, and Siti Aeisha Joharry, "A Corpus-Driven Analysis of Taylor Swift's Song Lyrics," *International Journal of Modern Languages and Applied Linguistics*, Vol. 7, No. 2, June 1, 2023, pp. 59–82.

90 Haupt, Angela, "Why Taylor Swift's Music Makes Us So Emotional," *TIME*, April 19, 2024, https://time.com/6968864/why-music-makes-us-emotional-taylor-swift.

91 Grammy, "Taylor Swift," https://www.grammy.com/artists/taylor-swift/15450, accessed December 9, 2025.

became an embodiment of the politics of the time as her lyrics contained messages that resonated with listeners.

39. Artists can take inspiration from many written sources when working on their musical composition. Some artists use poetry that they repurpose as lyrics for their music. For example, the poem "The Tyger" published in 1794 by English poet William Blake was later used by classical pianist and composer Benjamin Britten in his song cycle for baritone voice and piano, as well as a German electronic music band Tangerine Dream.[92] Perhaps more recognizably, "The Star-Spangled Banner" and "Auld Lang Syne" were both originally poems and later set to music to become the songs we know them as today – the national anthem of the United States and an iconic song to welcome the New Year.[93]

40. Finally, another very common practice is to set existing lyrics to new music or use the singer's voice to alter the meaning of the original text.[94] As I discuss in greater detail in **Section III.C** below, even with the same lyrics, the meaning of a song can be changed through the many non-textual elements.

41. The variety in music composition processes demonstrates that lyrics are only a part of the entire musical composition, if present at all. While some artists create music and lyrics simultaneously, many others treat lyrics as secondary or separate or, in the case of instrumental music, do not consider lyrics at all in their artistic processes.

C. Music Compositions with Shared or Similar Lyrics Can Lead to Different Emotional Expression

42. Lyrics do not always uniquely identify a song. There are many instances where multiple songs may use the same or similar lyrics with different underlying music. The difference in the underlying music or change in the singer's interpretation can have a large impact on what is being expressed by the composition, and how the audience experiences it.

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[92] Benjamin Britten composed "Songs & Proverbs of William Blake, Op. 74: VIII. The Tyger"; Tangerine Dream used the same poem in their song "Tyger." Link to Benjamin Britten's "The Tyger": https://youtu.be/xZxAdsFCBr0. Link to Tangerine Dream's "Tyger": https://youtu.be/_6UsrgRkOas&t=17.

[93] Maryland Center For History and Culture, "The Star-Spangled Banner," https://www.mdhistory.org/resources/the-star-spangled-banner, accessed December 12, 2025; Lewis, Robert, "Auld Lang Syne," *Britannica*, December 9, 2025, https://www.britannica.com/topic/Auld-Lang-Syne. Link to "The Star-Spangled Banner": https://youtu.be/DADmZdbQ9x8. Link to "Auld Lang Syne": https://youtu.be/W_6Vs8pADrQ.

[94] See, e.g., Forney, Kristine, Andrew Dell'Antonio, and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022, p. 33.

43. Consider the example of "Lux Aeterna," the text from the Roman Catholic Mass, which has been set to music by many composers.[95] One well-known setting is by Wolfgang Amadeus Mozart in his "Requiem Mass," known popularly from the movie Amadeus.[96] Another well-known setting of the same text is by György Ligeti in his choral work "Lux Aeterna," a dense contemporary sound-mass work.[97] The two pieces, though using the same lyrics, convey vastly different emotions. Ligeti's piece uses micro-polyphony to represent a cosmic presence, while Mozart's Lux Aeterna carries the audience from sorrow to hope.

44. In another notable example, Otis Redding's 1965 song "Respect" is sung from the male perspective and reenforces a traditional male-dominated hetero-relational power structure.[98] In contrast, Aretha Franklin's resetting of these lyrics, with cosmetic textual changes and the important change of perspective to a female vocalist, changed the meaning of the song from what some scholars articulate as misogynistic, to a feminist anthem.[99]

45. Many artists put their own voice and spin on the lyrics of others, from Elvis Presley covering "Hey Jude" by the Beatles to Miley Cyrus covering "You're Going to Make Me Lonesome When You Go" by Bob Dylan. In fact, some artists' interpretations of lyrics originally sung by someone else are more popular than the "original," like Whitney Houston's cover of "I Will Always Love You" by Dolly Parton.[100]

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[95] Trapp, Philip, "What Does The New Metallica Song Title 'Lux Aeterna' Mean?," *Loudwire*, November 28, 2022, https://loudwire.com/metallica-lux-aeterna-song-title-meaning ("The term 'Lux Aeterna,' while used for several pieces of art over the years, originated as a section of a liturgical chant in the Catholic requiem mass to honor the dead. Subsequently, several artists have re-imagined the antiphon used in communion.").

[96] Nashville Symphony Schermerhorn Symphony Center, "Wolfgang Amadeus Mozart Requiem, K.626," https://www.nashvillesymphony.org/classical-program-notes/wolfgang-amadeus-mozart-requiem-k-626. Link to "Requiem Mass": https://youtu.be/MafAZeag1_0.

[97] Judd, Timothy, "György Ligeti's 'Lux Aeterna': The Ethereal Land of Micropolyphony," *The Listeners' Club*, January 18, 2019, https://thelistenersclub.com/2019/01/18/gyorgy-ligetis-lux-aeterna-the-ethereal-land-of-micropolyphony. Link to "Lux Aeterna": https://youtu.be/j2cRjiC4ODI.

[98] NPR, "'Respect' Wasn't a Feminist Anthem Until Aretha Franklin Made it One," February 14, 2017, https://www.npr.org/2017/02/14/515183747/respect-wasnt-a-feminist-anthem-until-aretha-franklin-made-it-one ("[Aretha Franklin's] track was actually a clever gender-bending of a song by Otis Redding, whose original reinforced the traditional family structure of the time: Man works all day, brings money home to wife and demands her respect in return."). Link to Otis Redding's "Respect": https://youtu.be/rEgKSj1VHZ0&t=13.

[99] NPR, "'Respect' Wasn't a Feminist Anthem Until Aretha Franklin Made it One," February 14, 2017, https://www.npr.org/2017/02/14/515183747/respect-wasnt-a-feminist-anthem-until-aretha-franklin-made-it-one. Link to Aretha Franklin's "Respect": https://youtu.be/A134hShx_gw&t=9.

[100] King, Ariel, "10 Covers that Wound Up Being More Popular than the Original," *iHeart*, October 8, 2021, https://www.iheart.com/content/2021-10-08-10-covers-that-wound-up-being-more-popular-than-the-original. Link to Elvis Presley's "Hey Jude": https://youtu.be/R21bTCLgOCs. Link to Miley Cyrus' "You're Gonna Make Me Lonesome When You Go": https://youtu.be/I2wvaWTTmz8&t=37. Link to Whitney Houston's "I Will Always Love You": https://youtu.be/3JWTaaS7LdU.

46. Other examples involve artists from distant genres using the same set of lyrics, in what is commonly known as a "cover."[101] For example, Bob Seger and Metallica interpreted Seger's song "Turn the Page" in fundamentally different ways.[102] The lyrics describe someone struggling with weariness, isolation, and longing, and are based on Seger's experience as a touring musician. In the original recording, the instrumentation, including the blues-inflected saxophone riff, and the weary vocal timbre contribute to the loneliness and anonymity of his life on the road. Metallica's cover of this song is more aggressive, with hard-rock style vocals,[103] heavy drums, and distorted rhythm guitar and electric lead guitar replacing the saxophone riff. These changes result in a more intense and aggressive perception of the narrative meaning. A similar example of changed expression can be heard in Jimi Hendrix's cover of work-in-suit "All Along the Watchtower."[104] The original song by Bob Dylan uses a faster tempo (128BPM) and a lighter folk-rock texture with acoustic guitar, harmonica, and a simple drum-set pattern which lend a dark foreboding character to the song.[105,106] Jimi Hendrix's version of the song uses a slower tempo (112BPM), virtuosic lead electric guitar riffs, electric rhythm guitar, and distorted guitar interjections, raucous drum-set writing with complex fills, and vocals characterized by growls and other timbral effects. These musical elements combine to create a sense of rage, defiance, urgency, and tumult.[107]

47. As these examples illustrate, lyrics alone do not distinguish a composition, but instead must be paired with the music to achieve the full emotional response intended by the composer.

48. Moreover, in some instances, the same song may be associated with multiple different sets of lyrics. Those lyrics may convey fundamentally different meanings, although the overall expression of the song may remain the same because of the other compositional elements. For example, work-in-suit "Bittersweet Symphony" by the band The Verve appears with multiple different versions of the allegedly official lyrics, even in Plaintiffs' own records: one version

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[101] MasterClass, "What Is a Cover Song? A Brief History of Cover Songs," September 2, 2021, https://www.masterclass.com/articles/cover-song-music-guide.

[102] Link to Bob Seger's "Turn the Page": https://youtu.be/evnZfSEtr5k&t=19. Link to Metallica's "Turn the Page": https://youtu.be/qPOTEs_yTJo&t=30.

[103] Heidemann, Kate, "A System for Describing Vocal Timbre in Popular Song," *Journal of the Society for Music Theory*, Vol. 22, No. 1, 2016, pp. 1–17.

[104] Link to Jimi Hendrix's "All Along the Watchtower": https://youtu.be/TLV4_xaYynY.

[105] Link to Bob Dylan's "All Along the Watchtower": https://youtu.be/bT7Hj-ea0VE.

[106] BPM refers to beats per minute and is a measure of tempo.

[107] Zak III, Albin J., "Bob Dylan and Jimi Hendrix: Juxtaposition and Transformation 'All Along the Watchtower'," *Journal of the American Musicological Society*, Vol. 57, No. 3, 2004, pp. 599–644.

uses the lyric "I can change" whereas another uses the lyric "I can't change."[108] As ABKCO has acknowledged, these changes result in differences in meaning.[109] Similarly, Universal Music Publishing Group acknowledged the two copies of the lyrics to work-in-suit "Sweet Home Alabama"—one version with the line "I hope Neil Young will remember" and another with "I hope you young will remember"—have different meanings.[110] In another example, the rock song and work-in-suit, "We Built This City" has different lyrics across versions, with one version including the lyric "Who rides the wrecking ball into our guitars" and another using the lyric, "Who rides the wrecking ball in two rock guitars."[111]

D. Differences in Compositional Techniques Mean That Text of Lyrics Alone Is Not Sufficient to Convey the Same Expression as the Overall Music Composition

49. Composers and songwriters use a range of compositional techniques such as prosody or word painting to assign words meaning and expression that cannot be achieved through lyrics alone. These techniques are reflected in the musical form of a composition, or how a composer assembles the different elements into a coherent musical work. Text setting is the technique of pairing syllables with individual notes in a vocal composition.[112] The traditional expectation of text-setting is that the text will be set in a linguistically natural way, that is, that syllables that are stressed in spoken language will be paired with notes that are also stressed. Which

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[108] See 30(b)(6) Deposition of Alisa Coleman, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, October 29, 2025 ("Coleman Deposition"), pp. 77:13–77:20 (Q. Okay. But you'll agree with me that the text shown under the videos on genius.com [for the song Bittersweet Symphony by the Verve] says, 'I can change,' correct? A. That is what it says. Q. And the text shown in the sheet music produced by ABKCO says, 'I can't change,' right? […] A. Yes."), pp. 81:12–81:17 ("Q. And again, that ['I can change'] is consistent with what you heard on the MP3 but inconsistent with the sheet music ['I can't change' in] Exhibit 10, right? […] A. Both are correct. Both are authorized by ABKCO. Both – both can be true.").

[109] Coleman Deposition, pp. 69:19–69:23 ("Q. But you appreciate that, 'I can change' means something different from 'I can't change,' right? A. Yes.").

[110] 30(b)(6) Deposition of David Benjamin Kokakis, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 11, 2025 ("Kokakis Deposition"), pp. 122:25–123:25 ("Q. […] [I]f we go to the fifth line down, there's the lyric, 'well, I hope you young will remember.' Do you see that? A. Yes. Q. And if we then turn to Exhibit 20 [sheet music of Sweet Home Alabama], the fourth line, toward the end of that line is the lyric, 'well, I hope Neil Young will remember.' Do you see that? A. I do. Q. Those are different, right? […] [A.] Yes, they are different. […] Q. Different in meaning, correct? […] [A.] Yes. […] Q. Which one is right? […] [A.] Again, both […].").

[111] 30(b)(6) Deposition of Duff Berschback, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, October 10, 2025 ("Berschback Deposition"), pp. 92:2–94:9 ("Q. And the line says, 'Who rides the wrecking ball in two rock guitars,' the number two, followed by 'rock guitars?' A. Uh-huh. […] Q. Okay. In Exhibit 8, the line says, 'Who rides the wrecking ball into,' I-N-T-O, 'our guitars?' Do you see that? A. I do. […] Q. But the words, the actual words that are written down on the page are different words, correct? […] A. Yeah. […] Q. Which version of the written copy of the lyrics for 'We Built This City' is correct? […] [A.] Both.").

[112] Proto, Teresa, "Prosody, Melody and Rhythm in Vocal Music," *Linguistics in the Netherlands*, 2015, pp. 116–129 at p. 116 ("As a matter of fact, when lyrics are set to music, speech units are assigned to musical pitches in such a way as to conform to specific requirements of the singing idiom.").

notes are stressed in a meter is a matter of convention. Because of this expectation of natural text-setting, it is musically notable when a composer defies these conventions. The pairing of syllables to notes is therefore a musically meaningful technique.[113]

50. Another consideration is the number of notes assigned to each syllable.[114] This pairing of syllables and notes in prosody are described in three categories: syllabic, in which each syllable is assigned to a single note; melismatic, in which each syllable is assigned to many notes; and neumatic, in which each syllable is assigned to two to four notes.[115] These techniques allow for the artist to better communicate their intended meaning and emotions to the listener. They are part of the reason why a listener can have a stronger emotional reaction to the same set of words sung in a song than when reading them off a page.

51. Word painting is the practice of mirroring, in some way, the meaning of the words in a composition in the musical writing.[116] An early example of this can be found in George Frideric Handel's oratorio *Messiah*.[117] Another, more contemporary, example of word painting can be found in Katy Perry's work-in-suit "Roar." At the end of each chorus of this song, Perry imitates a lion's roar in the repeated 'Oh oh oh oh oh oh" non-textual vocalization following the lyrics "You're gonna hear me roar," illustrating, through word painting, the meaning of the text with a musical gesture.[118] A similar word painting device is used in Garth Brooks' work-in-suit "Friends in Low Places.". On the word "low" Garth Brooks sings his lowest note of the melody.[119] Another interesting example occurs in Billie Eilish's "everything i wanted." On the words "but my head was underwater," the equalization of the vocal track changes to muffle the sound, almost as if Eilish was underwater.[120]

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[113] StudySmarter, "Text Setting," https://www.studysmarter.co.uk/explanations/music/music-composition/text-setting, accessed December 12, 2025 ("Text setting is the process of aligning written lyrics with music in a way that reflects the natural rhythm and emotional tone of the language, ensuring clarity and expressiveness in a song or composition. This technique is crucial in choral and vocal compositions, where the prosody of the text must complement the melody for effective delivery. Understanding the interplay between words and music enhances both the listener's and performer's experience, making text setting a fundamental skill for composers and musicians.").

[114] Routledge Textbooks, "Text Setting (Melismatic vs. Syllabic)," https://routledgetextbooks.com/textbooks/9781138684478/globe/globe112.php, accessed December 10, 2025.

[115] Routledge Textbooks, "Text Setting (Melismatic vs. Syllabic)," https://routledgetextbooks.com/textbooks/9781138684478/globe/globe112.php, accessed December 10, 2025; OnMusic Dictionary, "Neumatic," June 5, 2016, https://dictionary.onmusic.org/terms/2330-neumatic.

[116] OnMusic Dictionary, "Word Painting," May 6, 2016, https://dictionary.onmusic.org/terms/3957-word_painting.

[117] The Handel and Haydn Society, "Interactive Program Notes: Handel's Messiah," https://handelandhaydn.org/interactive-program-notes-handels-messiah, accessed December 2, 2025. Link to "Messiah": https://youtu.be/2-QV_I-xseA&t=95.

[118] Link to Katy Perry's "Roar": https://youtu.be/CevxZvSJLk8 &t=89.

[119] Link to Garth Brooks "Friends in Low Places": https://music.amazon.com/albums/B01LXP3M5P.

[120] Link to Billie Eilish's "everything i wanted": https://youtu.be/EgBJmlPo8Xw&t=128.

52. The way a composer or songwriter assembles the different musical elements together determines musical form, or the structure or shape of a piece of music. Musical elements are combined and adjusted to create musical phrases, which can be thought of as "goal-directed motion" to a musical arrival, or the build-up and release of musical tension.[121] Starting from this basic building block of musical structure, phrases can be combined to create small and large scale works just as sentences in English can be organized into paragraphs, and later into novels or essays.[122] Larger sections are often defined and delineated by repetition of rhythm, harmony, or other musical elements. The chorus, for example, is a repeated structural element that is often used to distill the message of the song, and the verse-chorus form is most popular in pop and rock songs. Bob Dylan's work-in-suit "Blowin' in the Wind" uses a strophic form where the music is repeated, but with different lyrics for each verse. The repeated melody in this song helps emphasize the universality of the human struggle described in the lyrics, while the repetition of the last line in each verse, "The answer is blowin' in the wind" reinforces that the answers are constantly present, yet constantly elusive.[123]

53. While the lyrics can convey expression, without these other musical elements, the lyrics alone cannot communicate the same full messages. In fact, songs with their lyrics removed can be as impactful as songs with lyrics, demonstrating the secondary role lyrics can sometimes play. Instrumental versions of songs that originally had lyrics have a track record of attracting widespread popularity. The instrumental versions generally retain certain musical parameters, especially melody, tempo, and harmony, allowing the audience to recognize them and connect to them even without lyrics. For example, the TV Show Bridgerton often uses classical covers of contemporary pop songs.[124] Kris Bowers, the composer of the score for the show explained that they may choose a cover over an original piece if "there's something that can, lyrically, even though we don't hear lyrics, speak to a moment really well."[125] This ability for music to remain recognizable and convey emotion even when stripped of lyrics demonstrates how lyrics are only one part of a much broader set of musical elements.

54. In the following examples, the timbre and texture change, and the lyrics are removed, but the works retain their emotional impact, evidenced by the popular reception of the work. The

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[121] Laitz, Steven G., *The Complete Musician: An Integrated Approach to Theory, Analysis, and Listening*, 1 Ed., Oxford University Press, 2003, at p. 295.

[122] BaileyShea, Matt, *Lines and Lyrics An Introduction to Poetry and Song*, Yale University Press, 2021, at p. 146.

[123] Link to Bob Dylan's "Blowin' in the Wind": https://youtu.be/MMFj8uDubsE&t=34.

[124] Hill, Laura Wheatman, "'Bridgerton' Composer Kris Bowers & Vitamin String Quartet Continue to Make Classical Music Pop for Season 3," *Grammy*, May 16, 2024, https://www.grammy.com/news/bridgerton-classical-pop-music-kris-bowers-vitamin-string-quartet.

[125] Hill, Laura Wheatman, "'Bridgerton' Composer Kris Bowers & Vitamin String Quartet Continue to Make Classical Music Pop for Season 3," *Grammy*, May 16, 2024, https://www.grammy.com/news/bridgerton-classical-pop-music-kris-bowers-vitamin-string-quartet.

Croatian duo 2Cellos released an instrumental cover of AC/DC's "Thunderstruck" on YouTube in 2013 that has since garnered 284 million views and launched their international stadium-touring career.[126] "Thunderstruck" and the other cover repertoire from the group varies in important ways from the original source material, especially in that it does not include text, but it has attracted a devoted audience. Similarly, the German group Symphoniacs, of which I am a member, has made a career performing instrumental covers of pop dance music hits. For example, Symphoniacs' instrumental cover of Coldplay's "Sky Full of Stars" featuring violin, cello, piano and electronics—without any lyrics—has attracted 20 million views on YouTube.[127] Ultimately, while lyrics can be part of contributing to the overall expression of the work, they derive much of their expressive value through their combination with the underlying musical elements.

IV. LLMS AND GENAI TOOLS OFFER MAJOR BENEFITS TO COMPOSERS AND SONGWRITERS

A. Advances in Music Technology Have a Long History of Expanding—Rather Than Diminishing—Human Creativity

55. Throughout recorded musical history, musicians have used various technologies to augment their own creativity or automate the process of music creation. These technologies have ranged from those based on chance or the characteristics of nature, such as powering an instrument by wind, to automation through mechanical mechanisms such as the player piano, to more complex transformations of human-generated sound through the synthesizer, MIDI, or autotune. GenAI is simply the most recent in a long list of technological advances in music creation tools. Plaintiffs voice "growing alarm" over the spread and increased use of genAI technology and claim that the technology "will have potentially devastating effects on artists and the creation of new works."[128] This type of speculative catastrophic prediction has been made at prior times when musicians and artists faced new technology.

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[126] 2Cellos, "2Cellos – Thunderstruck [Official Video]," https://www.youtube.com/watch?v=uT3SBzmDxGk, accessed December 10, 2025; Xfinity Mobile Arena, "2Cellos Announce 2022 U.S. Tour with Performance at Xfinity Mobile Arena on April 1," July 19, 2021, https://www.xfinitymobilearena.com/news/detail/2cellos-announce-2022-us-tour-with-performance-at-wells-fargo-center-on-april-1.

[127] Symphoniacs, "Home Page," https://www.symphoniacs.com, accessed December 5, 2025 ("[Symphoniacs'] version of Coldplay's 'A Sky Full of Stars' in particular has achieved over 20 million YouTube views and trills fans around the world."). See Symphoniacs, "A Sky Full of Stars/Coldplay – Symphoniacs (Violin, Cello, Piano and Electronic Version/Cover)," *YouTube*, September 30, 2016, https://www.youtube.com/watch?v=rX2pB2kqHZ0.

[128] First Amended Complaint, ¶ 148.

56. Starting as far back as Ancient Greece, the Aeolian harp was an instrument designed to be played without human intervention, by the chance gusts of the wind.[129] Despite obviating the need for a human player, harps continued to exist and evolve;[130] the Aeolian harp did not replace harpists. The Guidonian hand, a method for singing and composing within the medieval hexachord system, is another early example of music technology that assisted in human creativity rather than replacing it, by making it easier for students to understand medieval music theory.[131] The Musikalisches Würfelspiel, a musical dice game developed during the Classical Era, was used to randomly generate music based on a collection of pre-composed musical fragments and the chance rolling of dice.[132] Originally pioneered by Wolfgang Amadeus Mozart,[133] this technique was used in the 18th century by C.P.E. Bach in a piece with the translated title "A method for making six bars of double counterpoint at the octave without knowing the rules."[134] Notably, the emergence of this new technique did not prevent Mozart or other well-known composers such as Franz Josef Haydn from continuing their successful compositional careers, despite allowing amateur musicians to compose music as well.[135]

57. A hundred years later, in 1895, a new music technology emerged with the invention of the player piano.[136] The self-playing piano (see **Figure 2**) used a mechanism to play notes by following a pattern of holes on a roll of paper.[137]

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[129] British Literature Wiki, "Aeolian Harps and the Romantics," https://sites.udel.edu/britlitwiki/aeolian-harps-and-the-romantics, accessed December 2, 2025.

[130] Levitan, Dan, "The History of the Harp," *Stanford Live*, October 31, 2024, https://live.stanford.edu/news/the-history-of-the-harp.

[131] Reisenweaver, Anna, "Guido of Arezzo and His Influence on Music Learning," *Musical Offerings*, Vol. 3, No. 1, 2012, pp. 37–59, at p. 47 ("With each note designated by a letter and its appropriate syllables, the gamut could be clearly understood as a system of overlapping hexachords. To aid in this understanding, the human hand was used as a learning device, known as the Guidonian Hand […] to allow the student to visualize the gamut and recall the intervals between notes.").

[132] MusOpen, "Mozart Musikalisches Würfelspiel, K. 516f," https://musopen.org/music/2914-musikalisches-wurfelspiel-k-516f, accessed December 5, 2025; Author, I. T., *Musical Dice Game Waltzes I*, Libre Edition Press, May 21, 2025, at p. 3.

[133] MusOpen, "Mozart Musikalisches Würfelspiel, K. 516f," https://musopen.org/music/2914-musikalisches-wurfelspiel-k-516f, accessed December 5, 2025

[134] Bottignole, Livia Malossi, "History of Games in Music and Music in Games. Die Musikalisches Würfelspiel," *Research Catalogue*, https://www.researchcatalogue.net/view/2622512/2737970, accessed December 15, 2025.

[135] Kelling, Hans-Wilhelm, "A Chronology of Mozart and His Times," *BYU Studies Quarterly*, Vol. 43, No. 3, July 1, 2004, pp. 1–12; Stewart, James, "Timeline: Franz Joseph Haydn," *Vermont Public*, December 7, 2015, https://www.vermontpublic.org/programs/2015-12-07/timeline-franz-joseph-haydn; Peterson, Ivars, "Mozart's Melody Machine," *ScienceNews*, August 23, 2001, https://www.sciencenews.org/article/mozarts-melody-machine.

[136] Cooper, Blake, "History of Player Piano Systems," *Cooper Piano*, April 7, 2025, https://cooperpiano.com/history-of-player-piano-systems.

[137] Wills, Matthew, "Player Pianos and the Commodification of Music," *JSTOR Daily*, December 26, 2017, https://daily-jstor-org.bibliotheek.ehb.be/what-player-pianos-meant-to-american-families.

Figure 2: Player Piano[138]



58. This technology attracted vocal critics, including John Philip Sousa, who, in his essay "The Menace of Mechanical Music," warned that it was becoming a "substitute for human skill, intelligence and soul."[139] Sousa warned of "the impending harm to American musical art" and predicted "a marked deterioration in American music and musical taste, an interruption in the musical development of the country, and a host of other injuries [as a result] of the multiplication of the various music-reproducing machines."[140] This technology served to increase access to music recordings in private homes before the phonograph and radio became more widely available and affordable.[141] Sousa's warnings did not materialize and the player piano did not replace pianists. In fact, the player piano coexisted with some of the most important pianists and composers of the Western classical canon, including Vladimir Horowitz, Arthur Rubinstein, Sergei Rachmaninoff, and many others.[142] While the popularity

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138 The Pianola Institute, "History of the Pianola – Player Pianos," https://www.pianola.org/history/history_playerpianos.cfm, accessed December 12, 2025.

139 Sousa, John Philip, "The Menace of Mechanical Music," *Appleton's Magazine*, Vol. 8, 1906, pp. 278–284 at p. 278.

140 Sousa, John Philip, "The Menace of Mechanical Music," *Appleton's Magazine*, Vol. 8, 1906, pp. 278–284 at p. 278.

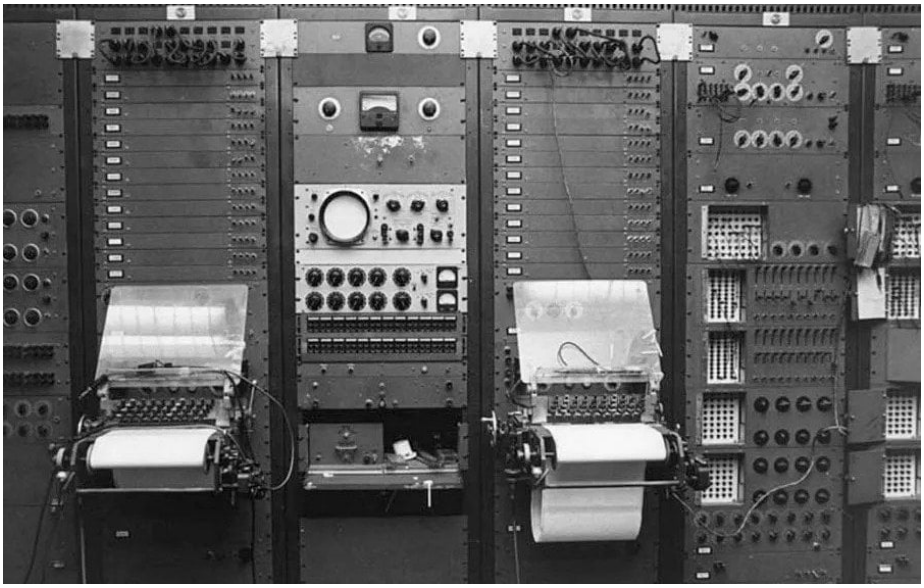
141 Wills, Matthew, "Player Pianos and the Commodification of Music," *JSTOR Daily*, December 26, 2017, https://daily-jstor-org.bibliotheek.ehb.be/what-player-pianos-meant-to-american-families.

142 See, e.g., Duchen, Jessica, "Best Classical Pianists of All Time: Top 25," *UDiscover Music*, October 1, 2025, https://www.udiscovermusic.com/classical-features/best-classical-pianists.

of the technology has subsided, it still exists today.[143] True to its original intent, it is now possible to purchase libraries of performances by well-known pianists that can be "performed" on digitally controlled player pianos.[144]

59. Starting in the mid-1900s, new technologies disrupted the music industry nearly every decade. One of the first modern and programmable synthesizers, the RCA Mark II Sound Synthesizer (see **Figure 3**) was created in 1957.[145]

Figure 3: Mark II Synthesizer[146]



60. A composer, even one without the ability to play a piano, guitar, or other traditional instrument, could punch holes in paper tape to create sequences of notes for the synthesizer to play.[147] Synthesizers made up a small niche in the industry until the Moog synthesizer was popularized by Wendy Carlos and her album *Switched on Bach* in 1968.[148] Though it was ultimately adopted broadly by rock and jazz musicians, at the time there was substantial pushback against

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143 Cooper, Blake, "History of Player Piano Systems," *Cooper Piano*, April 7, 2025, https://cooperpiano.com/history-of-player-piano-systems.

144 Yamaha, "About Disklavier TV," https://www.yamaha.com/usa/disklaviertv/about.html, accessed December 10, 2025.

145 Mitchell, Naomi, "Hello Victor: History of the RCA MkII Sound Synthesizer," *Perfect Circuit*, June 16, 2023, https://www.perfectcircuit.com/signal/rca-mkii-synthesizer-history.

146 Mitchell, Naomi, "Hello Victor: History of the RCA MkII Sound Synthesizer," *Perfect Circuit*, June 16, 2023, https://www.perfectcircuit.com/signal/rca-mkii-synthesizer-history.

147 Mitchell, Naomi, "Hello Victor: History of the RCA MkII Sound Synthesizer," *Perfect Circuit*, June 16, 2023, https://www.perfectcircuit.com/signal/rca-mkii-synthesizer-history.

148 Moog, "Switched-On Bach: How the World Met Moog," Janurary 25, 2018, https://www.moogmusic.com/the-wave/switched-bach-how-world-met-moog.

using the technology. There was deep concern among session musicians that synthesizers would replace their work; there were reports that the use of synthesizers "reduced studio work opportunities for musicians"[149] and one composer said, "I don't need musicians […] I can do it all at home on synthesizers."[150] In fact, at the time, the contract of a labor union representing professional musicians included a clause "designed to prevent studios from using synthesizer musicians to replace conventional players."[151] Instead, the disruptive force of the synthesizer and its progeny discussed below opened new creative possibilities, leading to transformative musical composition from artists including Pink Floyd, Radiohead, Kraftwerk, Daft Punk, and countless others, including many songwriters whose works are at issue in this suit.[152] The rock band Queen stated in their early liner notes that they did not use synthesizers, though they later adopted the technology as they were convinced by its transformative impact.[153] After the initial disruption, synthesizers created new avenues of work and income for musicians. The synthesizer became an instrument, just like guitar or piano, that musicians could specialize in,

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149 Holt, Denise M., "Musicians Tuned Out as Taped Music Slams Job Doors," *Daily Times-Advocate*, August 17, 1979, https://www.newspapers.com/image-view/570467642.

150 Jalon, Allan, "High-Tech Notes: Synthesizers: Sour Sound to Musicians," *Los Angeles Times*, December 6, 1985, https://www.latimes.com/archives/la-xpm-1985-12-06-mn-554-story.html.

151 Jalon, Allan, "High-Tech Notes: Synthesizers: Sour Sound to Musicians," *Los Angeles Times*, December 6, 1985, https://www.latimes.com/archives/la-xpm-1985-12-06-mn-554-story.html.

152 Computer Music, "The 40 Greatest Synth Sounds of All Time, No. 6: Pink Floyd – Shine On You Crazy Diamond," *MusicRadar*, May 24, 2021, https://www.musicradar.com/news/pink-floyd-best-synth-sound; Carr, Dan, "Recreating Radiohead's Keys and Synths with Software Instruments," *Reverb*, July 13, 2018, https://reverb.com/news/recreating-radioheads-keys-and-synths-with-software-instruments; Eilers, Lasse, "Kraftwerk – Their Legendary Synths,Sequencers and Sounds," *Gearnews*, https://www.gearnews.com/kraftwerk-synths-sequencers-sounds, accessed December 17, 2025; Reverb Machine, "Daft Punk's Discovery Synth Sounds," https://reverbmachine.com/blog/daft-punk-discovery-synth-sounds. For example, Owl City's work-in-suit "Fireflies" (Link: https://www.youtube.com/watch?v=psuRGfAaju4) and Cyndi Lauper's work-in-suit "Time After Time" (Link: https://www.youtube.com/watch?v=VdQY7BusJNU) used synthesizers as compositional tools. See Slater, Aaron, "How I Wrote 'Fireflies' by Adam Young (Owl City)," *Songwriting Magazine*, July 14, 2019, https://www.songwritingmagazine.co.uk/interviews/owl-city; Rosenschein, Ari, "Rob Hyman: The Hooters, Time After Time, and the JUNO-60," *Roland*, https://articles.roland.com/rob-hyman-the-hooters-time-after-time-and-the-juno-60, accessed December 17, 2025. This is a limited set of the works-in-suit that use synthesizer. Many more works in this suit use synthesizer than are listed here.

153 Griffiths, Daniel, "'No Synthesizers'? No Way! How Queen Backtracked on a Boast, Embraced Synths and went Stratospheric," *MusicRadar*, November 2023, https://www.musicradar.com/news/queen-no-synths-real-story.

develop mastery, and be hired to perform.[154] Because of the technical nature of the new instrument, new jobs emerged for synth programmers and technicians.[155]

61. The cycle of innovation repeated in the late 1970s, after the release of the Fairlight CMI synthesizer, which had the capability to record and re-play short clips of audio.[156] This technology gave rise to sampling, which is the practice of reproducing a clip of audio taken from another recording.[157] Samples can vary from very short clips to longer portions of music. Later samplers, like the Akai S950 (see **Figure 4**), allowed the practice to become more widespread, becoming a foundation of hip-hop and electronic music genres.[158]

Figure 4: Akai S950[159]



62. The creative use of this technology gave rise to the canonic beats of the golden era of hip-hop,[160] and are important components of many other songs including works-in-suit such as:[161]

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[154] For instance, Gordon Bahary who worked extensively with Stevie Wonder, see Greene, Jayson, "Stevie Wonder and His Dream Machines," *Pitchfork*, February 27, 2022, https://pitchfork.com/features/overtones/stevie-wonder-and-his-dream-machines-synth. Drew Schlesinger created thousands of presets for leading synthesizer manufacturers, see Spectrasonics, "Drew Schlesinger," https://www.spectrasonics.net/company/artists/artist.php?id=135, accessed December 12, 2025.

[155] See, e.g., Berklee, "Synth Programmer," https://www.berklee.edu/careers/roles/synth-programmer, accessed December 10, 2025.

[156] See, e.g., Taylor, Beth, "The Instrument That Invented Sampling," *National Film and Sound Archive of Australia*, https://www.nfsa.gov.au/latest/fairlight-instrument-invented-sampling, accessed December 10, 2025.

[157] See, e.g., Taylor, Beth, "The Instrument That Invented Sampling," *National Film and Sound Archive of Australia*, https://www.nfsa.gov.au/latest/fairlight-instrument-invented-sampling, accessed December 10, 2025.

[158] Computer Music, "A Brief History of Sampling," *MusicRadar*, August 5, 2014, https://www.musicradar.com/tuition/tech/a-brief-history-of-sampling-604868.

[159] Electronic Musician, "Akai S950 Review," *MusicRadar*, March 31, 2020, https://www.musicradar.com/news/akai-s950-review.

[160] Detrick, Ben, "The Dirty Heartbeat of the Golden Age," *The Village Voice*, November 6, 2007, https://www.villagevoice.com/the-dirty-heartbeat-of-the-golden-age.

[161] This is a limited set of the works-in-suit that use sampling. Many more works in this suit use sampling than are listed here.

Shakira's "Hips Don't Lie" (using samples from Wyclef Jean's "Dance Like This"),[162] Mark Ronson's "Uptown Funk" (using samples from Trinidad James' "All Gold Everything" and The Gap Band's "I Don't Believe You Want to Get Up and Dance (Oops, Up Side Your Head)"),[163] Katy Perry's "California Gurls" (using samples from Snoop Dogg's "Gin and Juice," and The Beach Boys' "California Girls").[164] Rather than serving as a substitute or drawing away audience of the sampled song, songs that are sampled in popular songs can in fact see increased sales and popularity.[165]

63. A few decades after the creation of the synthesizer, Musical Instrument Digital Interface (more commonly known as "MIDI") served as another disruptive technological force. Introduced in 1983, MIDI established a standardized communication protocol for synthesizers, sequencers, computers, and other connected devices that is still the industry standard today.[166] Before MIDI, there were some proprietary systems for communication between devices, for example from a note-sequencer to a synthesizer.[167] MIDI was the first technology that could serve as a "universal translator" between synthesizers and computers industry-wide.[168] When someone presses a key on a MIDI piano-style keyboard, the keyboard sends a "Note On" message to the synthesizer and a "Note Off" message when the key is released.[169] The keyboard also sends a standardized message for pitch and loudness and continuous values for control of effects like

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[162] Link to Shakira's "Hips Don't Lie": https://youtu.be/DUT5rEU6pqM; Link to Wyclef Jean's "Dance Like This": https://youtu.be/Pt18CfIuST4.

[163] Link to Mark Ronson's "Uptown Funk": https://youtu.be/OPf0YbXqDm0; Link to Trinidad James' "All Gold Everything": https://youtu.be/NK2FqPNIT_U; Link to The Gap Band's "I Don't Believe You Want to Get Up and Dance (Oops, Up Side Your Head)": https://youtu.be/j73heioWpNI.

[164] Link to Katy Perry's "California Gurls": https://youtu.be/F57P9C4SAW4, Link to Snoop Dogg's "Gin and Juice": https://youtu.be/fWCZse1iwE0&t=68; Link to The Beach Boys' "California Girls": https://youtu.be/DR2lvcdKSdU.

[165] dos Santos, Guilherme Soares S. and Flavio Figueiredo, "Assessing the Impact of Sampling, Remixes, and Covers on Original Song Popularity," *Proc. of the 1st Latin American Music Information Retrieval Workshop*, 2024, pp. 1–5.

[166] Robehmed, Natalie and Ryan Gaston, "A Brief History of MIDI," *Pefect Circuit*, November 8, 2019, https://www.perfectcircuit.com/signal/history-of-midi.

[167] Yenigun, Sami, "The MIDI Revolution: Synthesizing Music for the Masses," *NPR*, May 12, 2013, https://www.npr.org/sections/therecord/2013/05/12/182874125/the-midi-revolution-synthesizing-music-for-the-masses.

[168] Yenigun, Sami, "The MIDI Revolution: Synthesizing Music for the Masses," *NPR*, May 12, 2013, https://www.npr.org/sections/therecord/2013/05/12/182874125/the-midi-revolution-synthesizing-music-for-the-masses; Recording Arts Canada, "How MIDI Changed Music," February 28, 2020, https://recordingarts.com/record/how-midi-changed-music.

[169] Recording Arts Canada, "How MIDI Changed Music," February 28, 2020, https://recordingarts.com/record/how-midi-changed-music.

pitch-bend.[170] Early critics of the technology were worried about its musical limitations,[171] and "musicians feared for their futures as the musical applications of MIDI became more clear."[172] Critics complained that it would serve to homogenize composition toward popular idioms and was the result of "a new kind of 'deafness.'"[173] Critics at the time claimed that the parametrization of music into pitch, attack, release, and other discrete values as part of the MIDI standard were a simplification of the complexities of musicianship.[174] These concerns overwhelmingly did not materialize. In fact, MIDI continues to be used today in nearly every musical domain that is not entirely acoustic. It is an essential staple in digital audio workstations ("DAWs"), software applications used to record, edit, mix, and produce digital audio.[175] MIDI is used in nearly all computer-assisted music production work, which includes much of the popular repertoire from the last few decades and many works-in-suit.[176,177] Additionally, MIDI has democratized production so that artists without access to expensive recording studios can still create music. For example, the debut album *When We All Fall*

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170 Miraglia, Dustin, "How to Use MIDI: Tips, Tricks & Techniques for Using MIDI," *Unison Audio*, June 9, 2023, https://unison.audio/how-to-use-midi.

171 Loy, Gareth, "Musicians Make a Standard: The MIDI Phenomenon," *Computer Music Journal*, Vol. 9, No. 4, 1985, pp. 8–26 at p. 8 ("Whether MIDI gets good or bad reviews depends to some extent on whether it represents a step up or step down in expressive potential from the system the reviewer is currently using. It makes some happy that a networking standard exists for music instruments; it makes others frustrated that it has so many limitations. The limitations include limited bandwidth between devices, limited frequency and time resolution, limited access to synthesizer parameters for such things as timbre modification during synthesis, and lack of bidirectionality in communications.").

172 Recording Arts Canada, "How MIDI Changed Music," February 28, 2020, https://recordingarts.com/record/how-midi-changed-music.

173 Bernardini, Nicola and Gareth Loy, "Whither MIDI?," *Computer Music Journal*, Vol. 11, No. 1, 1987, pp. 9–12.

174 Bernardini, Nicola and Gareth Loy, "Whither MIDI?," *Computer Music Journal*, Vol. 11, No. 1, 1987, pp. 9–12.

175 See, e.g., Recording Arts Canada, "How MIDI Changed Music," February 28, 2020, https://recordingarts.com/record/how-midi-changed-music.

176 See, e.g., Yenigun, Sami, "The MIDI Revolution: Synthesizing Music for the Masses," *NPR*, May 12, 2013, https://www.npr.org/sections/therecord/2013/05/12/182874125/the-midi-revolution-synthesizing-music-for-the-masses.

177 See, e.g., works-in-suit The 1975's "Somebody Else" (link: https://youtu.be/Bimd2nZirT4&t=185), Maroon 5's "Payphone" (link: https://youtu.be/KRaWnd3LJfs&t=44) and Kelly Clarkson's "Miss Independent" (link: https://youtu.be/dS1ZW0FdoIU). Discogs, "The 1975 – I Like It When You Sleep, For You Are So Beautiful Yet So Unaware Of It," https://www.discogs.com/release/8757820-The-1975-I-Like-It-When-You-Sleep-For-You-Are-So-Beautiful-Yet-So-Unaware-Of-It, accessed December 10, 2025; Discogs, "Maroon 5 – Overexposed," https://www.discogs.com/release/3684952-Maroon-5-Overexposed, accessed December 10, 2025; Discogs, "Kelly Clarkson – Thankful," https://www.discogs.com/release/681987-Kelly-Clarkson-Thankful, accessed December 10, 2025.

Asleep, Where Do We Go? was famously produced in a bedroom studio, without advanced studio equipment, by Billie Eilish and her brother using a MIDI keyboard and a DAW.[178]

64. The trend in advances in music technology continued when Antares Audio Technologies in 1997 released Auto-Tune, an audio processing technology for pitch correction in both live performance and post-production.[179] Other solutions for pitch correction have since been released, including Celemony's Melodyne,[180] but the term "auto-tune" is now widely used as the proprietary eponym for the technique. Pitch correction works by analyzing the pitch of incoming audio signal to isolate the fundamental frequency (pitch) of the sound.[181] If the pitch is inaccurate, it is automatically adjusted to the nearest semitone, or to some other predefined pitch.[182] Like the other prior disruptive technologies, the use of auto-tune has also been met with controversy. Artists including Death Cab for Cutie,[183] Jay-Z,[184] and Christina Aguilera[185] have made public—and strongly-worded—statements against the use of auto-tune. Music critics have called auto-tune a "sinister invention"[186] and suggested that the use of the

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178 A MIDI piano roll is a graphical interface for creating and manipulating notes. Jones, Andy, "'The Less Stuff You Have, the Easier it is to Make Music': Why Billie Eilish's When We All Fall Asleep, Where do We Go? Is a Modern Masterpiece," *MusicRadar*, December 13, 2024, https://www.musicradar.com/artists/the-less-stuff-you-have-the-easier-it-is-to-make-music-why-billie-eilishs-when-we-all-fall-asleep-where-do-we-go-is-a-modern-masterpiece.

179 Antares, "The Science Behind Auto-Tune: How It Works," August 9, 2023, https://www.antarestech.com/community/the-science-behind-auto-tune; Mix Staff, "1997: Antares Auto-Tune," *Mixonline*, January 1, 2011, https://www.mixonline.com/technology/1997-antares-auto-tune-383728.

180 Walden, John, "Auto-Tune vs Melodyne," *Sound On Sound*, March 2007, https://www.soundonsound.com/reviews/auto-tune-vs-melodyne.

181 Antares, "The Science Behind Auto-Tune: How It Works," August 9, 2023, https://www.antarestech.com/community/the-science-behind-auto-tune.

182 Antares, "The Science Behind Auto-Tune: How It Works," August 9, 2023, https://www.antarestech.com/community/the-science-behind-auto-tune.

183 Montgomery, James, "Death Cab for Cutie Raise Awareness About Auto-Tune Abuse," *MTV*, February 10, 2009, https://web.archive.org/web/20190731051019/http://www.mtv.com/news/1604710/death-cab-for-cutie-raise-awareness-about-auto-tune-abuse ("'We're here to raise awareness about Auto-Tuner abuse […] we've seen a lot of good musicians being affected by this newfound digital manipulation of the human voice.' [… with autotune] musicians of tomorrow will never practice […] They will never try to be good, because yeah, you can just do it on the computer.'").

184 Reid, Shaheem, "Jay-Z Premieres New Song, 'D.O.A': 'Death of Auto-Tune'," *MTV*, June 6, 2009, https://web.archive.org/web/20090627025430/http://www.mtv.com/news/articles/1613390/20090606/jay_z.jhtml. Jay-Z released a song, "D.O.A." or "The Death of Auto-Tune" and "explain[ed] that he's taking aim at artists who use Auto-Tune as a crutch."

185 Price, Joe, "T-Pain Says He Doesn't 'Have Beef' with Christina Aguilera, Shares Pic of Singer in 'Autotune is for Pussies' Shirt," *Complex*, December 17, 2024, https://www.complex.com/music/a/backwoodsaltar/t-pain-christina-aguilera-auto-tune-shirt. Christina Aguilera wore a T-shirt disparaging the use of Auto-Tune.

186 The Age, "The Truth About Lip-Synching," October 13, 2004, https://www.theage.com.au/national/the-truth-about-lip-synching-20041013-gdysk1.html.

technology indicates a lack of integrity.[187] However, as with other transformative technologies described above, composers and songwriters have found interesting ways to use auto-tune for their creative ends. Not only is auto-tune now a standard tool in studio production,[188] it has been used at extreme settings for genre-defining results. Early uses of auto-tune include Aphex-Twin's "Funny Little Man"[189] and Cher's "Believe,"[190] which debuted the more extreme use of the technique that T-Pain adopted for his defining sound, as can be heard in work-in-suit "I'm N Luv (Wit a Stripper)."[191] At the extreme settings, the voice becomes robotic as it quickly jumps from pitch to pitch, without the natural transitions. Despite the advent of auto-tune in 1997, singers like Adele, Beyoncé, Kelly Clarkson, Alicia Keys, Bruno Mars, and Sam Smith, to name a few, have continued to be valued for their distinct vocal virtuosity. Auto-tune, while disruptive, was able to increase the creative production and quality of highly skilled professional performers while also allowing early-career and non-professional artists to create meaningful work.

65. More recent developments indicate the potential for LLMs and genAI tools to advance the creative output of the music industry in ways reminiscent of the historical technologies described above. Like these earlier technologies, genAI promises to contribute to an artistic renaissance and result in the creation of culturally important works when used as a tool by musicians. Some of these yet-to-come works may end up defining the sound of the current generation of artists, similar to the way the works discussed above did for prior generations. GenAI tools are slated to take their place in a long history of generative, algorithmic, and chance- or rules-based tools and techniques for creating music, used by musicians since the earliest recorded history. These technologies, while often perceived as disruptive in the moment, have existed alongside—rather than replaced—other techniques for creating music and have promoted new creative outputs.

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[187] Dombal, Ryan, "Interview Neko Case," *Pitchfork*, April 9, 2006, https://pitchfork.com/features/interview/6306-neko-case.

[188] See, e.g., Tyrangiel, Josh, "Auto-Tune: Why Pop Music Sounds Perfect," *Time*, February 5, 2009, https://time.com/archive/6687593/auto-tune-why-pop-music-sounds-perfect.

[189] CNN Business, "Autotune: Good or Bad?," June 14, 2016, https://www.cnn.com/2015/05/26/tech/gallery/autotune-artists-mci/index.html. Link to Aphex-Twin's "Funny Little Man": https://youtu.be/aM5ThfUyjEQ.

[190] Antares, "The Science Behind Auto-Tune: How It Works," August 9, 2023, https://www.antarestech.com/community/the-science-behind-auto-tune. Link to Cher's "Believe": https://youtu.be/nZXRV4MezEw.

[191] Farber, Jim, "Singers Do Better With T-Pain Relief," *Daily News*, January 12, 2019, https://www.nydailynews.com/2007/12/10/singers-do-better-with-t-pain-relief. Link to T-Pain's "I'm N Luv (Wit a Stripper)": https://youtu.be/QjgZZGo881E.

B. Composers and Songwriters Use LLMs and Other GenAI Tools in a Variety of Creative Applications

66. Plaintiffs allege that "many" user prompts include the term "lyric"[192] and support their allegations by constructing examples of queries requesting lyrics from Claude that purportedly infringed copyrighted works. However, Plaintiffs ignore the many varied uses of Claude that are unrelated to seeking lyrics and also fail to recognize that composers and songwriters use genAI tools, including LLMs such as Claude as well as multimodal genAI models, in a variety of creative applications.[193]

67. Similar to several other general purpose LLMs, including OpenAI's ChatGPT[194] and Microsoft's Copilot,[195] Anthropic's Claude models receive text-based inputs and provide text-based outputs and were designed for a variety of uses by individuals in various professions.[196] As such, composers and songwriters may also choose to use these tools in their music making process to give general purpose LLMs creative direction for lyrics or compositions.

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[192] First Amended Complaint, ¶¶ 10, 12, 90.

[193] In addition to using commercially available tools, composers and songwriters harness the power of this new technology by developing their own tools. Composers and creative coders like Dr. Jon Christopher Nelson at CEMI or Dr. Chris Poovey create complex digital synthesizers and novel versions of audio effect plugins to compose with. This allows them to have control over each stage of the music-making process, all the way down to the code. In popular genres of music, artists like Autechre use creative coding in the Max/MSP environment to create algorithms, including Markov chains, digital synthesizers, and sequencers to generate original material for their albums. Nelson, Jon Christopher, "Csound Software Downloads," https://jonchristophernelson.com/csound-software-downloads, accessed December 3, 2025; Poovey, Christopher, "Software," https://www.christopherpoovey.com/software.html, accessed December 3, 2025; Athenaterminal, "Autechre on Generative Music Techniques," https://www.tumblr.com/athenaterminal/169379384110/autechre-on-generative-music-techniques, accessed December 11, 2025.

[194] Hogan, Marc, "Musicians Are Already Using AI More Often Than We Think," *Pitchfork*, May 11, 2023, https://pitchfork.com/thepitch/musicians-are-already-using-ai-more-often-than-we-think ("Now lyricists can feed their verses into ChatGPT and ask for a better version, or prompt the bot to rewrite the song in someone else's style.").

[195] Microsoft Copilot, "How to Use AI for Songwriting," March 17, 2025, https://www.microsoft.com/en-us/microsoft-copilot/for-individuals/do-more-with-ai/ai-art-and-creativity/how-to-use-ai-for-songwriting ("Ever find that you have the perfect lyrics for a song, but you're hitting a wall while composing the music to go with them? Or do you have the perfect melody, but no words to fit the beat? Whether you need help crafting compelling lyrics or arranging chords, Copilot is ready to help. Depending on your needs, Copilot can suggest chord progressions, help with tricky rhymes, and more to help you create the perfect blend of sound and verse.").

[196] Analysis of one million Claude conversations conducted in October 2024 reported "Web and mobile application development assistance" to be the most frequent use. See Anthropic_0000012987–032, Tamkin, Alex et al., Anthropic, Clio: Privacy-Preserving Insights into Real-World AI Use, December 18, 2024, Figure 6, Table 7. Similarly, analysis of one million Claude conversations collected in December 2024 found significant usage of the technology in software development, with the "Computer & Mathematical" occupational category having the highest AI usage in the associated tasks at 37.2 percent. See Anthropic_0000441239–276, Handa, Kunal et al., Anthropic, Which Economic Tasks are Performed with AI? Evidence from Millions of Claude Conversations, February 11, 2025, Figure 2, Appendix E ("Analysis Metadata"). See also Claude, "Text Generation," https://platform.claude.com/docs/en/build-with-claude/text-generation, accessed December 10, 2025.

68. While not explicitly designed for composers and songwriters,[197] LLMs, including Claude,[198] can be used as tools to help artists brainstorm ideas, work on melodies or chord progressions, collaboratively develop lyrics, or assist with many other aspects of music composition.[199] This is consistent with Anthropic's responses to Plaintiffs' interrogatories based on a sample of user requests produced in this matter, which report that to the extent user requests mentioned "lyrics," "song" or a similar term, users were seeking Claude's assistance in creating their own lyrics or understanding lyrics, rather than reproducing lyrics.[200] This is consistent with existing or aspiring composers and songwriters using Claude as a tool to expand their own creativity.

69. Besides LLMs, which can assist with development of lyrics and chord progressions, there are many other multimodal commercial genAI tools specifically designed for collaboration with musicians in the creation of new music. These creatively valuable tools can assist composers

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[197] In a breakdown of Claude usage by job category, relevant categories are "Music Composers and Arrangers," "Musicians, Instrumental," and "Poets, Lyricists and Creative Writers." Each of these categories account for less than 0.1 percent of Claude usage. Also note that besides lyricists, this category includes poets and creative writers and can therefore only serve as the upper bound on the number of lyricists using the technology. Anthropic_0000441108–155, Anthropic, Anthropic Economic Index, September 15, 2025 at -114, -124-135. See also 30(b)(6) Deposition of Deep Ganguli, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 6, 2025 ("Ganguli Deposition"), pp. 105:10–106:8 ("Q. For these song- and lyric-related uses of CLAUDE, what has Anthropic done to monitor or analyze the frequency with which users use CLAUDE in these ways? A. […] So what I know is in the course – course of our research, we have found clusters that relate to songwriting – sorry – that relate to songs, whether – and my memory is sort of analyzing the song lyrics, interpreting them, asking questions about those song lyrics. And I know that this an atypical use case, and I know there are guardrails in place by the safeguards team to prevent people from using CLAUDE for generating those – generating sort of copyrighted lyrics.").

[198] I understand from the deposition of Anthropic's co-founder, Benjamin Mann, that Anthropic did not seek out song lyrics to include in its training dataset. See 30(b)(6) Deposition of Benjamin Mann, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 20, 2025 ("Mann Deposition"), pp. 52:8-52:13 ("Just for the purposes of this case, I will say that these kinds of documents typically do not contain song lyrics. It just so happened that that's kind of an artifact of what we were looking for, which is things to help with knowledge work. It wasn't something we expressly designed.").

[199] See, e.g., Oliveira, Alex, "AI for Independent Artists: Using Claude and Mistral to Write, Market, and Monetize Your Music," *Prediq*, August 19, 2025, https://www.prediq.io/ai-for-independent-artists-using-claude-and-mistral-to-write-market-and-monetize-your-music. See also Toolify.ai, "AI Music Generation: ChatGPT for Songwriting & Lyric Ideas," July 11, 2025, https://www.toolify.ai/ai-news/ai-music-generation-chatgpt-for-songwriting-lyric-ideas-3591264.

[200] Defendant Anthropic PBC's Amended and Supplemental Responses and Objections to Plaintiffs' Third Set of Interrogatories (No. 18), *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 5, 2025 ("Responses and Objections to Plaintiffs' Third Set of Interrogatories No. 18"), p. 8 ("Analysis of the data from Clio reveals that requesting song lyrics is not how Anthropic users typically use Claude. […] The vast majority of users do not use Claude to request song lyrics. In the Clio data that Anthropic produced, of the more than 5,000 user requests that Clio analyzed, only seven, or less than 0.01%, even mentioned 'lyric,' 'lyrics,' 'song,' or 'songs.'"). p. 9 ("This data reveals that the majority of prompts that reference lyrics or songs are not requests for lyrics themselves, but rather prompts seeking Claude's help to generate original songs, improve lyrics, or understand lyrics.").

and songwriters with vocals or instrumentation.[201] For example, tools like Suno, Udio, and Aiva all use genAI to create new, original audio files based on artistic and aesthetic prompting by the user.[202] These tools allow the user to prompt the model with both audio and text prompts and will generate a new audio file based on the provided input. Suno and Udio also provide functionality to assist artists writing their own lyrics,[203] can iterate on those lyrics using the underlying LLM model,[204] and can even use synthetic voices created by genAI to sing those lyrics.[205] In addition to commercial tools, there are also custom genAI models, such as the LYRA and VEGA models that I am currently developing in collaboration with other CEMI colleagues.[206]

70. VEGA, a machine learning architecture developed in collaboration with Dr. Marco Buongiorno Nardelli, emerged from a desire to explore the creative potential of machine hallucination, or how genAI can deform and reimagine musical material in ways that challenge our assumptions about authorship and variation.[207] The network is based on a traditional Variational Auto-Encoder with the novel addition of a General Adversarial Discriminator. VEGA converts chunks of symbolic music (MIDI and/or XML) into images for training. The latent space of "hallucinated" variation can then be scanned through and output for artistic experimentation. This model can also be fine-tuned with symbolic music supplied by the user. In addition to VEGA's creative applications in experimental music, I am also developing a JUCE implementation of this technology to allow inferencing inside a DAW for AI-powered loop generation for drums, synths, and bass.[208]

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201 For example, I have used several publicly available genAI tools in my dissertation including Udio, Suno, AWS Polly, ElevenLabs, Ircam RAVE, ChatGPT, Claude, Midjourney, Sora, and FireFly, as well as AI tools integrated into visual editing environments like Adobe Photoshop and Adobe Illustrator, and audio editing tools in Ozone's RX 11 software.

202 Singh, Sneha, "Suno in Talks for Funding Round Valuing AI Music Startup at $2 Billion," *TechStory*, October 19, 2025, https://techstory.in/suno-in-talks-for-funding-round-valuing-ai-music-startup-at-2-billion; Dessign, "Udio AI," https://dessign.net/udio-ai, accessed December 3, 2025; AIVA, "Introducing Lyra," https://blog.aiva.ai, accessed December 3, 2025.

203 Udio, "Create a Song with Your Own Lyrics," https://help.udio.com/en/articles/10716221-create-a-song-with-your-own-lyrics, accessed December 10, 2025.

204 Suno, "What is Lyrics Co-Writing," https://help.suno.com/en/articles/4425473, accessed December 10, 2025.

205 Udio, "Voices," https://help.udio.com/en/articles/12055317-voices, accessed December 3, 2025.

206 Both VEGA and LYRA are trained solely on self-created or publicly available datasets.

207 The work on VEGA builds on recent work at the *Institut de recherche et coordination acoustique/musique* ("IRCAM") on the RAVE model, a real-time variational auto encoder, and the work on MusicVAE at Google's Magenta lab, a variational auto encoder for blending different symbolic music inputs. Caillon, Antoine and Philippe Esling, "RAVE: A Variational Autoencoder for Fast and High-Quality Neural Audio Synthesis," *Sorbonne Université*, 2021, pp. 1–15; Roberts, Adam et al., "MusicVAE: Creating a Palette for Musical Scores with Machine Learning," *Magenta*, March 15, 2018, https://magenta.withgoogle.com/music-vae.

208 My paper on this research is scheduled to be submitted for publication in December 2025.

71. LYRA is a new model that I am working on for multi-modal audio synthesis that acts as a bridge between language and sound, allowing artists to sculpt timbre and gesture through natural language. The system aligns text and audio embeddings within parallel latent spaces and then decodes them through a neural synthesis engine trained to produce high-fidelity, expressive sound. Users can recombine latent factors between modalities—such as mapping descriptive language onto timbral features or transforming one sound through the latent structure of another. This flexibility makes LYRA both a research framework for studying cross-modal representation and a practical tool for sound artists exploring genAI.

72. Composers and songwriters increasingly also use image- and video-based genAI tools as part of their creative work.[209] There are many potential use cases for this technology, including the creation of audio-visual art, rapid prototyping of brand and promotional materials, and other visual work that may or may not be within the primary domain expertise of the composer or songwriter.[210] A 2025 survey of users of one music-making genAI platform indicated that 66 percent of respondents had used AI for at least one "creative task," including creating instrumental parts, generating new melodies or toplines, arranging ideas into a complete song, or adding lead vocals. 52 percent of respondents used AI for promotion, with the most popular category being to create cover artwork.[211]

73. Similar to earlier technological developments, LLMs open areas of composition for composers and songwriters who may excel in some areas of the songwriting process but face limitation in others.[212] Just as synthesizers and MIDI allowed composers to produce music in new ways, genAI can serve as a sounding board and a partner in the composition process. Below I discuss illustrative examples of artists who have been using genAI in various ways in their music-making processes.

1. GenAI as Brainstorm Partner and Collaborator

74. Members of several popular bands have described using or wanting to use genAI to help come up with new ideas, break through creative roadblocks, or provide variations on current drafts to help them find their way to the final product. For example, ABBA's Björn Ulvaeus used

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209 These tools may include models and platforms such as DALL-E, Midjourney, Adobe Firefly, Stable Diffusion, Runway ML, Veo, Pika, and others.

210 LANDR, "How Musicians Use AI," November 2025, https://cdn.landr.com/files/How_Musicians_Use_AI.pdf, slides 10, 15.

211 LANDR, "How Musicians Use AI," November 2025, https://cdn.landr.com/files/How_Musicians_Use_AI.pdf, slides 8–10. While these tools could be used as a collaborative partner to help an artist work on new lyrics, there were no AI usage types related to lyrics in the breakdown of top uses from respondents, which aligns with Anthropic's data discussed above.

212 See, e.g., Chayka, Kyle, "That New Hit Song on Spotify? It Was Made by A.I.," *The New Yorker*, November 12, 2025, https://www.newyorker.com/culture/infinite-scroll/that-new-hit-song-on-spotify-it-was-made-by-ai.

genAI as a brainstorming partner in composing a new musical. He described interacting with genAI as having "another songwriter in the room" and using the output to create new lyrical ideas to move past creative blocks.[213] Pete Townshend, the songwriter and founding member of the rock band The Who, expressed excitement about the possibility of using genAI tools, like Suno, to help rework some of his over 450 unfinished tracks "that didn't quite work because [he] didn't get them quite right the first time."[214] A singer and songwriter Toyah Wilcox recently announced on her YouTube channel that she was releasing an album of demos on which the first five songs were "generated by AI, with a lot of input from [Toyah]."[215] She put in the lyrics, key, and style, and added her own vocals on top of what genAI generated, using genAI as a version of a first draft.[216]

75. Just like these composers and songwriters, I used Udio as a brainstorming partner and a collaborative tool to develop musical material for the end of my composition "Understanding."[217] I used text prompts to control the style and instrumentation of the generated output, and lyrics in an invented nonsense language that I had developed using an LLM. At each iteration of the prompting, Udio provides two outputs that can be either slightly different or substantially different. I would choose the output that more closely matches my desired outcome, and then use Udio's tools to extend, remix, or re-prompt the result. In this process, I would often follow both forks of the output for dozens of generations of prompts. While I was controlling the parameters and guiding Udio in particular creative directions, I also allowed it to introduce unexpected elements. This process led me to arrive at audio outputs that I would not have been able to produce in traditional ways. Once I aggregated sufficient source material, I used my DAW to edit, mix, and master the composition, just as I would after a traditional recording session.

2. GenAI as Translator

76. GenAI is also being used by artists and music companies to "convert" songs into other languages. For example, Universal Music Group released a cover of Brenda Lee's "Rockin'

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213 Phillipp, Charlotte, "ABBA Musician Bjorn Ulvaeus Says He's Using AI to Help Write New Musical," *People*, June 5, 2025, https://people.com/abba-musician-bjorn-ulvaeus-using-ai-to-help-write-new-musical-11749109.

214 Simpson, Will, "'I'm Quite Interested in AI... Getting Some of My Songs that Didn't Quite Work and Putting Them up onto Suno... There Might be Hits': Why Pete Townshend is Interested in Using AI," *MusicRadar*, November 15, 2025, https://www.musicradar.com/artists/guitarists/im-quite-interested-in-ai-getting-some-of-my-songs-that-didnt-quite-work-and-putting-them-up-onto-suno-there-might-be-hits-why-pete-townshend-is-interested-in-using-ai.

215 Toyah, "Toyah at Home – November 2025," November 1, 2025, https://youtu.be/XEi0UWAnQLI, 10:38–11:40.

216 Toyah, "Toyah at Home – November 2025," November 1, 2025, https://youtu.be/XEi0UWAnQLI, 10:38–11:40.

217 In another example, I used genAI tools as a brainstorm partner in my piece "Feld" for cello and electronics. I used genAI to generate rhythmic patterns with complex interrelations. I was able to build this structure using plain language, allowing me to focus on other aspects of the compositional process.

Around the Christmas Tree" in Spanish.[218] They hired a songwriter to translate the lyrics and a vocalist to provide the new sung Spanish vocals, and then used SoundLabs to modify the vocalist's vocals to sound more like the original singer.[219] Similarly, recording artist Lauv used an AI voice cloning tool to translate his songs into Korean, and MIDNATT used AI to translate his debut single into six different languages using the same process Universal Music Group used to translate "Rockin' Around the Christmas Tree."[220]

3. GenAI as Vocalist

77. In a different application, composers and songwriters are using genAI to create synthetic voices. Holly Herndon is an experimental electronic composer and singer, and her compositional output is primarily electronic music featuring voice. Herndon composes with genAI tools trained on human voices. She released her album *Proto* in 2019, which features a genAI "singer" called Spawn that was trained on audio files of Herndon's voice, and the voices of others.[221] Herndon approached teaching Spawn to speak and sing like she does in the same way she would teach a child, by singing and speaking to the AI system, and also organized events where groups of other singers would contribute their voices to diversify the output of the tool.[222] Herndon went on to create Holly+, a genAI tool that allows other composers and songwriters to generate vocal audio trained on her voice.[223] Using this tool, she released a cover of Dolly Parton's "Jolene," sung by her genAI voice.[224]

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218 Link to Brenda Lee's "Noche Buena Y Navidad (Rockin' Around The Christmas Tree)": https://youtu.be/Pkdgy2h0aBE.

219 Universal Music, "Brenda Lee's Iconic 'Rockin' Around the Christmas Tree' Released in Spanish for the First Time with Help From Soundlabs AI's Responsibly Trained Micdrop AI Technology," October 25, 2024, https://www.universalmusic.com/brenda-lees-iconic-rockin-around-the-christmas-tree-released-in-spanish-for-the-first-time-with-help-from-soundlabs-ais-responsibly-trained-micdrop-ai-tech.

220 Robinson, Kristin, "How Lauv Used AI to Translate His Latest Single Into Korean," *Billboard*, November 8, 2023, https://www.billboard.com/music/pop/lauv-single-translated-into-korean-love-u-like-that-hooky-1235465936; Benjamin, Jeff, "HYBE's 'New' K-Pop Artist Midnatt Is Using AI Technology for a Remarkably Human Purpose," *Billboard*, May 17, 2023, https://www.billboard.com/music/pop/artificial-technology-kpop-artist-midnatt-hybe-interview-1235329459. Link to MIDNATT's "Masquerade": https://youtu.be/l19AEmRvh-Y.

221 Hahn, Rachel, "Behind Holly Herndon's Radically Human AI Music," *Vogue*, September 10, 2019, https://www.vogue.com/article/holly-herndon-interview-proto-dropbox-documentary-proto-ai-music-spawn-new-album.

222 Hsu, Hua, "Electronic Pop For The Surveillance Era," *The New Yorker*, May 13, 2019, https://www.newyorker.com/magazine/2019/05/20/electronic-pop-for-the-surveillance-era.

223 Holly+, "Home," https://holly.plus, accessed December 3, 2025; Herndon, Holly, "Holly+," *Paragraph*, July 13, 2021, https://paragraph.com/@holly-herndon/holly.

224 Dazed, "Holly Herndon Releases AI Cover of Dolly Parton's 'Jolene'," November 3, 2022, https://www.dazeddigital.com/music/article/57372/1/holly-herndon-releases-ai-cover-of-dolly-partons-jolene. Link to Holly Herndon's "Jolene": https://youtu.be/kPAEMUzDxuo.

78. Claire Boucher, known as Grimes, also engages with genAI tools in her work. She has created a genAI tool called GrimesAI that allows users to input audio and transform the audio so it sounds like she is singing it with her voice.[225] She has stated that she is happy to be "a guinea pig" for this technology, as a way of moving research forward.[226] She sees this tool not as a replacement for her, but rather as an extension of her creative work.[227]

4. GenAI as Visual Art Partner

79. Brian Eno is a composer and a songwriter known for his work in ambient and electronic music. His work has been akin to that of an genAI-artist for many years, because it focuses on creating systems that generate music.[228] Despite much of his music being generative, he comes up with the initial ideas and makes many aesthetic and curatorial decisions during the process of creating the music.[229] Not surprisingly, Brian Eno has also started to incorporate genAI tools into his creative process. With the filmmaker Gary Hustwit, Eno released a documentary film about his life and music which uses genAI to create a different version of the film every day from a collection of hundreds of hours of footage.[230] In another instance, he worked with Dentsu Lab in Tokyo to create a genAI music video for his composition "The Ship."[231] Similar

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225 Elf Tech, "Create," https://elf.tech/create, accessed December 11, 2025.

226 Romo, Vanessa, "Grimes Invites Fans to Make Songs with an AI-Generated Version of Her Voice," *NPR*, April 24, 2023, https://www.npr.org/2023/04/24/1171738670/grimes-ai-songs-voice.

227 Spotify, "GrimesAI," https://open.spotify.com/artist/7qiNgbnabvfRbA9lomTgEk, accessed December 3, 2025; Wieduwilt, Christopher, "Grimes Speaks Out: 'There's Lots of Room for AI in Art'," *AI Musicpreneur*, September 3, 2024, https://www.aimusicpreneur.com/ai-music-news/grimes-speaks-out-theres-lots-of-room-for-ai-in-art.

228 Shariatmadari, David, "'I Don't Like Being Revered': Brian Eno on Art, AI, and Why He Hates Talking About David Bowie," *The Guardian*, January 11, 2025, https://www.theguardian.com/music/2025/jan/11/i-dont-like-being-revered-brian-eno-on-art-ai-and-why-he-hates-talking-about-david-bowie.

229 Shariatmadari, David, "'I Don't Like Being Revered': Brian Eno on Art, AI, and Why He Hates Talking About David Bowie," *The Guardian*, January 11, 2025, https://www.theguardian.com/music/2025/jan/11/i-dont-like-being-revered-brian-eno-on-art-ai-and-why-he-hates-talking-about-david-bowie ("But although I'm not present and controlling the moment of the performance, I have, first of all, had the idea to do them. Secondly, I built the apparatus by which they are made. And that involves a lot of decisions, of trying out and thinking 'that doesn't work', and 'I'll change the rules a bit', and so on and so on.' His point is that you still need a curator, an editor, and that has to be a human being.").

230 Roberts, Rachel, "'Groundbreaking' Brian Eno Documentary Film is Different Every Time It's Shown in Cinemas," *MusicTech*, July 10, 2024, https://musictech.com/news/industry/documentary-film-brian-different-every-screening.

231 Dentsu Lab Tokyo, "Brian Eno's The Ship – A Generative Film," https://dentsulab.tokyo/en/works/the-ship, accessed December 3, 2025. Link to Brian Eno's "The Ship": https://youtu.be/pn1riJSHhkY.

to his earlier generative work, Eno sees genAI as a tool for producing raw artistic material that requires human aesthetic and curatorial decisions in order to transform into interesting art.[232]

80. Using another personal example, in working on my own audio-visual piece "flicker," I generated thousands of images with text-to-image prompting using the genAI tool Sora from OpenAI. Through prompt-engineering and variation in generation parameters, I created seven sets of images to use as source material for further processing and animation in TouchDesigner, a visual programming environment for real-time interactive visuals. This work was picked by a jury for premiere at the Currents 2025 Arts & Technology Festival.[233]

5. GenAI as a Musical Persona

81. Taking the capabilities offered by genAI even further, some artists create whole virtual personas. Multiple Grammy-award winning music producer Timbaland is known for his work with Missy Elliott, Justin Timberlake, Aaliyah, Jay-Z, and Beyonce.[234] In 2025 he created a company called Stage Zero that focuses on creating a new genre of music called A-Pop (Artificial Pop).[235] Stage Zero created a new AI artist named TaTa Taktumi using Suno, a genAI platform that can be used to generate audio from text and/or audio inputs. Timbaland begins the creative process by uploading a sample of his own music to Suno as a prompt, which Suno then reworks based on Timbaland's text prompts and settings.[236] Timbaland used Suno's "Persona" mode to customize the vocal sound of TaTa Taktumi and maintain the vocal likeness over time.[237] Timbaland and his collaborators write lyrics for Taktumi without genAI or LLMs. Timbaland argues that music created with genAI has "genuine soul," and that it allows for

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232 Kielty, Martin, "How Brian Eno Used AI to Make Music Like His Own," *Ultimate Classic Rock*, January 13, 2025, https://ultimateclassicrock.com/brian-eno-ai-music.

233 Currents, "Dream Machine Event Details," https://currentsnewmedia.org/events/the-dream-machine, accessed December 15, 2025.

234 A music producer often oversees the process of composing or writing a song. This includes composing the music, writing the lyrics, recording the musicians, and assembling and processing the recorded material to create a final product. The producer may share creative input on any of these steps with other musicians, or they may work alone.

235 Dalugdug, Mandy, "Timbaland Launches AI Music Company Stage Zero, With First AI Artist, TaTa," *Music Business Worldwide*, June 9, 2025, https://www.musicbusinessworldwide.com/timbaland-launches-ai-music-company-stage-zero-with-first-ai-artist-tata.

236 Pearce, Sheldon, "Timbaland's AI Music Project is a Ghost in a Misguided Machine," *NPR*, June 17, 2025, https://www.npr.org/2025/06/17/nx-s1-5431544/timbaland-ai-music-suno-stage-zero-tata-generative.

237 Pearce, Sheldon, "Timbaland's AI Music Project is a Ghost in a Misguided Machine," *NPR*, June 17, 2025, https://www.npr.org/2025/06/17/nx-s1-5431544/timbaland-ai-music-suno-stage-zero-tata-generative ("The TaTa character was derived from the platform's 'Persona' feature, which allows users to capture the sound and voice profile from a particular generation and reuse it on future tracks.").

better communication of his musical intentions.[238] Timbaland also argues that "AI is a tool, not a replacement. I love working with real artists. This is just another instrument."[239]

82. Similarly, Nick Arter found success using AI personas in a way that he was not able to achieve otherwise.[240] As explained in an article by *The New Yorker*, Arter grew up in a musical family, listening to 90's hip-hop with his parents and 70's R&B with his uncles, who were working DJs. He started recording hip-hop tracks in his adolescence, first directly onto tape and then using computers, imitating the artists that inspired him. Though he did not find success as a rapper, he was later able to use this musical background to create a series of successful alternate personae, complete with fictional backstories and imagery, and release music under their names. Arter's workflow with genAI is a familiar one. He writes his own lyrics based on his own experience and aesthetics, but also to reflect current trends. He sketches these lyrics and prompt ideas on his phone and then inputs these into Suno and Udio. With these genAI tools he can create dozens of versions of song ideas, and then stitch together something that he is happy with. He then uses Midjourney to create album art and then he uploads the song to streaming platforms. His work has resonated with listeners, garnering him hundreds of thousands of streams. Arter states that his approach is "just a new way of being an artist."[241]

83. These real-world examples alongside my own experiences using genAI tools illustrate my opinion that genAI tools, like the music technologies that have come before it, can be used to advance human creativity in music as opposed to being a replacement.

C. Implications of Training Corpus for Heterogeneity of Output of GenAI Models

84. The variety of ways artists have incorporated genAI tools into their work was made possible because genAI models available to them produce interesting, creative, and flexible output. Without sufficiently diverse and voluminous training data, genAI models may not be able to produce output that users would find helpful or relevant. As I explain in this section, having large, heterogeneous sets of data for training genAI models is important because it improves generalization and reduces bias. This applies to genAI models broadly but includes LLMs trained on sets of text data. Because genAI models work by "learning" patterns, using a diverse

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238 Galiher, Stephen Andrew, "Timbaland Debuts AI 'Artist' TaTa Taktumi's First Music Video and It's as 'Soulless' as You Expected It To Be," *VICE*, October 14, 2025, https://www.vice.com/en/article/timbaland-debuts-ai-artist-tata-taktumis-first-music-video-and-its-as-soulless-as-you-expected-it-to-be.

239 Johncy, Joel, "Timbaland's AI Artist Debut: Perfect Sound, Imperfect Feeling," *Point Blank Music School*, October 22, 2025, https://www.pointblankmusicschool.com/blog/timbalands-ai-artist-debut-perfect-sound-imperfect-feeling.

240 Chayka, Kyle, "That New Hit Song on Spotify? It Was Made by A.I.," *The New Yorker*, November 12, 2025, https://www.newyorker.com/culture/infinite-scroll/that-new-hit-song-on-spotify-it-was-made-by-ai.

241 Chayka, Kyle, "That New Hit Song on Spotify? It Was Made by A.I.," *The New Yorker*, November 12, 2025, https://www.newyorker.com/culture/infinite-scroll/that-new-hit-song-on-spotify-it-was-made-by-ai.

set of training data will improve their ability to apply those patterns in novel settings. These characteristics are not unique to Claude but apply broadly to all genAI models.

85. GenAI models work by encoding statistical relationships and patterns observed in fragments within a training dataset and then applying those patterns in novel settings to create new, original content.[242] In the case of Claude, this involves the algorithm "studying" a corpus of text, transforming and encoding that text into numerical tokens and weights within its neural network architecture, and then after post-training and finetuning, generating text-based output in response to a specific prompt.[243] For example, the user may provide Claude a first draft of a poem and ask it to revise or expand the text. Similarly, in the case of Midjourney, this may involve the algorithm "studying" the relationships between images and textual descriptions of them in order to be able to generate a new image in response to a text-based prompt.[244] In another example, Udio facilitates sound generation in response to inputs that can include text and audio recordings.[245]

86. Using a large and diverse set of training data, spanning many sources, styles, topics, languages, and formats, broadens a model's functionality by preventing overfitting and allowing generalization.[246] For example, a model trained on blog posts in English would struggle to generate formal writing in French, reducing its robustness and applicability outside of its

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242 Belcic, Ivan, "What Is a Generative Model?," *IBM*, https://www.ibm.com/think/topics/generative-model, accessed December 18, 2025.

243 Anthropic_0000217042–048, Anthropic, Notes on Training Production Claude, April 13, 2023; Claude, "Text Generation," https://platform.claude.com/docs/en/build-with-claude/text-generation, accessed December 10, 2025 ("Claude has been trained to ingest code, prose, and other natural language inputs, and provide text outputs in response.").

244 See, e.g., Geeks for Geeks, "What is Midjourney AI and How Does it Work?," August 20, 2025, https://www.geeksforgeeks.org/artificial-intelligence/what-is-midjourney-ai-and-how-does-it-work ("AI Model Processing: Midjourney uses a diffusion based generative model. It starts with random noise and gradually transforms it into a coherent image that matches the text prompt guided by training on billions of text image pairs.").

245 See, e.g., Udio, "About," https://www.udio.com/about-us, accessed December 11, 2025 ("udio.com allows users to create music from simple text prompts by specifying topics, genres, and other descriptors which are then transformed into professional quality tracks."). See also Udio, "Create Music with Your Own Audio," https://help.udio.com/en/articles/10754328-create-music-with-your-own-audio, accessed December 11, 2025 ("Want to take your music further? Upload your own audio to create, remix, stylize, or extend your music!").

246 Yu, Yu, Shahram Khadivi, and Jia Xu, "Can Data Diversity Enhance Learning Generalization?," *Proceedings of the 29th International Conference on Computational Linguistics*, 2022, pp. 4933–4945 at p. 4933 ("[T]he diversification of training samples alleviates overfitting and improves model generalization and accuracy."); Witty, Sam et al., "Measuring and Characterizing Generalization in Deep Reinforcement Learning," *Applied AI Letters*, 2021, pp. 1–14 at p. 3 ("Generalization has been cast as avoiding overfitting to a particular training environment, implying that sampling from diverse environments is necessary for generalization.").

training data.[247] Exposing a genAI model to a broad set of training data allows it to perform well in novel contexts and on completely distinct tasks, such as writing a poem or editing a research article on quantum mechanics. A model built using insufficient training data may fail to perform well in response to an unfamiliar prompt—just as a student who focused on memorizing practice tests, rather than learning analytical methods and concepts more broadly, will fail when faced with a slightly reframed question.[248] In current machine learning architectures, large, high-quality datasets are required to achieve high quality generative output.[249] The median size of training sets increased from 5.9 million data points in 2010, to 750 billion in 2023, and while researchers are pursuing architectures and training methods that require less training data, the increasing need for large amounts of data continues.[250] Anthropic's models are subject to a similar training process.[251] Anthropic estimates using trillions of data points (or tokens) to train its LLM models.[252]

87. The size and diversity of the training dataset will have implications for the output of a genAI model. A model trained on a narrow set of data would be more likely to regurgitate chunks of

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247 Yu, Yu, Shahram Khadivi, and Jia Xu, "Can Data Diversity Enhance Learning Generalization?," *Proceedings of the 29th International Conference on Computational Linguistics*, 2022, pp. 4933–4945 at p. 4933 ("For example, when models shift towards one target domain like Twitter, they may become erroneous for other domains like medical or travel, and real-world applications on news report data, for example, do not know which queries to receive before they launch, resulting in a critical performance gap between laboratory findings and reality.").

248 Amir, Guy et al., "Verifying the Generalization of Deep Learning to Out-of-Distribution Domains," *Journal of Automated Reasoning*, Vol. 68, No. 17, 2024, pp. 1–60 at p. 2 ("One critical limitation lies in the well-known challenge faced by deep neural networks (DNNs) when attempting to generalize to novel input domains. This refers to their tendency to exhibit suboptimal performance on inputs significantly different from those encountered during training.").

249 Hagos, Desta Haileselassie, Rick Battle, and Danda B. Rawat, "Recent Advances in Generative AI and Large Language Models: Current Status, Challenges, and Perspectives," *IEEE Transactions on Artificial Intelligence*, 2024, pp. 1–21 at p. 2 ("The increasing availability of data has enabled the training of LLMs and Generative AI models on larger and more diverse datasets, significantly improving their performance.").

250 Roded, Tal and Peter Slattery, "What Drives Progress in AI?," *MIT FutureTech*, March 19, 2024, https://futuretech.mit.edu/news/what-drives-progress-in-ai-trends-in-data.

251 See, e.g., Anthropic_0000217042–048, Anthropic, Notes on Training Production Claude, April 13, 2023; Anthropic_0000000829–902, Bai, Yuntao et al., Anthropic, Training a Helpful and Harmless Assistant with Reinforcement Learning from Human Feedback, April 12, 2022.

252 Declaration of Jared Kaplan in Support of Defendant's Opposition to Plaintiff's Motion for Preliminary Injunction, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, January 15, 2024 ("Kaplan Declaration"), ¶ 23; Defendant Anthropic PBC's Supplemental Responses and Objections to Plaintiff's Third Set of Interrogatories (Nos. 16, 19), *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 12, 2025 ("Reponses and Objections to Plaintiffs' Third Set of Interrogatories Nos. 16, 19") at pp. 9–10 ("For Anthropic's LLMs to function effectively, trillions of inputs are required to enable the models to effectively recognize language patterns.").

data, such as the same melody fragments.[253] Without the ability to create new and original output, such models would have limited appeal to composers and songwriters interested in creating new musical works. The power of genAI models comes not from their ability to memorize and regurgitate but rather from their ability to assist the user in developing new source material for their work.[254] The more unique content a model has access to, the more "creative" the model can be, as it has seen more examples and can thus create multiple, new patterns, melodies or lyrics.[255] With a more limited training set, the genAI model would produce very similar outputs for each user, even if the prompts differed. In contrast, robust data sets increase the creative usefulness of these tools for composers and songwriters.

88. This is no different from other types of multimodal genAI tools that generate sound or visuals. Without large, diverse, heterogeneous training data, it would not be possible for genAI models to output outside the frame of the training data. Coconet, a machine learning model developed by Google's Magenta Labs, was designed to reconstruct chorales by Johann Sebastian Bach from fragments. The model was trained on a set of 306 Bach Chorales, and has been optimized to "restore Bach's music from fragments."[256] Because of the homogenous nature of this model's training data, it can only harmonize in the style of Bach. If it is fed a fragment of music from another composer, it will still harmonize that fragment in the style of Bach. Similarly, VEGA, the model being developed at CEMI, is also designed to be trained on small,

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253 See, e.g., Zhao, Hanbing et al., "AI-Driven Music Composition: Melody Generation Using Recurrent Neural Networks and Variational Autoencoders," *Alexandria Engineering Journal*, Vol. 120, 2025, pp. 258–270 at p. 269 ("Furthermore, the diversity of generated melodies was found to be limited when trained on datasets with highly repetitive patterns, emphasizing the critical role of data diversity in enhancing model generalization. […] Additionally, augmenting the training dataset with more varied and complex musical examples could further enhance the model's ability to produce innovative and diverse melodies."). See also Amir, Guy et al., "Verifying the Generalization of Deep Learning to Out-of-Distribution Domains," *Journal of Automated Reasoning*, Vol. 68, No. 17, 2024, pp. 1–60 at p. 2 ("The rules derived from this training may falter in generalizing to novel, unencountered inputs due to several factors: [...] (2) certain inputs not being adequately represented in the finite training dataset.").

254 See, e.g., Chui, Michael et al., "The Economic Potential of Generative AI: The Next Productivity Frontier," *McKinsey & Company*, June 14, 2023, https://www.mckinsey.com/capabilities/tech-and-ai/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier ("The latest generative AI applications can perform a range of routine tasks, such as the reorganization and classification of data. But it is their ability to write text, compose music, and create digital art that has garnered headline and persuade consumers and households to experiment on their own."). See also Ivcevic, Zorana and Mike Grandinetti, "Artificial Intelligence as a Tool for Creativity," *Journal of Creativity*, Vol. 34, 2024, pp. 1–5.

255 Zhao, Hanbing et al., "AI-Driven Music Composition: Melody Generation Using Recurrent Neural Networks and Variational Autoencoders," *Alexandria Engineering Journal*, Vol. 120, 2025, pp. 258–270 at p. 269 ("Furthermore, the diversity of generated melodies was found to be limited when trained on datasets with highly repetitive patterns, emphasizing the critical role of data diversity in enhancing model generalization. [...] augmenting the training dataset with more varied and complex musical examples could further enhance the model's ability to produce innovative and diverse melodies.").

256 Huang, Cheng-Zhi Anna et al., "Coconet: The ML Model Behind Today's Bach Doodle," *Magenta*, March 20, 2019, https://magenta.withgoogle.com/coconet.

homogenous data sets and has so far been separately trained on music by Bach and Scarlatti. Unlike Coconet, which is designed to recreate its training dataset faithfully, VEGA is designed to generate musical variation related to its training data. Nonetheless, when trained on Bach Chorales, for example, the generated output is distinctly chorale-like. The model is not able to generalize to create music in the style of Mozart, let alone someone like, for example, James Brown, one of the founders of funk, soul, and hip-hop.

89. Finally, using a diverse dataset also helps to reduce bias, avoid blind spots caused by homogenous or limited data sets, and counter the fact that certain perspectives can be overrepresented in the training data.[257] Comprehensive data sets are important for avoiding bias, which can lead to a model that does not accurately respond to certain types of prompts. If an LLM built for a musical purpose has not been trained on a diverse set of materials relevant to the interests of a particular singer-songwriter and their desired process of composition, for example, the LLM will have no way to respond accurately to an end user working in this type of genre for their own original work. For example, current music-focused models have been primarily trained on Western music, which has limited the ability of these models to assist users who are interested in creating non-Western music.[258] The exclusion of non-Western music from training sets can lead to various issues, including: "cultural homogenization, reinforcement of Western culture dominance, […] misrepresentation of musical styles, and most importantly, gradual decline leading to the disappearance of many musical genres."[259] Without a varied and diverse training set, AI models could have more narrowed and less generalized outputs, which may undermine their purpose of amplifying new emergent or creative outputs.

90. This, however, does not mean that a general-purpose LLM would need to specifically be trained on the text of song lyrics to understand and generate lyric-like text; other data exists

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257 See, e.g., Solak, Ahmet et al., "Bias Beyond Borders: Global Inequalities in AI-Generated Music," *ETH Zurich*, 2025, pp. 1–5.

258 Mehta, Atharva et al., "Music for All: Representational Bias and Cross-Cultural Adaptability of Music Generation Models," *Findings of the Association for Computational Linguistics: NAACL 2025*, 2025, pp. 4569–4585.

259 Mehta, Atharva et al., "Music for All: Representational Bias and Cross-Cultural Adaptability of Music Generation Models," *Findings of the Association for Computational Linguistics: NAACL 2025*, 2025, pp. 4569–4585 at p. 4577.

that would allow a general-purpose model to understand various genres and styles without access to lyric data.[260]

D. GenAI Tools Offer Major Benefits to Composers and Songwriters and Are Similar to Earlier Technological Advances in Music

91. The various ways artists today are using genAI tools mirror the ways artists used prior technological advancements like the synthesizer and MIDI. Zedd, a popular DJ/producer, compares genAI to the DAW software environments that composers and songwriters have used for decades to create music. These software environments allow composers and songwriters to program digital piano rolls, similar to the player piano, to "play" any instrument that they can imagine. Composers and songwriters can also use hardware MIDI controllers to play the instruments in real time. In Zedd's words, "The truth is that we've been using AI forever, […] it's just that we haven't labeled it 'AI.'"[261]

92. In addition to the examples I presented in **Section IV.B**, in my own practice as a songwriter and composer who engages with numerous genAI tools including Claude, ChatGPT, CoPilot, Udio, Suno, Midjourney, Sora, and FireFly I have found that it is possible to create interesting, creative ideas that are not derivative of known artists but are rather transformed, original material shaped by my artistic taste and aesthetic. Like my human collaborators, genAI tools can help brainstorm or refine ideas but I, as the creator, take those ideas and form them into a polished final product. As my own work and the many examples in **Section IV.B** illustrate, there are many creative uses of genAI technologies that are emerging across the music industry.

93. With the introduction of genAI technology, composers and songwriters have experienced a dramatic expansion of tools, methods, and workflows that can enhance their creative output.

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[260] Mann Deposition, pp. 114:5–115:10 ("Q. Does Anthropic consider it important to include song lyrics, generally, in Claude's training data? A. I would say, no, I don't think we view it as important to include lyrics. […] I believe that even if we didn't have the lyrics themselves, there are enough – there's enough content in all the different kinds of data that we collect that is about songs, about lyrics, about the process of creating songs, that Claude would continue to have a strong understanding of what song lyrics are, and that there are enough analogs to song lyrics, such as poems, that are completely different, many of which are public domain, that Claude would have no problem understanding what song lyrics are and how to write new ones without access to any of the lyrics indicated in this case, let alone outside of the case."); Deposition of Jared Kaplan, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 21, 2025 ("Kaplan Deposition"), 291:6–292:8 ("Q. […] Dr. Kaplan, do you agree that in order for Claude to be able to respond to prompts relating to song lyrics, it needs to be trained on song lyrics? […] A. My personal opinion is that the answer to the question is no. […] Typically, Anthropic doesn't have any particular interest in song lyrics, and so it's not something that Anthropic researchers have spent any specific time working on. […] As I indicated earlier, I think it's likely that music reviews, discussions of songs, discussions of music, of poetry are likely to be more relevant to Claude's behavior than song lyrics.").

[261] Irvin, Jack, "Zedd Says He 'Would Have Never Been Able to Make the Music I Make if it Wasn't for AI'," *People*, August 23, 2024, https://people.com/zedd-telos-album-intel-lucky-ai-experience-exclusive-8700314.

These same artists have also found a democratization of knowledge that allows them to achieve musical outcomes that may not have been accessible before. For example, a student composer or songwriter may want to make a music video for their song, but cannot afford to hire film-makers. Instead the student can use Midjourney or Sora, fine-tuned on their own material, to create original video content for their artistic release. This decoupling of multi-modal artistic creation can allow independent artists to create release-ready work with limited budgets.

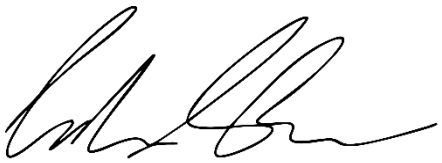
94. GenAI tools can also reduce barriers to entry for new creators and democratize access to music for members of disadvantaged communities. For example, while I worked as a member of Bridge Arts Ensemble with students in underprivileged school districts in upstate New York, I realized there were often no instruments for the students to play. As a result, I developed a curriculum in computer music that allowed students who would have otherwise been impeded in their music creation to have access to creative expression. In practice, the learning process started with hands-on workshops in songwriting using a DAW, MIDI controllers, sample libraries, and virtual synthesizers. The students would work in groups at the computer to compose a specific component of the song such as programming drums or writing a melody, while the rest of the class would provide feedback from the projected display. By the end of the workshop, the class would have a finished song in whatever popular style they had chosen. The process was designed to be replicable on equipment available at the schools, including open-source software and basic computational resources. Without access to any further music education, or financial investment, the students would leave the workshop with all the tools to continue writing songs on their own.

V. CONCLUSION

95. As discussed above, the text of the lyrics themselves constitutes only a part of the overall musical composition and, by itself is insufficient to convey the same expression. Lyrics, when they are included within a musical composition, derive much of their expressive value when combined with the other compositional elements such as melody, harmony, and instrumentation. Music composers differ in their approach to composition, with some composers developing lyrics at different stages in the process (if at all), while others collaborating with lyricists to add lyrics later. Additionally, compositions with the same or similar lyrics can take on different meanings and expressions when the underlying musical elements differ.

96. Further, genAI tools have the potential to enhance the creative capacity of existing composers and songwriters as well as to reduce barriers to entry for new creators. GenAI tools, like Claude, are already being used by artists to transform their creative processes. The growth of creative potential stems from an LLM model's ability to generalize, which requires model builders to have access to large heterogeneous training sets of data for those genAI tools, including Claude. The introduction of new technologies and their ability to aid—not replace—

creators in the music space is not a new phenomenon, and having access to genAI tools, like Claude, stands to advance the progress of creation in music.



Colin E. Stokes

Appendix A

Colin Ewing Stokes

Composer, Cellist, Music Technologist | Researcher in Generative AI for Audio and Video Systems
Email | Website | GitHub | LinkedIn

EDUCATION

The University of North Texas, Denton, Texas (2022 – Present)
PhD Candidate in Music, Division of Composition Studies, Computer Music Media
Minor in Artificial Intelligence in Computer Music Systems Design
Expected Graduation: Spring 2026

- Research focus on AI-integrated composition and deep learning computational music systems.
- AI-integrated software design for composition and analysis
- Contributor to AbletonOSC repository for Python/Ableton integration.
- Composition Studies with Panayiotis Kokoras, Andrew May, Marco Buongiorno Nardelli, Jon Nelson and David Stout.
- Teaching Fellow role:
    - Sophomore Composition Seminar (2025 – Present).
- Teaching Assistant roles:
    - Center for Experimental Music and Intermedia (CEMI) (2024 – Present).
    - Initiative for Advanced Research in Technology and the Arts (iARTA) (2024 – Present).
    - Contemporary Materials and Techniques I + II (2024 – Present).
- Graduate Assistantship in Recording Services (2022 – 2024).

Bait Al Oud, Abu Dhabi, United Arab Emirates (Winter/Spring 2015, Spring 2024)

- Oud studies and Middle Eastern music theory (maqam) with Sherine Tohamy.

Manhattan School of Music, New York, New York (Fall 2014)

- Contemporary Performance Program.
- Cello studies with Fred Sherry.
- Electronic music studies with Todd Reynolds.

The Juilliard School, New York, New York (2010 – 2012)
Master of Music in Performance (2012)

- Cello studies with Richard Aaron.

The Eastman School of Music, Rochester, New York (2006 – 2010)
Bachelor of Music in Performance (2010)

- Performer's Certificate jury award for excellence in performance (2009 – 2010).
- Cello studies with Steven Doane and Rosemary Elliott.

Other Musical Studies

- Professional studies with leading artists including Eighth Blackbird, Yo-Yo Ma, Claude and Pamela Frank, and the Juilliard, Keller, Takacs, Tokyo and Ying String Quartets.

TEACHING

- **Adjunct Faculty**, Dallas College, Dallas, Texas (2023 – Present)
  Teaching undergraduate courses in cello and music appreciation.

- **Adjunct Faculty**, Tarrant County College, Fort Worth, Texas (2023 – Present)
  Teaching undergraduate courses in cello and chamber music.

- **Teaching Fellow**, University of North Texas (2025 – Present)
  Private lesson instruction in composition and computational music.

- **Teaching Assistant**, Center for Experimental Music and Intermedia (CEMI), University of North Texas (2024 – Present)
  Assisted in instruction and technical coordination for courses in experimental music and intermedia composition. Managed installation and maintenance of complex studio environments for immersive audio and video work.

- **Teaching Assistant**, Initiative for Advanced Research in Technology and the Arts (iARTA), University of North Texas (2024 – Present)
  Supported interdisciplinary courses exploring the intersection of technology and the arts.

- **Teaching Assistant**, Contemporary Materials and Techniques I + II, University of North Texas (2024 – Present)
  Taught undergraduate-level courses on contemporary compositional approaches and techniques.

- **Music Theory Grader**, Theory I + II, University of North Texas (2022 – 2023)
  Provided detailed assessments and feedback for undergraduate theory coursework.

- **Jury Member**, Apollo International Music & Arts Competition, Hong Kong (2023)
  Evaluated performances and compositions for international competition.

- **Music Theory Grader**, Theory II, University of North Texas (2022 – 2023)
  Provided detailed assessments and feedback for undergraduate theory coursework.

- **Instructor in Cello**, Berliner Stadtmusikanten, Berlin, Germany (2020 – 2022)
  Taught private and group cello lessons.

- **Instructor in Music Technology**, Idyllwild Arts Academy, California (2020)
  Taught courses on performing with electronics and computer music composition. Developed curricula integrating new technologies into artistic practices.

- **Teaching Artist**, Bridge Arts Ensemble, New York (2016 – 2020)
  Designed and delivered workshops on computer music composition and music technology in underserved schools. This project reached tens of thousands of students across rural New York State.

- **Creator/Consultant**, Electronic Music Curriculum, Transcendence Theater Company, Sonoma, California (2019 – 2020)
  Developed electronic music programs tailored to remedial secondary education.

- **Artist in Residence**, University of Notre Dame, University of Chicago, North Kentucky University, Oberlin College, Belmont University, and American University (2018 – 2019)
  Conducted workshops and masterclasses on composition and the performance of contemporary classical music.

- **Artist in Residence,** Bowdoin Virtuosi, Bowdoin International Music Festival, Maine (2011)
  Taught chamber music and solo performance during festival residency.

DISCOGRAPHY AND RECORDINGS

The following albums and recordings have reached a wide audience. **Cairokee's Roma** has been streamed 184 million times with 258,000 monthly listeners. **Symphoniacs**' album spent several weeks on the iTunes top 10 and the related music videos have garnered over 30 million views on YouTube. Arrangements for **Symphoniacs'** singles *The Chase, Toccata Reloaded, O Fortuna, Ave Maria (Schubert),* and *Ave Maria (Bach/Gounod)* have garnered an additional 808,000 views.

Classical:

- fEver – with David Stout, **In-progress, 2026**
  credits: composition, cello, producer, audio engineer
- *Ariadne's Tears* – Colin Stokes and Marco Buongiorno Nardelli, **In-progress, 2026**
  credits: composition, cello, producer, audio engineer
- *The Night Shall Break* – Zohn Collective, **Neuma Records, 2024**
  credits: cello, producer
- *Catch Somewhere* – John Liberatore and Zohn Collective, **New Focus Recordings, 2023**
  credit: cello
- *Sandburg Songs* – Matthew Schreibeis and Zohn Collective, **Albany Records, 2021**
  credits: cello
- *RPL Chamber Project* – Rafael Piccolotto Delima, **2014**
  credits: cello
- *Unfinished Tango* – Le Zhang, **2014**
  credits: cello
- *Collected Chamber Works* – Andrew Violette, **2014**
  credits: cello

Classical Crossover:

- *The Chase (single)* – Symphoniacs, **2022**
  credits: arranging, cello

- *Ave Maria (Bach/Gounod)* – Symphoniacs, **2021**
  credits: arranging, cello, session engineer, video production
- *Ave Maria (Schubert)* – Symphoniacs, **2021**
  credits: arranging, cello, session engineer, video production
- *Toccata Reloaded* – Symphoniacs, **2020**
  credits: arranging, video production, session engineer, cello
- *A New Age for New Age Vol. 2*, **Whatever's Clever Records, 2020**
  credits: composition, cello, producer, audio engineer
- *Symphoniacs* – Symphoniacs, **Warner Music Japan, Warner Music, 2019**
  credit: cello
- *O Fortuna from Carmina Burana* – Symphoniacs, **2016**
  credits: arranging, cello
- *Symphoniacs* – Symphoniacs, **Polydor Records, Universal Music, 2016**
  credit: cello

Jazz/World:

- *Tigre* – Banda Magda, **GroundUP Records, 2017**
  credit: cello
- *Chroma* – Petros Klampanis, **Minos/EMI Music, 2017**
  credit: cello
- *Minor Dispute* – Petros Klampanis, **Cristal Records, 2014**
  credit: cello
- *Yerakina* – Banda Magda, **GroundUP Records, 2014**
  credit: cello

Popular:

- *Untitled* – Rob Grant, **In Progress, 2026**
  credits: cello, session engineer, producer, string arranging
- *Jeete Jagte* – Abhishek Ghag, **In Progress, 2026**
  credits: cello, string arranging, session engineer
- *Innocence* – Amanda Brown, **In Progress, 2026**
  credits: cello, string arranging, session engineer, string production
- *Extraordinary* – Laces (single), **Head Bitch Music, 2025**
  credits: cello, session engineer
- *DOMINOES* – Zia Victoria (single), **Ladybug Records, 2025**
  credits: cello, session engineer
- *Body Speaks* – FLAVIA (Wide Awake EP), **Preach Records LLC, 2024**
  credits: cello, session engineer
- *Come Back to Me (Acoustic Version)* – ALANI (Come Back to Me EP), **ALANI HT, 2024**
  credits: cello, session engineer
- *Roma* – Cairokee, **Cairokee Productions, 2022**
  credits: session engineer, producer for strings, drums, and keys, string arranging, session contracting
- *The Future's Still Ringing in My Ears* – Sam Cohen – **30th Century Records, 2019**
  credit: cello

- *Courtney Hartman – Ready Reckoner* – **Reckoner Records, 2019**
  credit: cello
- *Elvis Perkins – Creation Myths* – **MiR Records, 2020**
  credit: cello
- *The Lay Awakes* – The Lay Awakes, **2014**
  credit: cello, string arrangement
- *Concrete City* – Snir Yamin, **Leesta Vall Records, 2014**
  credit: cello, string arrangement
- *Micky – Everytime,* **2014**
  credit: cello

RESEARCH PROFILE

PhD Candidate in Music (University of North Texas, 2022–present) with a minor in **Artificial Intelligence in Computer Music Systems Design**. My research develops **deep learning architectures for generative audio, symbolic music modeling, and multimodal AI systems**. I specialize in bridging symbolic representations (scores, MIDI) with audio synthesis through **variational autoencoders, masked acoustic-token models, and multimodal conditioning**.
I bring 15+ years of professional experience as a touring cellist and composer to AI research, leveraging domain expertise in music to design models that are both technically novel and musically relevant. Current projects include:

- **VEGA:** a VAE with discriminator for symbolic music generation.
- **LYRA:** a Distilled Low-Step Masked Acoustic Token Modeling for Prompted Audio Generation
  Immersive multimodal composition systems: integrating TouchDesigner, Ableton Live, and generative ML.

SKILLS, LANGUAGES AND PROFICENCIES

Artificial Intelligence and Machine Learning:

- Advanced knowledge of machine learning and deep learning models, including theoretical frameworks and practical applications for creative and research-based workflows. This work has produced a novel set of models based on IRCAM's RAVE framework, a collection of consumer facing compositional tools using symbolic music generation in VAE-discriminator networks, and an audio synthesis model in progress.
- Proficient in designing, training, fine-tuning, and evaluating machine learning models for algorithmic composition, immersive audio, data sonification, and other creative and research applications.
- Extensive experience integrating commercial AI tools into artistic workflows and academic research projects, including serving as a beta tester for Output's CoProducer Delta software and a named contributor to AbletonOSC.
- Expert in generative AI platforms and tools for image, video, and audio creation, including Udio, DALL-E, Stable Diffusion, Runway ML, Adobe Firefly, MidJourney, and OpenAI's Whisper.

Programming and Technical Skills:

- Skilled in programming languages and frameworks: Python, R, C, C++, JUCE, TensorFlow, PyTorch, scikit-learn, and CSound.
- Contributor to the AbletonOSC Python library, enhancing interoperability between AI systems and music production software.
- Proficient in music and audio production tools: Ableton Live, Logic Pro, Pro Tools, Reaper, SpatGRIS, IEM Plugin Bundle, Max, TouchDesigner, Final Cut Pro, and Adobe Creative Cloud.

Audio Engineering and Design:

- Extensive experience in recording studio and live-sound reinforcement theory and practice.
- Advanced skills in analog audio electronic design and manufacturing, including microphones and signal processors.

Certifications and Languages:

- Coursera certifications in Machine Learning (Andrew Ng, Stanford University) and C/C++ Programming.
- Certified in Dante Network Protocol (Level three).

PUBLICATIONS AND WORKS IN PROGRESS

- "Our Vision for the Creative Applications of Deep Learning: The Center for Experimental Music and Intermedia, University of North Texas" **Journal SEAMUS, Volume 33, No. 1-2, Spring/Fall 2022**
- **Works in Progress**
    - VEGA: A VAE architecture with GAN discriminator for Symbolic Music Generation (Article)
    - LYRA: Distilled Low-Step Masked Acoustic Token Modeling for Prompted Audio Generation (Article)
    - Audio Visual Aesthetics in Immersive Intelligent Systems: Expanding the Compositional Toolkit with Multi-Modal Generative ML Systems (Dissertation)

COMPOSITIONS

Fixed Media:

- **foam**, Ambisonic fixed media and 270-degree projection (2024)
  Uses generative audio and video created from hundreds of iterations of prompt engineering with Adobe Firefly, Udio, Generative Fill in Adobe Photoshop, and generative upscaling in Adobe Lightroom.

- **Understanding**, 44-channel fixed media and 270-degree projection (2024)
  Understanding was created using an integrated network of Ableton Live, TouchDesigner, and Python scripting. The piece is based on a library of 50 words related to displacement, curated by visual artist Veronica Ibarguengoitia Tena. These words were organized into a custom dictionary read randomly by CHOP Exec nodes in TouchDesigner. Their placement within the 9600x1080px projection space was determined algorithmically, with density modulated by a modified square root curve.

The audio consists of over 600 edited clips of recordings of non-native English speakers reading the words of the dictionary. These clips are triggered algorithmically through Python scripts, allowing for granular control of timing and density.

A future iteration of *Understanding* is planned as an immersive installation with 360-degree projection. In this version, ambient speech will be captured using hanging microphones and processed through a speech-to-text model. Keywords from the transcriptions will be modulated and projected, while a separate model will analyze the text's valence. This data will control RGB values of the projected text, dynamically blending visuals and audio to reflect the evolving emotional context of the environment.

- **Coconut**, 44-channel fixed media (2024)
- **Our Little Ones' Feet**, stereo fixed media (2024)
- **Closing Material**, spatialized fixed media (2023)
- **Leid**, 39-channel fixed media (2022)
- **Interspherism**, fixed media (2021)
- **Citron**, sampled cello (2021)

Instrument and Electronics:

- **Our Little Ones' Feet**, cello and stereo fixed media (2024)
- **Feld**, cello and 39-channel spatialized electronics (2023)
- **Macht III**, cello and pedal (2020)
- **Macht II**, live processed cello (2020)
- **Electrism**, computer and cello (2019)
- **Inside it**, computer and recorded/live processed cellos (2019)

Ensemble and Instrumental Works:

- **Passengers**, cello octet (2024)
  Features isorhythmic patterns generated algorithmically with a large language model (LLM) model.
- **Feld**, bass clarinet and marimba (2023)
- **Flatiron**, two mandolins (2019)
- **Passing girl** (NA4NA commission), piano, cello, and tape (2019)
- **From:To** percussion, amplified water, 39-channel live-spatialized fixed media, and 270-degree projection (2023)
  Performed by running an Ableton Live session from a Jupyter Notebook executing blocks of Python code.

Improvisational and Experimental:

- **Granulator I–V**, improvised granular synthesis (2019)
- **Moving on**, keyboards and live electronics (2019)
- **trex v4**, analog synthesizers (2019)

Arrangements:

- **Dance Monkey** – Tones and I, Symphoniacs (2020)

- **Midnight Express, The Chase** – Giorgio Moroder, Symphoniacs (2019)
  135,000 views on YouTube.
- **Bittersweet Symphony** – The Verve, Symphoniacs (2019)
- **Op. 131 – Beethoven**, Symphoniacs (2019)

ENSEMBLES

Founding Member and Leadership Roles:

- **Symphoniacs** (2013 – Present)
  Founding member of this internationally acclaimed electro-classical ensemble. 115k subscribers on YouTube and nearly 100 million streams on all platforms.

- **Zohn Collective** (2017 – Present)
  Founding member of this contemporary music ensemble focused on artist-driven projects, collaborations, and performances of new art music, supported by grants from the National Endowment for the Arts, the Mid Atlantic Foundation and others.

- **Arts-FI** (2013 – 2016)
  Co-Artistic Director of this ensemble made of Juilliard alumni dedicated to interdisciplinary performances integrating music, theater, and visual arts.

- **Gaspard Ensemble** (2013 – 2016)
  Founding member of this chamber ensemble exploring early modernist French music and newly commissioned art music. Founded with pianist Nahre Sol and composer Philip Lasser.

- **Slow Game** (2015 – 2016)
  Founding member of this electro-acoustic improvisation duo, integrating live electronics and acoustic instruments.

- **Wily Fire** (2014 – 2015)
  Founding member of this experimental trio exploring electro-acoustic music and multimedia integration.

- **Ensemble LPR** (2012 – 2013)
  Founding member of Le Poisson Rouge's resident ensemble, performing with visiting artists such as Ólafur Arnalds and Cory Henry.

- **Mona String Quartet** (2008 – 2011)
  Founding member of this string quartet with a focus on mid 20th century to contemporary repertoire.

Other Ensemble Roles:

- **Bridge Arts Ensemble** (2015 – 2020)
  Teaching Artist delivering interactive performances and workshops to underserved communities across New York State.

- **Eastman Broadband Ensemble** (2006 – 2017)
  Member of a contemporary ensemble performing works by living composers. Directed by composers Ricardo Zohn Muldoon and Carlos Sanchez-Gutierrez.

- **Le Train Bleu** (2010 – 2016)
  Member of a modern music ensemble in New York City, known for distinctive programming and interdisciplinary collaborations. Regularly performed at venues such as Le Poisson Rouge, Joe's Pub, and Drom, working with artists like Matt Marks, Andy Akiho, and the Lar Lubovitch Dance Company.

FESTIVALS

- Artist in Residence, soundSCAPE Festival, Maccagno, Italy (2017)
- Fellow at Norfolk Chamber Music Festival, Connecticut (2008, 2010)
- Heifetz International Institute, New Hampshire (2002, 2009)
- Sarasota Music Festival, Florida (2008)
- Fellow at Music Academy of the West, California (2007)

AWARDS AND SCHOLARSHIPS

- Porter-Evans Scholarship, The University of North Texas (2024 – 2025)
- Presser Graduate Music Award, Presser Foundation (2023 – 2024)
- Robert Colon McSween Scholarship, University of North Texas (2023 – 2024)
- Graduate Assistantship, University of North Texas (2022 – 2026)
- Berlin Musikfond Stipendium, Artist Grant for the creation of new electro-acoustic work (2022)
- National Endowment for the Arts Grant, National Endowment for the Arts (2019)
- USArtists International Grant, Mid Atlantic Arts Foundation (2018)
- Paul R. Judy Center for Innovation and Research Grant, University of Rochester (2017)
- The Manhattan School of Music Scholarship, Manhattan School of Music (2014 – 2015)
- M. & E. Cohen Scholarship, The Juilliard School (2011 – 2012)
- Stonzek Memorial Scholarship, The Juilliard School (2010 – 2011)
- Howard Hanson Scholarship, Eastman School of Music (2006 – 2010)
- First Prize at Coeur d'Alene Young Artists Competition (2010)
- Second Prize at Empire State Competition, New York (2009)
- Performer's Certificate, (awarded after 3rd year jury for excellence in performance) Eastman School of Music (2010)
- The Joan G. and Joseph Klein, Jr. Prize for the Most Promising Performing Artist, Baltimore School for the Arts (2006)

PERFORMANCES AND BROADCASTS

2025

- Mond for multi-channel electro-acoustic audio and video performed on the immersive projection space Dream Cube, Currents Art and Technology Festival, Santa Fe, New Mexico, June 2025

- Traces of the Imaginary II with Marco Buongiorno Nardelli and Alice Grischenko, Currents Art and Technology Festival, Santa Fe, New Mexico, June 2025
- fEVER with David Stout, Currents Art and Technology Festival, Santa Fe, New Mexico, June 2025
- Intermedia Performance with David Stout, technical director, Merril Ellis Intermedia Theater, Denton, Texas, April 2025
- Flicker for multi-channel audio and audio-reactive immersive video, New Media Contemporary, Dallas, Texas, April 2025
- World Premiere of Passengers for Eight Cellos, University of North Texas, Denton, Texas, March 2025
- Recital with Michael Cassiano, Merrill Ellis Intermedia Theater, Denton, Texas, March 2025
- Traces of the Imaginary, SEAMUS Conference, Purdue University, West Lafayette, Indiana, March 2025
- Future Port with Alvin Leung, Merrill Ellis Intermedia Theater, Denton, Texas, February 2025
- Our Little Ones' Feet, for 8 channel fixed media, Electric LaTex Festival, University of Texas, Austin, Texas, January 2025

2024

- Understanding, for 44 channel fixed media and 270-degree projection, Merrill Ellis Intermedia Theater, Denton, Texas, 2024
- foam, for 44 channel fixed media and 270-degree projection, Merrill Ellis Intermedia Theater, Denton, Texas, 2024
- Traces of the Imaginary, music for cello and electronics, Denton, Texas, October 2024
- Coconut, for fixed media diffused on 44 speaker dome, Merrill Ellis Intermedia Theater, Denton, Texas, September 2024
- Traces of the Imaginary, for cello and electronics, Santa Fe, New Mexico, June 2024
- Symphoniacs performance, Klagenfurt, Austria, May 2024
- Our Little Ones' Feet, fixed media diffused on 44 speaker dome, Merril Eelis Intermedia Theater, Denton, Texas, April 2024
- Zohn Trio performance and residency, Denison University, Granville, Ohio, February 2024

2023

- Symphoniacs performance, Vaduz, Liechtenstein, December 2023
- Symphoniacs performances, Lienz, Austria and Berlin, Germany, October 2023
- Dvorak Cello Concerto, Gettysburg Chamber Orchestra, Gettysburg, Pennsylvania, September 2023
- Symphoniacs performance**,** Festsaal Kreuzberg, Berlin Germany, June 2023
- Symphoniacs performance, Draußen im Grünen, Hamburg, Germany, June 2023
- Symphoniacs performance, Sommerkulturfestival, Berlin Germany, June 2023
- Symphoniacs performance, Berlin Tempodrom, Berlin Germany, June 2023
- Symphoniacs performance, Klagenfurt Festival, Klagenfurt, Austria, June 2023
- Zohn Collective performances, Lange Tag der Neuen Musik, Düsseldorf, Germany, June 2023
- Zohn Collective residency, Robert Schumann Hochschule, Düsseldorf, Germany, May – June 2023
- Symphoniacs performance, Klagenfurt Festival, Klagenfurt, Austria, June 2023
- Symphoniacs performance, Berlin, Germany, June 2023
- Zohn Collective performance, Bologna, Italy, May 2023

- Zohn Collective residency, Kunstakademie Düsseldorf, Düsseldorf, Germany, May 2023
- Performance of Flint by Alden Bostwick, UNT Voertman Hall, Denton, Texas, March 2023
- Performance of Surrender by Alvin Leung, UNT Voertman Hall, Denton, Texas, March 2023
- Performance of In the Beauty of Night by Heather Pryse, UNT Voertman Hall, Denton, Texas, April 2023
- Performance of Closing Material, Merrill Ellis Intermedia Theater, Denton, Texas, April 2023
- Performance of Resonance Ecology by Garrison Gerard, Merrill Ellis Intermedia Theater, Denton, Texas, April 2023
- Performance of From:To for live spatialized fixed media, percussion and 270-degree projection, Merrill Ellis Intermedia Theater, Denton, Texas, April 2023
- Performance of Nonet by Samuel Ash, UNT Voertman Hall, Denton, Texas, March 2023
- Performance of Stone Age by Panayiotis Kokoras at SEAMUS conference, New York University, New York, New York, April 2023
- Performance of Danzon No. 5 by Gabriel Marquez, UNT Voertman Hall, Denton, Texas, March 2023
- Performance of Undulations by Ronald Bonitatibus, UNT Recital Hall, Denton, Texas, March 2023
- Performance of Feld (fixed media and cello), Merrill Ellis Intermedia Theater, Denton, Texas, February 2023
- Performance of Shut your eyes by Kory Reeder, Dallas Contemporary, Dallas, Texas, February 2023
- Zohn Collective residency, Vanderbilt University, Nashville Tennessee, January 2023

2021 - 2022

- Performance of Molten Plains by Kory Reeder, Rubber Gloves, Denton, Texas, December 2022
- Performance of Leid (stereo-version) and projection, Dallas Contemporary, Dallas, Texas, November 2022
- Performance with Nova Ensemble, UNT Voertman Hall, Denton, Texas, November 2022
- Performance of Leid (39-channel spatialized fixed media) and 270-degree projection, Merrill Ellis Intermedia Theater, Denton, Texas, November 2022
- Performance of Graspings for solo cello by Willyn Whiting, UNT Recital Hall, Denton, Texas, October 2022
- Performance of Citron for fixed media and 5 screen projection, Merrill Ellis Intermedia Theater, Denton, Texas, October 2022
- Performance of Macht I for fixed media, Rubber Gloves, Texas September 2022
- Symphoniacs performances, Austria and Germany

2020

- Symphoniacs performances, Berlin Axica Center, Berlin Konzerthaus, Merano Festival Headline, Meran Italy
- Performances with SYML, Washington D.C. The Anthem, New York Radio City Music Hall, March 2020

2019

- Symphoniacs performances, Nairobi Kenya, Capri Italy, Montenegro Sveti Stefan, London, Parma Italy, Trento Italy, Linz Brucknerhaus, Tokyo Warner Music, Tokyo International Forum Hall C, 2019
- Zohn Collective residencies, University of Notre Dame, University of Chicago, North Kentucky University, Oberlin College, February, March and October 2019

- Solo performance (cello and electronics) and workshops, American University, April 2019
- Performance with Molly Barth and Konstantine Manaev, Berlin Germany, June 2019
- Lincoln Center Moments Performance, Kaplan Penthouse – Lincoln Center, New York, October 2019

2018

- Zohn Collective tour of Ricardo Zohn-Muldoon's Comala, US and Mexico, 2018
- Zohn Collective residency, Belmont University, Nashville, March 2018
- Symphoniacs performances, Bochum Jahrhunderthalle, Vienna Austria Center, Milan Museo Nazionale Scienza e Tecnologia "Leonardo da Vinci", Ludwigshafen Friedrich Ebert Halle, Vienna (Headliner at Life Ball) Vienna City Hall, Budapest Pesti Vigadó, Geneva Lake Geneva, Cologne DOCK.ONE, Wuppertal Barmer Bahnhof, Berlin E-Werk, Marbella Ocean Club, Monte-Carlo Hôtel Hermitage, Cortina d'Ampezzo Franz Kraler, Heidelberg Schloss Heidelberg, Dominican Republic Puerto Plata, Brussels The Golden Boot, 2018
- Performance with Ensemble Dal Niente, Spectrum, New York, 2018

2017

- Chamber ensemble, Off-Broadway production of Curvy Widow, New York, New York, 2017
- Eastman Broadband Residency at soundSCAPE Festival, Maccagno, Italy, 2017
- Televised performances with Symphoniacs on Heidi Klum's Germany's Next Top Model and ZDF's Fernsehgarten, Germany, Switzerland, Austria, 2017
- Headline performance with Symphoniacs at Die Silvesterparty am Brandenburger Tor, Europe's largest New Year's Eve celebration, for a live audience of more than 700,000, Berlin, Germany, 2017
- European tour with Symphoniacs, Munich Philharmonie, Stuttgart Beethovensaal, Hamburg Laeiszhalle, Frankfurt Alte Oper, Freiburg Konzerthaus, Vienna MuseumsQuartier and Hofburg Palace, Berlin Admiralspalast, Hannover Theater am Aegi, Mannheim Rosengarten, Zurich Theater 11, Cologne Gürzenich, Essen Colosseum and Leipzig Haus Auensee, 2017

2016

- Four-month residency, Lincoln Center Stage piano quintet, MS Oosterdam, 2016
- Two performances with Symphoniacs on The Helene Fischer Show to a combined live audience of 20,000 and a televised audience of 8 million, Düsseldorf, Germany, 2016
- Performance of Elgar Cello Concerto and Philip Lasser Vocalise with Gettysburg Chamber Orchestra, Gettysburg, Pennsylvania, 2016
- Performance with Symphoniacs on Florian Silbereisen's Schlagerbooom to a live audience of 12,000 and televised audience of 7 million, Dortmund, Germany, 2016
- Performance with Symphoniacs on ZDF's Morgenmagazin, Berlin, Germany**,** 2016
- Performance with Symphoniacs at Bush Hall for the International Live Music Conference, London, England, 2016
- Performance with Symphoniacs for Universal Music's Universal Inside 2016 at Mercedes Benz Arena, Berlin, Germany, 2016

2014 - 2015

- Performance of Arts-FI's 2014 touring show, Into the Sun for Lincoln Center's Boro-Linc at Casita Maria Center for Arts & Education, Bronx, New York, 2015

- Performance of Golijov, Bach and Fairouz at Carnegie Weill Hall and Joe's Pub, New York, New York, 2015
- Performances of Luciano Berio Sequenza XIV with American Virtuosi at Vassar College, Poughkeepsie, New York, 2015
- Performance with faculty oud ensemble at Beit Al 'Oud, Abu Dhabi, United Arab Emirates, 2015
- Tour with experimental electro-acoustic duo Slow Game, North Carolina, Kentucky, Ohio, 2015
- Tour of ArtsFI's project The Invitation, Kansas, 2015
- Annual performance at New York Botanical Gardens with Le Train Bleu, Tara O'Conner, Todd Phillips and Ransom Wilson, New York, New York, 2014, 2015
- Tour of Ricardo Zohn-Muldoon Comala with Eastman Broadband Ensemble, Pittsburgh, Rochester, Cincinnati, Lexington, 2014
- Solo cello, world premier of Aaron Jay Kernis On Distant Shores with Rioult Dance and Tactus Ensemble, New York, New York, 2014
- Performance with Bryan Carter Jazz Quartet at Joe's Pub, New York, New York, 2014
- Performances with electro-improv trio, Wily Fire, with Molly Joyce, New York, New York, 2014
- Residency at the Bravo! Vail Festival with Le Train Bleu, Calder Quartet and Anne-Marie McDermott, Vail, Colorado, 2014
- Experimental electro-spatial installation with Sympho and Bora Yoon of site-specific work InSpiral at The Tower at Oliver Ranch, Sonoma County, California, 2014
- Tour of ArtsFI's project Into the Sun, Kansas**,** 2014
- ArtsFI educational residency, working with 1000 students on self-expression, music and poetry, Garden City, Kansas**,** 2014

2005 - 2013

- Performance of Andy Akiho – LIgNEous I and Paola Prestini – As Sleep Befell, River to River Festival, New York, New York, 2013
- Performances with Ólafur Arnalds, Daniel Hope and Ensemble LPR, Le Poisson Rouge, New York, New York, 2012-2013
- Frederic Rzewski – Coming Together and Attica, Michael Gordon – Yo Shakespeare with Le Train Bleu at Le Poisson Rouge and Galapagos Art Space, New York, New York, 2012
- F.J. Haydn - Piano Trio in F-sharp minor, Wednesdays at One - Alice Tully Hall, New York, New York, 2012
- Music of Brahms with Bowdoin Virtuosi, Brunswick, Maine, 2011
- Fundraising Recital and Outreach for Haiti, Sanibel Island, Florida, 2011
- Recital tours with pianist Andrew Dunlop, U.S., U.K. and Spain, 2009-2010
  - Featured on NPR's Performance Today, 2005
  - Heitor Villa – Lobos' Bachianas Brasileiras No. 5 with Yo-Yo Ma, Janice Chandler-Eteme, and Cellists from the Baltimore Symphony conducted by Maestro Yuri Temirkanov at the Meyerhoff Symphony Hall and the Gala Opening of the Strathmore Music Hall, Maryland, 2005

Appendix B
Materials Considered

Legal Documents

30(b)(6) Deposition of Alisa Coleman, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, October 29, 2025.

30(b)(6) Deposition of Benjamin Mann, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 20, 2025.

30(b)(6) Deposition of David Benjamin Kokakis, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 11, 2025.

30(b)(6) Deposition of Deep Ganguli, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 6, 2025.

30(b)(6) Deposition of Duff Berschback, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, October 10, 2025.

Declaration of Jared Kaplan in Support of Defendant's Opposition to Plaintiff's Motion for Preliminary Injunction, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, January 15, 2024.

Defendant Anthropic PBC's Amended and Supplemental Responses and Objections to Plaintiffs' Third Set of Interrogatories (No. 18), *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 5, 2025.

Defendant Anthropic PBC's Supplemental Responses and Objections to Plaintiff's Third Set of Interrogatories (Nos. 16, 19), *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 12, 2025.

Deposition of Jared Kaplan, *Concord Music Group, Inc. et al. v. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, November 21, 2025.

First Amended Complaint and Demand for Jury Trial, *Concord Music Group, Inc. et al. vs. Anthropic PBC*, 5:24-cv-03811-EKL-SVK, April 25, 2025.

Bates-Stamped Documents

Anthropic_0000441108–155, Anthropic, Anthropic Economic Index, September 15, 2025.

Anthropic_0000012987–032, Tamkin, Alex et al., Anthropic, Clio: Privacy-Preserving Insights into Real-World AI Use, December 18, 2024.

Anthropic_0000217042–048, Anthropic, Notes on Training Production Claude, April 13, 2023.

Anthropic_0000000829–902, Bai, Yuntao et al., Anthropic, Training a Helpful and Harmless Assistant with Reinforcement Learning from Human Feedback, April 12, 2022.

Anthropic_0000441239–276, Handa, Kunal et al., Anthropic, Which Economic Tasks are Performed with AI? Evidence from Millions of Claude Conversations, February 11, 2025.

Academic Articles and Books

Ali, S. Omar and Zehra F. Peynircioglu, "Songs and Emotions: Are Lyrics and Melodies Equal Partners?," *Psychology of Music*, Vol. 34, No. 4, 2006, p. 511–534.

Amir, Guy et al., "Verifying the Generalization of Deep Learning to Out-of-Distribution Domains," *Journal of Automated Reasoning*, Vol. 68, No. 17, 2024, pp. 1–60.

Appen, Ralf von and Markus Frei-Hauenschild, "AABA, Refrain, Chorus, Bridge, Prechorus – Song Forms and Their Historical Development," *Black Box Pop: Analysen populärer Musik*, edited by Dietrich Helms and Thomas Phleps, 2012.

Author, I. T., *Musical Dice Game Waltzes I*, Libre Edition Press, May 21, 2025.

BaileyShea, Matt, *Lines and Lyrics An Introduction to Poetry and Song*, Yale University Press, 2021.

Bauer, William R., "Scat Singing: A Timbral and Phonemic Analysis," *Current Musicology*, Vol. 71, No. 73, 2002, pp. 303–323.

Bernardini, Nicola and Gareth Loy, "Whither MIDI?," *Computer Music Journal*, Vol. 11, No. 1, 1987, pp. 9–12.

Biamonte, Nicole, "Formal Functions of Metric Dissonance in Rock Music," *Society for Music Theory*, Vol. 20, No. 2, 2014, pp. 1–24.

Brauneis, Robert, "Copyright and the World's Most Popular Song," *GW Law Faculty Publications & Other Works*, 2010, pp. 1–68.

Caillon, Antoine and Philippe Esling, "RAVE: A Variational Autoencoder for Fast and High-Quality Neural Audio Synthesis," *Sorbonne Université*, 2021, pp. 1–15.

Clercq, Trevor de, "Embracing Ambiguity in the Analysis of Form in Pop/Rock Music, 1982–1991," *Society for Music Theory*, Vol. 23, No. 3, 2017.

Covach, John, "From 'Craft' to 'Art' Formal Structure in the Music of the Beatles," *Reading the Beatles: Cultural Studies, Literary Criticism, and the Fab Four*, edited by Kenneth Womack and Todd F. Davis, State University of New York Press, 2006.

dos Santos, Guilherme Soares S. and Flavio Figueiredo, "Assessing the Impact of Sampling, Remixes, and Covers on Original Song Popularity," *Proc. of the 1st Latin American Music Information Retrieval Workshop*, 2024, pp. 1–5.

Forney, Kristine, Andrew Dell'Antonio and Joseph Machlis, *Enjoyment of Music: Essential Listening Edition*, 14 Ed., W. W. Norton & Company, 2022.

Hagos, Desta Haileselassie, Rick Battle and Danda B. Rawat, "Recent Advances in Generative AI and Large Language Models: Current Status, Challenges, and Perspectives," *IEEE Transactions on Artificial Intelligence*, 2024, pp. 1–21.

Heidemann, Kate, "A System for Describing Vocal Timbre in Popular Song," *Journal of the Society for Music Theory*, Vol. 22, No. 1, 2016, pp. 1–17.

Ho, Ang-Cheng Kris, "Calm or Tension? The Musical Demands in Strung Out (1967) and Spiegel im Spiegel (1978)," *International Journal of Social Sciences and Humanity*, Vol. 6, No. 7, 2016, pp. 557–560.

Ivcevic, Zorana and Mike Grandinetti, "Artificial Intelligence as a Tool for Creativity," *Journal of Creativity*, Vol. 34, 2024, pp. 1–5.

Kelling, Hans-Wilhelm, "A Chronology of Mozart and His Times," *BYU Studies Quarterly*, Vol. 43, No. 3, July 1, 2004, pp. 1–12.

Kendong, Faruq Ahmad, Afifah Sakinah Daud and Siti Aeisha Joharry, "A Corpus-Driven Analysis of Taylor Swift's Song Lyrics," *International Journal of Modern Languages and Applied Linguistics*, Vol. 7, No. 2, June 1, 2023, pp. 59–82.

Laitz, Steven G., *The Complete Musician: An Integrated Approach to Theory, Analysis, and Listening*, 1 Ed., Oxford University Press, 2003.

Le, Bonnie and Francis Scully, "Music Around the World," *Music Appreciation*, edited by Bonnie Le, Brenda Wimberly, Constance Chemay, Francis Scully, Jesse Boyd and Steven Edwards, LOUIS: The Louisiana Library Network.

Li, Ang, "The Historical Evolution of the Popularization of Classical Music and the Development of the Fusion of Multiple Music Styles," *Herança - History, Heritage and Culture Journal*, Vol. 7, No. 1, 2024, pp. 113–125.

Loy, Gareth, "Musicians Make a Standard: The MIDI Phenomenon," *Computer Music Journal*, Vol. 9, No. 4, 1985, pp. 8–26.

Malin, Yonatan, "Metric Displacement Dissonance and Romantic Longing in the German Lied," *Music Analysis*, Vol. 25, No. 3, 2006, pp. 251–288.

Mehta, Atharva et al., "Music for All: Representational Bias and Cross-Cultural Adaptability of Music Generation Models," *Findings of the Association for Computational Linguistics: NAACL 2025*, 2025, pp. 4569–4585.

Osborn, Brad, "Subverting the Verse–Chorus Paradigm Terminally Climactic Forms in Recent Rock Music," *Music Theory Spectrum*, Vol. 35, No. 1, 2013, pp. 23–47.

Pizà, Antoni, *Listening to the World*, New York, The City University of New York, 2023.

Proto, Teresa, "Prosody, Melody and Rhythm in Vocal Music," *Linguistics in the Netherlands*, 2015, pp. 116–129.

Reisenweaver, Anna, "Guido of Arezzo and His Influence on Music Learning," *Musical Offerings*, Vol. 3, No. 1, 2012, pp. 37–59.

Solak, Ahmet et al., "Bias Beyond Borders: Global Inequalities in AI-Generated Music," *ETH Zurich*, 2025, pp. 1–5.

Sousa, John Philip, "The Menace of Mechanical Music," *Appleton's Magazine*, Vol. 8, 1906, pp. 278–284.

Summach, Jay, "The Structure, Function, and Genesis of the Prechorus," *Society for Music Theory*, Vol. 17, No. 3, 2011, pp. 1–13.

Titze, Ingo R., "The Human Instrument," *Scientific American*, January 2008.

Wallmark, Zachary, "Analyzing Vocables in Rap: A Case Study of Megan Thee Stallion," *Society for Music Theory*, Vol. 28, No. 2, 2022, pp. 1–22.

Willimek, Bernd and Daniela Willimek, "Feelings Which Strike a Chord, and Chords Which Strike a Feeling," *Open Journal of Acoustics*, Vol. 7, 2017, pp. 10–17.

Willson, Rachel Beckles, "Music Theory and Analysis," *Introduction to Music Studies*, edited by J. P. E. Harper-Scott and Jim Samson, Cambridge University Press, 2009.

Witek, Maria A. et al., "Syncopation, Body-Movement and Pleasure in Groove Music," *PLoS ONE*, Vol. 9, No. 4, 2014, pp. 1–12.

Witty, Sam et al., "Measuring and Characterizing Generalization in Deep Reinforcement Learning," *Applied AI Letters*, 2021, pp. 1–14.

Yu, Yu, Shahram Khadivi and Jia Xu, "Can Data Diversity Enhance Learning Generalization?," *Proceedings of the 29th International Conference on Computational Linguistics*, 2022, pp. 4933–4945.

Zak III, Albin J., "Bob Dylan and Jimi Hendrix: Juxtaposition and Transformation 'All Along the Watchtower'," *Journal of the American Musicological Society*, Vol. 57, No. 3, 2004, pp. 599–644.

Zhao, Hanbing et al., "AI-Driven Music Composition: Melody Generation Using Recurrent Neural Networks and Variational Autoencoders," *Alexandria Engineering Journal*, Vol. 120, 2025, pp. 258–270.

Public Documents

2Cellos, "2Cellos – Thunderstruck [Official Video]," available at https://www.youtube.com/watch?v=uT3SBzmDxGk, accessed December 10, 2025.

Ahlgrim, Callie, "Ariana Grande Gets Less Than 10% of Royalties from '7 Rings,' Her Most Popular Single Ever – Here's Why," *Business Insider*, March 20, 2019, available at https://www.businessinsider.com/ariana-grande-7-rings-royalties-rodgers-and-hammerstein-my-favourite-things-sample-2019-3.

AIVA, "Introducing Lyra," available at https://blog.aiva.ai, accessed December 3, 2025.

Antares, "The Science Behind Auto-Tune: How It Works," August 9, 2023, available at https://www.antarestech.com/community/the-science-behind-auto-tune.

Anthropic, "Introducing Claude," March 14, 2023, available at https://www.anthropic.com/news/introducing-claude.

Athenaterminal, "Autechre on Generative Music Techniques," available at https://www.tumblr.com/athenaterminal/169379384110/autechre-on-generative-music-techniques, accessed December 11, 2025.

Avid, "Music Theory: Basics and Fundamental Concepts," October 6, 2023, available at https://www.avid.com/resource-center/music-theory.

Belcic, Ivan, "What Is a Generative Model?," *IBM*, available at https://www.ibm.com/think/topics/generative-model, accessed December 18, 2025.

Belcic, Ivan and Cole Stryker, "What Is Claude AI?," *IBM*, December 2, 2025, available at https://www.ibm.com/think/topics/claude-ai.

Benjamin, Jeff, "HYBE's 'New' K-Pop Artist Midnatt Is Using AI Technology for a Remarkably Human Purpose," *Billboard*, May 17, 2023, available at https://www.billboard.com/music/pop/artificial-technology-kpop-artist-midnatt-hybe-interview-1235329459.

Berklee, "Synth Programmer," available at https://www.berklee.edu/careers/roles/synth-programmer, accessed December 10, 2025.

Blume, Jason, "How to Write to a Music Track: The Art of Toplining," *BMI*, June 23, 2022, available at https://www.bmi.com/news/entry/how-to-write-to-a-music-track-the-art-of-toplining.

Bottignole, Livia Malossi, "History of Games in Music and Music in Games. Die Musikalisches Würfelspiel," *Research Catalogue*, available at https://www.researchcatalogue.net/view/2622512/2737970, accessed December 15, 2025.

Britannica Editors, "Popular Music," *Britannica*, available at https://www.britannica.com/art/popular-music, accessed December 17, 2025.

British Literature Wiki, "Aeolian Harps and the Romantics," available at https://sites.udel.edu/britlitwiki/aeolian-harps-and-the-romantics, accessed December 2, 2025.

Bronson, Fred, "How Ariana Grande's '7 Rings' Took a 'Sound of Music' Classic to the Top," *Variety*, January 28, 2019, available at https://variety.com/2019/music/news/ariana-grande-things-7-rings-sound-of-music-1203121782.

Carr, Dan, "Recreating Radiohead's Keys and Synths with Software Instruments," *Reverb*, July 13, 2018, available at https://reverb.com/news/recreating-radioheads-keys-and-synths-with-software-instruments.

Chayka, Kyle, "That New Hit Song on Spotify? It Was Made by A.I.," *The New Yorker*, November 12, 2025, available at https://www.newyorker.com/culture/infinite-scroll/that-new-hit-song-on-spotify-it-was-made-by-ai.

Chui, Michael et al., "The Economic Potential of Generative AI: The Next Productivity Frontier," *McKinsey & Company*, June 14, 2023, available at

https://www.mckinsey.com/capabilities/tech-and-ai/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier.

Claude, "Claude Can Now Create and Edit Files," September 9, 2025, available at https://claude.com/blog/create-files.

Claude, "Text Generation," available at https://platform.claude.com/docs/en/build-with-claude/text-generation, accessed December 10, 2025.

CNN Business, "Autotune: Good or Bad?," June 14, 2016, available at https://www.cnn.com/2015/05/26/tech/gallery/autotune-artists-mci/index.html.

Computer Music, "The 40 Greatest Synth Sounds of All Time, No. 6: Pink Floyd – Shine On You Crazy Diamond," *MusicRadar*, May 24, 2021, available at https://www.musicradar.com/news/pink-floyd-best-synth-sound.

Computer Music, "A Brief History of Sampling," *MusicRadar*, August 5, 2014, available at https://www.musicradar.com/tuition/tech/a-brief-history-of-sampling-604868.

Cooper, Blake, "History of Player Piano Systems," *Cooper Piano*, April 7, 2025, available at https://cooperpiano.com/history-of-player-piano-systems.

Crowe, Cameron, "Harry Styles' New Direction," *Rolling Stone*, April 18, 2017, available at https://www.rollingstone.com/feature/harry-styles-new-direction-119432.

Currents, "Dream Machine Event Details," available at https://currentsnewmedia.org/events/the-dream-machine, accessed December 15, 2025.

Dalugdug, Mandy, "Timbaland Launches AI Music Company Stage Zero, With First AI Artist, TaTa," *Music Business Worldwide*, June 9, 2025, available at https://www.musicbusinessworldwide.com/timbaland-launches-ai-music-company-stage-zero-with-first-ai-artist-tata.

Dazed, "Holly Herndon Releases AI Cover of Dolly Parton's 'Jolene'," November 3, 2022, available at https://www.dazeddigital.com/music/article/57372/1/holly-herndon-releases-ai-cover-of-dolly-partons-jolene.

Dentsu Lab Tokyo, "Brian Eno's The Ship – A Generative Film," available at https://dentsulab.tokyo/en/works/the-ship, accessed December 3, 2025.

Dessign, "Udio AI," available at https://dessign.net/udio-ai, accessed December 3, 2025.

Detrick, Ben, "The Dirty Heartbeat of the Golden Age," *The Village Voice*, November 6, 2007, available at https://www.villagevoice.com/the-dirty-heartbeat-of-the-golden-age.

Discogs, "The 1975 – I Like It When You Sleep, For You Are So Beautiful Yet So Unaware Of It," available at https://www.discogs.com/release/8757820-The-1975-I-Like-It-When-You-Sleep-For-You-Are-So-Beautiful-Yet-So-Unaware-Of-It, accessed December 10, 2025.

Discogs, "Kelly Clarkson – Thankful," available at https://www.discogs.com/release/681987-Kelly-Clarkson-Thankful, accessed December 10, 2025.

Discogs, "Maroon 5 – Overexposed," available at https://www.discogs.com/release/3684952-Maroon-5-Overexposed, accessed December 10, 2025.

Dombal, Ryan, "Interview Neko Case," *Pitchfork*, April 9, 2006, available at https://pitchfork.com/features/interview/6306-neko-case.

Duchen, Jessica, "Best Classical Pianists of All Time: Top 25," *UDiscover Music*, October 1, 2025, available at https://www.udiscovermusic.com/classical-features/best-classical-pianists.

Edwards, Clayton, "On This Day in 2006, Jimmy Page's Solo From Led Zeppelin's 'Stairway to Heaven' Was Voted the Best of All Time," *American Songwriter*, March 26, 2025, available at https://americansongwriter.com/on-this-day-in-2006-jimmy-pages-solo-from-led-zeppelins-stairway-to-heaven-was-voted-the-best-of-all-time.

Eilers, Lasse, "Kraftwerk – Their Legendary Synths,Sequencers and Sounds," *Gearnews*, available at https://www.gearnews.com/kraftwerk-synths-sequencers-sounds, accessed December 17, 2025.

Electronic Musician, "Akai S950 Review," *MusicRadar*, March 31, 2020, available at https://www.musicradar.com/news/akai-s950-review.

Elf Tech, "Create," available at https://elf.tech/create, accessed December 11, 2025.

Farber, Jim, "Singers Do Better With T-Pain Relief," *Daily News*, January 12, 2019, available at https://www.nydailynews.com/2007/12/10/singers-do-better-with-t-pain-relief.

Galiher, Stephen Andrew, "Timbaland Debuts AI 'Artist' TaTa Taktumi's First Music Video and It's as 'Soulless' as You Expected It To Be," *VICE*, October 14, 2025, available at https://www.vice.com/en/article/timbaland-debuts-ai-artist-tata-taktumis-first-music-video-and-its-as-soulless-as-you-expected-it-to-be.

Geeks for Geeks, "What is Midjourney AI and How Does it Work?," August 20, 2025, available at https://www.geeksforgeeks.org/artificial-intelligence/what-is-midjourney-ai-and-how-does-it-work.

Grammy, "Taylor Swift," available at https://www.grammy.com/artists/taylor-swift/15450, accessed December 9, 2025.

Greene, Jayson, "Stevie Wonder and His Dream Machines," *Pitchfork*, February 27, 2022, available at https://pitchfork.com/features/overtones/stevie-wonder-and-his-dream-machines-synth.

Griffiths, Daniel, "'No Synthesizers'? No Way! How Queen Backtracked on a Boast, Embraced Synths and went Stratospheric," *MusicRadar*, November 2023, available at https://www.musicradar.com/news/queen-no-synths-real-story.

Hahn, Rachel, "Behind Holly Herndon's Radically Human AI Music," *Vogue*, September 10, 2019, available at https://www.vogue.com/article/holly-herndon-interview-proto-dropbox-documentary-proto-ai-music-spawn-new-album.

Haupt, Angela, "Why Taylor Swift's Music Makes Us So Emotional," *TIME*, April 19, 2024, available at https://time.com/6968864/why-music-makes-us-emotional-taylor-swift.

Herndon, Holly, "Holly+," *Paragraph*, July 13, 2021, available at https://paragraph.com/@holly-herndon/holly.

Hill, Laura Wheatman, "'Bridgerton' Composer Kris Bowers & Vitamin String Quartet Continue to Make Classical Music Pop for Season 3," *Grammy*, May 16, 2024, available at https://www.grammy.com/news/bridgerton-classical-pop-music-kris-bowers-vitamin-string-quartet.

Hill, Mildred, "Happy Birthday to You," *IMSLP*, 1893, Edited by Supertchan, available at https://imslp.org/wiki/Happy_Birthday_to_You_(Hill,_Mildred)#IMSLP46139.

Hogan, Marc, "Musicians Are Already Using AI More Often Than We Think," *Pitchfork*, May 11, 2023, available at https://pitchfork.com/thepitch/musicians-are-already-using-ai-more-often-than-we-think.

Holly+, "Home," available at https://holly.plus, accessed December 3, 2025.

Holt, Denise M., "Musicians Tuned Out as Taped Music Slams Job Doors," *Daily Times-Advocate*, August 17, 1979, available at https://www.newspapers.com/image-view/570467642.

Hsu, Hua, "Electronic Pop For The Surveillance Era," *The New Yorker*, May 13, 2019, available at https://www.newyorker.com/magazine/2019/05/20/electronic-pop-for-the-surveillance-era.

Huang, Cheng-Zhi Anna et al., "Coconet: The ML Model Behind Today's Bach Doodle," *Magenta*, March 20, 2019, available at https://magenta.withgoogle.com/coconet.

Irvin, Jack, "Zedd Says He 'Would Have Never Been Able to Make the Music I Make if it Wasn't for AI'," *People*, August 23, 2024, available at https://people.com/zedd-telos-album-intel-lucky-ai-experience-exclusive-8700314.

Jalon, Allan, "High-Tech Notes: Synthesizers: Sour Sound to Musicians," *Los Angeles Times*, December 6, 1985, available at https://www.latimes.com/archives/la-xpm-1985-12-06-mn-554-story.html.

Johncy, Joel, "Timbaland's AI Artist Debut: Perfect Sound, Imperfect Feeling," *Point Blank Music School*, October 22, 2025, available at https://www.pointblankmusicschool.com/blog/timbalands-ai-artist-debut-perfect-sound-imperfect-feeling.

Jones, Andy, "'The Less Stuff You Have, the Easier it is to Make Music': Why Billie Eilish's When We All Fall Asleep, Where do We Go? Is a Modern Masterpiece," *MusicRadar*, December 13, 2024, available at https://www.musicradar.com/artists/the-less-stuff-you-have-the-easier-it-is-to-make-music-why-billie-eilishs-when-we-all-fall-asleep-where-do-we-go-is-a-modern-masterpiece.

Judd, Timothy, "György Ligeti's 'Lux Aeterna': The Ethereal Land of Micropolyphony," *The Listeners' Club*, January 18, 2019, available at https://thelistenersclub.com/2019/01/18/gyorgy-ligetis-lux-aeterna-the-ethereal-land-of-micropolyphony.

Kielty, Martin, "How Brian Eno Used AI to Make Music Like His Own," *Ultimate Classic Rock*, January 13, 2025, available at https://ultimateclassicrock.com/brian-eno-ai-music.

King, Ariel, "10 Covers that Wound Up Being More Popular than the Original," *iHeart*, October 8, 2021, available at https://www.iheart.com/content/2021-10-08-10-covers-that-wound-up-being-more-popular-than-the-original.

LANDR, "How Musicians Use AI," November 2025, available at https://cdn.landr.com/files/How_Musicians_Use_AI.pdf.

Levitan, Dan, "The History of the Harp," *Stanford Live*, October 31, 2024, available at https://live.stanford.edu/news/the-history-of-the-harp.

Lewis, Robert, "Auld Lang Syne," *Britannica*, December 9, 2025, available at https://www.britannica.com/topic/Auld-Lang-Syne.

Lumen Learning, "Tempo Measurement," available at https://courses.lumenlearning.com/suny-musicappreciationtheory/chapter/introduction-to-tempo, accessed December 9, 2025.

Martin, Paul, "CPR to Stayin' Alive Beat Helps Keep Proper Rate," *ProCPR*, August 26, 2022, available at https://www.procpr.org/blog/training/cpr-stayin-alive-song.

Maryland Center For History and Culture, "The Star-Spangled Banner," available at https://www.mdhistory.org/resources/the-star-spangled-banner, accessed December 12, 2025.

MasterClass, "Understanding Rhythm in Music: 7 Elements of Rhythm," June 7, 2021, available at https://www.masterclass.com/articles/understanding-rhythm-in-music.

MasterClass, "What Is a Cover Song? A Brief History of Cover Songs," September 2, 2021, available at https://www.masterclass.com/articles/cover-song-music-guide.

McCartney, Paul, "Paul McCartney Reveals the Stories Behind His Greatest Hits," *The Times*, October 17, 2021, available at https://www.thetimes.com/culture/music/article/paul-mccartney-the-lyrics-book-beatles-0xhq8trnd.

Melchior, Al, "The Reverse-Engineering Behind the Meaning of Phil Collins' 'Sussudio'," *American Songwriter*, January 16, 2024, available at https://americansongwriter.com/the-reverse-engineered-meaning-behind-phil-collins-sussudio.

Microsoft Copilot, "How to Use AI for Songwriting," March 17, 2025, available at https://www.microsoft.com/en-us/microsoft-copilot/for-individuals/do-more-with-ai/ai-art-and-creativity/how-to-use-ai-for-songwriting.

Miraglia, Dustin, "How to Use MIDI: Tips, Tricks & Techniques for Using MIDI," *Unison Audio*, June 9, 2023, available at https://unison.audio/how-to-use-midi.

Mitchell, Naomi, "Hello Victor: History of the RCA MkII Sound Synthesizer," *Perfect Circuit*, June 16, 2023, available at https://www.perfectcircuit.com/signal/rca-mkii-synthesizer-history.

Mix Staff, "1997: Antares Auto-Tune," *Mixonline*, January 1, 2011, available at https://www.mixonline.com/technology/1997-antares-auto-tune-383728.

Montgomery, James, "Death Cab for Cutie Raise Awareness About Auto-Tune Abuse," *MTV*, February 10, 2009, available at https://web.archive.org/web/20190731051019/http://www.mtv.com/news/1604710/death-cab-for-cutie-raise-awareness-about-auto-tune-abuse.

Moog, "Switched-On Bach: How the World Met Moog," Janurary 25, 2018, available at https://www.moogmusic.com/the-wave/switched-bach-how-world-met-moog.

MusOpen, "Mozart Musikalisches Würfelspiel, K. 516f," available at https://musopen.org/music/2914-musikalisches-wurfelspiel-k-516f, accessed December 5, 2025.

Nashville Symphony Schermerhorn Symphony Center, "Wolfgang Amadeus Mozart Requiem, K.626," available at https://www.nashvillesymphony.org/classical-program-notes/wolfgang-amadeus-mozart-requiem-k-626.

Nelson, Jon Christopher, "Csound Software Downloads," available at https://jonchristophernelson.com/csound-software-downloads, accessed December 3, 2025.

NPR, "'Respect' Wasn't a Feminist Anthem Until Aretha Franklin Made it One," February 14, 2017, available at https://www.npr.org/2017/02/14/515183747/respect-wasnt-a-feminist-anthem-until-aretha-franklin-made-it-one.

Oliveira, Alex, "AI for Independent Artists: Using Claude and Mistral to Write, Market, and Monetize Your Music," *Prediq*, August 19, 2025, available at https://www.prediq.io/ai-for-independent-artists-using-claude-and-mistral-to-write-market-and-monetize-your-music.

OnMusic Dictionary, "Neumatic," June 5, 2016, available at https://dictionary.onmusic.org/terms/2330-neumatic.

OnMusic Dictionary, "Word Painting," May 6, 2016, available at https://dictionary.onmusic.org/terms/3957-word_painting.

Oxford English Dictionary, "Allegro," available at https://www.oed.com/dictionary/allegro_n?tab=meaning_and_use, accessed December 15, 2025.

Oxford English Dictionary, "Furioso," available at https://www.oed.com/dictionary/furioso_adj?tab=meaning_and_use, accessed December 15, 2025.

Oxford English Dictionary, "Vocalise," available at https://www.oed.com/dictionary/vocalise_n?tab=meaning_and_use, accessed December 15, 2025.

Pearce, Sheldon, "Timbaland's AI Music Project is a Ghost in a Misguided Machine," *NPR*, June 17, 2025, available at https://www.npr.org/2025/06/17/nx-s1-5431544/timbaland-ai-music-suno-stage-zero-tata-generative.

Peterson, Ivars, "Mozart's Melody Machine," *ScienceNews*, August 23, 2001, available at https://www.sciencenews.org/article/mozarts-melody-machine.

Phillipp, Charlotte, "ABBA Musician Bjorn Ulvaeus Says He's Using AI to Help Write New Musical," *People*, June 5, 2025, available at https://people.com/abba-musician-bjorn-ulvaeus-using-ai-to-help-write-new-musical-11749109.

Poovey, Christopher, "Software," available at https://www.christopherpoovey.com/software.html, accessed December 3, 2025.

Price, Joe, "T-Pain Says He Doesn't 'Have Beef' with Christina Aguilera, Shares Pic of Singer in 'Autotune is for Pussies' Shirt," *Complex*, December 17, 2024, available at https://www.complex.com/music/a/backwoodsaltar/t-pain-christina-aguilera-auto-tune-shirt.

Reality Club, "Bid-A-Note With Katie & David | Season 1 Ep. 4 | Name That Tune," *YouTube*, January 28, 2021, available at https://www.youtube.com/watch?v=8znmCzp9uqk.

Recording Arts Canada, "How MIDI Changed Music," February 28, 2020, available at https://recordingarts.com/record/how-midi-changed-music.

Reid, Shaheem, "Jay-Z Premieres New Song, 'D.O.A': 'Death of Auto-Tune'," *MTV*, June 6, 2009, available at https://web.archive.org/web/20090627025430/http://www.mtv.com/news/articles/1613390/20090606/jay_z.jhtml.

Reverb Machine, "Daft Punk's Discovery Synth Sounds," available at https://reverbmachine.com/blog/daft-punk-discovery-synth-sounds.

Robehmed, Natalie and Ryan Gaston, "A Brief History of MIDI," *Pefect Circuit*, November 8, 2019, available at https://www.perfectcircuit.com/signal/history-of-midi.

Roberts, Adam et al., "MusicVAE: Creating a Palette for Musical Scores with Machine Learning," *Magenta*, March 15, 2018, available at https://magenta.withgoogle.com/music-vae.

Roberts, Rachel, "'Groundbreaking' Brian Eno Documentary Film is Different Every Time It's Shown in Cinemas," *MusicTech*, July 10, 2024, available at https://musictech.com/news/industry/documentary-film-brian-different-every-screening.

Robertson, Claire, "The Elements of Music," available at https://www.hoffmanacademy.com/blog/elements-of-music, accessed December 5, 2025.

Robinson, Kristin, "How Lauv Used AI to Translate His Latest Single Into Korean," *Billboard*, November 8, 2023, available at https://www.billboard.com/music/pop/lauv-single-translated-into-korean-love-u-like-that-hooky-1235465936.

Roded, Tal and Peter Slattery, "What Drives Progress in AI?," *MIT FutureTech*, March 19, 2024, available at https://futuretech.mit.edu/news/what-drives-progress-in-ai-trends-in-data.

Romo, Vanessa, "Grimes Invites Fans to Make Songs with an AI-Generated Version of Her Voice," *NPR*, April 24, 2023, available at https://www.npr.org/2023/04/24/1171738670/grimes-ai-songs-voice.

Rosenschein, Ari, "Rob Hyman: The Hooters, Time After Time, and the JUNO-60," *Roland*, available at https://articles.roland.com/rob-hyman-the-hooters-time-after-time-and-the-juno-60, accessed December 17, 2025.

Routledge Textbooks, "Text Setting (Melismatic vs. Syllabic)," available at https://routledgetextbooks.com/textbooks/9781138684478/globe/globe112.php, accessed December 10, 2025.

Shariatmadari, David, "'I Don't Like Being Revered': Brian Eno on Art, AI, and Why He Hates Talking About David Bowie," *The Guardian*, January 11, 2025, available at https://www.theguardian.com/music/2025/jan/11/i-dont-like-being-revered-brian-eno-on-art-ai-and-why-he-hates-talking-about-david-bowie.

Simpson, Will, "'I'm Quite Interested in AI... Getting Some of My Songs that Didn't Quite Work and Putting Them up onto Suno... There Might be Hits': Why Pete Townshend is Interested in Using AI," *MusicRadar*, November 15, 2025, available at https://www.musicradar.com/artists/guitarists/im-quite-interested-in-ai-getting-some-of-my-songs-that-didnt-quite-work-and-putting-them-up-onto-suno-there-might-be-hits-why-pete-townshend-is-interested-in-using-ai.

Singh, Sneha, "Suno in Talks for Funding Round Valuing AI Music Startup at $2 Billion," *TechStory*, October 19, 2025, available at https://techstory.in/suno-in-talks-for-funding-round-valuing-ai-music-startup-at-2-billion.

Slater, Aaron, "How I Wrote 'Fireflies' by Adam Young (Owl City)," *Songwriting Magazine*, July 14, 2019, available at https://www.songwritingmagazine.co.uk/interviews/owl-city.

Spectrasonics, "Drew Schlesinger," available at https://www.spectrasonics.net/company/artists/artist.php?id=135, accessed December 12, 2025.

Spotify, "GrimesAI," available at https://open.spotify.com/artist/7qiNgbnabvfRbA9lomTgEk, accessed December 3, 2025.

St. Asaph, Katherine, "Sia is the 21st Century's Most Resilient Songwriter," *NPR*, November 6, 2018, available at https://www.npr.org/2018/11/06/664395501/sia-is-the-21st-centurys-most-resilient-songwriter.

Stewart, James, "Timeline: Franz Joseph Haydn," *Vermont Public*, December 7, 2015, available at https://www.vermontpublic.org/programs/2015-12-07/timeline-franz-joseph-haydn.

Stockhausen: Sounds in Space, "Kontakte – Planning & Design," available at https://stockhausenspace.blogspot.com/2015/11/kontakte-planning-design.html, accessed December 2, 2025.

StudySmarter, "Text Setting," available at https://www.studysmarter.co.uk/explanations/music/music-composition/text-setting, accessed December 12, 2025.

Suno, "What is Lyrics Co-Writing," available at https://help.suno.com/en/articles/4425473, accessed December 10, 2025.

Symphoniacs, "Home Page," available at https://www.symphoniacs.com, accessed December 5, 2025.

Symphoniacs, "A Sky Full of Stars/Coldplay – Symphoniacs (Violin, Cello, Piano and Electronic Version/Cover)," *YouTube*, September 30, 2016, available at https://www.youtube.com/watch?v=rX2pB2kqHZ0.

Taylor, Beth, "The Instrument That Invented Sampling," *National Film and Sound Archive of Australia*, available at https://www.nfsa.gov.au/latest/fairlight-instrument-invented-sampling, accessed December 10, 2025.

The Age, "The Truth About Lip-Synching," October 13, 2004, available at https://www.theage.com.au/national/the-truth-about-lip-synching-20041013-gdysk1.html.

The Handel and Haydn Society, "Interactive Program Notes: Handel's Messiah," available at https://handelandhaydn.org/interactive-program-notes-handels-messiah, accessed December 2, 2025.

The Pianola Institute, "History of the Pianola – Player Pianos," available at https://www.pianola.org/history/history_playerpianos.cfm, accessed December 12, 2025.

The Society of Composers & Lyricists, "George & Ira Gershwin," October 23, 2009, available at https://thescl.com/hall-of-fame/george-ira-gershwin.

Toolify.ai, "AI Music Generation: ChatGPT for Songwriting & Lyric Ideas," July 11, 2025, available at https://www.toolify.ai/ai-news/ai-music-generation-chatgpt-for-songwriting-lyric-ideas-3591264.

Toyah, "Toyah at Home – November 2025," November 1, 2025, available at https://youtu.be/XEi0UWAnQLI.

Trapp, Philip, "What Does The New Metallica Song Title 'Lux Aeterna' Mean?," *Loudwire*, November 28, 2022, available at https://loudwire.com/metallica-lux-aeterna-song-title-meaning.

Tyrangiel, Josh, "Auto-Tune: Why Pop Music Sounds Perfect," *Time*, February 5, 2009, available at https://time.com/archive/6687593/auto-tune-why-pop-music-sounds-perfect.

Udio, "About," available at https://www.udio.com/about-us, accessed December 11, 2025.

Udio, "Create a Song with Your Own Lyrics," available at https://help.udio.com/en/articles/10716221-create-a-song-with-your-own-lyrics, accessed December 10, 2025.

Udio, "Create Music with Your Own Audio," available at https://help.udio.com/en/articles/10754328-create-music-with-your-own-audio, accessed December 11, 2025.

Udio, "Voices," available at https://help.udio.com/en/articles/12055317-voices, accessed December 3, 2025.

Universal Music, "Brenda Lee's Iconic 'Rockin' Around the Christmas Tree' Released in Spanish for the First Time with Help From Soundlabs AI's Responsibly Trained Micdrop

AI Technology," October 25, 2024, available at https://www.universalmusic.com/brenda-lees-iconic-rockin-around-the-christmas-tree-released-in-spanish-for-the-first-time-with-help-from-soundlabs-ais-responsibly-trained-micdrop-ai-tech.

Walden, John, "Auto-Tune vs Melodyne," *Sound On Sound*, March 2007, available at https://www.soundonsound.com/reviews/auto-tune-vs-melodyne.

Wieduwilt, Christopher, "Grimes Speaks Out: 'There's Lots of Room for AI in Art'," *AI Musicpreneur*, September 3, 2024, available at https://www.aimusicpreneur.com/ai-music-news/grimes-speaks-out-theres-lots-of-room-for-ai-in-art.

Wills, Matthew, "Player Pianos and the Commodification of Music," *JSTOR Daily*, December 26, 2017, available at https://daily-jstor-org.bibliotheek.ehb.be/what-player-pianos-meant-to-american-families.

Xfinity Mobile Arena, "2Cellos Announce 2022 U.S. Tour with Performance at Xfinity Mobile Arena on April 1," July 19, 2021, available at https://www.xfinitymobilearena.com/news/detail/2cellos-announce-2022-us-tour-with-performance-at-wells-fargo-center-on-april-1.

Yamaha, "About Disklavier TV," available at https://www.yamaha.com/usa/disklaviertv/about.html, accessed December 10, 2025.

Yenigun, Sami, "The MIDI Revolution: Synthesizing Music for the Masses," *NPR*, May 12, 2013, available at https://www.npr.org/sections/therecord/2013/05/12/182874125/the-midi-revolution-synthesizing-music-for-the-masses.

Links to Songs

Adele, "Adele – Turning Tables (Live at The Royal Albert Hall)," available at https://youtu.be/bsFCO8–oCEQ, accessed December 16, 2025.

Adele, "Rumour Has It," available at https://youtu.be/A8IRqCJVkOo&t=49, accessed December 16, 2025.

American Bach Soloists, "'Handel's Messiah in Grace Cathedral' (complete) • Beautiful HD • America Bach Soloists," available at https://youtu.be/2–QV_I–xseA&t=95, accessed December 16, 2025.

Amnesty International USA, "Miley Cyrus featuring Johnzo West – 'You're Gonna Make Me Lonesome When You Go,'" available at https://youtu.be/I2wvaWTTmz8&t=37, accessed December 16, 2025.

Aphex Twin, "Funny Little Man," available at https://youtu.be/aM5ThfUyjEQ, accessed December 18, 2025.

Aretha Franklin, "Aretha Franklin – Respect (Official Lyric Video)," available at https://youtu.be/A134hShx_gw&t=9, accessed December 16, 2025.

Ariana Grande, "Ariana Grande – 7 Rings (Official Video)," available at https://youtu.be/QYh6mYIJG2Y&t=12, accessed December 16, 2025.

Beegees, "Bee Gees – Stayin' Alive (Official Music Video)," available at https://youtu.be/fNFzfwLM72c&t=13, accessed December 16, 2025.

Billie Eilish, "Billie Eilish – everything i wanted," available at https://youtu.be/EgBJmlPo8Xw&t=128, accessed December 17, 2025.

Bob Dylan, "Bob Dylan – All Along the Watchtower (Official Audio)," available at https://youtu.be/bT7Hj–ea0VE, accessed December 17, 2025.

Bob Dylan, "Bob Dylan – Blowin' in the Wind (Official Audio)," available at https://youtu.be/MMFj8uDubsE&t=34, accessed December 16, 2025.

Bob Seger, "Bob Seger & The Silver Bullet Band – Turn the Page (Live at Cobo Hall, Detroit / 1975)," available at https://youtu.be/evnZfSEtr5k&t=19, accessed December 16, 2025.

Boston Philharmonic, "Beethoven: Symphony No 5, First Movement (Benjamin Zander, Boston Philharmonic Orchestra)," available at https://youtu.be/n3EiRynr1Us&t=8, accessed December 16, 2025.

Brenda Lee, "Brenda Lee - Noche Buena Y Navidad (Rockin' Around the Christmas Tree)," available at https://youtu.be/Pkdgy2h0aBE, accessed December 18, 2025.

Capitol Records, "Sign of the Times (Stripped) – Steve Horner [Bridgerton Season 2 (Covers from the Netflix Series)]," available at https://youtu.be/ROAEQWtWjC0&t=17, accessed December 16, 2025.

Cher, "Cher – Believe (Official Music Video) [4K Remaster]," available at https://youtu.be/nZXRV4MezEw, accessed December 18, 2025.

Chicago Symphony Orchestra, "Muti Conducts Beethoven 9," available at https://youtu.be/rOjHhS5MtvA&t=3563, accessed December 16, 2025.

Choral Scholars of University College Dublin, "Auld Lang Syne – The Choral Scholars of University College Dublin," available at https://youtu.be/W_6Vs8pADrQ, accessed December 16, 2025.

Collegium Musicum Berlin, "Mozart: Requiem – Lacrimosa | SO & GC | CM Berlin," available at https://youtu.be/MafAZeag1_0, accessed December 16, 2025.

Cyndi Lauper, "Cyndi Lauper – Time After Time (Official HD Video)," available at https://www.youtube.com/watch?v=VdQY7BusJNU, accessed December 17, 2025.

Ella Fitzgerald, "Embraceable You," available at https://youtu.be/jk2pwv69–xg&t=20, accessed December 16, 2025.

Elton John, "Candle in the Wind (Remastered 2014)," available at https://youtu.be/MYU3F8uUGiw, accessed December 16, 2025.

Elton John, "Elton John – Tiny Dancer," available at https://youtu.be/yYcyacLRPNs&t=41, accessed December 16, 2025.

Elton John, "Your Song," available at https://youtu.be/FT3D1Cu6g10, accessed December 16, 2025.

Elvis Presley, "Hey Jude," available at https://youtu.be/R21bTCLgOCs, accessed December 16, 2025.

Ensemble Musikfabrik, "Karlheinz Stockhausen – Kontakte (1958 – 1960)," available at https://youtu.be/nbdmzSeFy_Y, accessed December 16, 2025.

Eric Clapton, "Tears in Heaven," available at https://youtu.be/VVqXLXMch9g&t=12, accessed December 16, 2025.

France Musique Concerts, "Ligeti: Lux Aeterna," available at https://youtu.be/j2cRjiC4ODI, accessed December 16, 2025.

Garth Brooks, "Friends in Low Places," available at https://music.amazon.com/albums/B01LXP3M5P, accessed December 16, 2025.

Harry Styles, "Harry Styles – Sign of the Times (Official Video)," available at https://youtu.be/qN4ooNx77u0&t=16, accessed December 16, 2025.

Holly Herndon, "Holly Herndon – Jolene (feat. Holly+)," available at https://youtu.be/kPAEMUzDxuo, accessed December 18, 2025.

HYBE LABELS, "MIDNATT 'Masquerade' Official MV (Available in 6 languages ENG/KR/JP/CH/ES/VN), available at https://youtu.be/l19AEmRvh-Y&t=34, accessed December 18, 2025.

Jimi Hendrix, "The Jimi Hendrix Experience – All Along the Watchtower (Official Audio)," available at https://youtu.be/TLV4_xaYynY, accessed December 17, 2025.

Joe Cocker, "Joe Cocker – You Are So Beautiful (Lyric Video)," available at https://youtu.be/DhMnhIY1pE0&t=12, accessed December 16, 2025.

JohnWilliamsVEVO, "John Williams – The Imperial March from The Empire Strikes Back (Audio)," available at https://youtu.be/u7HF4JG1pOg, accessed December 16, 2025.

Justin Bieber, "Justin Bieber – Baby ft. Ludacris," available at https://youtu.be/kffacxfA7G4&t=100, accessed December 16, 2025.

Katy Perry, "Katy Perry – California Gurls (Official Music Video) ft. Snoop Dogg," available at https://youtu.be/F57P9C4SAW4, accessed December 18, 2025.

Katy Perry, "Katy Perry – Roar," available at https://youtu.be/CevxZvSJLk8%20&t=89, accessed December 17, 2025.

Kelly Clarkson, "Kelly Clarkson – Miss Independent (Official Video)," available at https://youtu.be/dS1ZW0FdoIU, accessed December 18, 2025.

Led Zeppelin, "Led Zeppelin – Stairway to Heaven (Official Audio)," available at https://youtu.be/QkF3oxziUI4, accessed December 16, 2025.

Louis Armstrong, "Heebie Jeebies," available at https://youtu.be/LrvCxkL6Ims&t=113, accessed December 16, 2025.

Louis Armstrong, "Louis Armstrong – What a Wonderful World (Official Video)," available at https://youtu.be/rBrd_3VMC3c&t=25, accessed December 16, 2025.

Mark Ronson, "Mark Ronson – Uptown Funk (Official Video) ft. Bruno Mars," available at https://youtu.be/OPf0YbXqDm0, accessed December 18, 2025.

Maroon 5, "Maroon 5 – Payphone ft. Wiz Khalifa (Explicit) (Official Music Video)," available at https://youtu.be/KRaWnd3LJfs&t=44, accessed December 18, 2025.

Metallica, "Metallica: Turn the Page (Official Music Video)," available at https://youtu.be/qPOTEs_yTJo&t=30, accessed December 16, 2025.

Metropolitan Opera, "Porgy and Bess: 'Summertime,'" available at https://youtu.be/NghjBMn6ZJM, accessed December 16, 2025.

Nicki Minaj, "Nicki Minaj – Anaconda," available at https://www.youtube.com/watch?v=LDZX4ooRsWs&t=67s, accessed December 16, 2025.

Otis Redding, "Respect," available at https://youtu.be/rEgKSj1VHZ0&t=13, accessed December 16, 2025.

Owl City, "Owl City – Fireflies (Official Music Video)," available at https://youtu.be/psuRGfAaju4, accessed December 17, 2025.

Paul van Dyk, "Paul van Dyk – For an Angel 2009," available at https://youtu.be/sRvEwXDxz_I, accessed December 17, 2025.

Phil Collins, "Phil Collins – Sussudio (Official Music Video) [HD Upgrade]," available at https://youtu.be/r0qBaBb1Y–U&t=70, accessed December 16, 2025.

Rihanna, "Rihanna – Diamonds," available at https://youtu.be/lWA2pjMjpBs&t=40, accessed December 16, 2025.

Rihanna, "Rihanna – Disturbia," available at https://youtu.be/E1mU6h4Xdxc&t=85, accessed December 16, 2025.

Rodgers & Hammerstein, "My Favorite Things from The Sound of Music (Official HD Video)," available at https://youtu.be/0IagRZBvLtw&t=47, accessed December 16, 2025.

Shakira, "Shakira - Hips Don't Lie (featuring Wyclef Jean) (Official 4k Video) ft. Wyclef Jean," available at https://youtu.be/DUT5rEU6pqM, accessed December 18, 2025.

SnoopDoggTV, "Snoop Dogg – Gin And Juice," available at https://youtu.be/fWCZse1iwE0&t=68, accessed December 18, 2025.

Spice Girls, "Spice Girls – Wannabe (Official Music Video)," available at https://youtu.be/gJLIiF15wjQ&t=86, accessed December 16, 2025.

T Pain, "T-Pain – I'm N Luv (Wit A Stripper) featuring Mike Jones (Official HD Video) ft. Mike Jones," available at https://youtu.be/QjgZZGo881E, accessed December 17, 2025.

Tangerine Dream, "Tyger," available at https://youtu.be/_6UsrgRkOas&t=17, accessed December 16, 2025.

Terre Haute Symphony Orchestra, "I Got Rhythm (1930) – George Gershwin," available at https://youtu.be/XVRHMyUe8RY, accessed December 16, 2025.

The 1975, "The 1975 – Somebody Else (Official Video)," available at https://youtu.be/Bimd2nZirT4 &t=185, accessed December 18, 2025.

The Andrews Sisters – Topic, "Boogie Woogie Bugle Boy," available at https://youtu.be/ivCcPZPZMtU&t=50, accessed December 16, 2025.

The Beach Boys, "California Girls (Stereo)," available at https://youtu.be/DR2lvcdKSdU, accessed December 18, 2025.

The Beatles, "Ob-La-Di, Ob-La-Da (Remastered 2009)," available at https://youtu.be/9x5WY_jmsko&t=26, accessed December 17, 2025

The Gap Band, "I Don't Believe You Want To Get Up And Dance (Oops, Up Side Your Head)," available at https://youtu.be/j73heioWpNI, accessed December 18, 2025.

The Police, "The Police – De Do Do Do, De Da Da Da (Official Music Video)," available at https://youtu.be/7v2GDbEmjGE&t=65, accessed December 16, 2025.

The Police, "The Police – Wrapped Around Your Finger (Official Music Video)," available at https://youtu.be/svWINSRhQU0&t=45, accessed December 16, 2025.

The United States Army Field Band, "The Star-Spangled Banner – The National Anthem of the United States of America," available at https://youtu.be/DADmZdbQ9x8, accessed December 16, 2025.

The University of Louisville, "The Story Behind the Happy Birthday Song," available at https://youtu.be/1WQHsk557f4, accessed December 16, 2025.

Tiësto, "Tiësto – Adagio for Strings," available at https://youtu.be/2EaE0_gQLw0, accessed December 17, 2025.

Trinidad James, "Trinidad James – All Gold Everything (Explicit)," available at https://youtu.be/NK2FqPNIT_U, accessed December 18, 2025.

Vanessa Carlton, "Vanessa Carlton – A Thousand Miles," available at https://youtu.be/Cwkej79U3ek&t=19, accessed December 16, 2025.

Warp Records, "Brian Eno The Ship," available at https://youtu.be/pn1riJSHhkY&t=605, accessed December 18, 2025.

WasNotWasVEVO, "Was (Not Was) – Walk the Dinosaur," available at https://youtu.be/zYKupOsaJmk, accessed December 16, 2025.

Whitney Houston, "Whitney Houston – I Will Always Love You (Official 4K Video)," available at https://youtu.be/3JWTaaS7LdU, accessed December 16, 2025.

Wigmore Hall, "James Newby – Benjamin Britten, The Tyger," available at https://youtu.be/xZxAdsFCBr0, accessed December 16, 2025.

Wyclef Jean, "Dance Like This," available at https://youtu.be/Pt18CfIuST4, accessed December 18, 2025.