Music and AI: How Artists Can Leverage AI to Deepen Fan Engagement and Boost their Creativity

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Abstract: *Artificial Intelligence (AI) is used across various applications in music, ranging from music creation to distribution and consumption, right up to completing the feedback loop to inform music creation. AI has been looked at as a threat to artist creativity and growth. In this paper, AI is presented as a powerful ally for artists. This paper covers various applications of AI across different points in the music creation and distribution process as well as engagement and feedback process. It provides concrete direction to artists to embrace AI to position them to succeed by continuing building connections with their fans and pushing the boundaries of their own creativity by using AI. The paper showcases case studies of artists who have successfully leveraged AI in their creative careers. Finally, the paper also highlights certain ethical considerations that come with the application of AI and how artists can mitigate these concerns.*

Keywords: AI, ASR, NLP, recommendations, music

1. Introduction

Artificial Intelligence (AI) is a multi - disciplinary branch of computer science that focuses on the development of algorithms that an perform tasks that are typically performed by humans [1]. AI refers to machines simulating how humans talk, learn, think and act. AI has been applied to various aspects of music creation, distribution and consumption since decades [2]. AI is applied across many use cases in music, like generation of music, classification of music containers, music recommendations, music transcription, analysis of music and presentation of music via a variety of interfaces like mobile and web apps, voice assistants, smart televisions, and so on [3]. Music artists are rapidly recognizing the impact of AI, not as a threat of replacement, but as a way to amplify their reach and engagement among fans. Music artists can also use various AI tools that are at their disposal now to assist in their creative process. With the advancements in voice technology, artists can also leverage Automatic Speech Recognition (ASR), Natural Language Processing (NLP) and conversational AI in various way to achieve their creation, distribution and consumption goals.

The music industry has undergone major shifts over time. One significant shift has been the rise of music streaming apps like Spotify, Apple Music, YouTube and others. These services are quickly becoming a popular, if not *the* most popular modes of streaming music across the world [4]. These streaming services provide an easy way for users to discover new music and artists, manage their music catalog and preferences, and consume music wherever and whenever they want. This has resulted in a shift in the way in which users consume music. The sales of Compact Discs (CDs) since the advent of streaming music apps has been declining. Artists have found new, and even directs ways of connecting with the listeners of their music. This includes streaming apps, direct - to - customer offerings and tools to assist artists across various parts of their music journey.

As streaming apps continue gaining popularity, a new challenge has immerged. While streaming apps make it relatively easier for smaller artists to expose their music to their existing and potential fans, it has also become increasingly challenging for artists to stand out among the millions of other artists who have also made their music accessible via the same streaming apps. This competition highlights the need for artists to not only create content that is outstanding and differentiating, but also to distribute and present that content in innovative ways. AI - enabled tools can help artists optimize their presence in the streaming apps by creating and publishing exceptional music, finding and presenting content to potential and existing fans, analyzing content consumption patterns across the world and using this feedback to optimize, both, existing as well as upcoming music catalog of artists.

This paper explores some of the AI - powered techniques that can help artists with their goals of content creation, distribution, engagement and feedback for future music and related priorities.

2. Use of Automatic Speech Recognition in Content Creation

Automatic Speech Recognition (ASR) is the process of transformation of spoken words into text that can be ingested and parsed by text processors of any form [5]. ASR can add efficiency and speed to the content creation process by enabling artists to convert their speech and into written text with high accuracy [6]. Some concrete ways in which artists can employ ASR in their creation process are noted below.

2.1 ASR for Transcription

ASR can transcribe brainstorming sessions, impromptu conversations and on - the - fly ideation for artists, helping artists keep a record of any spontaneous creative ideas, insights, inspiration and to - do items.

2.2 ASR for Lyrics

In the early stages of songwriting when ideas are free flowing, some artists might create melodies and snippets of lyrics on the go. ASR enabled devices (e. g., a native voice assistant in the mobile phone or an ASR app) can help artists transcribe these early thoughts on the go [7]. Artists can go back to these lyrics at a later time to refine, build upon and polish them.

2.3 ASR for Efficiency

ASR brings efficiency to the content creation process by enabling artists to write songs and refine them more quickly. This can be especially beneficial for artists who need to meet certain deadlines. By taking away the task of having to write their ideas and lyrics manually, ASR helps give back time to artists to focus on the creative side. Further, application of AI techniques over ASR content can also help artists classify their creations into thematic albums or projects.

3. Deepening Fan Engagement using NLP and NLU

Natural Language Understanding (NLU) is the process of taking a string of tokens, usually textual but could also be visual, and transforming that input into an output that is a syntactic and semantic understanding of the intent of that input [8]. For example, if the input is "*what is the weather?*" the NLU output should imply that the user is seeking the weather forecast of the location they are in, unless they specify otherwise in a follow - up interaction, and that they are looking to understand the weather forecast for the immediate time following the time they made this request (e. g. if the request was made early morning, then they might likely want to know the weather for the rest of the day, but if the request was made late in the day, they might be interested in knowing the weather for the rest of the day as well as the following day). The semantic understanding here is implied by the NLU system not assuming that the user is asking for the meaning of the word "weather" or that the user is asking about a science magazine called "The Weather", and so on. See Fig.1 for reference.

Natural Language Processing (NLP) is a super - set of natural language that includes NLU and more. NLP is the processing of text in a literal sense. This includes converting spoken / heard word into tokens and assembling these tokens into coherent strings that can further be processed for NLU [9]. NLP includes tokenization, lemmatization (i. e. normalization) and natural language generation as well [10]. Continuing the example used above, NLP involves taking the sound of "*what is the weather?*", converting it into words of the English dictionary and then passing on to NLU to make sense out of it. Further, once the query result is available (i. e., here the weather forecast), NLP also involves converting that query result into a form that can be understandable by the user. For example, showing the query output in a human readable format if the user has a screen in front of them or converting into speech (i. e., text - to - speech) if the user is interfacing through a screen - free device like a pure voice assistant [11]. See Fig.1 for reference.

3.1 Leveraging NLU for Fan Engagement

NLU can help artists understand fan sentiment at a broad level and parse it as they need to for a more granular understanding of their fan base and their reactions to the music they receive [12]. Various NLU - powered tools help aggregate expressed sentiments across social media platforms like Facebook, Twitter and others, as well as niche fan communities like Reddit or other music forums, analyze this aggregated data and then present the analysis in an easy to digest format for artists to act on. For example, an artist might learn that their upbeat songs resonate more with their younger fan base in Brazil's Sao Paulo while their pensive music does better with the middle - aged crowds in other cities. This insight can help them tweak their setlist for performing concerts across various cities of Brazil and also tailor their marketing strategies accordingly.

Another way to leverage NLU is understanding the sentiment that artists end up expressing through their songs. For example, an artist might leverage NLU to get an impartial, or at least an independent, assessment of how some of their songs come across in terms of the sentiments expressed, gain insights about the emotional impact of their music and leverage these insights to guide their creative direction**Error! Bookmark not defined.**. Finally, NLU can also help artists unearth insights that aren't as straightforward or simplistic. For example, NLU tools can help artists identify specific moods, themes and emotions that their fans feel through their music based on reactions on social media or the internet in general. Some insights might be that the artist's music feels depressing to many fans. If the artist was unaware or unintentional about their music being depressing, these insights can give them this new information that can help them direct their creativity in a direction that they desire. Another application is in the event of some negative sentiment created in fans due to some reason. In such cases, the sentiment analysis available via these NLU tools can be a powerful input to the artist and their PR team to swiftly and effectively respond to the crisis.

3.2 Using NLP for Connecting with Fans

Artists care about connecting with their fans. However, it is hard to connect and respond to every fan's outreach. This is where NLP - powered virtual assistants can help artists bridge the gap with fans [13]. NLP - powered bots can help the artist and/or their management team by engaging with fans in real time to answer simple questions like upcoming concerts and their info (e. g., venue, time, ticket availability), upcoming music (e. g., release date of next album), merchandize information and any other casual questions. These interactions can be made of high quality by not only training the NLP models with the most accurate information but also fine - tuning the models with the latest information. Further, NLP models can also be trained to reflect the artist's particular style of communicating so it feels like an extension of the artist themselves. The NLP - powered assistants can go a step further and remember every individual, including their name, their past interactions, their interests and so on to provide bespoke responses to them, which might be hard to impossible for artists to do themselves. Another advantage of NLP - powered assistants

is that they can be available around the clock, which is particularly helpful to the management team of those artists that have a global fanbase. By implementing NLP - powered assistants to handle some of these tasks, both the artist and their management team can get more time to focus on the actual creative process and other tasks that need their expertise for accomplishment.

Another way to leverage NLP - powered chatbots could be by creating engagement campaigns like polls, quizzes, contests or even exclusive sneak peeks into content that can create a buzz. The NLP - enabled chatbots can also drive promotion about upcoming concerts, encourage ticket purchases or promote upcoming tours of the artist. Finally, these chatbots can also be the artist's own survey mechanism at scale to get feedback directly from their fans.

4. Leveraging AI for Music Recommendations

In the world of streaming apps, the recommendation system in each of these apps is one of the most, if not the most critical component that can drive the discovery of new songs, new artists and deepen the engagement of all artists with their fans.

4.1 Using AI - powered algorithms for Higher Engagement and Discovery

Music recommendations in streaming apps are critical to surface just the right music and artists to users in order to keep them engaged and have them coming back repeatedly for more. Most of these recommendation engines are powered by AI, enabling them to be scalable, personalized and optimized for the desired reward functions like longer listening times [14]. AI can be used to understand every user's unique taste profile and preferences when it comes to music, including their likes as well as dislikes, and then matching it with the corresponding attributes of every music container like an album, a playlist, an artist's entire discography and so on in order to always present the most compelling recommendations [15]. Recommendations are also key to helping users discover new music and new artists in order to keep them engaged for longer without their feeling like their experience is becoming 'stale' [16]. The better and more nuanced these AI algorithms are, the better exposure they can drive of an artist and their catalog with their existing and future fan – base [17].

4.2 Using AI to Guide Creation

Artists can benefit from the insights generated by AI - powered tools in order to understand what drives the growth of their fan base. For example, artists might learn that their music resonates particularly well with the young demographic who seem to engage more with their core EDM creation than their pop - like creation [18]. This insight can help artists tailor their music to be more of EDM and then, in collaboration with music streaming apps, target their music towards the touch points where the youth are more likely to encounter their content, thus boosting their chances of growing their fan - base. These insights can also inform other activities of artists like informing what songs to

perform during live shows, what songs to highlight in marketing campaigns, and so on. Further, if artists can get insights like "fans who like your music also like artist X's music", they could potentially collaborate with artist X to cross - promote each other's content or potentially even co - create music to delight, and grow, both fan bases [19].

4.3 Optimizing in - app Presence

Artists can leverage some of the AI - insights and partner with the streaming apps in order to optimize their presence in the app. For example, if artists know that their fan base usually also likes music by 2 - 3 other artists, they could work with the streaming app to curate playlists featuring specifically all these artists and them promoting it to the common fan - base. This could help every artist on that playlist expand their fan base**Error! Bookmark not defined.**. Further, the AI - insights could also be used to optimize the artist page that most streaming apps usually have. For example, an artist could be more deliberate about their image, content of their bio, what albums they choose to highlight on their artist page, and so on based on the insights about what their fans would like the most. Finally, streaming apps might also provide AI - based insights to artists about how fans are engaging with their content in the app that could be helpful to the artist. For example, if an artist gets the insight from the streaming app that most of their fan base is listening to their music on a virtual voice assistant like Alexa or Google Assistant instead of the app itself, then they could further promote on their social media how their fans can ask these virtual assistants to play their favorite music or even work with the virtual assistant companies to create delightful experiences specifically on the voice assistants.

5. Using AI in Content Generation

AI can not only bring efficiency to the content generation process as discussed previously. It can help in the content creation process itself.

5.1 Using AI to overcome Cold Start

Artists can often run into writer's block or struggle for inspiration when they want to start fresh work. AI can be a solution to overcome this cold start problem. For example, if the artist throws words that are on their mind to an AI - assistant (e. g., "*I'm thinking autumn, fall colors, solitude, engulfing scarves, pumpkin spice, gray skies*"), the AI - assistant might come up with a few verses on these lines to get the songwriting process going [20].

5.2 Collaboration with AI

Taking this a step further, artists could even collaborate with AI to co - write songs, or even co - perform them [21]. Artists could take the base of the lyrics from an AI, and then layer it with their own creativity in terms of tweaking and adjusting lyrics, changing the style to convey their emotions and adapting it to the artist's unique style that is known and loved by their fans. Though it might need more advancements in AI to sound as natural as humans, it will be possible in the near future to have actual collaborations of

artists with AI where the AI is co - performing a song with the artist.

5.3 Enabling Exploration

Natural language generation (NLG) powered by AI can help artists venture into new areas. For example, if an artist has primarily been performing country music, they could leverage NLG to come up with lyrics for a few songs in the rock or pop genres. AI can help not just in terms of songwriting, but also in terms of generating music, melodies and tunes that can help artists push their creative boundaries.

6. Real world Case Studies

There are several artists who have used AI in different, interesting and innovative ways. Some notable examples are captured below.

6.1 Use of AI to create music albums

Many artists have used AI to create albums. Among the more popular examples are Taryn Southern, who used AI to create her album "I AM AI", in which the music was AI - generated and Taryn wrote the lyrics and performed the vocals [22]. Holly Herndon is another musician who has used AI to create her album "PROTO". Holly used an AI program called "Spawn" that was trained on her voice and generated new sounds based on her input, resulting in unique music that is a blend of human and machine creation [23]. YACHT is another band that used AI to create their album "Chain Tripping". Similar to Taryn Southern, the band provided the lyrics and vocals and the AI generated music [24].

6.2 Use of AI in Live Performances

Reeps One (real name Harry Yeff), is a beatboxer and visual artist from the UK. Reeps One is known for having pushed the boundaries of the art of possible with the human voice. He has collaborated with AI systems to create live interactive performances that blend his vocals with generative visuals [25]. Michelle Rabbia is an Italian percussionist who has explored the fusion of AI and jazz. He has leveraged ML algorithms to improvise jazz alongside human performers [26]. Artists also use AI in live performances to create music that evolves based on the real - time feedback received from the audience [27, 28].

6.3 Other Creative Applications of AI

Daito Manabe is a Japanese designer, programmer and DJ. He has gained international recognition for his innovative work at the intersection of technology and art [29]. He has created music videos and installations that leverage facial recognition, motion detection and tracking and AI - generated visuals to create innovative effects. Similarly, Lucy Siyao Liu is a media artist who leverages AI for creative and interactive art installations that respond to human presence and interactions and engage users in immersive experiences [30].

7. Ethical Considerations and Mitigations

While AI can bring numerous benefits and advantages to artists, there are significant ethical considerations that need to be accounted for. Some of them are captured below.

7.1 Ethical Considerations

Firstly, the amount of data that needs to be collected in order for any AI - systems to analyze and uncover useful insights can raise privacy concerns [31]. Fans might not be comfortable sharing excessive data either directly with artists or streaming apps. Secondly, as with all AI - based solutions, there is always a risk of introducing bias in the system if the AI system isn't actively managed from the point of view of bias and fairness. These AI biases can negatively affect minorities in the artist's fanbase that the artist should actively work to address**Error! Bookmark not defined.**. Thirdly, there is always a risk of security breaches and leaking of data whenever any data is collected for AI purposes. Finally, there are open questions around Intellectual Property (IP) rights of content that is created using AI. Ownership and copyright issues can come up that lead to legal complications.

7.2 Mitigation Strategies

There are several steps that can be taken by artists to mitigate the ethical risks identified above [32]. Artists should be transparent about the data that is being collected, the policy of storing this data, how and where this data will be used and if it will be shared with anyone in order for fans to make measured decisions about what data they want to share. Consent should be sought from fans in an unambiguous and transparent way before collecting any data in order to build trust with them. It is always a good practice to only collect the data that is actually useful instead of biasing towards collecting a lot of data and assuming its use will be figured out later. There should also be robust cybersecurity and data privacy and protection measures implemented to protect data. Some examples are encryption, controlled access levels, strict authentication and authorization mechanisms to access and use data and logs of activity to trace any historical events of interaction with this data. Timely security assessments should be performed to ensure adherence to the latest and highest standards of data security.

8. Conclusion

In conclusion, AI can be a powerful technology for artists to use in their content creation process as well as to engage with their fans more deeply and in a scalable fashion. AI can be a powerful ally for artists to grow their fan base and push the limits of their own creativity. By leveraging ASR, NLU, NLP, recommendations and insights generated by AI, artists can navigate the rapid changes in the way music is being discovered and consumed by users. However, there are also ethical considerations that artists should be mindful of and mitigate while using AI.
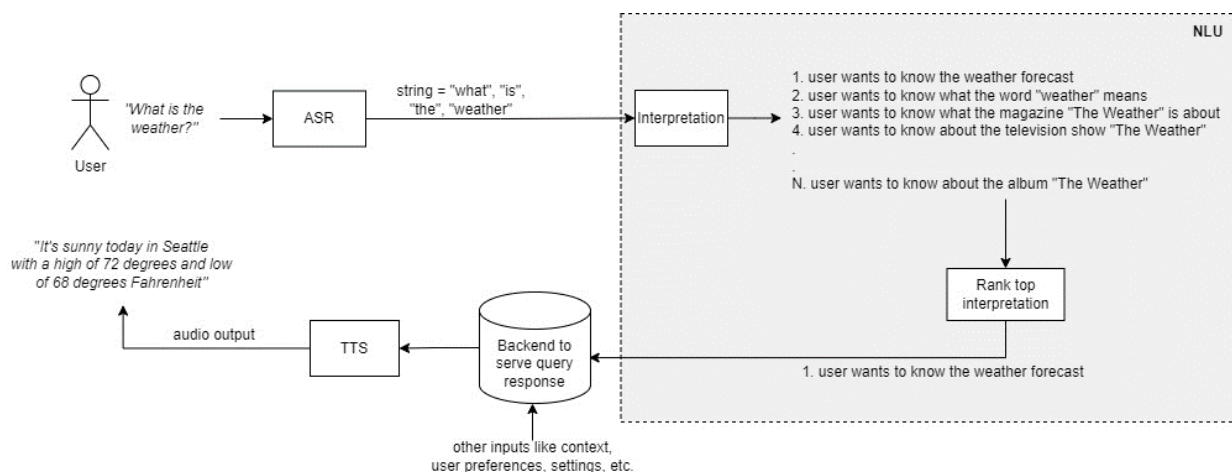
9. Figures

Figure 1: How ASR and NLU process a vocal user input to enable response via audio

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