Allegheny College
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Senior Thesis

AI Driven music Playlist Genration

by

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Abstract

Artificial Intelligence (AI) has the potential to revolutionize the music industry. As outlined in my senior thesis presentation, AI-based music generation can automate routine tasks, offer new creative possibilities, and enable personalized music creation. However, there are also challenges and limitations to AI-based music generation, such as the need for diverse datasets and the difficulty in evaluating the quality of generated music. Ethical considerations in using AI for creative processes are also a concern.

This research paper delves into the challenges and limitations of AI-based music generation. We discuss the need for diverse datasets, the difficulty in evaluating the quality of generated music, and the ethical considerations in using AI for creative processes. We then propose an architectural drafting and planning workflow that addresses these challenges. Our workflow involves user prompts with text, AI-generated audio, and downloadable audio. We believe that this workflow can help to improve the quality of AI-generated music and make it more accessible to all users.

When working on this project, I conducted a systematic review of several papers related to AI and music generation. Based on my review I found that AI-based music generation has the potential to transform the music industry by automating routine tasks, offering new creative possibilities, and enabling personalized music creation. However, there are still challenges and limitations to AI-based music generation that need to be addressed.

This research highlights the transformative potential of AI for the music industry. I believe that AI-based music generation can make music more accessible, creative, and personalized. However, there are still challenges and limitations that need to be addressed before AI can be fully integrated into the music industry.

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Introduction

Since the creation of Artificial intelligence (AI), it has been changing the game in many industries with the help of integrating it into their creations. The music industry is no exception. The potential of AI revolutionizing the music industry is vast, and results have already been achieved successfully. This tool has the ability to analyze vast amounts of data and create music that is indistinguishable from human-generated content. This technology can also analyze the emotions and movements of a person's body and create a customizable interface that allows users to control music playbacks, making it an inclusive and accessible tool for all.

An AI tool called "AI BOOM" of the 1980s led to a significant advancement in the area, which set the foundation for future development. This tool aimed to improve the use of artificial intelligence technologies, including deep learning as well as expert systems, with a view towards enabling computers to learn from their mistakes and make independent decisions on their own without human involvement. [1]This period marked significant progress in AI and laid the foundation for future advancements in the field.

Skipping forward to 2020-2021, we can observe the massive influence of AI in the creative process, mainly through the use of Chat GPT, which brought about text-based AI. Generative AI, like ChatGpt, is able to create content that is increasingly indistinguishable from human-made content. This has immense implications for industries such as gaming, music, film, entertainment, and marketing, among others, and has broader societal and ethical considerations.

There are several advantages of using AI in music creation, including faster music creation with more efficiency and accuracy: A. I can analyze large amounts of data, such as existing music compositions, and generate similar styles of music. This technology can also be used to create completely original songs, giving users a wide range of new sounds and styles to choose

from.

Artificial intelligence has demonstrated the ability to change human life by accomplishing human tasks within seconds or minutes, depending on the user's task. It has proven that it can create text-based games, which can design game characters, generate character strategies, and create visual content for games, including real-time 3D scene rendering and character painting, in fighting games or any game designed by AI without human intervention. In music, Artificial intelligence has proved its worth in generating music compositions, imitating musical styles and artists, and even collaborating with human musicians to create a hit list on major platforms.

Artificial Intelligence (AI) has revolutionized the field of music education. This is because AI gives musicians new methods and tools that make learning music simpler. For instance, The AI tool allows users to analyze their performance and then provide them with personalized feedback, which would be based on the analysis it picks up. It will help them know where they are good at and where they need to improve their skills. Besides this, these AI tools can also recommend appropriate exercises or practice routines specifically designed to make learning more accessible and more efficient.

This technology made music education accessible to many who would not have otherwise had access to such an opportunity due to either age restrictions or lack of money. Additionally, AI music tools enable users to set their practice pace, thus giving immediate responses and monitoring progress over time. These factors mean learners can now acquire knowledge faster and more effectively than ever.

When it comes to music videos, AI can bring a new level of creativity and innovation. By analyzing the lyrics and melody of a song, AI can generate visual content that matches perfectly with the music, making it more engaging and immersive for the viewer.

Without AI, the user's own creativity and musical abilities limit their ability to create a music video. This is particularly true when one wants to experiment with new sounds and styles, which might prove difficult without AI.

AI has the potential to change the way we make music and music videos by generating a wide range of sounds and visual elements instantly. This technology allows musicians and artists to explore different creative paths and break their limits to produce something special.

AI technology is able to analyze the movements and emotions of a person's body using sensors, cameras, or wearable devices. This information is then

used to create a customized interface that allows the user to control music playback and even create music themselves. For instance, this technology can be used by an individual who cannot play traditional musical instruments to create music by simply moving his body.

This technology also helps in making live performances accessible by allowing disabled performers to control stage lighting and music playing in them.[11] All in all, this technology can potentially make music more inclusive and accessible to people with all abilities.

The present study gives us an in-depth analysis of artificial intelligence-based music generation within the modern scene, examining its capabilities and limitations in detail. It brings together findings from various sources to provide a comprehensive perspective on the subject matter.

In order to address this void between research and progress, this paper proposes a highly detailed experimental design. To overcome these challenges currently facing researchers in this domain, it offers solutions which will facilitate better production of AI-generated music. Therefore, by systematically assessing how good songs produced by AI are under different environmental conditions, this study aims to identify some critical determinants for effective output generation in future endeavors.

This paper provides beyond findings from different sources and explores the challenges and opportunities the Artificial Intelligence would provide to the users. It goes through the importance of developing the tool and deploying it in the field of music exploration in a transparent manner. This research paper would be another discussion on AI, but it attempts to give direction to what should come next with AI innovation when implemented in music listening experiance.

Table 1: Research Questions

Research Question	Description
How can artificial intelligence generate a diverse playlist that matches with the users mood?	This research question explores how artificial intelligence can be used to generate a playlist that reflects the listeners current mood. This could involve using natural language processing to examine the user's words and sentiments and then using that information to select songs that match the user's mood. The playlist should be diverse including songs from a variety of genres and artists to provide a rich and engaging listening experience.

Motivation

Artificial Intelligence (AI) can revolutionize the music industry's music composition by empowering users with a vast range of cutting tools and ushering in a new era of musical exploration. [5] This tool is not just for simplifying the music creation process but also for broadening the very limits of the music. Imagine an AI algorithm generating unique melodies and harmonies that stretch the boundaries of traditional genres we listen to today. Consider the possibilities of designing dynamic soundscapes that respond to the user's emotion in real-time or even co-creating a unique masterpiece with the AI tool. The possibilities of working with AI are as limitless as the human imagination. Here are some potential applications of AI in the music creation as follows:

- Personalized Music composition

- Efficiency and creativity
- Exploration of new styles and Genres
- Assistance for Musicians
- Challenges and opportunities for copyright and Royalties
- New revenue streams

One of the most significant ways to explore the potential of AI is through personalized music composition. The AI tool can analyze users' preferences based on the sound they like or could be instruments and create customized music tailored to the user's emotional state or mood. The AI tool can do this by learning from different arrays of musical data, analyzing different patterns in the music the user likes, and then using it to generate new music. This level of personalization could lead to a massive shift in the music industry. Instead of mass-produced music, the AI can create a unique and personalized composition. This could lead to the creating new music genres that are more personal and creative. As stated in the research paper by Willian et al., AI in music could lead to a shift from mass-produced music to personalized composition. This shift could have profound implications for the music industry, changing how music is produced and consumed.

In addition to personalized music composition, AI can also revolutionize the creative process by improving efficiency and creativity.[7] By automating certain aspects of the music-making process, such as generating backing tracks, engineering sounds, or suggesting chord progressions, AI tools can streamline the creative process and help artists or users explore new musical styles and ideas more quickly and efficiently. With AI assistance, artists can experiment with different arrangements and sounds, leading to more innovative and experimental music compositions. By freeing up time and energy for the creative process, AI can increase the efficiency of music composition, allowing users to explore and develop their creative ideas more effectively.

Building on this, the AI tool can enhance creativity by exploring new styles and genres. It helps users go out of their creative comfort zone and experience discovering new sounds and approaches. This exploration is not a random walk but a structured journey where the AI tool leverages its ability to analyze a large volume of data on music style and trends. The AI tool serves as a guide. It allows users to generate new suggestions for different genres based on their moods or preferences, leading them in a new direction and discovering contemporary artists and styles they might never have considered. This process can result in learning innovative music compositions

that may have yet to be explored through traditional methods, fostering creativity and diversity in the music industry.

Moreover, AI tools help musicians, providing valuable assistance in various ways. This is done by analyzing each musician's musical style and preference and suggesting ways to blend their artistic style as a collaboration on what the AI tool offers. This can lead to the creation of unique and innovative compositions that reflect the collective creativity of the group. Furthermore, AI tools could help artists navigate the complex world of music copyright and royalties by analyzing the legal landscape and the specific details of the artists' work. The tool can provide guidelines on protecting the rights to the music created by the artist using the tool and maximizing earnings from it. So far, I've personally seen no papers talking about people earning by using such tools, but it had been an open conversation and investigation. If a tool has the potential to help the artist protect the rights of ownership to the music, this can be a game changer for the musicians, especially for those who are just starting in the music industry.

Even though the benefits of using AI as a possible creative tool were mentioned, there are some challenges in using such a tool that artists, musical engineers, and the music industry itself as a whole must navigate. One primary concern is the issue of ownership and attribution. With AI-based music generation, it becomes challenging whether the copyright belongs to the musician, the developer of the AI tool, or both. This becomes unclear and can lead to difficulties in determining rightful ownership and attribution, potentially leading to a legal dispute. The use of AI in music composition may affect traditional notions of intellectual property rights with the music. Musicians and music engineers may find themselves navigating the ethical considerations regarding creating, distributing, and monetizing newly generated music. This may require reevaluating existing policies and laws to ensure that they can address the unique challenges posed by using AI in music composition.

Finally, as mentioned above about the issue of copyrights, another concern could be the ability to gain revenue and compensation for the newly composed music. Incorporating AI in music composition may alter the distribution of royalties and compensation for the artist or the user. Determining fair compensation may be challenging for the elements of the tool used within the music created by the artist, especially when multiple stakeholders are involved.

The potential of AI in music composition is significant and needed by

any user or artist who likes to create music. This can transform the artist's ability to make music with the help of the tool and for the industry to gain revenue through the artist's work. With the integration of AI into music, there can be a new era of musical exploration and creativity that can catalyze innovation. To unlock this tool's feature, we have to address the challenges mentioned above, carefully analyze them with our research, and ensure that AI integration in music is done in a way that respects the rights of both entities. As we progress in this project, we can create policies that promote transparency, fairness, and respect for intellectual property while making the tool more affordable and accessible to everyone, from professional musicians to amateur creators. By doing so, we can ensure that the benefits of this technology are available to all, regardless of their background or experience.

Current State of the Art

AI, such as ChatGPT and DALL-E, has the potential to go way beyond just generating text and images. AI-powered tools have been witnessed in the music industry that musicians can use in various ways. For instance, AI can analyze one's style as a musician and suggest better ways of playing or help produce new music by generating melodies and chord progressions. Additionally, it can enable fellow artists to work together despite their different locations on earth through a platform that allows sharing and collaboration on musical works.

AI does not only assist musicians to grow their abilities but also enables them to gain more fans. Personalized music videos can now be generated by artists, which are created according to what their fans like. As a result, this helps enhance interaction, leading to a stronger bond between the artist and their audiences.

However, one of the main challenge when it comes to using AI to capture especially when it comes to generating a music that truly captures the emotional depth of human created music. Emotions are often influenced by various aspects such as personal experience, cultural background, and social connections. Thus, this makes it a difficult task to forge an AI model that accurately captures and mirrors the entire range of human emotions in a music composition.

Moreover, music is not just a matter of notes and chords; it is also about the story it tells, which would create a connection with the audience. Artists

of ten draw inspiration from their surroundings, past relationships, or personal experiences, all of which contribute to making their unique compositions. This is another aspect where AI-composed music has shortcomings since machines are not able to reproduce human life and the unique circumstances under which artists make music.

During the course of my project, I will improve my AI tool's implementation in music by using another tool similar to this AI tool, which would be mentioned in the related works. This AI must be guided by an already existing machine learning model since making a custom machine learning solution within time limits would be difficult, and I still need to gain the skills for it. In following this practical path, I aim to exploit the prototype to make it fit into my needs well enough so as to produce quality music while still serving its users efficiently and effectively.

The first step for this project is to gather an extensive dataset of sounds and music samples, all from selected libraries made for this intention. After receiving that dataset, detailed preprocessing occurs in order to prepare the data so that it can be integrated effectively into the training set of the current machine learning model. Once training comes to an end, it becomes essential to critically examine how well the model performs before carrying out multiple rounds of fine-tuning aimed at making it align perfectly with what I want as well as the intended results. To ensure that the music generated by the model meets such criteria, iterative refining is very important.

Through a refined model, I would be able to create music effortlessly through the prompts I would feed the AI model. The project reaches a turning point at this transformative ability, which it will show how a pre-existing model has been modified to achieve the creative aims of this AI tool. Lastly, this is followed by a user interface for users to either download or preview their generated music. The user interface joins together the complexities of producing music using an artificial intelligence system and the end-user's experience, ensuring that people can easily access and enjoy listening to songs produced by the AI composer.

Goals of the Project

The primary objective of this project is to explore new applications of Artificial intelligence in the music industry, address the limitations of the current technology, and explore innovative solutions that can enhance the user's con-

sumption of music. The project aims to investigate the potential of AI tools for music composition that can improve the overall user experience.

In addition to technical proficiency, the project seeks to examine AI's potential to generate music. This involves creating a tool that can showcase a genre that may not be widely listened to in the United States but could be introduced to users as part of the AI's suggestion. The aspect of the project underscores the potential of this tool to broaden the scope of AI in the musical horizons and introduce listeners to new genres that they might not have discovered before.

Furthermore, this project aims to push the boundaries of what is possible with AI in music composition. This includes exploring how AI can capture the emotional depth of human-created music, which would require a deep understanding and further research and development. Finally, the most important goal for this project is to ensure that this technology is being used in a way that is ethical, fair, and beneficial to everyone. This involves considering the implications of AI-generated music on the music industry and working to ensure that the benefits of this technology are affordable and accessible to all.

The most important goal for this project is to make sure that this technology is being used in an ethical, fair, and beneficial manner to all. This means considering what AI-generated music means for the music industry and trying to make the benefits of it cheap enough so that anyone can use it. The project understands how AI has the capability to disrupt the music industry but wants to ensure that it does so in a positive way that includes everyone.

By achieving and implementing these goals, this project can help shape the future of music in a way that is exciting, inclusive, and full of endless possibilities. This project could be a gateway to the future for the correlation of technology with music. With this project, the AI tool used for music creation offers an opportunity for the user to enhance their creativity rather than replace it and be entirely dependent on this tool. AI's ability to reshape the music industry is a testament to its transformative power, highlighting how it can encourage innovative thinking and advocate for ethical and transparent practices. Some representation of the process is presented in the image below.

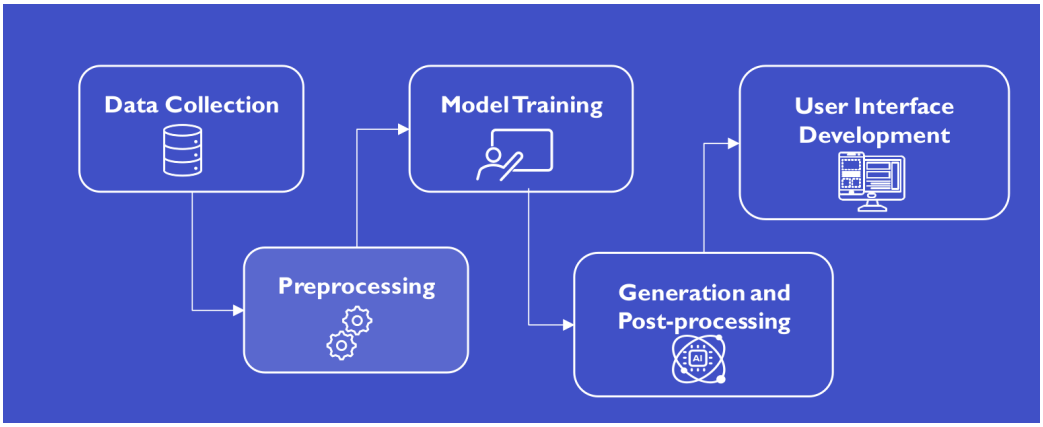

Figure 1: process

Ethical Implications

Music is a major part of human life as well as being a world wide cultural phenomenon. It can make people feel many different things and it has qualities that are profound. It is an emotional experience that can uplift, provide solace, or even bring about memories of a lifetime through a single song. In the cintext of artificial intelligence assisted music curation, such as Spotify's customized playlist, this emotional aspect becomes crucial. The AI algorithms are designed to handel and understand the emotions and moods of the user and cater them to their needs.

The project relies on Spotify's vast music library and has brought to light issues of fair and equal access, which is a pressing concern for users who may lack the desire or resources to subscribe to the service. Therefore, it is essential to explore ways to address these ethical considerations surrounding AI-assisted music curation.

Moreover, the potential biases in AI music recommendation models pose challenges in accurately reflecting user preferences and moods, which could lead to misrepresentation or perpetuation of biases. The preservation of traditional music and the avoidance of music homogenization are also significant concerns, as the algorithms and training data used could potentially overlook the nuances of traditional musical instruments and cultural contexts, leading to a loss of authenticity and creative stagnation.

Furthermore, the accuracy of mood detection and interpretation by the AI model is a critical aspect, as music often conveys multiple emotions simultaneously, and any inaccuracies could lead to inconsistent or unsatisfactory results.

To address these ethical concerns, it is crucial to involve diverse stakeholders in the development and training of AI music composition tools, implement robust privacy measures, ensure diverse and representative training data, promote the use of authentic musical instruments, and continuously improve the model's ability to interpret and respond to complex emotions. These steps are vital in creating an ethical and inclusive AI-driven music experience.

Through the development of this project, there are some critical ethical considerations to be addressed and explained more down below:

- Spotify Login Subscription
- OpenAI Model Musical Suggestion Bias
- Instrumental Bias and Traditional Music Preservation
- Music Homogenization and Sample Reuse
- Mood Detection and Interpretation Accuracy

Spotify Login Subscription: A tool that uses artificial intelligence to create personalized music playlists based on user preferences has been developed. However, there is a potential issue regarding the requirement of a Spotify subscription, as the tool's algorithm needs access to Spotify's vast music library to work optimally. This requirement could pose a challenge for users who are unable or unwilling to purchase the subscription.

This raises ethical concerns about ensuring equal and impartial access to all of the tool's features without placing additional financial burdens on users or restricting its availability. It also highlights the need for solutions to be developed that ensure all users of the tool have an equal opportunity to benefit from its features, regardless of their financial situation or access to music streaming services.

OpenAI Model Musical Suggestion Bias: It's essential to recognize that AI-powered music recommendation models are not immune to biases as their development continues to progress. These systems may even display partiality in their suggestions, which could lead to recommending genres or styles of music that do not align with the user's preferences or current mood. For instance, if a user desires to listen to lively music, the model may suggest

tracks of rap or hip-hop instead of rock or another style of music that the user prefers. These concerns raise questions about the accuracy and customization of the recommendations, as well as the possibility of perpetuating prejudices or misrepresenting the user's preferences.

Biases can originate from different sources, including the data employed for the model's training, the algorithms utilized to generate recommendations, or even the underlying assumptions made by the system's developers. As a consequence, the recommendations may lack diversity and potentially distort the user's music preferences.

It is crucial that music recommendation models are created to be fair and accurate, with consideration given to potential biases that may emerge, and strategies put in place to prevent them. This involves making sure that the data used to train the model is varied and representative of different music genres and styles, and regularly monitoring the system to detect and correct any biases that may develop over time. Ultimately, by prioritizing impartiality and precision in music recommendations powered by AI, we can provide all users with a more personalized and enjoyable music listening experience.

Instrumental Bias and Traditional Music Preservation: The popularity of AI music composition models is increasing, and it's crucial to take into account the potential limitations of their use. A significant challenge that arises is that the algorithms and training data used for these models might not always be capable of capturing the subtleties of traditional musical instruments and cultural contexts.

Preserving the authenticity and storytelling aspects that are integral to traditional music can be a significant challenge. When generating music using AI, if the training data is not comprehensive and representative enough, it becomes difficult for the resulting music to fully encompass the diverse musical traditions' rich histories and stories. This is a particularly significant concern when it comes to traditional music, which often relies on these storytelling elements to convey deep meaning.

It is essential to address the issue of AI music composition models by using comprehensive and representative training data. This involves incorporating a diverse selection of traditional instruments, genres, and cultural expressions from all over the world. By doing so, we can ensure that AI-generated music accurately reflects the intricate and varied nature of musical traditions. This will help preserve the authenticity and storytelling elements that make them so compelling.

Music Homogenization and Sample Reuse: Music Homogenization and Sample Reuse: The music industry has been undergoing a Game changer Revolutionizeation thanks to the advancements in Artificial Intelligence (AI) Tech. AI-powered tools are capable of creating unheard of and Creative sounds that were previously unimaginable. However some music enThusiasts are worried that the use of AI-Produced music may lead to an echo chamber effect where the same sounds and samples are constantly recycled resulting in a lack of originality and creative stagnation.

To address this concern it is Essential to Foster musicians producers and AI Constructers to use real musical instruments and diverse sound sources rather than relying heavily on existing samples. By incorporating a wide range of sound sources such as natural sounds field recordings and live Effectivenesss AI-Produced music can take on a new dimension of creativity and originality.

Furthermore incorporating diverse sound sources can help prevent the homogenization of music where all music sounds the same due to the overuse of similar samples and sounds. By encouraging the use of real instruments and diverse sound sources AI-Produced music can avoid the echo chamber effect and foster creativity and innovation in the industry.

Thus it is essential to recognize the potential of AI-Produced music but also to ensure that it does not lead to creative stagnation and homogenization. By promoting the use of diverse sound sources and real instruments one can ensure that AI-Produced music continues to Send the boundaries and Make unique and Creative sounds that inspire and captivate listeners.

Mood Detection and Interpretation Accuracy: As artificial intelligence Tech progresses one are witnessing the eCombinence of Representations that can produce music based on the emotional state or mood of the Operator. Nonetheless these Representations encounter several obstacles. One significant challenge is the difficulty of precisely Explaining and responding to intricate or nuanced moods. Music is a Complicated art that can express multiple emotions simultaneously and the Representation may find it hard to capture these subtle differences accurately which could result in inconsistent or unsatisfactory outcomes.

This Problem is of particular concern from an ethical standpoint as it raises questions about the Representation's ability to accurately identify and translate Complicated emotional states into appropriate musical compositions. Inaccurate translations could not only lead to disappointed Operators but one could also reinforce harmful stereotypes about certain emotional

states. For instance if the Representation consistently associates sadness with slow melancholic music it could propagate the notion that sadness is a negative emotion that should be avoided.

It is Essential to Ensure that the AI Representations are Maked with attention to these subtleties and that one are consistently Examinationed to ensure their precision and coherence. This approach will not only Improve the Operator's Encounter but also Foster ethical and conscientious AI advancement.It is Essential to Ensure that the AI Representations are Maked with attention to these subtleties and that one are consistently Examinationed to ensure their precision and coherence. This approach will not only Improve the Operator's Encounter but also Foster ethical and conscientious AI advancement.

To address the ethical concerns associated with AI-powered music composition tools, it is vital to involve a diverse range of stakeholders. This includes musicians, cultural experts, and end-users in the development and training process. Furthermore, implementing strong privacy measures, utilizing diverse and representative training data, encouraging the use of authentic musical instruments, and continuously improving the model's ability to interpret and respond to complex emotions are key steps towards creating an ethical and inclusive AI-generated music experience.

Related work

The use of artificial intelligence tool in the recent years with image generation, text to audio composition and even music composition gained a significant amount of attention due to the pottential to foster collaboration and interaction between the tool and the user. These AI tools use advanced algorithms and machine learning techniques to generate musical composition, allowing users and musicians to work alongside each other in creating a unique and dynamic piece. By harnessing the power of AI, musicians, and users can not only receive assistance in composition but also engage in real-time improvisation and co-creative sessions with an artificially intelligent creative partner [9]. AI tools for music composition offer numerous benefits for musicians and users [2]. They improve the efficiency of professional song creation and provide rich music materials for music creators [6].

Additionally, AI composition has the potential to enhance various scenes such as advertising, social interaction, and entertainment. Moreover, recent advancements in AI techniques and the availability of powerful computer resources have made it feasible to engage in artistic collaborations with a machine intelligence that possesses degrees of creative agency and autonomy beyond traditional tools or instruments, whether digital or analog [9]. These AI tools have the ability to analyze music, generate compositions, and even harmonize existing melodies. They can help musicians overcome creative blocks, provide new perspectives and ideas, and enable them to explore different musical styles and genres. Furthermore, AI tools for music composition facilitate spontaneous interaction and collaboration between human musicians and artificial musicians [2]. These tools enable users to co-create music in real-time, engaging in pair composition and improvisation sessions.

Moreover, AI systems can serve as valuable teammates in the music composition process. They can provide suggestions, recommendations, and alternative musical ideas, acting as a collaborative assistant to users and musi-

cians. This collaboration can lead to the exploration of novel musical styles and genres, as AI tools have the ability to analyze vast amounts of existing music and generate compositions that push the boundaries of traditional music composition [10]. Additionally, AI tools for music composition can facilitate cross-cultural collaborations by incorporating diverse musical styles and influences.

The use of AI in the music industry has indeed revolutionized the music industry, like how the company Spotify has integrated a Spotify DJ into their application interface. The integration of AI has significantly changed the use of the platform both for the user and for the music streaming industry [12]. For users, the tool enabled more personalized and accurate recommendations based on the user's preferences. This is done through AI algorithms analyzing users' historical and current listening behavior to create a personalized playlist, such as a weekly discovery playlist and a mix playlist. This enhances the user experience by providing them with the user's favorite songs, genres, and artists and introducing them to new music that aligns with the mood of the user.

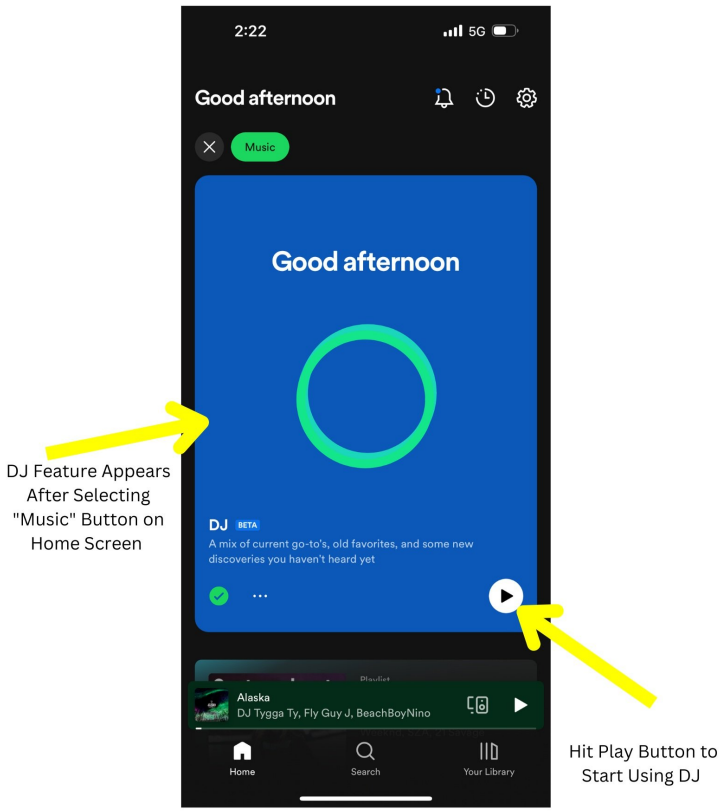

Figure 2: Spotify DJ

Although there are good sides to using this tool, several challenges come with it. Some mentioned in a paper state that the integration of AI into the creative process involves numerous legal, ethical, and practical difficulties [13]. One of the main problems is determining authorship and inventorship. Because AI systems make a significant contribution to creative output, it isn't easy to decide who should be considered an author or inventor. The absence of a single human creator complicates traditional notions of artistic property and recognition.

In addition, another issue comes up in terms of copyright law. Whether AI-generated works should be eligible for copyright protection calls for a reconsideration of existing legal frameworks. Moreover, assigning copyright between the AI system, end user(s), or any other involved parties only makes this field more complex. Achieving a balance that ensures an equal distribution of rights among copyright owners in relation to AI-generated works remains challenging for lawyers and judges.

Substantial ethical considerations accompany the utilization of AI in the creative process. The algorithms that propel AI systems are marred by issues of bias, fairness, and discrimination that raise ethical questions requiring careful examination. Creative undertakings thrive on inclusivity and diversity, but this may be jeopardized if societal prejudices continue to dominate AI-generated content creation; hence, there is a need for careful ethical consideration when developing and deploying AI systems.

The demand for design ethics standardization is an important answer to the ethical challenges posed in relation to creative AI. It is necessary to establish ethical standards so as to ensure the responsible design and use of AI systems that promote equity, responsibility, and openness. Ethical principles must guide the creative process against inadvertently enhancing prejudice or discrimination in connection with content generated through AI.

The integration of AI into the creative process adds another layer of complexity through trade-offs in risk determination. AI systems often do the calculation of risk scores, and this means that there are built-in trade-offs between fairness and accuracy. It's essential to strike a balance here because favoring one side could mean sacrificing the other. However, using these trade-offs requires careful weighing up of consequences arising from risks in relation to AI-driven creativity.

The broader concerns around AI's impact on the creative industry go beyond legal and ethical issues. Copyright laws are being transformed by the revolutionary effects of AI, as well as technological progressions and changing business models. The world's creative industry is at a crossroads, and dealing with the intricate overlap linking creativity with artificial intelligence must be done proactively through an adaptive approach that tackles these many-sided problems head-on. There are a lot of challenges that are related to AI and the creative process, which cover legal, ethical, and practical considerations over a range. It is essential to address these challenges so that there can be an equitable, accountable, and all-inclusive incorporation of AI in creative works while maintaining the sanctity of the creative process with its attendant

transformative aspects.

In related work, I came across this one AI-integrated tool by Open AI that helps with music as a creative process. A paper by Dhariwal where it discusses of a tool callled Jukebox. The tool `Jukebox` is a generative model for music that focuses on creating songs across various genres [4]. Its purpose is to produce music with different features, including melody, composition, timbre, and vocals. This application utilizes models that can generate music from different genres like rock, hip-hop, and jazz.

This application's development involves using the VQ-VAE (Vector Quantized Variational Autoencoder) method. To achieve this, VQ-VAE is used to encode the raw audio into a lower-dimensional space that makes it easier to compute and analyze music. In encoding, the essential musical information is taken while reducing non-important data about it. It also enables modeling various musical structures ranging from timbre to global coherence.

The methodology used by this tool includes training different VQ-VAE models with different temporal resolutions. Each model focuses on separate levels of compression and abstraction. The input audio is segmented and encoded into latent vectors, which are then quantized to the nearest codebook vectors. The decoder part of the VQ-VAE reconstructs the audio from the codebook vectors, allowing for music generation.

The data used to train these models include raw audio samples collected from various genres. These samples serve as input for training VQ-VAE models. They learn high-level semantics of music by capturing these patterns and structures in input data. The training process involves optimizing different loss functions such as reconstruction loss, codebook loss, and commitment loss.

After training the models, musicians or any other users can use the generated music to create or explore new musical pieces. With this tool, one can produce music from a variety of genres; therefore, there are many choices available for the users. Users can try different compositional techniques, melodies, as well as timbres. Users can take advantage of this source of inspiration in their compositions, use it as a basis for building blocks, or even go so far as to incorporate it into their already-finished songs.

Generally speaking, this generative music tool applies sophisticated methods such as VQ-VAE in order to compress raw sounds and analyze them, thereby making it possible to generate various kinds of coherent music. It is an artistic resource for musicians and the public who want to explore and

experiment with different musical ideas.

One thing that stood out when conducting this research was that the work with AI is not a complete process but rather a work in progress. No paper mentions that AI is this big tool that could replace a human's work, especially in the music industry, where this tool could take over a music engineer's work and produce a track or an album. It doesn't have the knowledge or the capacity to take over a machine and has control by itself.

This aligns with the concerns raised in a paper on AI's long-term impact on cultural consumption. This paper done by Born states that AI-driven recommendation algorithms might simplify intricate social and cultural factors, including sex, race, ethnicity, and genre (thus enforcing rigid and misleading identification boundaries) [3]. Generalized demographic and identity classifications can lead to overemphasizing well-represented or known content or relationships, favoring them over new ideas or alternative content. Consequently, individuals' musical preferences may become disconnected from their overall cultural and social lives, thereby disintegrating organic and complex musical taste that is synonymous with different societies and cultures combined.

Furthermore, the paper also raises the question of whether AI-driven recommendation systems that aim to predict "what's next" or "now" in someone's musical taste might neglect or displace these other types of chance, world-centered, and world-involving musical experiences. In addition, this paper finds that such detachment from broader cultural and social ecologies may cause a radical individualization and disembedding of musical growth and development, which can be reduced to and computed by a set of formalisms, rules, and reductions.

The challenges include simple explanations regarding complex sociocultural variables surrounding music recommendation by AIs, disconnection of preferred music from broader social-cultural encounters as well as disruption in naturalistic multipronged expansion with societies. These challenges underscore the fact that AI may transform the music industry. However, it is still a work in progress that cannot replace intricate acts of human creativity and intercultural comprehension.

Upon reviewing existing research done on AI as a tool for music composition and the capacity to enable collaboration between the artists and creators of the AI tool. Some key themes were the ethical challenges in using AI for a creative process and the need for diverse datasets. Current systems exhibit increasing competence in generative tasks such as composing melodies and

harmonies automatically, imitating styles, or co-creating in real-time with humans. The functionality of this tool enhances accessibility, augments creativity for the user, and connects the musician regardless of whether the artist is a professional or an amateur.

Nevertheless, limitations still impede the originality, subtlety, and resonance that can be achieved from AI compositions compared to those created by talented human creators. Additionally, the use of biased training datasets may perpetuate stylistic conformity while marginalizing certain voices. Other than data inadequacies, there are ongoing fundamental discussions about whether machine creativity is different from the traditional form way of creating music. This lack of clarity complicates the question of copyright, attribution, and displacement when it comes to an algorithm-composed work.

Most of these researchers are actively exploring participatory data collection, transparent model reporting, rights management standards, and certification regimes to govern responsible AI integration in music. Constructing collaborative ecosystems integrating stakeholders across technology, law, government, academia, and community provides a pathway for sustainable progress. Renewed scrutiny of core machine learning assumptions also shows potential to enhance algorithmic musicality through probabilistic or psychoacoustic approaches.

Ultimately, the rapid emergence of generative AI marks only the prelude to a more extended opera reconciling automation with the ineffable spark at the heart of human creativity. Current systems still function predominantly as tools for efficiency or idea stimulation rather than peers in the creative fellowship binding composers across millennia. The work of orchestrating this balance demands acknowledging AI's noisy potential alongside envisioning its eloquence. From this resonance, the essential task begins of sculpting technological change for emancipatory ends with accountability.

This endeavor, in the case of music, revolves around equal access and participation with resistance to homogeneity or displacement of existing creative communities. Responsible innovation in AI systems could offer new possibilities beyond those that erode cultural traditions that have contributed to the richness of this art form. These obstacles can be overcome through multidisciplinary collaboration and vigilance in relation to inclusivity. Machine with kindness may learn how to sing our song.

The extent of AI's originality or emotional expressiveness has yet to be written. We are on the final coda of a great work by computational creativity. This choice echoes with a call to dedicate ourselves to its careful cultivation

so that more voices can join it. There is still dissonance here, but if we persistently teach these tools, they will eventually learn how to play well enough.

Method of approach

The main objective of this project is to develop an innovative tool that leverages the capability of an AI model. This tool, in conjunction with Spotify's API, is designed to generate a personalized playlist that aligns with the user's current mood or musical preference. The source code and other relevant artifacts for this project are hosted on GitHub and can be accessed at this link.

The integration of the AI model and Spotify's API is intended to enhance the user experience with discovering new music, thereby enriching their overall listening experience. By offering a tailored musical journey, the tool aspires to make each listening session unique and enjoyable for the user.

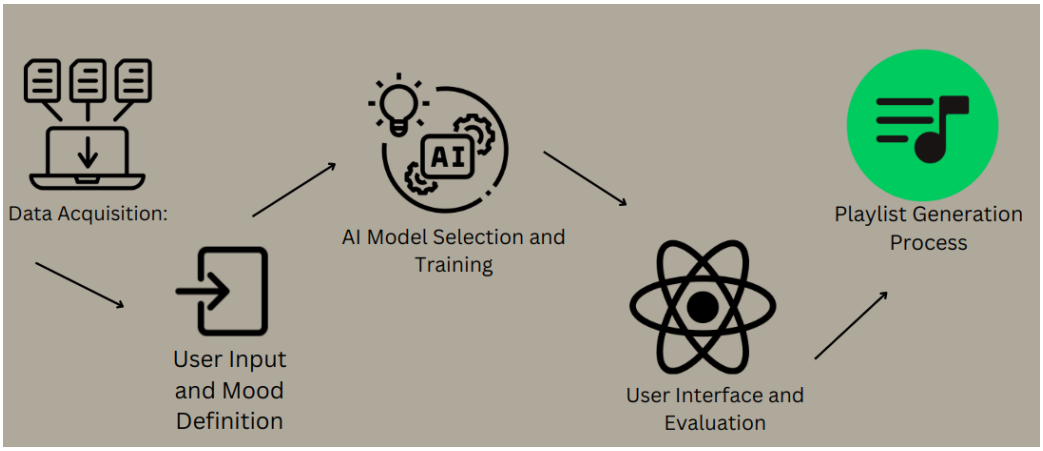

Figure 3: Methodology Flowchart

The initial step of this project involves the gathering of data from the spotify API using the spotify library. During this process, the user will

be prompted to grant access to their spotify accounts, ensuring compliance with Spotify's terms and conditions. To maintain transparency between the developer and the user, the tool will provide users with a detailed project description and outline the reason why the collecting of information or data is needed, fostering trust and adherence. to ethical standards. Once the user's data is securely collected, the tool will analyze their listening habits identifying patterns, preferences and similarities within their musical preferences. This process involves extracting relevant information from the user's spotify data, implementing algorithms to detect trends and correlations within the data, and incorporating the AI language model to enhance the analysis process.

Once a thorough understanding of the user's musical preference is obtained through data analysis, the tool will utilize the AI language model to generate a personalized playlist that is specific based on the user's mood. This process involves formulating a structured prompt that captures the subtleties of the user's musical preference and their current mood in a playlist. By querying the AI language model and interpreting the returned JSON response, the tool will generate a personalized playlist that aligns with the user's musical taste or depending on how they are feeling at that moment. Like for instance if a user is feeling energetinc or about to go blow some steams, the tool will generate a playlist using those mood prompts and instructing the model to generate a list of songs with details like title, artist, and album. These playlists will then be refined and curated through filtering algorithms and user feedback systems, ensuring a unique and engaging listening experience for the user.

The tool will connect with the Spotify API to help users link their personal playlists directly to Spotify. Of these playlists, some of them will include songs produced by the AI language model and linked to user accounts through the Spotify API. Moreover, there will be other features that will enable people to explore playlists made by others who also have the same musical preferences as themselves and share them, promoting a community-based music discovery.

The user then can customize the generated playlist to their desired number of songs to be created through the dropdown menu. So far for this project, it is designed to handel from 10 to 50 songs. Upon selection, the tool will help enhance the users listening experinace to their preference and mood.

In a research paper done by Jennifer Svensson states that Music has an

undeniable power to influence our emotions and overall well-being. [14] This is done by tapping into neurological pathways, evoking memories and resonating with personal experiances, music can elicit a wide range of affective states, from happines and calm to malaneholy and excitment.

The framework of Avensson catagorizes moods along two key dimensions such as valence, representing the pleasure-displeasure spectrum and arousal, reflecting the rest activation scale. By allowing users to self identify target moods like happiness, sadness, relaxation, or energy, the tool will be able to map these onto corresponding valece and arousal levels.

Once the user gets sattisfied with the list of musics presented by the tool, they can choose to let the tool create the playlist in their Spotify account. As mentioned above, this requires the use of the Spotify API inorder to create the playlists. Once created, the user can access and enjoy the customized playlist directly within their spotify account.

In terms of the user interface of the tool, the UI is the main bridge between the user and the complex processes happening in the background. It is designed in a way it is user friendly, and simple to use.

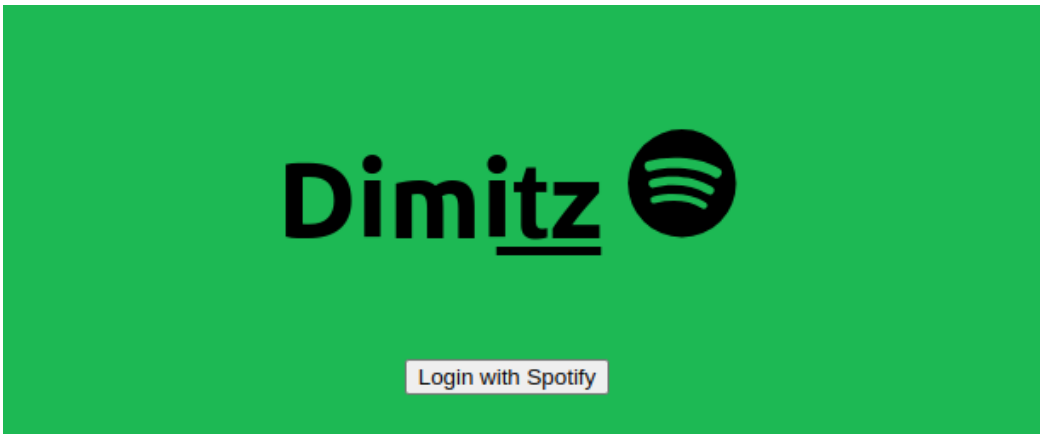

Figure 4: UI

As you can see from the image above, the user clicks on the 'Log in with Spotify' button, which initalizes the login flow. This is the first interaction the user has with the tool, and the `SpotifyLogin` component,located in `SpotifyLogin.js` and imported into App.js, is responsible for this process.

The `SpotifyLogin` funciton is defines as follows:

```
function SpotifyLogin() {
  const client_Id=process.env.REACT_APP_SPOTIFY_CLIENT_ID;
  const REDIRECT_URI='http://localhost:8000/';
  const scopes=['playlist-modify-public']; // Adjust scopes as needed
  const AUTH_ENDPOINT='https://accounts.spotify.com/authorize';
  const RESPONSE_TYPE='token';
```

When the user clicks on the login button, they are redirected to Spotify's authorization page, prompting them to grant access to their Spotify accounts. This redirection is handled by the handleLogin function, which constructs the authorization URL with the necessary parameters and redirects the user to this URL.

After granting the necessary permissions, Spotify redirects the user back to the application with an access token in the URL hash. This redirection triggers the `handleCallback` function, which is set to run whenever the URL includes the redirect URI.

```
const handleCallback = useCallback(() => {
  const urlParams = new URLSearchParams(window.location.search);
  const code = urlParams.get('code');
  const state = urlParams.get('state');

  if (state === null) {
    window.location.href = '/#' + querystring.stringify({ error: 'state_mismatch' });
  } else {
    const authOptions = {
      url: 'https://accounts.spotify.com/api/token',
      method: 'post',
      params: {
        code: code,
        redirect_uri: REDIRECT_URI,
        grant_type: 'authorization_code'
      },
      headers: {
        'content-type': 'application/x-www-form-urlencoded',
        'Authorization': 'Basic ' + (new Buffer.from(client_Id + ':' + client_secret).toString('base64'))
      },
    };
```

Figure 5: Callback

The `handleCallback` function and the subsequent steps form part of the OAuth 2.0 authorization flow, where the process begins by parssing the URL to obtain the authorization code and state. It then checks for state mismatch to prevent cross-site request forgery. If the state matches, it makes a POST request to the Spotify Accounts service's api/token endpoint to exchange the authorization code for an access token.

The access token is then stored securely in the local storage and used for subsequent API requests. This is done by setting the `isLoggedIn` state to true and storing isLoggedIn in local storage. Once the user has granted access and the token is secured, the `fetchSpotifyUserProfile` function is called to fetch the user's Spotify profile data. This function makes a GET request to the Spotify Web API's me endpoint and logs the user's Spotify profile data to the console.

```
    axios(authOptions)
      .then(response => {
        const accessToken = response.data.access_token;
        console.log("Access Token:", accessToken);
        setIsLoggedIn(true); // Set isLoggedIn to true when the access token is received
        localStorage.setItem('isLoggedIn', 'true'); // Store isLoggedIn in local storage
        fetchSpotifyUserProfile(accessToken);
      })
      .catch(error => console.error("Error fetching access token:", error));
  }
}, [client_Id, client_secret, setIsLoggedIn]); // Add setIsLoggedIn to the dependency array

useEffect(() => {
  if (window.location.href.includes(REDIRECT_URI)) {
    handleCallback();
  }
}, [handleCallback]);
```

Figure 6: Access token storage

Finally, the tool will display the user's name and profile picture. This entire process ensures a seamless and secure user experience. The click will redirect the user to Spotify's authorization page, prompting them to grant access to their Spotify accounts. This authorization is crucial as it allows the tool to create and modify playlists on behalf of the user, providing a personalized and interactive music discovery experience.

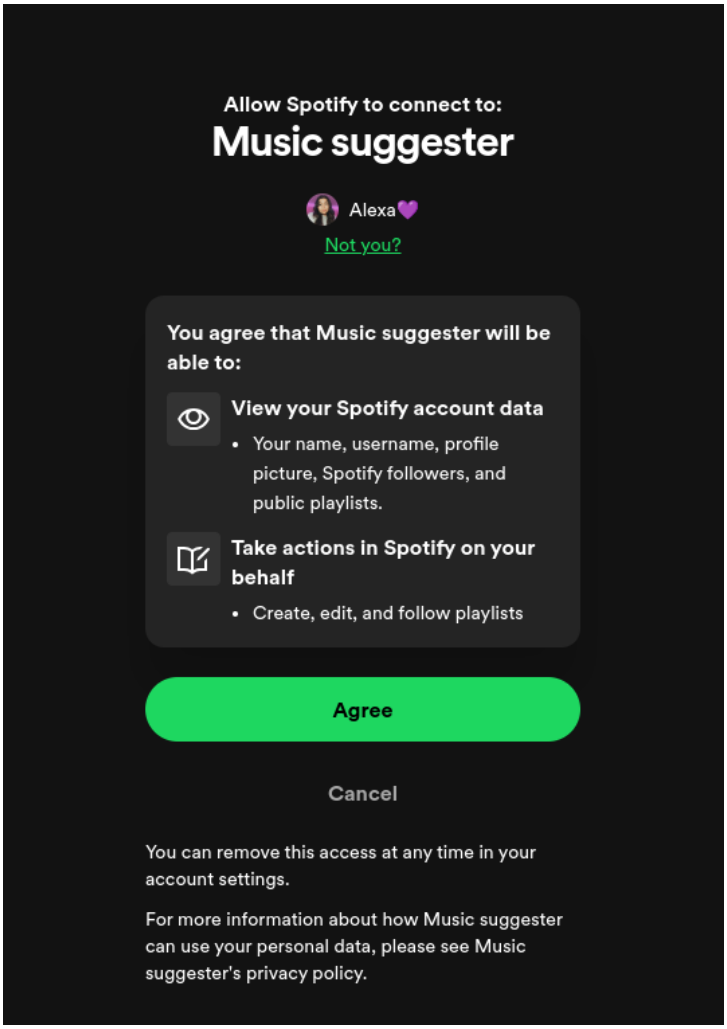

Figure 7: Login

The way spotify generates playlist, it uses a combination of collective filtering, natural language processing, and audio analysis to genrate playlists and reccoment songs to their users. [8] Collaborative filtering is a method of making automatic predictions about the interests of a user by collecting preferences from many users. This process involves collecting preferences from multiple users to make automatic predictions about an individual's interests. This approach assumes that if two users have similar preferences on one issue, they are more likely to have similar preferences on another issue

as well.

Moreover, natural language processing is used to analyze the metadata and textual information associated with songs, albums, and playlists to better understand users' musical tastes. By analyzing the language used in song titles, artist names, and album descriptions, Spotify can provide users with more accurate and relevant recommendations.

Finally, audio analysis technology is used to analyze the musical characteristics of songs, such as tempo, key, and genre, to better understand users' musical preferences. This allows Spotify to generate playlists that are tailored to users' specific tastes and preferences. For the purpose of this project, the tool will be using An AI language model to generate a playlist based on a user's mood, which is a different approach but can also result in personalized song recommendations.

The tool uses the chatgpt openai model which would be responsible for capturing the users mood. This is done through a `useState` hook to create a state variable mood and a function `setMood` to update it. The users mood is captured from the input in the form of the prompt, and the `handleMoodChange` function is triggered whenever the user types into that field, by updating the `mood` state variable. The `mood` is then passed as a prop to the `PlaylistGenerator` component.

```
const ChatGpt = () => {
  const [mood, setMood] = useState('');
  const [error, setError] = useState(null); // Add error state to handle API errors

  Codeium: Refactor | Explain | Generate JSDoc | ×
  const handleMoodChange = (event) => {
    setMood(event.target.value);
  };

  return (
    <div>
      <p>How are you feeling today?</p>
      <input type="text" placeholder="Enter your mood" value={mood} onChange={handleMoodChange} />
      {error && <div style={{ color: 'red' }}>{error.message}</div>} // Display error message if API call fails
      <PlaylistGenerator mood={mood} />
    </div>
  );
```

Figure 8: Mood functions

From the `PlaylistGenerator` component, accepts the prop `mood` which first defins it as happy if not, it passes to the input and renders a user interface with the dropwon menue to select the desired number of songs.

```
const PlaylistGenerator = ({ mood = 'happy' }) => {
}
```

In the playlistgenerator componwnt, it uses a `UseState` hook used to handel the state of the number of songs and list of the genereted songs. The `numSongs` state variables taht is initialized to 10 for a minimum number of songs, while the s`songs` state is initialized as an empty array.

```
const [numSongs, setNumSongs] = useState(10);
const [songs, setSongs] = useState([]);
```

The `handleNumSongsChange` function is used to handel the change in the number of songs. It updates the `numSongs` state variable with the new value.

```
const handleNumSongsChange = (event) => {
  setNumSongs(event.target.value);
};
```

The `useEffect` hook is used to make a POST request to the OpenAI API when ever the `mood` and the `numSongs` state variables are updated. The request playload includes parameters for the model and the prompt instructing the model to generate a playlist based on the user's mood andwith the desired number of songs.

```
const payload = {
  temperature: 0,
  max_tokens: 3000,
  model: "gpt-4",
  prompt: `You are an assistant that only responds in JSON.
  Create a list of ${numSongs} unique songs based off the following
  statement: "${mood}". Include "id", "title", "artist", "album"
  in your response. An example response is: "
  [
    {
        "id": 1,
        "title": "Hey Jude",
        "artist": "The Beatles",
        "album": "The Beatles (White Album)",
        "duration": "4:56"
    }
  ]".`
};
```

Figure 9: OpenAI prompt set

The API response is then parsed to extract the list of songs, enabling the rendering process of the songs in the user interface.

Experiments

This chapter provides a detailed overview of the experimental setup and evaluation of the project. THis involves from the development of the application, using the diffrent apis and and finally the generation of the playlist using the the OpenAI's ChatGPT model.

Experimental Design

A web-based application that utilizes the functionalities of both Spotify and OpenAI's ChatGPT. The application will be designed to facilitate seamless interaction between the user and the two platforms. To achieve this, it was carefully crafted the experimental design to ensure that our objectives are met. The approach for this experiment involves thorough testing and optimization of the application's features and functionalities to guarantee a smooth user experience. With this experiment, we seek to demonstrate the potential of AI and machine learning in enhancing user engagement with online platforms.

One approach I did for this experiment was, designed a Python function `get_track_features(track_id)` that uses the Spotify API to fetch audio features of a track and determine its mood. The mood is determined based on the 'valence' attribute of the audio features, which is a measure of musical positiveness. The numbers used to categorize the mood - 0.7 and 0.3 - were chosen intuitively for the purpose of this experiment.

If the valence is greater than 0.7 the song is assumed to have a `happy` mood. If it less than 0.3 the song is considered 'sad'. Any value in between is categorized as 'energetic' indicating a fun and Vibrant mood. The funtion is find below:

```python
def get_track_features(track_id):
    audio_features = sp.audio_features(track_id)[0]
    track_details = sp.track(track_id)

    # Extract mood from audio_features
    mood = ''
    if audio_features['valence'] > 0.7:
        mood = 'happy'
    elif audio_features['valence'] < 0.3:
        mood = 'sad'
    else:
        mood = 'energetic'
    return mood
```

Figure 10: Experiment

The function also retrievees track details providing additional information about the song. With this Role one can Produce a table of songs along with their moods Retrieveed directly from the Spotify API. This table can then was being used to create an analysis from the graph representing the distribution of different moods in a Operator playlist providing interesting Understandings into the Operator music preferences. The table is find below :

Table 2: Mood Distribution

mood	artist_name	genre	danceability	loudness
energetic	Odiseo	[progressive psytrance, trance mexicano]	0.780	-9.955
sad	Vlasta Marek	[singing bowl]	0.177	-31.498
happy	LCD Soundsystem	[alternative dance, alternative rock, art pop,]	0.530	-7.014
sad	Glenn Horiuchi Trio	[]	0.508	-33.178
sad	Zucchero	[italian adult pop, italian pop rock]	0.347	-7.657

The ploted graph represents the different moods from the table above. The x-axis shows the different moods as seen in the table above. The y-axis shows the number of songs/ tracks of each mood as seen in the table above.

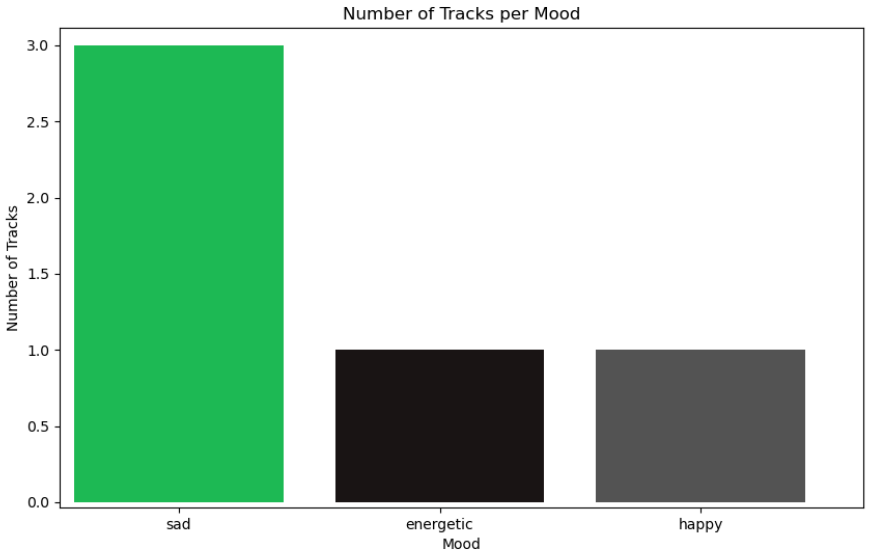

Figure 11: Graph of Moods Vs Tracks

Development Environment Setup: As part of the project's technology stack selection process, I carried out a comprehensive analysis of several options to ensure that we opted for the most suitable technology stack that would allow us to provide the best user experience and achieve optimal performance.

After much deliberation and consideration, we ultimately decided to use React.js for the frontend. This framework has proven to be highly flexible and efficient in building user interfaces that are visually impressive and intuitive to use. React.js also offers a wide range of tools and libraries that make it easy to build complex and responsive user interfaces.

I carefully considered the backend and decided to use App.js with server.js to handle any intricate server-side logic. This combination offers a dependable and adaptable solution, enabling us to effectively manage data and guarantee the smooth performance of our application. Node.js is renowned for its speed and capacity to handle large amounts of data, while Server.js provides a sturdy and flexible framework for constructing RESTful APIs and web applications.

API Keys Setup: As part of the ongoing experimentation, I have suc-

cessfully completed the registration process to obtain the API keys required for accessing the services of two major platforms - Spotify and OpenAI. These API keys serve as a crucial authentication mechanism that enables us to make authorized requests to both services, ensuring that our usage of their services is secure and compliant. By obtaining these API keys, we can now seamlessly integrate the features and functionality of these platforms into our application, which in turn will enhance the user experience and create more value for our customers.

With regards to Spotify, the tool have the liability to access their extensive music library and metadata, as well as their recommendation and search functionalities. This will allow us to provide personalized music recommendations to our users, based on their listening history and preferences. Moreover, we can enhance the overall music discovery experience by incorporating Spotify's playlist and album creation capabilities into our application.

Similarly, with OpenAI, we can leverage their state-of-the-art language processing capabilities, such as natural language understanding and text generation, to enhance the overall functionality of our application. This will enable us to provide more accurate and relevant responses to user queries, as well as generate high-quality text content for various use cases, such as chatbots, emails, and social media posts.

Overall, obtaining these API keys is a significant milestone in our experimentation journey, as it allows us to harness the power of these two major platforms and create a more engaging and valuable experience for our users.

User Login and Permissions: The tool incorporates a secure login flow that utilizes Spotify's authorization API. This feature grants our app the ability to create playlists on behalf of the user. When a user logs in, the app seamlessly acquires an access token, which is then used to authenticate and authorize subsequent requests to the Spotify API. I then follow all recommended best practices to ensure a secure and reliable process to obtain this access token.

Once obtained, the access token is securely stored within our app and is only used when a user interacts with our playlist creation feature. The tool prioritize the security of our users' data and have taken every necessary precaution to ensure that any user data we store or process is protected. My measures include employing industry-standard encryption protocols and ensuring that data access is restricted to authorized personnel only.

User Input and Prompt Building: The playlist creation tool is designed to provide users with a highly personalized and intuitive experience.

It features a user interface that allows users to input their desired playlist description and the number of songs they want to include in their playlist. This information is then processed by the tool to construct a clear and comprehensive prompt for OpenAI's ChatGPT API.

The tool's ability to integrate this advanced technology means that it can provide users with a highly personalized and intuitive playlist creation experience that is tailored to their specific preferences and requirements. By utilizing natural language processing, the tool is able to understand the user's inputs and generate recommendations that are both relevant and coherent.

Overall, the playlist creation tool is an innovative and powerful solution that enables users to create customized playlists quickly and easily. Its ability to leverage advanced technology ensures that users get the most personalized and intuitive experience possible.

Sending the Prompt and Processing Response: To send a POST request to ChatGPT's API, the tool uses an HTTP library, which provides a way to send HTTP requests to the server and receive HTTP responses in return. The request contains a custom prompt, which is then processed by ChatGPT. The JSON response received from ChatGPT is then parsed to extract a list of songs, which are considered as the most relevant based on the input prompt.

The API then includes this list of songs in its response, which is received by us after we submit our request. This process enables us to obtain a customized list of songs based on our input prompt, which can be used for various purposes such as generating playlists or recommending music to users.

Displaying Playlist and Optional Playlist Creation: The music playlist that is generated by the system is designed to offer users a seamless and enjoyable music listening experience. The list is presented in a clear and easy-to-read format that ensures users can quickly access their favorite tracks without any hassle. The system also offers users the flexibility to create a brand new playlist in Spotify based on the list that has been generated. This feature allows users to customize their music experience and create playlists that cater to their specific preferences, ensuring they can enjoy their favorite tracks in a personalized and engaging manner.

Furthermore, the generated playlist offers a comprehensive music experience that is tailored to the user's taste. The system scans the user's music library, analyzing their previous listening behavior, and recommends songs that align with their preferences. This helps users discover new music and enjoy a wider range of tracks that match their music taste.

Evaluation

In order to measure the success of the project, it was conducted a thorough evaluation based on multiple factors. One of the key factors was the relevance and variety of the songs in the generated playlists. It aimed to ensure that the playlists were not only diverse but also accurately reflected the user's preferences and mood. To achieve this, we collected user feedback and analyzed it extensively. We carefully considered the feedback provided by our users to assess the accuracy of the playlists in reflecting the user's input.

Playlist Accuracy & Variety: we measured user feedback to assess if generated playlists were diverse, reflected user mood, and aligned with preferences. This is an ongoing work, and we aim to refine the model to further improve accuracy.

Apart from the accuracy of the generated playlists, it also evaluates the user experience of our application. This included analyzing the intuitiveness and ease of use of the user interface. I believe that providing a seamless user experience is an integral part of any successful application, and thus, we placed significant emphasis on this aspect of our evaluation.

User Experience: We evaluated the user interface for its intuitiveness and ease of use. This is an ongoing work, and we aim to continuously improve the UI based on user feedback.

Overall, we are confident that the evaluation process we employed was comprehensive and enabled us to accurately assess the success of our project.

Threats to Validity

It is important to consider the potential threats to the validity of our experiment in order to ensure that the results accurately reflect the effectiveness of our application. One such threat is the subjective nature of music preference. As music preference is a highly personal and subjective matter, it is possible that some users may not be fully satisfied with the generated playlists due to their individual tastes and preferences.

Furthermore, the accuracy of the playlists is dependent on the effectiveness of the prompts given to ChatGPT. While ChatGPT is capable of generating high-quality playlists based on user input, there is always the possibility that the prompts given by users may not perfectly capture their musical preference or mood, resulting in less accurate playlists.

Finally, the application relies on third-party services, specifically Spotify and OpenAI. Any changes or issues with these services could potentially impact the functionality of the application. For example, if Spotify were to change their API or introduce a bug, it could cause for the application to malfunction. Similarly, if OpenAI were to experience technical difficulties, it could impact the performance of ChatGPT and the application as a whole. It is important to monitor these third-party services closely and ensure that our application can adapt to any changes or issues that may arise.

Conclusion

Despite the subjective nature of music preferences and potential dependencies on third-party services, the project demonstrated its capability to provide a seamless and personalized music listening experience. Moving forward, continuous monitoring of user feedback is needed and adaptation to changes in third-party services will be essential in maintaining the tool's relevance and effectiveness in the dynamic landscape of music technology.

Summary of Results

The music playlist application tool that was developed was a complete success. The tool utilized the integration of Spotify and OpenAI's APIs to provide personalized music recommendations based on the user's mood, with a vast range of different genres fetched directly from the Spotify API.

To ensure the quality of data extraction, the tool implemented a secure user login flow through the Spotify authorization API, which allowed users to seamlessly connect their Spotify account to our application. The application also incorporated user input for playlist preferences and prompt building for ChatGPT API.

For the evaluation process, I primarily focused on playlist accuracy and user experience. In addition, I also considered potential threats to validity, including subjective music preferences and dependencies on third-party services, which could affect the overall user experience.

The ultimate goal was to provide a personalized and seamless music listening experience for the users while keeping in mind various factors for evaluation and potential threats to validity. Thanks to the integration of Spotify and OpenAI APIs, the application delivered a highly personalized and enjoyable music experience.

Future Work

Developing this tool to cater to a larger audience is one of the key difficulties I am facing. The current version of the tool is dependent on the Spotify API, which necessitates a subscription. However, in the future, I aspire to create an iteration of the tool that can produce playlists utilizing free music sources like soundcloud or other platforms. This will widen the tool's availability and prove beneficial to users who lack a music streaming subscription.

ANother thing that i am looking to improve was the tool's recommendation capabilities in the future. At present, the tool creates playlists according to the user's current mood. I intend to expand this feature to suggest new music genres based on the user's listening history and preferences. This would offer users a more varied and rewarding listening experience.

Future Ethical Implications and Recommendations

It is important to do not forget the moral implications of any AI tool, mainly in terms of releasing or the use of the software in public.

Ensuring statistics privacy is of utmost significance. The device makes use of the Spotify API to retrieve person records with the intention to create playlists. It is essential to address consumer statistics in a safe and responsible way. We advocate enforcing strong statistics privacy protocols and transparently speaking those protocols to customers.

It's important to cope with the problem of bias in pointers. AI models have the ability to unintentionally undertake and reflect biases that exist inside the statistics used to educate them. Therefore, it's vital to make sure that the recommendations supplied by using these gear are unbiased and impartial. Regularly reviewing the guidelines generated by means of the tool can assist discover any ability biases, and it is vital to take corrective action if any bias is detected.

Transparency is every other crucial subject. Users should be knowledgeable approximately how their information is being used to generate tips. We advise developing a clean and concise clarification of the tool's workings that can be without difficulty understood by using customers.

The following are some of the subjects that have not begun to be resolved, as well as guidelines for the AI-based totally tune playlist generator initiative.

Addressing those concerns will resource in making sure that the tool is honest, moral, and fantastic to all purchasers.

Conclusions

The use of AI technology for music curation has created numerous opportunities for both music fans and creators. However, as with any technological development, this exciting journey is not without its ethical implications. It is imperative that we handle these challenges with caution to ensure that AI music is utilized for positive purposes, promoting diversity, equity, and responsible technological progress.

The ethical concerns raised by the project require us to focus on a number of important issues. These include guaranteeing that everyone has the same opportunities to utilize AI music tools, minimizing any potential biases in the recommendations made by such tools, safeguarding the originality of traditional music, promoting creativity, and further improving the ability of AI models to correctly perceive and react to intricate human emotions.

In response to the research question "How can artificial intelligence generate a diverse playlist that matches with the users mood?", AI has the capability to examine a user's music listening history, preferences, and interactions to create a playlist that matches their current mood. Machine learning algorithms are utilized to identify patterns in the user's music selections, while sentiment analysis is used to determine their current emotional state. Once the AI system has analyzed this data, it can choose songs from a variety of genres and artists that are suitable for the user's mood. This creates a personalized and engaging listening experience for the user.

Through collaborative development, the challenges can be addressed, and an ethically sound and enriching AI-driven musical experience can be achieved for everyone. Robust privacy measures and diverse stakeholder involvement are also necessary for this. Achieving this goal would require a joint effort from everyone involved in the industry, including musicians, AI developers, music streaming platforms, and consumers. Continuous improvement is paramount to ensuring that this experience remains ethical and fulfilling.

The potential for music in the future is vast, and if we integrate AI in a responsible manner, it can continue to be a powerful tool for fostering emotional connections, artistic expression, and cultural exploration for future

generations. By collaborating and taking an active role in ethical considerations, we can create a better future for music that is inclusive, diverse, and empowering for everyone.

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