

Why Taylor Swift Should Not Be Taken Lightly:

Using Data Visualization Techniques to Analyze Taylor Swift's Music

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ABSTRACT

Taylor Swift, who has been both celebrated and scrutinized in her decade-long, genre-bending career, seems to be taking a new, more subdued and contemplative direction in her latest work; however, despite her numerous accolades and devoted fanbase, she has been subjected to a barrage of contradictory criticisms, being criticized for revealing too much about her personal life in her music while also being dismissed as a manufactured, inauthentic pop star. The study draws on a variety of sources to construct a detailed picture of Taylor Swift's career trajectory, focusing on her music's popularity, lyrical themes, and emotional depth. We use a multifaceted approach to analyze Taylor Swift's music, including an examination of her Spotify data, a survey of UNC-Chapel Hill students, and a comparative analysis of her songs against those of other successful artists. The study begins by exploring Taylor Swift's popularity and its correlation with the energy levels and danceability levels of her songs. By meticulously analyzing her Spotify data, we reveal a fascinating upward trend in Taylor Swift's popularity. Our study also investigates how this upward trend of her popularity relates to different musical categories, such as acoustic-ness and instrumentalness, and how they have shifted over the course of her career. In addition, the paper delves into the emotional depth of Taylor Swift's music, with a particular focus on the fifth tracks on each of her albums.. These songs are renowned for their vulnerability and profound emotional themes, and we explore how they resonate with audiences compared to her non-track 5 songs. To do this, we surveyed UNC-Chapel Hill students and asked them to rate her fifth tracks as well as random non-track-five songs. This data provided us with a rich understanding of the audience's preferences for Taylor Swift's deep and meaningful music. One of the paper's most intriguing insights is its debunking of the myth that Taylor Swift only writes about her exes. We achieve this by comparing the success of her "break up" songs and non-break up songs from each album. This comparison shows that Taylor Swift's success is not limited to songs about failed relationships and that she is capable of writing songs about a wide range of topics. Our study demonstrates the immense talent and versatility of this iconic artist, while debunking the deeply entrenched sexist notions regarding her music.

Keywords: Taylor Swift, Spotify data, Comparative analysis, Music industry trends, Music data, popular culture trends

INTRODUCTION

Our motivating problem revolves around the unfair and sexist criticism that Taylor Swift has been subjected to throughout her career. Swift has often been criticized for her personal life, her relationships, and her music, with many critics dismissing her as a mere "pop star" who lacks depth and creativity. This criticism is largely due to internalized sexism and misogyny in the music industry, which often devalues and trivializes the work of female artists. To challenge this perception and showcase the emotional depth and power of her music, our project aims to investigate the significance of the fifth track on each of Swift's ten albums. Through data visualizations and analysis, we will demonstrate how these emotionally raw and honest songs reveal Swift's profound musical talent and creativity. Furthermore we will also probe into our key problem by creating visualizations that highlight differences in the level of appreciation that audiences have for her songs that are explicitly about break-ups and songs that are not. Such visualizations will help us understand if individuals only idolize her for her surface-level break-up ballads or if they connect with her diverse soundtrack for other reasons.

RELATED WORK

One of the first steps that we undertook in our research was to understand Taylor Swift's recent success as a musician compared to other successful artists. The main article that we used to understand this was an article by the Wall Street Journal titled "How Taylor Swift's 'Midnights' Compares to Other Top-Selling Albums" [1]. This article highlights Taylor Swift's remarkable success with her album, *Midnights*, which sold 1.58 million copies in its first week, cementing her status as one of the most successful and influential musicians of her generation. The article provided us with valuable insights into the impact of Swift's music on the industry and highlights the strategies she employed to achieve such a level of success. Furthermore, the article's coverage of Swift's album debut was used to examine trends in the music industry and to explore the strategies for leveraging both physical and digital formats to achieve commercial success. As such, the article served as a valuable resource for our research, providing insights into Swift's achievements and the broader trends in the music industry.

Another article that we used to understand Taylor's revenue as a musician compared to other artists was an article by Forbes titled "The World's 10 Highest-Paid Entertainers" [2]. The article highlights the year 2022's top-earning celebrities, musicians and creators, while highlighting how "the pop icon scored most of her \$92 million in earnings from music she'd released in years past" [2].

Another key dataset that we used for research purposes was a dataset posted by a contributor on Kaggle that highlights each Taylor Swift song as well as its corresponding data from Spotify that highlights the name of the song, album, release date, length of the song, popularity, danceability, acousticness, and energy levels for every Taylor Swift song [3]. We primarily used this dataset to map out the popularity of

Taylor Swift's discography over time, as well as to understand the type of songs which had a higher level of popularity and danceability over time.

An article by Washington Post, titled "If you think Taylor Swift sings only about her exes, then you don't get Taylor Swift" [4] was also a key part of our research since it helped us understand Swift's ability to connect with fans through various themes beyond the common perception of her solely writing about ex-boyfriends. Demonstrating that she deserves to be taken seriously as an artist and entrepreneur, the article provides valuable insight into the multifaceted aspects of Swift's career, allowing for a more nuanced understanding of her achievements and contributions to the music industry.

Another article that was integral to our background research was an article by JStor titled "The Linguistic Evolution of Taylor Swift" [5]. This article explores Taylor Swift's musical journey, focusing on her surprise release of the indie album "Folklore," which received critical and commercial acclaim. With "Folklore," Swift took a step towards a more contemplative form of music, demonstrating her versatility and ability to evolve, instead of solely being understood as a surface-level popstar. The article helped us understand the linguistic aspects of Swift's music and code-switching, highlighting the social motivations behind these choices. Swift, like many other artists, has been accused of faking accents or changing her style to fit into different genres. The article contends that despite the challenges she faces in terms of authenticity, Swift's storytelling and use of language in her songwriting continue to resonate with her audience.

To further understand the idea behind Taylor Swift's most emotionally vulnerable and profound fifth tracks on her albums, we referred to an article by the popular culture website Nylon titled "ALL OF TAYLOR SWIFT'S TRACK 5 SONGS, RANKED" [6]. The author of the article provides an overview of all ten of Swift's track five songs, highlighting the emotional impact and key lyrics of each. We chose to use this resource because it offers an interesting insight into an aspect of Taylor Swift's music that has consistently resonated with her fan base over the years.

An article by BBC titled "Taylor Swift makes history as she takes over the entire US top 10" [7] was also helpful to our background research on the project. The information about Taylor Swift's historic achievement of taking over the entire US top 10 with her latest album, *Midnights*, was particularly helpful to us in further understanding Swift's ability to adapt and reinvent herself to remain relevant.

An article and video by Time magazine titled "Watch Taylor Swift Shut Down 'Sexist' Music Critics" [8] helped us understand the constant misogynistic criticism that Swift faces for writing about her past relationships. The article further corroborated the sexist angle that people take when analyzing Swift's music, as she herself highlights how other male musicians like Ed Sheeran and Bruno Mars are never under scrutiny for writing about "their exes, their current girlfriends, their love life" [8].

DESCRIPTIONS AND JUSTIFICATIONS

Our main artifact for this project is a presentation-style data report. It is labeled as Final Artifact in our GitHub repository. Taylor Swift has been subjected to unfair and sexist criticism throughout her career. Swift has often been criticized for her personal life, her relationships, and her music, with many critics dismissing her as a mere "pop star" who lacks depth and creativity. This criticism is largely due to internalized sexism and misogyny in the music industry, which often devalues and trivializes the work of female artists. To challenge this perception and showcase the emotional depth and power of her music, our project aims to investigate the significance of the fifth track on each of Swift's ten albums. Through data visualizations and analysis, we will demonstrate how these emotionally raw and honest songs reveal Swift's profound musical talent and creativity. We use a multifaceted approach to analyze Taylor Swift's music, including an examination of her Spotify data, a survey of UNC students, and a comparative analysis of her songs against those of other successful artists. The first data visualization we created is Figure 1¹ (can be found in "Spotify_Visualizations.ipynb"). Our initial aim was to delve into the popularity, danceability, and energy of the songs produced by the artist. To accomplish this, we began by analyzing a selection of her tracks and how their popularity correlated with their danceability and tempo. When the visualization was first launched, it displayed all of her songs with their respective popularity, danceability, and tempo. We later made the visualization interactive by incorporating a dropdown menu, which facilitated filtering by album. With this feature, we were able to examine the artist's popularity trends across different albums and identify any links between popularity and danceability or tempo.

Figure 2 (which can be found in "Spotify_Visualizations.ipynb") is a visualization that highlights how the popularity of Swift's albums has increased over time as we graph the attribute of "popularity" over "release_date". These attributes can be found in the Spotify data on Taylor's music that we were able to find on Kaggle [3]. Figure 1 and 2 were created using this dataset, and were visualized in order to highlight the upward trend in the popularity of Swift's albums over time.

Figure 4 is a combination of view coordinated histograms that were created using respondent data from a Google form that we sent out to students at the University of North Carolina at Chapel Hill. The link to our Google form responses is: <https://docs.google.com/forms/d/1f6ZNUUcSK07CRoUzbzRKkZkaesRm6LRquXPAb2XU60s/edit#responses>. Figure 4 highlights how a majority of the majority of the respondents considered Taylor Swift to be their favorite artist, and the majority of respondents also consider her to be more successful than other musical artists. Figure 4 and 5 can be found in the Python notebook "break up and non break up streams.ipynb".

Figure 6 is a graph that delves deeper into highlighting how contrary to popular belief, the majority of our respondents do not believe that Taylor Swift only writes break-up songs about her exes. This pie chart is important to understand as it spotlights how the perception that

¹ Each figure number is according to graph labels in our main artifact that in on our GitHub repository

Taylor Swift exclusively writes songs about her past relationships may not be accurate. Figure 6 can be found in the file titled “survey_results.csv”.

Figure 7 is a word-cloud visualization based on our survey question “Choose one word to describe Taylor's music”. It highlights some of the words that respondents described Taylor’s music to be, including “iconic”, “catchy” and “transformative”. The word cloud highlights how many of our respondents idolize and think of her as a seriously talented and notable artist.

Figure 8 is a visualization that highlights the albums that sold over a million copies in a week from 1992 to 2022. Highlighted in dark red, the histogram shows how Taylor Swift has now become the first artist to achieve this level of sales for five separate albums. Additionally, this histogram which categorically shows the units in millions sold for each album highlights how Swift’s most recent album *Midnights* has achieved the biggest sales week since Adele's record-breaking album “25” seven years ago. Including this visualization is important as it showcases the immense success of Taylor Swift's latest album and demonstrates her continued relevance and popularity in the music industry.

Figure 8 can be found in the notebook “https://github.com/Mmarianarr/final-project-aayush110/blob/main/TaylorSwift_MarianasVis.ipynb” in our GitHub repository.

Figures 9 and 10 were created using Altair. They show the relationship between total number of songs and total number of streams across various popular artists. When one selects Taylor Swift using the figure 10 dropdown button, one can see how her total number of songs released between 2020 and 2021 is much higher compared to other artists. With all streams combined of her songs that made it to Spotify's top 200 (2020-2021), one can see that her number of streams is significantly higher than any other artist. This not only demonstrates her popularity as an artist but also her talent and creativity of creating this number of songs that made it to Spotify Top 200. Figures 9 and 10 can be found in the “https://github.com/Mmarianarr/final-project-aayush110/blob/main/TaylorSwift_MarianasVis.ipynb” notebook in the GitHub repository.

Figure 11 is a data visualization that captures the diverse streams of revenue for various artists over the years spanning from 2019 to 2021. By selecting Taylor Swift, one is able to discern a notable pattern of consistent growth in both her publishing and streaming revenues. This serves to emphasize her exceptional work ethic, unwavering dedication to her craft, and sustained success throughout the years. Moreover, it unequivocally demonstrates a positive correlation between her unmatched popularity and her exceptional talent. Figures 9, 10 and 11 were created using the https://github.com/Mmarianarr/final-project-aayush110/blob/main/TaylorSwift_MarianasVis.ipynb dataset.

Figure 12 is a scatterplot that was included in our data report to show how Taylor Swift's most popular songs are not solely centered around romantic relationships, which is intriguing considering that she is widely recognized for producing music that explores the complexities of

love. Despite the shift in focus, Taylor Swift's music remains highly relatable and resonates with her fans, whether she is singing about relationships or other themes. This observation showcases her versatility as an artist and her remarkable capacity to engage with her audience in diverse and meaningful ways. Figure 12 was made using the "spotify_taylorswift.csv" dataset found in our public repository, and the visualization can be found in the Python notebook "Spotify_Visualizations.ipynb".

Figures 13 to 24 are histograms that were created using Altair. The reason that we chose to visualize our data using these histograms was to spotlight how not all of Taylor's most popular songs revolve around the theme of broken-up, sordid romances. These histograms (which exist for each of Swift's albums) highlight that for every "break-up-song" on Swift's albums, there exists a "non-break-up-song" on each of her albums with a higher number of streams on Spotify. To identify whether a song qualified as a break-up song or a non-break-up song on each of her albums, we all read through the lyrics of each song as a group and ultimately took a vote. After analyzing the number of streams on the Spotify web application for each of her songs we realized this pattern of at least one non-break-up-song having a higher number of streams than a break-up-song on each of her albums. We thought that the best way to visualize this differentiated pattern would be through separate histograms for each album. The code for these visualizations can be found in the notebook in the repository, titled "break up and non break up streams.ipynb".

Figure 25 was made using figures 13 to 24. Figure 25 sums up all the graphs (figures 13 to 24) that were comparing the Spotify streams of one break up song on Swift's albums and one non-break-up song. Figure 25 highlights that after summing up all the Spotify streams of the break-up songs we chose and all the non-break-up songs we chose, the higher number of streams belonged to the non-break-up songs. This figure is view-coordinated with figure 26 that highlights responses from our survey where we asked respondents: "Do you think Taylor Swift only writes break up songs about her exes?". As per the survey (and figure 26), only 11 respondents out of a 108 people answered yes to that question. Figure 25 and 26 are important in highlighting how the popularity of Taylor Swift's music is not just limited to people listening to her and appreciating her music about fractured romantic relationships.

Figure 27 in our data artifact compares Swift's overall revenue growth to other popular music artists from 2020 to 2022. We compiled the data from various sources and used a multi-line graph to port her revenue growth compared to the popular artists such as Drake, Rihanna, Post Malone, and Billie Eilish. Though her revenue in a certain year might not be the highest among the other music artists that were studied, her overall music revenue growth and trajectory over the 3-year span from 2020 to 2022 is on par or if not better than the other artists. Not to mention, her peak music revenue in 2022 is higher than the other music artists as can be seen in the figure. Our research shows that Taylor Swift's revenue growth from 2020 to 2022 has been impressive, and she has managed to hold her own against other top-earning musicians such as Drake.

Figure 28 is found in “Spotify_Visualizations.ipynb”, and it is a line graph that analyzes Taylor Swift's songs across various categories, such as "acousticness," "danceability," "energy," "instrumentalness," "liveness," "speechlessness," and "valence”. By plotting the artist's typical values or formula for each category on the graph, we can discern the overall trend or pattern in their music. For instance, we may discover that the artist tends to favor high levels of energy and danceability in their music, while maintaining lower values for acoustic-ness and instrumentalness. Such findings indicate a preference for lively and upbeat tracks that prioritize rhythm and melody, over more stripped-down or instrumental pieces.

Based on many articles and discussions on social media platforms, Taylor Swift’s fans have identified that Swift’s most emotionally raw and cathartic songs are the fifth tracks on her albums. Swift, herself later acknowledged this by stating that she has in fact been placing her most emotional and honest songs as the fifth tracks on her albums. In light of Taylor Swift not being perceived as a seriously distinguished artist due to deep-rooted sexism, our project uses figures 29, 30 and 31 to focus on how deeply adored her fifth tracks are, on every album. Figure 30 is a visualization that highlights what our survey respondents rated each of Swift’s fifth tracks (found in “Track5_NoneTrack5.ipynb”). Meanwhile, figure 29 represents what they rated her non-fifth-tracks. Figure 31 is the most insightful out of all three graphs because it compares the average rating of a track 5 song versus a none-track-five song (found in “Track5_NoneTrack5.ipynb”). The visualization shows how respondents predominantly reacted more positively to the track 5 songs. Based on our collected data the average rating of a track five song was 7.73 (out of 10), while the average rating of a non-track-five song was 6.25 (out of 10). It is important to note that the majority of the Track 5 songs are not about her exes, while the majority of the randomly generated songs were written about her previous relationship partners. Another important observation is the fact that (as per figure 30), her highest track 5 song was “You’re On Your Own Kid” which is an emotionally charged song that alludes to more than just a breakup. In the lyrics, Swift alludes to her struggle with an eating disorder and also highlights the duality of embracing lost friendships and making connections with new people. The fact that our respondents gave their highest rating to a song that is not a surface-level break-up ballad shows how the appreciation of her music is not limited to the songs she writes about her “exes”.

Another question that we decided to ask people was whether they thought Taylor’s music was in general emotionally profound. The data from this question is represented as figure 32 in the artifact. Results from 108 respondents revealed that 89.8% of the people surveyed did believe that Taylor’s music does invoke intense and deep emotions. Though these survey results cannot be extrapolated to represent a larger audience, figure 32 does give us some insight into how the average college student at UNC-Chapel Hill particularly feels about Taylor’s music and its profound and emotional intensity. Figure 32 is a pie chart since it clearly differentiates the survey respondents who believe that her music is deep and profound from the respondents who do not believe that.

DISCUSSION

Our research has revealed some interesting findings about Taylor Swift and her music. We found that her track 5's ratings are higher than non-track 5's, indicating that the demographic we surveyed prefers the more profound and deep songs that she creates. Furthermore, when compared to other successful artists, Taylor Swift's success is stronger. Her revenue was consistently increasing, and her publishing and streaming revenues were constantly on the rise. In addition, when we analyzed the Spotify top 200 songs, a higher proportion of her songs made it onto the list than other artists. Interestingly, we discovered that her most popular songs are not breakup songs. Our survey also showed that 58.3% of respondents named Taylor Swift as their favorite artist, 94.4% believed she is more successful than other musical artists, and 89.8% said that Taylor Swift does not only write songs about her exes. These findings suggest that Taylor Swift's music is not limited to surface-level break-up songs. Our visualizations and research project demonstrate how her music is appreciated by a wide demographic, her success is due to her ability to create meaningful, relatable songs that resonate with her fans.

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