Exploring the Non-Fungible Token (NFT) Discourse: A Sentiment Analysis of User Discussions on Reddit. (1511 words)

1. Introduction:

The emergence of non-fungible tokens (NFTs) sparked a heated debate across various digital platforms, reflecting the polarized opinions surrounding this novel application of blockchain technology. As unique digital assets that certify ownership and authenticity, NFTs gained widespread attention in March 2021 when Beeple's digital artwork "Everydays: The First 5,000 Days" sold for an unprecedented $69 million at Christie's auction house (Thomas, E., 2023). This milestone event propelled NFTs into mainstream media and ignited a frenzy of interest, with the NFT market peaking at $17.6 billion by the end of 2021. However, this meteoric rise was short-lived, as the market experienced a staggering 97% decline by March 2022, plummeting to just $466 million (Wilson, J., 2022).

The rise and fall of the NFT phenomenon have been closely linked with the narratives and discussions on social media platforms like Reddit. Subreddits such as r/NFT and r/CryptoCurrency have served as epicentres for conversations, memes, and shared narratives, shaping the public discourse around NFTs. Previous studies have leveraged sentiment analysis techniques on social media data to understand the role of public opinion in driving NFT markets (Qian et al., 2022) and the dominant factors influencing NFT asset valuation (Kapoor et al., 2022). Additionally, research has highlighted the significance of user-driven communities, such as those on Discord, in shaping the valuation of NFTs through shared information (Kim et al., 2022). However, there is a lack of research specifically investigating the evolution of sentiment around NFTs within the Reddit community, which has been a pivotal platform for discussions on this topic.

By conducting a sentiment analysis of user discussions on Reddit, this study aims to shed light on how the public perception of NFTs has evolved over time, particularly around two pivotal events: the record-breaking Beeple's sale in March 2021 and the subsequent market downturn in March 2022. Understanding the sentiment dynamics within the Reddit community can provide valuable insights into public discourse surrounding blockchain technologies and their wider impacts.

2. Research Question:

How did the sentiment around non-fungible tokens (NFTs) evolve over time within user discussions on Reddit?

3. Method

3.1. Data:

For this study, Reddit comments discussing NFTs were collected from popular subreddits r/NFT and r/CryptoCurrency using the keywords 'NFT', 'non-fungible token', 'digital art', and 'blockchain'. These keywords were chosen to capture a broad range of discussions related to NFTs, as they represent common terms associated with this emerging technology.

The data collection comprised collecting 250 top-voted comments each from four distinct time frames to analyse the sentiment around specific events in the NFT market:

1. Pre-Beeple's Everydays Sale: Comments were collected one month before March 11, 2021, representing the period leading up to the record-breaking $69 million sale of Beeple's digital artwork at Christie's auction house.

2. NFT Market Peak: Comments were collected one month after March 11, 2021, capturing the discussions during the peak of the NFT market.

3. NFT Market Crash: Comments were collected one month before March 20, 2022, representing the period when the NFT market experienced a significant downturn, with a 97% decline from its peak.

4. Post-Decline: Comments were collected one month after March 20, 2022, representing the discussions following the market crash.

The Python Reddit API Wrapper (PRAW) library was used to retrieve comments from relevant discussion threads within the specified time frames. The data extracted for each comment included the author's name, comment text, timestamp, score (upvotes/downvotes), author's unique ID, and the source subreddit.

3.2. Analysis:

Several preprocessing steps were applied to ensure data quality, such as excluding comments from deleted or removed authors, filtering out non-English comments using the langdetect library, and removing non-ASCII characters and symbols from the comment text. After collecting and preprocessing the data from the four-time frames, the resulting datasets were merged into a final dataset comprising 693 comments, which served as the basis for the sentiment analysis.

Sentiment analysis was performed using the pre-trained Valence Aware Dictionary and sEntiment Reasoner (VADER) model, which is well-suited for social media data. A sentiment score ranging from -1 (most negative) to 1 (most positive) was calculated for each comment and added as a new column to the dataset. After computing the sentiment score, the sentiment categories were established by dividing the range of -1 to 1 into five intervals and assigning a category to each interval (Table 1). A subset of the data post-cleaning and sentiment labelling is presented in Figure 1.

Sentiment Score Range	Sentiment Category
Score > 0.5	Very Positive
0.1 <= Score < 0.5	Somewhat Positive
-0.1 <= Score < 0.1	Neutral
-0.5 <= Score < -0.1	Somewhat Negative
Score < -0.5	Very Negative

Table 1. Assigning Sentiment Categories Based on VADER Sentiment Scores

	Author	Text	Date	Score	Author_ID	Subreddit	Sentiment_Score	Sentiment_Category	Sentiment
673	FreshEZ	This sub is so stupid but this post is that ra...	2022-03-20 16:55:52	1	wzrtj	CryptoCurrency	-0.6337	very negative	Negative
312	80worf80	The passive-aggressive saltiness about NFTs ma...	2021-03-07 15:33:21	-1	7mjvva70	CryptoCurrency	0.0772	neutral	Positive
751	SpaceGrape	No, useless NFTs are dying. But they have use...	2022-03-20 21:12:44	1	4byf6	CryptoCurrency	0.6652	very positive	Positive
227	blind_shoemaker	This hat on the internet you speak of, I must ...	2021-03-07 06:05:53	19	j2d8p	CryptoCurrency	0.7096	very positive	Positive
255	rookert42	Totally something that GET Protocol is doing a...	2021-03-07 08:50:04	3	ihu25b	CryptoCurrency	-0.2960	somewhat negative	Negative
242	pianoforte88	Yes! Glad somebody wrote about this. when I re...	2021-03-07 08:16:06	6	7v2y5cl4	CryptoCurrency	0.1739	somewhat positive	Positive
182	Soft-Brush5126	The NFT Alphabet is available at (https://open...	2021-03-15 00:57:17	1	8q2hb82a	NFT	0.0000	neutral	Neutral

Figure 1. Subset of Data after Cleaning and Sentiment Labelling

Box plots and histograms were utilized to analyse the frequency distribution of sentiment scores across the dataset, while the bar charts displayed the count and percentage of Reddit comments falling under positive, negative, and neutral sentiment categories. A side-by-side stacked bar chart was generated to compare the percentage distribution of these categories around the four key time frames/events on which the data was collected. To understand temporal changes, the dataset was grouped by month, and the percentage change of positive and negative sentiments was calculated and visualized using line plots.

4. Results:

The sentiment analysis of Reddit comments regarding NFTs revealed valuable insights into the evolving public perception surrounding this emerging technology. Figure 2 utilizes a box plot and a histogram to illustrate the overall distribution of sentiment scores across the dataset. The box plot shows that most scores are concentrated around the range of 0.25, with outliers on both the positive and negative extremes. The histogram peaks around the neutral score of 0 and shows a slight positive skew. This suggests that while a considerable portion of the Reddit community remained impartial towards NFTs, there were also significant subgroups having strong positive or negative opinions.
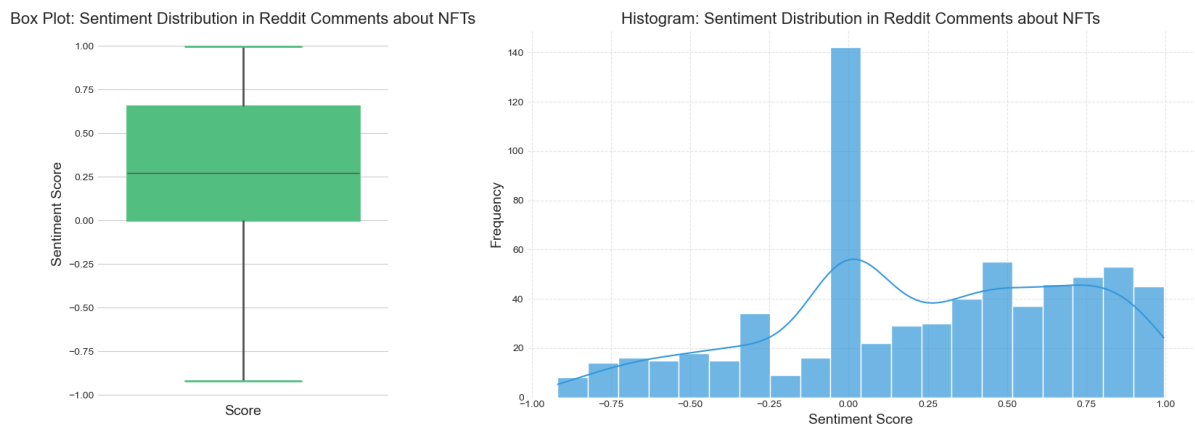

Figure 2. Distribution of Sentiment Scores in Reddit Comments about NFTs
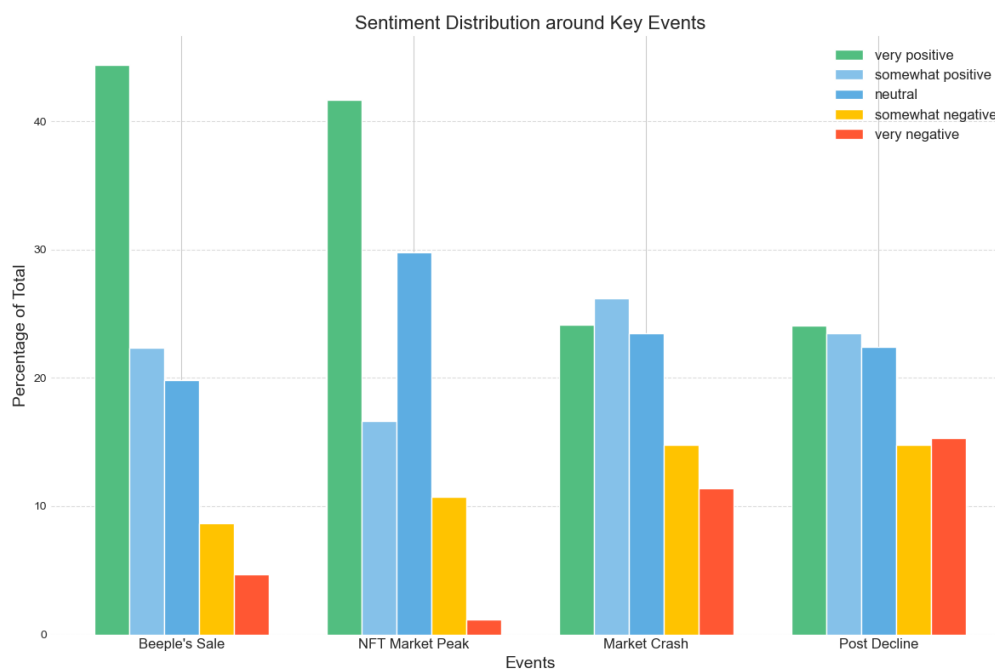
The breakdown of sentiment in the very positive, somewhat positive, somewhat negative, very negative and neutral categories across the dataset is shown in Table 2 below. The majority of comments were categorized as "Very Positive" (34.3%) or "Somewhat Positive" (22.8%), and thus more than half of the comments indicated a sense of optimism and enthusiasm towards NFTs within the community. The "Neutral" comments (22.5%) mostly originated from a lack of strong opinions, whereas the presence of "Somewhat Negative" (11.8%) and "Negative" (8.5%) sentiment categories suggested that a one-fifth of Reddit users expressed criticism and concerns towards NFTs.

Sentiment Category	Count	Percentage of Total
Very Positive	238	34.3%
Somewhat Positive	158	22.8%
Neutral	156	22.5%
Somewhat Negative	82	11.8%
Negative	59	8.5%

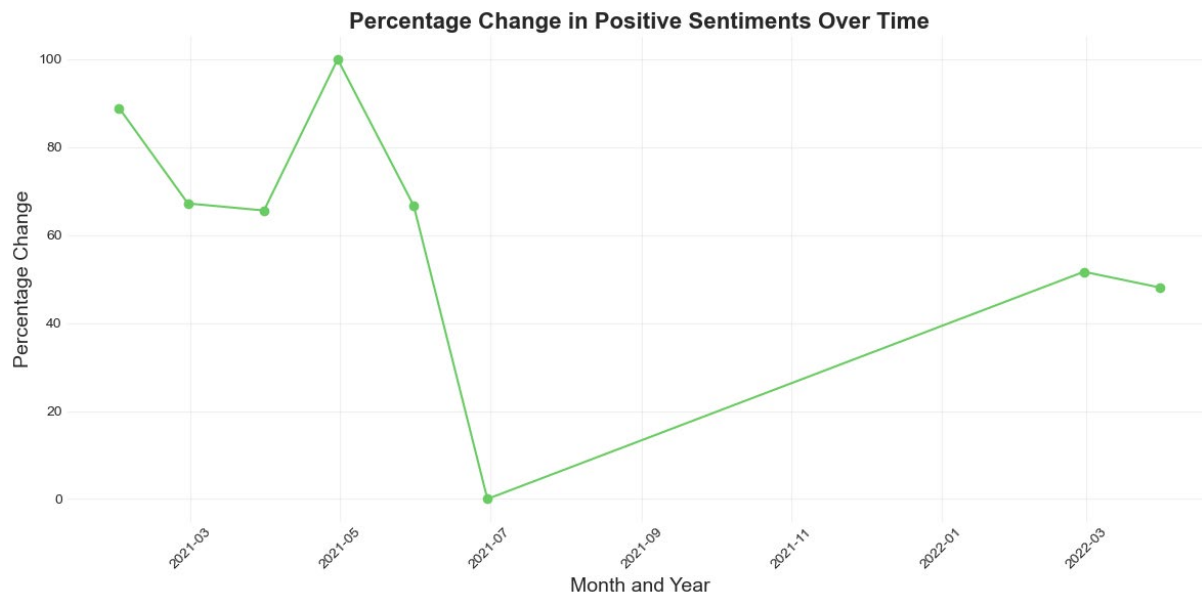**Table 2. Count and Percentages of Sentiment Categories**

Figure 3 depicts the sentiment distribution around four pivotal events in the NFT market timeline. During Beeple's Sale, the sentiment was overwhelmingly positive with more than 60% of comments being positive, reflecting the initial excitement surrounding NFTs. However, as the market reached its peak, the "neutral" comments increased to 30% shifting the sentiment gradually towards neutrality with a decline in the percentage of total positive comments. This could indicate a more realistic outlook as the initial hype diminished.

As the NFT market experienced a significant crash, the sentiment distribution became more dispersed, with a noticeable increase in the percentage of "somewhat negative" (15%) and "very negative" (12%) comments. This trend continued into the Post Decline period, where negative sentiments gained further prominence, suggesting growing public dissatisfaction and scepticism towards NFTs in the aftermath of the market dip.
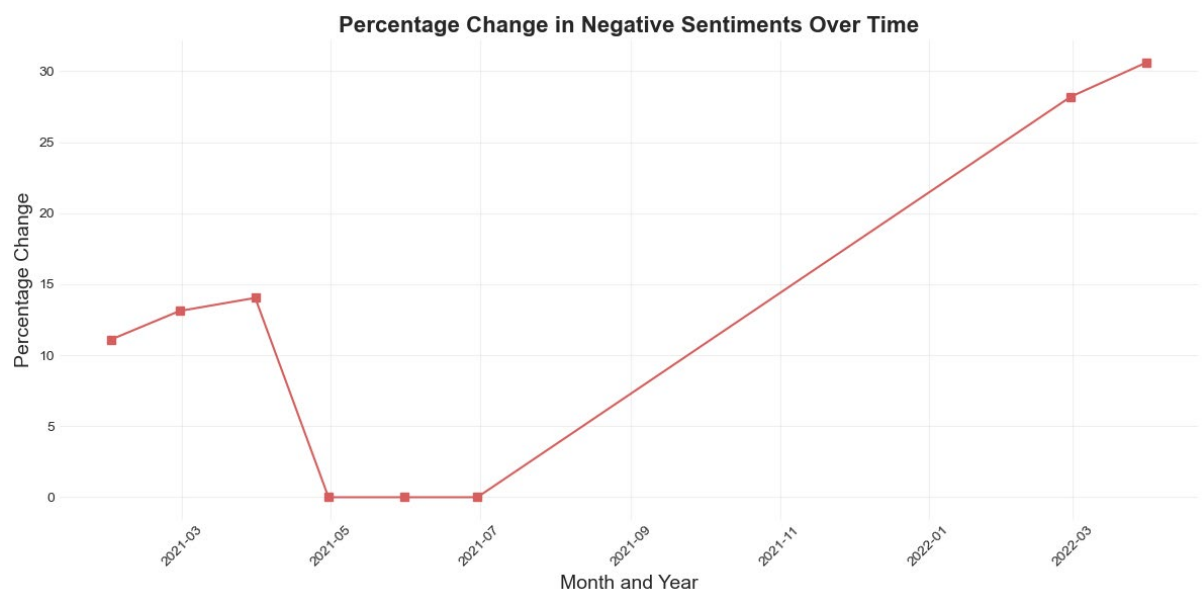

Figure 3. Sentiment Category Percentage of Total Distribution around Key Events

The time-series analysis presented in Figures 4 and 5 reinforces these observations. Figure 4 shows a sharp spike in positive sentiment immediately after Beeple's Sale, followed by a gradual decline as the market peaked and eventually crashed. Conversely, Figure 5 reveals a steady increase in negative sentiment, particularly after the Market Crash event, reaching its highest levels in the Post Decline period. These findings suggest that the public sentiment on Reddit closely reflected the trajectory of the NFT market, with initial positivity giving way to more negative perceptions as market conditions deteriorated.

Figure 4. Line Plot of Percentage Change in Positive Sentiments Over Time

Figure 5. Line Plot of Percentage Change in Negative Sentiments Over Time

5. Conclusion and Limitations:

The sentiment analysis of Reddit comments aimed to provide insights into how public perception of non-fungible tokens (NFTs) evolved over time. The results revealed a clear connection between the sentiment expressed on Reddit and the trajectory of the NFT market, particularly around two pivotal events: the record-breaking sale of Beeple's digital artwork in March 2021 and the subsequent market downturn in March 2022.

The findings demonstrated that the initial excitement and positive sentiment surrounding NFTs during Beeple's sale gradually shifted towards neutrality as the market peaked. Subsequently, as the NFT market experienced a significant crash, there was a noticeable rise in negative sentiment,

with increasing criticism and scepticism towards NFTs. This trend persisted in the post-decline period, with a steep decrease in positive comments and an exponential increase in negativity. Thus, the sentiment analysis conveyed that user discussions on Reddit evolved over the time as the NFT market fluctuated.

However, the study had its own limitations as the data collection and analysis were only limited to specific subreddits (r/NFT and r/CryptoCurrency) and a fixed number of top-voted comments within predefined time frames. This may not capture the full scope of discussions and sentiments expressed across all relevant subreddits or less popular comments. Additionally, the sentiment analysis model used (VADER) may have limitations in accurately classifying context-dependent or sarcastic comments, which are common on social media platforms like Reddit. Despite these limitations, this study provides a framework for future research to build upon in investigating sentiment shifts around user discussions on Reddit involving emerging technologies such as NFTs.

6. References:

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