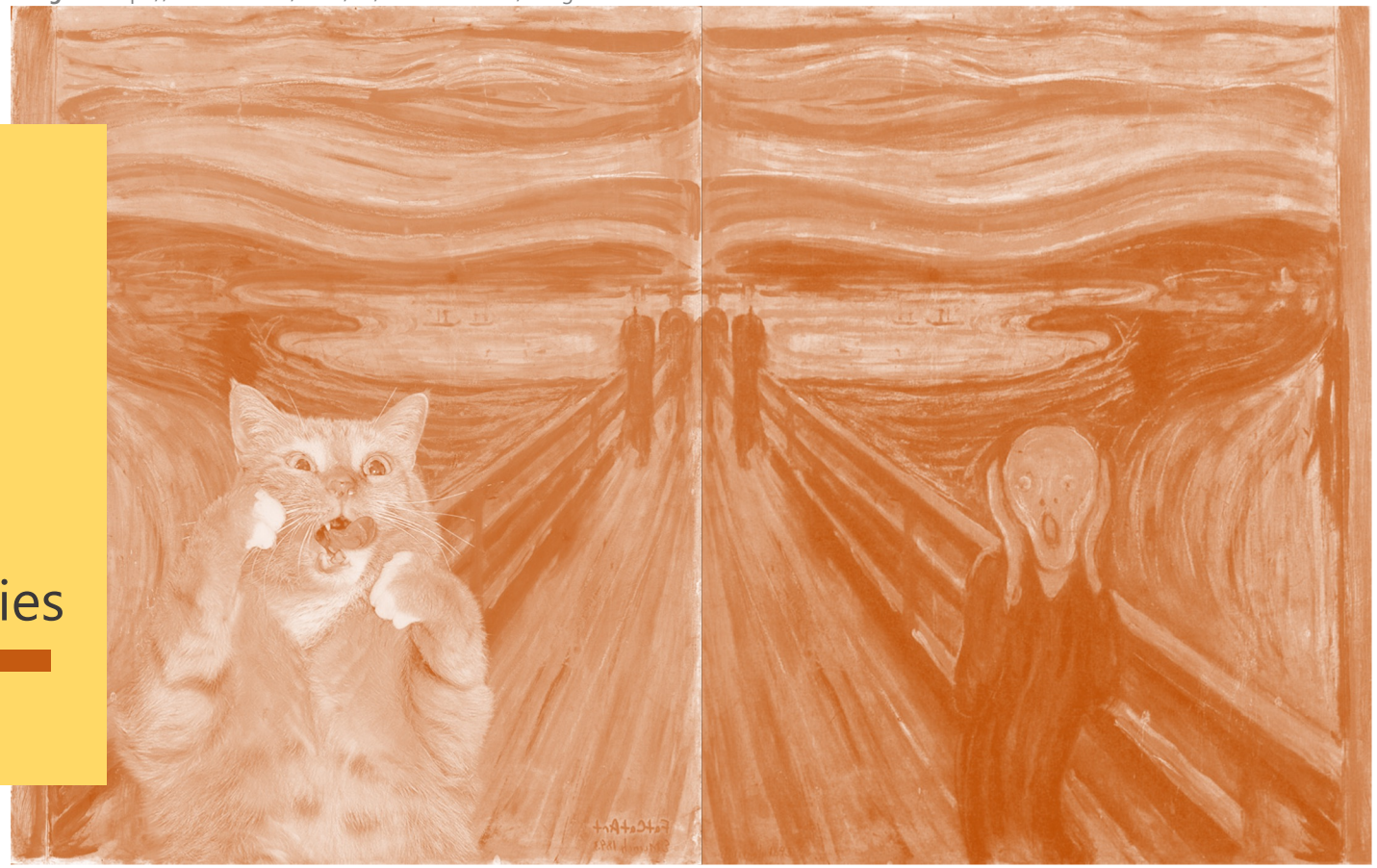
Artificial Intelligence & Art

Understanding and predicting
the chatter from **online** communities

img src: https://fatcatart.com/2016/08/scream-munch/?lang=en



DSI-41 Project Group 2: Faiz, Gabriel, Lionel

Market trends – AI and the arts

The digital artwork* market size is expected to reach

US$ 12.12 billion by 2030,

from US$ 4.09 billion in 2023, at a **CAGR of 16.8%** during the forecast period.

* refers to art that is created and presented in digital forms using digital technology

Eva Toorenent has been working as a freelance artist and illustrator since 2019. Late last year, she was shocked to discover that another artist had taken artwork she'd posted on Instagram and used it to "fine tune" the AI model Midjourney to produce AI art in her style. The other artist then sold the artwork to a gallery.

Eva Toorenent has worked as an artist and illustrator since 2019. Eva Toorenent

"It was hurtful," she told Insider. "My work has been stolen before, but this was a new kind of violating feeling that I haven't felt before."

Since then, she has increasingly encountered generative AI in her work, and says that the technology is being used to cut corners and costs, leaving freelance artists to pay the price.

"It's scary to see," she said. "But honestly, it feels inevitable."

https://www.businessinsider.com/ai-taking-jobs-fears-artists-say-already-happening-2023-10

Current topics regarding AI and the arts

- **Impact on artists**
  - in terms of work and revenue
- **Authenticity / creativity**
  - AI algorithms may not truly reflect an understanding of human creativity or emotion
- **Copyright and authorship**
  - complex, and regulations are still being worked out in this very new area…
- **Ethical and privacy concerns**
  - how training data is being used, and how algorithms may perpetuate extant biases

…On the other hand, AI is here to stay with **huge potential** as in terms of market demand and as a collaborative tool

BUT WHAT PEOPLE ARE REALLY TALKING ABOUT?

Problem statement and objectives

- To train a model using Natural Language Processing (NLP) to **accurately predict which of 2 subreddits a given post comes from**,
- How we can understand **key differences in 'pro-AI' and 'anti-AI' discourse** and **sentiments** to guide policymakers

r\DefendingAIArt vs r\ArtistHate

Why this matters

Our model solution offers the option of **a quick ground sensing to assess online chatter** and understand which way the discourse is evolving

Useful for guiding policymaking, regardless of whether you are:

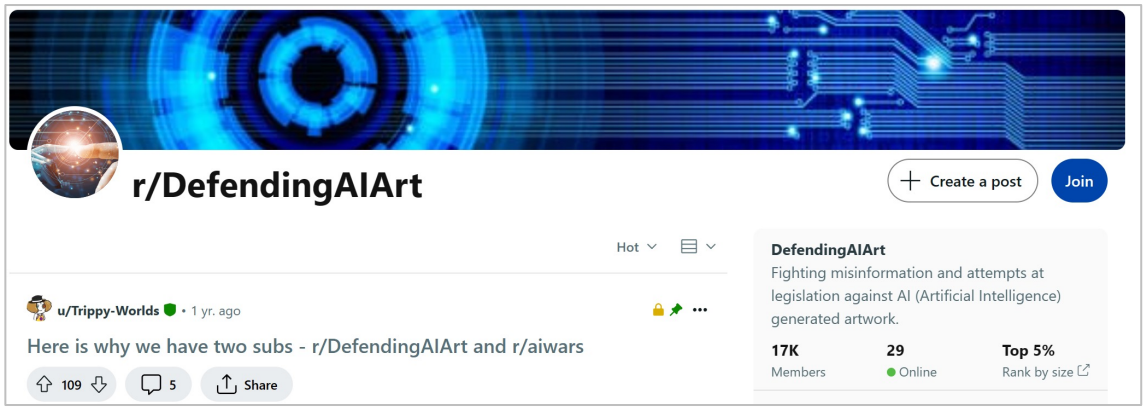
- furthering **related industry and AI tech initiatives** (e.g. iMDA),
- **developing the local arts scene** and **engaging with artists/art institutions/the general public** (e.g. NAC)
- establishing relevant **guidelines and regulatory frameworks** to keep up with the pace of AI development (e.g. PDPC, IPOS)

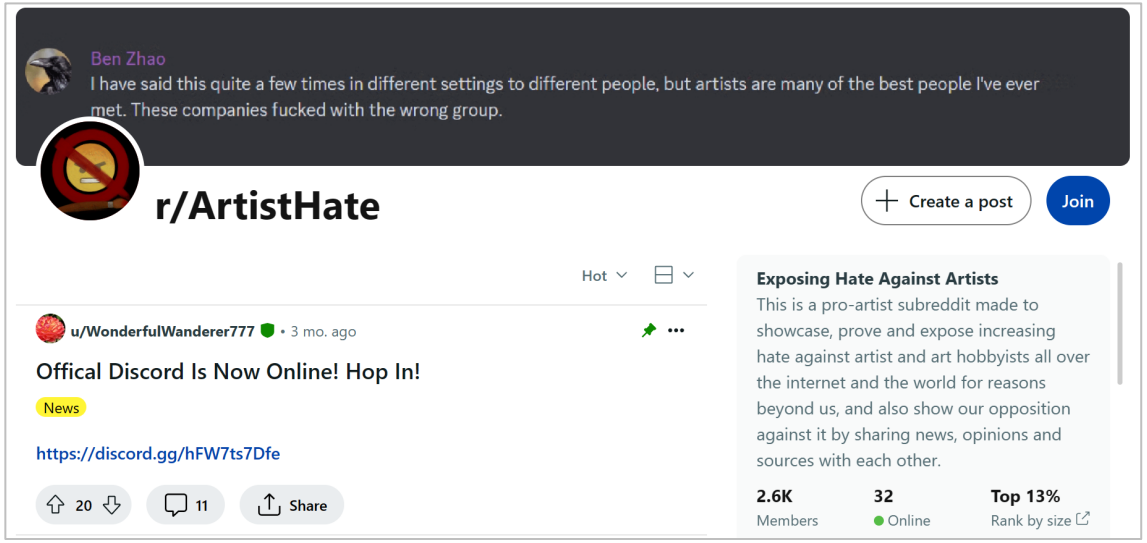
The subreddits

Both subreddits were created in 2023: recency and comparability in time periods

- **r/DefendingAIArt**:
  i.e. the 'pro' camp. Describes itself as a "space for pro-AI activism" and is aimed at "fighting misinformation and attempts at legislation against AI generated artwork"

- **r/ArtistHate**:
  i.e. the 'anti' camp. Named as such for Redditors to discuss what is being observed as "increasing hate against artist and art hobbyists" when their interests should be better protected amidst AI



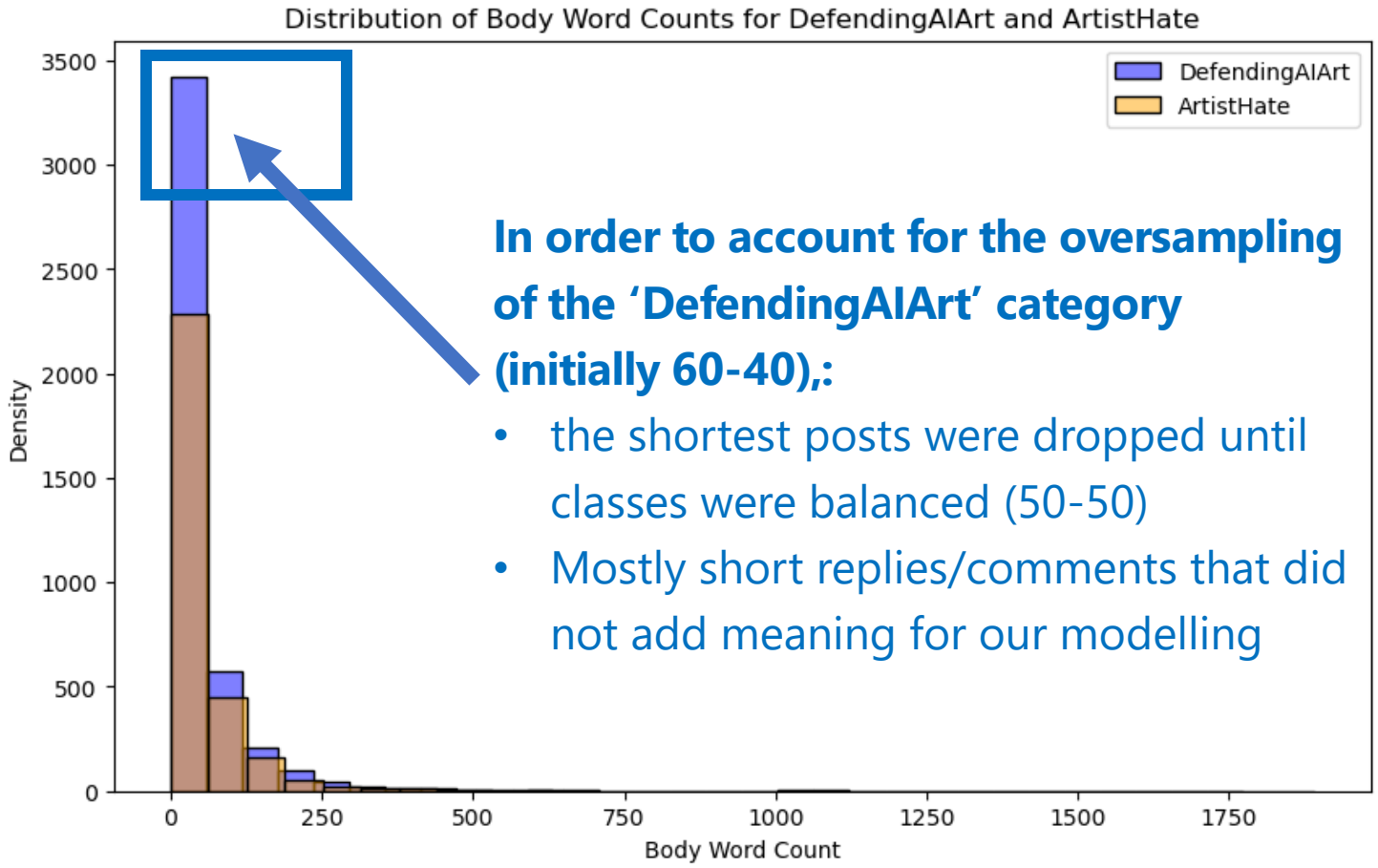


Preprocessing of data

- Scraping of posts via PRAW to access Reddit API
- Text cleaning and pre-processing to capture essence of words
  - Removing deleted / bot-generated posts
  - Rendering emoticons and emojis as text descriptions to capture possible sentiment
  - Removing urls and gif links

Preprocessing of data

- Scraping of posts via PRAW to access Reddit API
- Text cleaning and pre-processing to capture essence of words
  - Removing deleted / bot-generated posts
  - Rendering emoticons and emojis as text descriptions to capture possible sentiment
  - Removing urls and gif links
- Balancing of classes (50-50) to better evaluate predictions for either camp
- Resulting in a **total of ~n=6,000 usable rows of data** consisting of original posts and comments



In order to account for the oversampling of the 'DefendingAIArt' category (initially 60-40),:

- the shortest posts were dropped until classes were balanced (50-50)
- Mostly short replies/comments that did not add meaning for our modelling

Sentiment analysis

What the scores mean for both subreddits on average:

- Overall **somewhat positive** sentiments (compound scores >0.05)
- **Balance of subjective opinions and objective discussions** (subjectivity scores around 0.5)

Insights:

- Encouraging as it suggests the current discourse is not strongly polarising or emotional
- However the overall positive sentiment inferred has its shortcomings as humour or sarcasm may not be picked up by the current algorithm

	Compound score* for sentiment	Subjectivity Score^
DefendingAIArt	0.07	0.49
ArtistHate	0.11	0.46

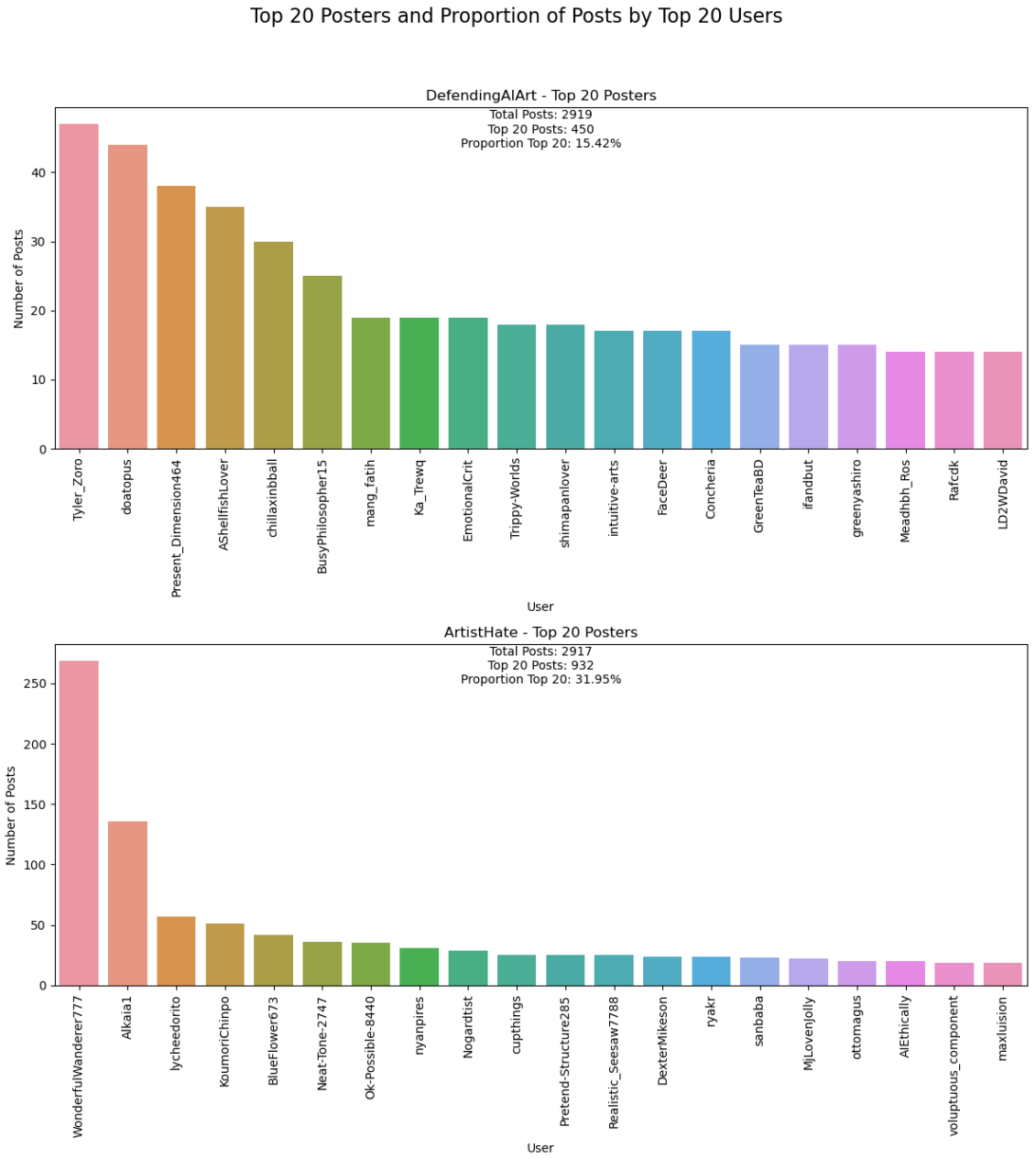
* Based on VADER (Valence Aware Dictionary and sEntiment Reasoner) sentiment analysis tool

^ Based on TextBlob (Python NLP library)

Other observations: Redditor base

The nature of debate and conversations may be dominated by a select few in the ‘anti-AI’-camp:

- **r\DefendingAIArt**: almost **twice the no. of unique users** (1096) compared to ArtistHate (603)
- **r\ArtistHate**: much **higher proportion of posts** (32.0%) **contributed by the top 20 users** compared to DefendingAIArt (15.4%)



Other observations:
Single-word counts

Big overlap when looking at single words (even after removing stop-words)

Top 20 words by frequency from r\DefendingAIArt

1.	**ai**	11.	**use**
2.	**art**	12.	**want**
3.	**people**	13.	**image**
4.	**artist**	14.	**time**
5.	**just**	15.	**way**
6.	**like**	16.	**good**
7.	**make**	17.	**know**
8.	**work**	18.	**really**
9.	**think**	19.	**human**
10.	**thing**	20.	say

Top 20 words by frequency from r\ArtistHate

1.	**ai**	11.	**image**
2.	**people**	12.	**want**
3.	**art**	13.	**time**
4.	**just**	14.	**use**
5.	**like**	15.	**way**
6.	**artist**	16.	**human**
7.	**work**	17.	**know**
8.	**make**	18.	**really**
9.	**thing**	19.	**good**
10.	**think**	20.	model

Other observations:
2-word counts

Still several common words, suggesting they are discussing **similar** AI-specific issues – simply with different perspectives.

Top 20 words by frequency from r\DefendingAIArt

1.	ai art	1.	make art
2.	anti ai	2.	like ai
3.	use ai	3.	stable diffusion
4.	using ai	4.	people like
5.	ai artist	5.	ai people
6.	ai generated	6.	fan art
7.	look like	7.	art ai
8.	feel like	8.	fair use
9.	just like	9.	lot people
10.	ai tool	10.	pro ai

Top 20 words by frequency from r\ArtistHate

1.	ai art	1.	using ai
2.	ai bros	2.	ai image
3.	ai generated	3.	art just
4.	generative ai	4.	lot people
5.	look like	5.	ai bro
6.	ai artist	6.	thing like
7.	feel like	7.	just want
8.	just like	8.	training data
9.	use ai	9.	people want
10.	stable diffusion	10.	ai just

Other observations:
2-word counts

Still several common words, suggesting they are discussing **similar** AI-specific issues – simply with different perspectives.

Top 20 words by frequency from r\DefendingAIArt

1. ai art
2. anti ai
3. use ai
4. using ai
5. ai artist
6. ai generated
7. **look like**
8. **feel like**
9. **just like**
10. ai tool
11. make art
12. [illegible]
13. stable diffusion
14. people like
15. [illegible] people
16. fan art
17. art ai
18. fair use
19. lot people
20. pro ai

Comments about AI-generated output… is it 'really' art?

Top 20 words by frequency from r\ArtistHate

1. ai art
2. [illegible]
3. [illegible] generated
4. generative ai
5. **look like**
6. ai artist
7. **feel like**
8. **just like**
9. use ai
10. stable diffusion
11. using ai
12. ai image
13. art just
14. lot people
15. ai bro
16. thing like
17. just want
18. training data
19. people want
20. ai just

Other observations:
2-word counts

Still several common words, suggesting they are discussing **similar** AI-specific issues – simply with different perspectives.

Top 20 words by frequency from r\DefendingAIArt

1. ai art
2. anti ai
3. use ai
4. using ai
5. ai artist
6. ai generated
7. look like
8. feel like
9. just like
10. ai tool
11. make art
12. like ai
13. stable diffusion
14. people like
15. ai people
16. [illegible]
17. [illegible]
18. fair use
19. lot people
20. pro ai

Top 20 words by frequency from r\ArtistHate

1. ai art
2. ai bros
3. ai generated
4. [illegible]
5. [illegible]
6. ai artist
7. [illegible] like
8. just like
9. use ai
10. stable diffusion
11. using ai
12. ai image
13. art just
14. lot people
15. ai bro
16. thing like
17. just want
18. training data
19. people want
20. ai just

mentions of generative AI-tools 'Stable Diffusion' (text to image algorithm)

Other observations:
2-word counts

Some indication of unique arguments being put forth by opposing camps

Top 20 words by frequency from r\DefendingAIArt

1. ai art
2. anti ai
3. use ai
4. using ai
5. ai artist
6. ai generated
7. look like
8. feel like
9. just like
10. ai tool
11. make art
12. like ai
13. stable diffusion
14. people like
15. ai people
16. fan art
17. art ai
18. **fair use**
19. lot people
20. pro ai

Top 20 words by frequency from r\ArtistHate

1. ai art
2. ai bros
3. ai generated
4. generative ai
5. look like
6. ai artist
7. feel like
8. just like
9. use ai
10. stable diffusion
11. using ai
12. ai image
13. art just
14. lot people
15. ai bro
16. thing like
17. just want
18. **training data**
19. people want
20. ai just

Actual modelling – models tested

	Training accuracy	Testing accuracy	Precision	Recall	F1 score	Computation time
Multinomial Naive Bayes	0.83	0.68	0.67	0.73	0.70	1 x
Logistic Regression	0.96	0.71	0.73	0.67	0.70	2 x
K-Nearest Neighbors	1.0	0.55	0.70	0.17	0.28	2 x
Random Forest	0.93	0.65	0.63	0.71	0.67	Up to 12 x

Actual modelling – final model

	Training accuracy	Testing accuracy	Precision	Recall	F1 score	Computation time
Multinomial Naive Bayes	**0.83**	**0.68**	**0.67**	**0.73**	**0.70**	**1 x**

- **Able to get predictions correct almost 70% of the time overall**
- Better **generalisability** to unseen data (smallest difference between train/test scores)
- Computationally **fastest (and cheapest)**
- **Simplicity** in implement – can handle discrete data (text) and word counts
- Highly **scalable** – can easily read high volume of posts

DEMO time

Consideration for next steps

Could we further strengthen the predictive accuracy of the model?

- Issue-wise, similar vocabulary being used to describe flip sides of the same coin on either camp → can make it challenging for models to distinguish
- Data limited to posts from 2023 onwards, due to recency of topic
- Our predictive accuracy of close to 70% is already **significantly better than the baseline by twenty percent!**

Possible next steps: funding for additional research to

- collect data across more social media platforms
- supplement with other data collection methods (e.g. focus groups with artists and other individuals)

Recommendations

1. **More initiatives in these areas**:

- **Extend our research** to other social media platforms, or other methods such as in-depth interviews/ focus groups/ surveys with artists and other individuals

- Initiatives to **promote human artist-AI system collaboration**, not replacement

- **Broader educational efforts** to raise awareness about how AI impacts artists and other professionals such as curators, art-related tech developers etc.

2. **Review potential concerns, e.g. review regulatory/ ethical guidelines (Code of Practice):**

- Clarity around **IP ownership** of AI-generated artworks to ensure artists are protected
- Safeguard individuals' **privacy and use of training data** fed into AI models
- Encourage **ethical data sourcing practices** by artists and developers
- Requiring **disclosure** in the use of AI for artwork

3. **More public engagement**

- Industry stakeholders: **artists, technology developers, art institutions**
- Involve **the public** in decision-making processes

Q&A

Appendix

Models

1. Multinomial Naive Bayes:

- **Type:** Probabilistic classifier well-suited for text classification tasks.
- **How it works:** assumes that features are conditionally independent given the class. Effective when dealing with high-dimensional, sparse data, such as word counts in text documents.

2. Logistic Regression:

- **Type:** Linear model
- **How it works:** Models the probability of an instance belonging to a particular class using the logistic function. It's a linear model with a logistic (sigmoid) activation function, making it suitable for tasks where the decision boundary is assumed to be linear.

3. K Nearest Neighbors (KNN):

1. **Type:** Instance-based method
- **How it works:** Classifies a new instance based on the majority class of its k-nearest neighbors in the feature space. The choice of 'k' determines the number of neighbors considered, and the class with the most representatives among them is assigned to the new instance.

4. Random Forest:

- **Type:** Ensemble method (Bagging)
- **How it works:** Constructs multiple decision trees during training and outputs the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. Reduces overfitting and improves generalization compared to individual decision trees.

5. AdaBoost (Adaptive Boosting):

- **Type:** Ensemble method (Boosting)
- **How it works:** Iteratively trains weak learners (models slightly better than random guessing) and assigns weights to instances based on the accuracy of previous rounds. Focuses on misclassified instances to improve overall performance. Combines the weak learners to create a strong, accurate model.

Evaluation metrics at a glance

Accuracy:

- **Formula:** (TP + TN) / (TP + TN + FP + FN)
- Measures the overall correctness of the model by considering both correct predictions of the positive class and negative class

Precision:

- **Formula:** TP / (TP + FP)
- Focuses on the accuracy of positive predictions, i.e. measures how many of the predicted positive instances are actually positive.

Recall (Sensitivity or True Positive Rate):

- **Formula:** TP / (TP + FN)
- Measures the ability of the model to capture all the positive instances; sensitivity to the model's ability to avoid false negatives.

F1 Score:

- **Formula:** 2 * (Precision * Recall) / (Precision + Recall)
- Harmonic mean of precision and recall. It provides a balance between precision and recall, giving equal weight to false positives and false negatives.