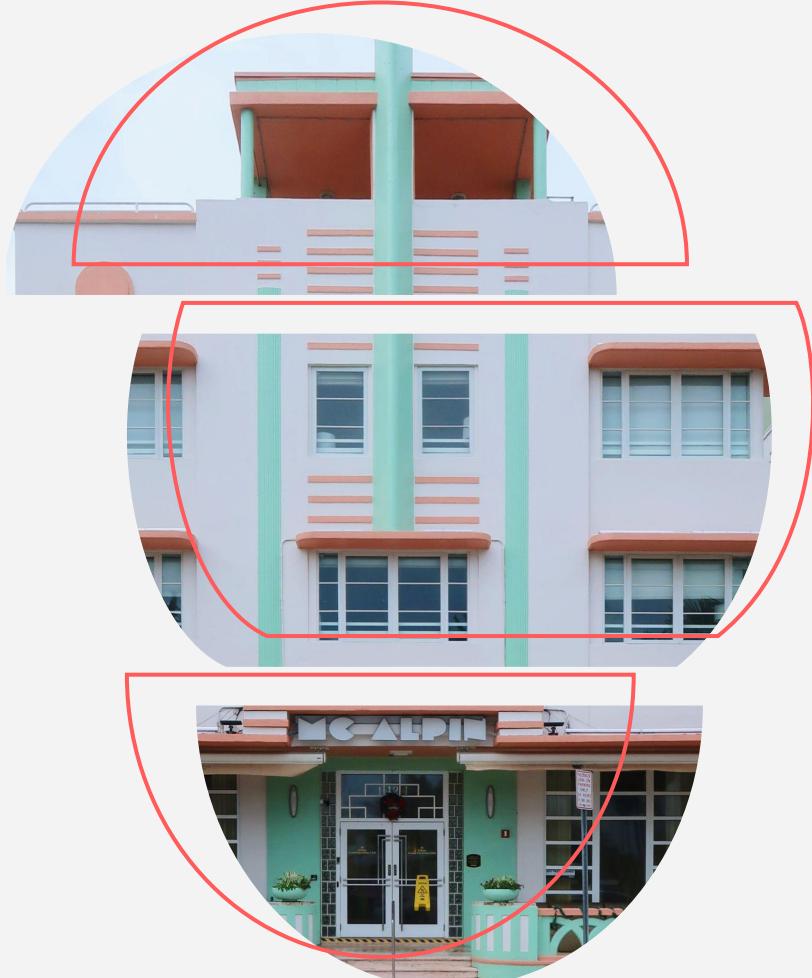


PRODUCTION/ SET DESIGN

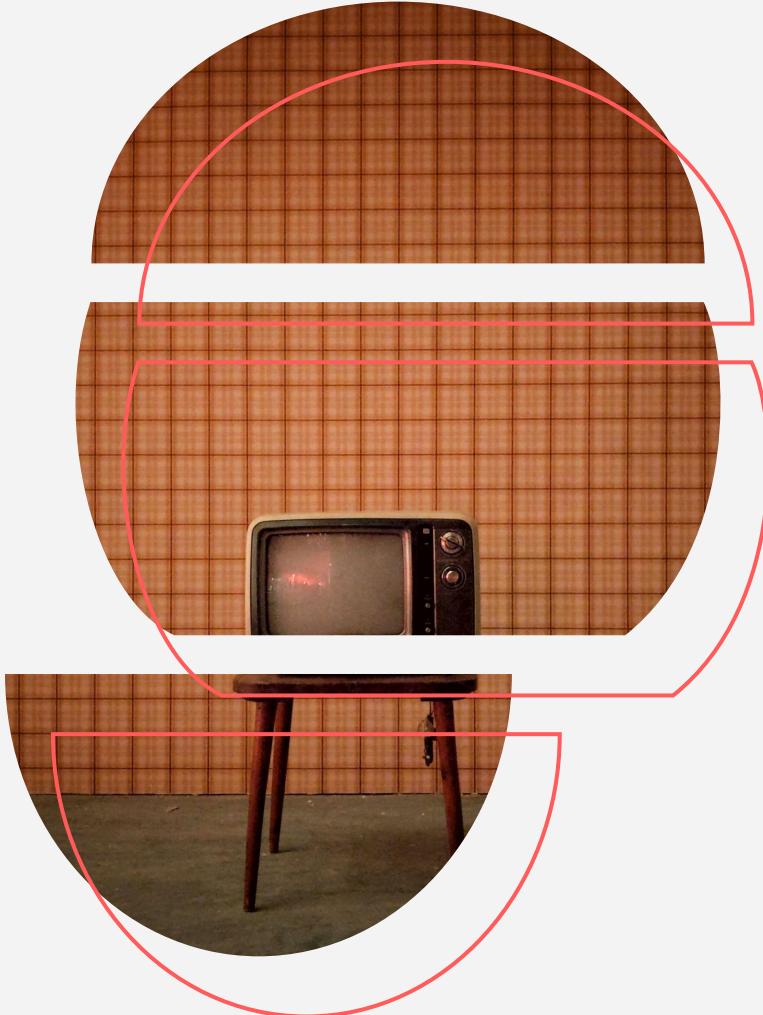
PREDICTING EMOTION EVOKED BY AN 'IMAGE'
&

DESIGNING AN ENVIRONMENT AROUND THE EMOTION



01

Use Case Why detect?





**eg. SET DESIGN /
Wes Anderson**

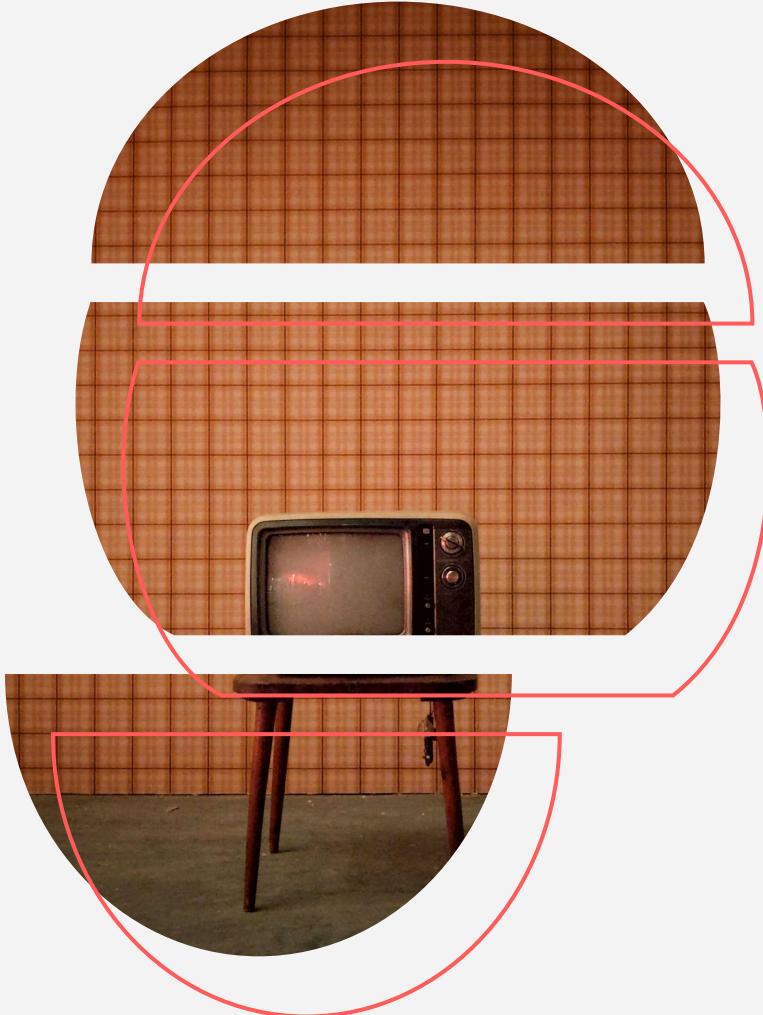
GOAL

- Detect an emotion evoked by an image (to then)
- Use image to associate environment with that emotion
- Use cases: environment / production / set design



02

Methodology Data/ Models



DATASET

WikiArt

Emotions

Psychological Study

20 annotators

More than 4000 artworks

20 emotions

Grouped as: Positive / Negative / Mixed

gratitude, happiness, humility, love, optimism, trust / anger, arrogance, disgust, fear, pessimism, regret, sadness, shame / agreeableness, anticipation, disagreeableness, shyness, surprise, neutral

4 Data Sets

Images scraped

4 DF: 1 probability & 3 presence/absence of emotions

ARTWORKS

Images

anticipation



anticipation



happiness



surprise



trust



disgust



anticipation



surprise



fear



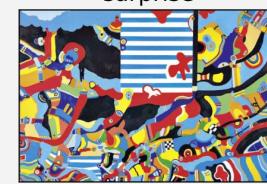
surprise



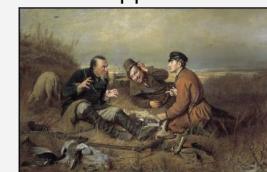
trust



surprise



happiness



fear

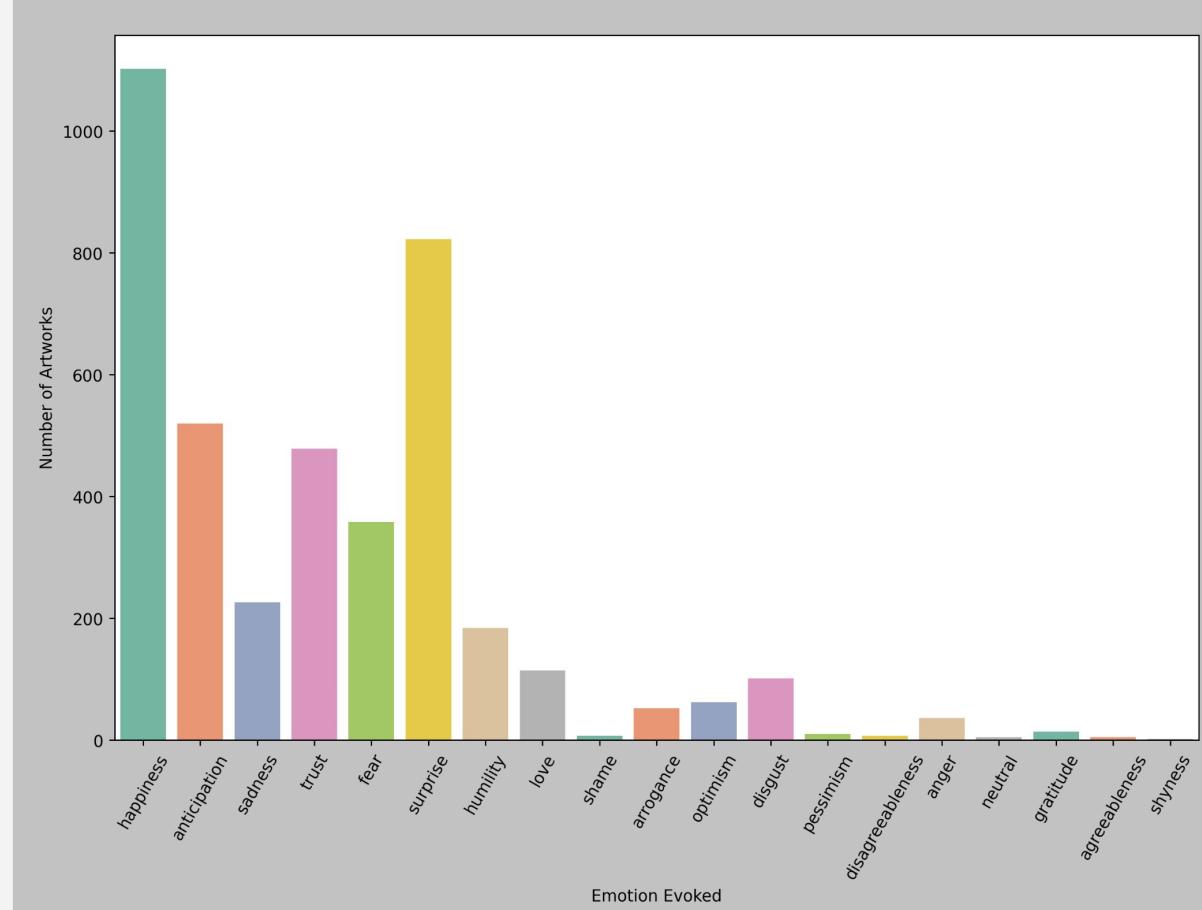


happiness



TARGET Distribution

Top Emotion Evoked



WORKFLOW Models Built

1. Multi class, multi label

2 versions

Accuracies: ~25% & ~30%

2. Multi class, single label

Accuracy: ~27%

3. Binary class

First, top 2 emotions: happiness & surprise. Acc: ~85%
Then, positive & negative emotions. Acc: 71% (test acc)

4. Three class

Positive, Negative, Mixed Emotions
(as per authors of study) Acc: 68%

MODELS

Tools

Multi class models

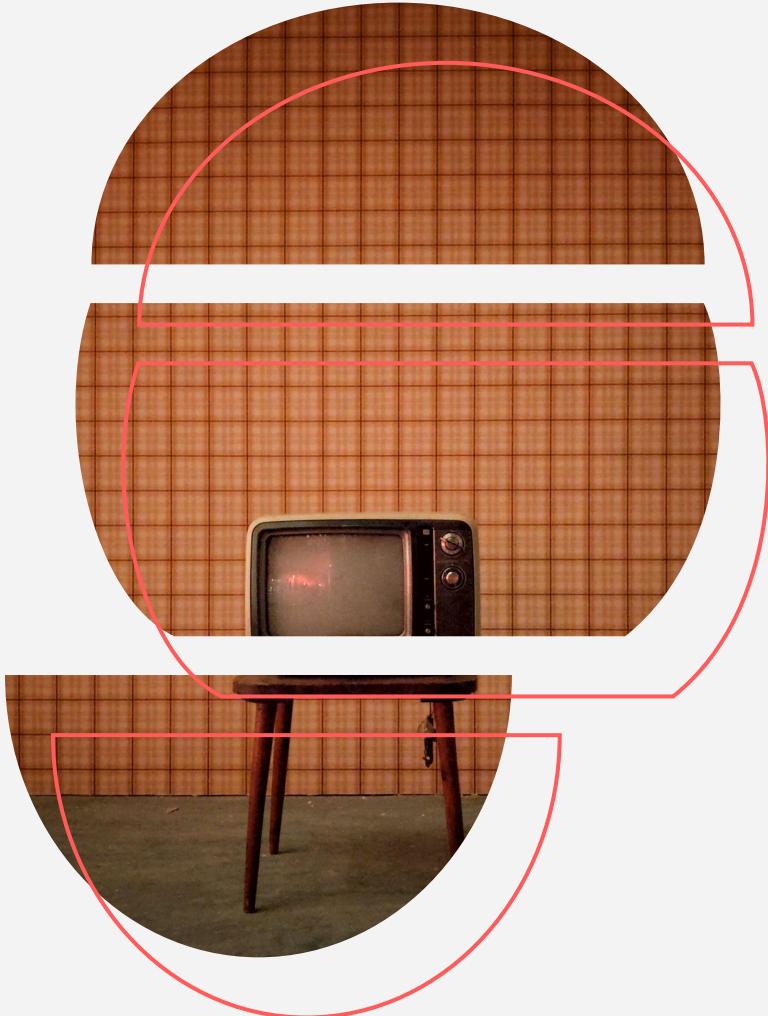
- Data Aug. + MobileNet (w Dropout + L2)
 - Simple 1 layer
 - Transfer Learning with VGG16

Binary + Three class models

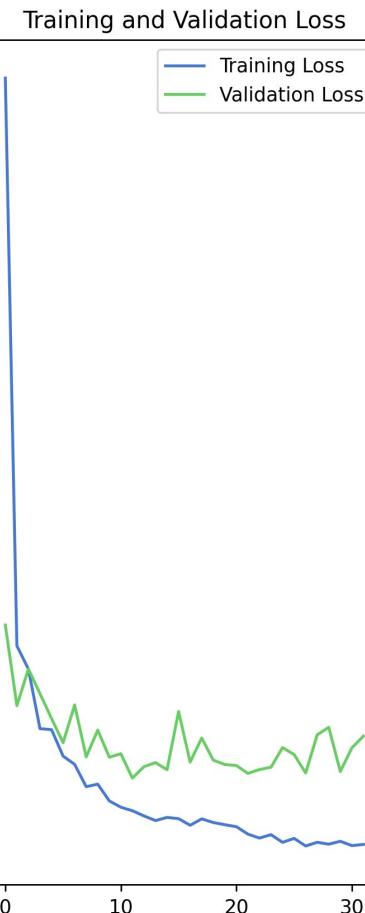
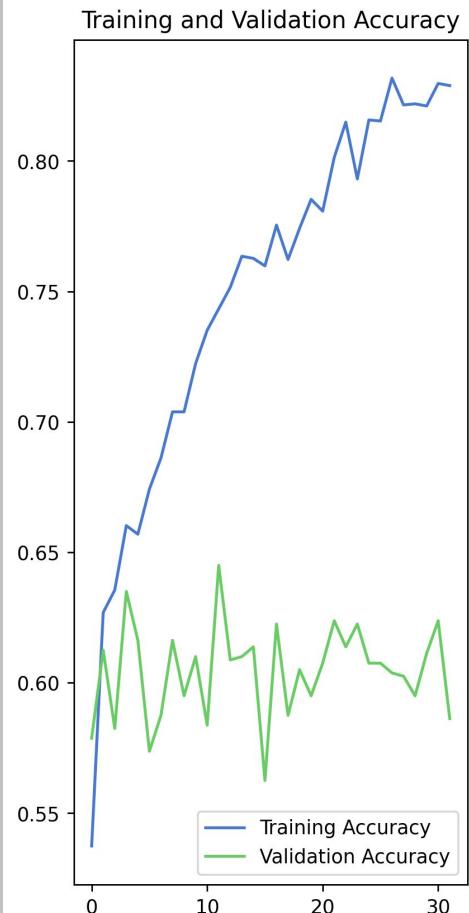
- Simple MobileNet with 1 Dense Layer, Data Aug (+EarlyStopping)

03

Results Data/ Models



Three - Class Model



3-class Model

Baseline Accuracy: 42%

Model Train Accuracy: 75%

Model Val Accuracy: 60%

Model Test Accuracy: 68 %

Model F1 score: 65%

METRICS Accuracy

Misclassifications

Predicted: positive. Actual: mixed



Predicted: mixed. Actual: positive



Predicted: positive. Actual: negative



Predicted: positive. Actual: mixed



Predicted: negative. Actual: positive



Predicted: positive. Actual: mixed



Predicted: mixed. Actual: positive



Predicted: positive. Actual: mixed



Predicted: positive. Actual: negative



Predicted: mixed. Actual: positive



Predicted: mixed. Actual: positive



Predicted: positive. Actual: mixed



Predicted: mixed. Actual: positive



Predicted: positive. Actual: negative



Predicted: mixed. Actual: positive



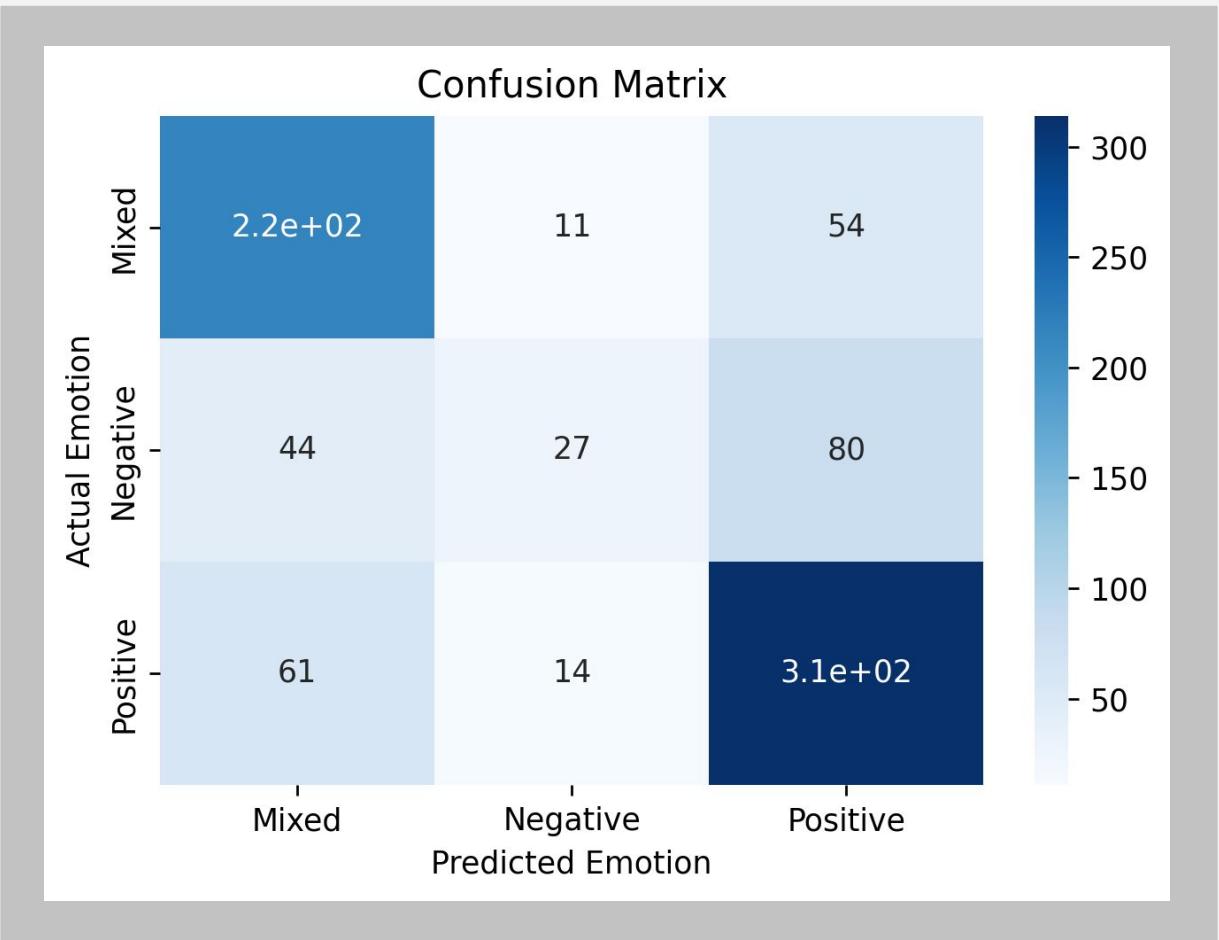
Predicted: mixed. Actual: positive



3-class Model

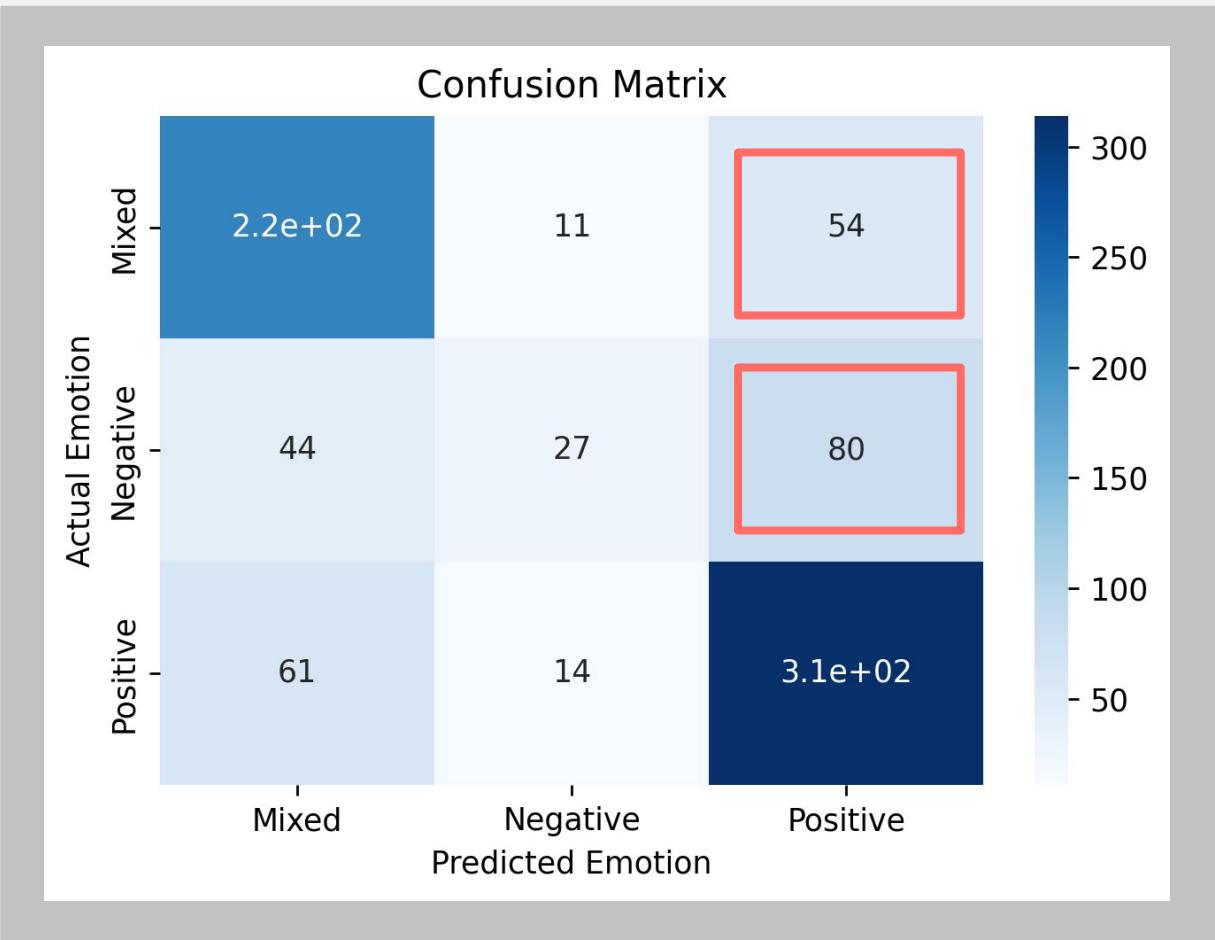
Confusion Matrix

METRICS
Confusion



3-class Model

Confusion Matrix



METRICS
Confusion

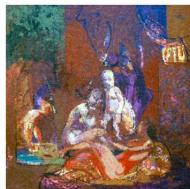
Predict **Positive** Actual **Negative**

Predicted: Positive. Actual: Negative



Predicted: Positive. Actual: Mixed

**Predict Positive
Actual Mixed**



This image most likely evokes mixed emotions with a 67.84 percent accuracy.



Prediction: Mixed

Orozco, Omnisciencia, 1925

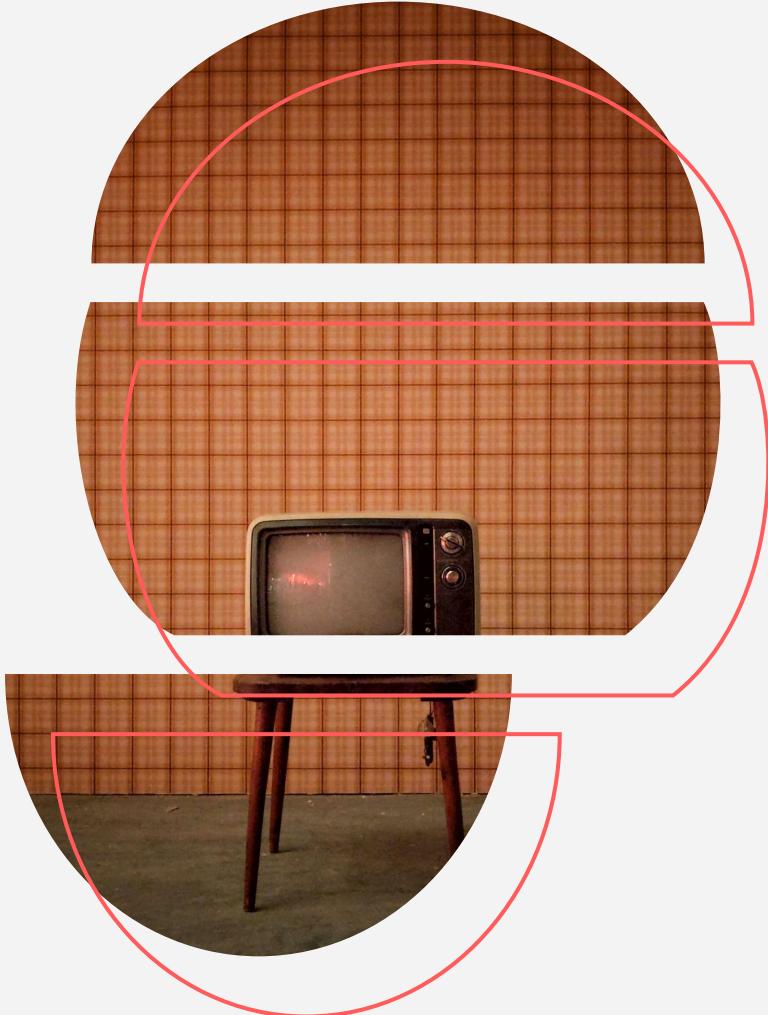
This image most likely evokes mixed emotions with a 67.84 percent accuracy.



Prediction: Mixed
Anonymous Art,
From my bedroom

04

Conclusions & Further Work



3 - CLASS Conclusions

01

Bright Colors

Predicts: Positive
Actual: Could be anything

02

Gray/Muted Color

Predicts: Negative
Actual: Could be anything

03

Realism / Whole White bodies

Predicts: Positive
Actual: Depends on context

04

Face Distortions / Cut / Crop

Predicts: Mixed
Actual: Negative

05

Uncertainty

Predicts: Mixed
Actual: Negative

06

Too much in scene + Nudity

Predicts: Mixed or Negative
Actual: Could be all

FURTHER WORK

Data acquisition

Diversity

Big assumption w/dataset: Subjectivity



Multi-class / multi -label

Being able to predict more labels:

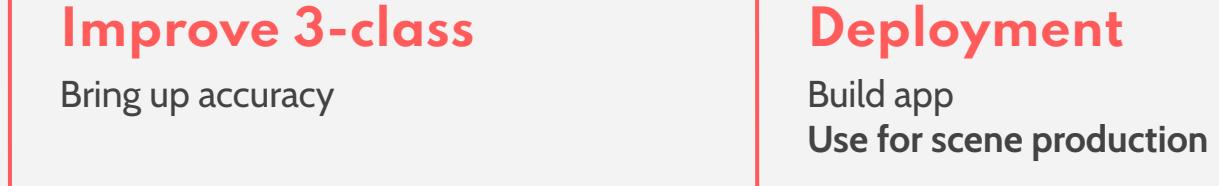
Would bring down bias

No image is straightforward



Improve 3-class

Bring up accuracy



Deployment

Build app

Use for scene production

Cover page photo by [Eryka-Ragna](#) on [Unsplash](#)

Separator pages photo by [Ajeet Mistry](#) on [Unsplash](#)

Full page photo by [Viviana Riske](#) on [Unsplash](#)

Questions? & Appendix

Presentation template by Slidesgo

Icons, infographic & images by Freepik

Research Citation

WikiArt Emotions: An Annotated Dataset of Emotions Evoked by Art

Saif M. Mohammad and Svetlana Kiritchenko (saif.mohammad.svetlana.kiritchenko@nrc-cnc.gc.ca)

RESEARCH QUESTIONS

- what makes art evocative?
- how does art convey different emotions?
- what attributes make a painting well liked?
- how much does the title of an art impact its emotional response?
- what is the extent to which categories of art evoke consistent emotions?

THE SOURCE OF THE ART

WikiArt.org: 151,151 pieces of art; 10 art styles; 168 style categories

- notable art in each category is shown in a *Featured* page
- selected ~200 items from each of the featured pages of 22 categories

Style

Contemporary Art: ~2000 pieces

Minimalism

Modern Art: ~60,000 pieces

Impressionism, Expressionism, Post Impressionism, Surrealism, Abstract Expressionism, Cubism, Pop Art, Abstract Art, Art Informel, Color Field Painting, Neo-Expressionism, Magic Realism, Lyric Abstraction

Post-Renaissance Art: ~ 35,000 pieces

Realism, Romanticism, Baroque, Neoclassicism, Rococo

Renaissance Art: ~6,000 pieces

Northern Renaissance, High Renaissance, Early Renaissance

THE WIKIART EMOTIONS DATASET

www.saifmohammad.com/WebPages/wikiartemotions.html

Annotated 4,105 pieces of art for emotions evoked, amount liked, whether they depict a face

- 10 people per item, crowdsourcing
- 4 styles: Renaissance, Post-Renaissance, Modern, Contemporary
- 22 categories: Impressionism, Figurative art, Realism, etc.

APPLICATIONS

- search paintings evoking the desired emotional response
- automatically detect emotions evoked by paintings
- automatically transform paintings
- identify what makes paintings evocative

LABEL DISTRIBUTION

4 out of 10 say emotion present

AVERAGE ART RATINGS

-3 (dislike a lot) to 3 (like a lot)

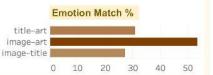


Title: Mona Lisa
Year: 1504
Artist: Leonardo da Vinci
Style: Renaissance
Category: High Renaissance

Annotations:
Avg. art rating: 2.25 Face, body, face
Emotions in image, title: happiness, trust
image: happiness, trust
title: happiness, trust

EMOTIONS EVOKED FROM IMAGE, TITLE, AND ART

- title conveys different sets of emotions than
 - image alone or art as a whole
 - even art and image differ in a large percentage of instances



Title: Don Quixote and Sancho Panza in the mountains, XIX cent.

Artist: Horace Daumier

Style: Impressionism (Modern)

Avg. art rating: 0.4

Emotions (image, title): sadness

Emotions (image): fear

Emotions (title): happiness

Other or Mixed

agreement	0.10	15.40
anticipation	0.20	
curiosity	0.10	
suspicion		
vigilance		
disagreement		
defiance		
conflict		
shyness		
self-consciousness		
reserve		
relief		
surprise		
surrealism		
amazement		
confusion		
neutral	0.00	27.40



AGREEMENT

Fleiss' K per emotion per category: from -0.02 to 0.31.

Higher:

- Renaissance, Post-Renaissance
- basic emotions: happiness, love, sadness, anger, fear
- art with face or body

Lower:

- Modern Art, Contemporary Art
- complex emotions: shame, regret, optimism, etc.
- art with no face or body

WHAT MAKES ART WELL LIKED

- art that evokes positive emotions (love, trust, humility, happiness, etc.)
- Post-Renaissance, Renaissance (Realism, Rococo, Neoclassicism, etc.)

Romanticism, Neoclassicism, Impressionism evoking love as well as Impressionism evoking optimism



Title: Hornet, 1970

Artist: Dan Christensen

Style: Color Field Painting (Modern Art)

Avg. art rating: 0.4

Emotions (image, title): (the most disliked)

Emotions (image, title): anticipation, surprise

Emotions (title): anticipation



Title: Young mother contemplating her sleeping child in candlelight, 1785

Artist: Albert Anker

Style: Realism (Post Renaissance)

Avg. art rating: 2.8

Emotions (image, title): happiness, love, trust

Emotions (image): happiness, love, trust

Emotions (title): happiness, love, trust



Title: Don Quixote and Sancho Panza in the mountains, XIX cent.

Artist: Horace Daumier

Style: Impressionism (Modern)

Avg. art rating: 0.4

Emotions (image, title): (the most disliked)

Emotions (image, title): sadness

Emotions (title): happiness

WikiArt Emotions

WikiArt Emotions: An Annotated Dataset of Emotions Evoked by Art.

Saif M. Mohammad and Svetlana Kiritchenko.

In Proceedings of the 11th Edition of the Language Resources and Evaluation Conference (LREC-2018), May 2018, Miyazaki, Japan.

Dataset DataFrame

Presence/ Absence of Emotion

In [9]: emotions_df_5.head(3)

Out[9]:

Style	Category	Artist	Title	Year	Is painting	Face/body	Ave. art rating	Art (image+title): agreeableness	...	TitleOnly: love	TitleOnly: optimism	TitleOnly: pessimism	TitleOnly: regret	TitleOnly: sadness	TitleC sh:
Modern Art	Impressionism	Charles Courtney Curran	In the Luxembourg Garden	1889	yes	face	2.33	0 ...	0	0	0	0	0	0	0
Modern Art	Neo-Expressionism	Keith Haring	The Marriage of Heaven and Hell	1984	yes	body	0.70	0 ...	0	0	0	0	0	0	0
Modern Art	Post-Impressionism	Jozsef Rippl-Ronai	Uncle Piacsek in front of the Black Sideboard	1906	yes	face	1.60	0 ...	0	0	0	0	0	0	0

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In Proceedings of the 11th Edition of the Language Resources and Evaluation Conference (LREC-2018), May 2018, Miyazaki, Japan.

Dataset DataFrame Probability of Emotion

In [29]: prob_df.head(3)																
Out[29]:																
ID	Style	Category	Artist	Title	Year	Is painting	Face/body	Ave. art rating	Art (image+title): agreeableness	...	TitleOnly: love	TitleOnly: optimism	TitleOnly: pessimism	TitleOnly: regret	TitleOnly: sadness	T
3e1ae	Modern Art	Impressionism	Charles Courtney Curran	In the Luxembourg Garden	1889	yes	face	2.33	0.036	...	0.155	0.238	0.024	0.012	0.024	0.024
3e76	Modern Art	Neo-Expressionism	Keith Haring	The Marriage of Heaven and Hell	1984	yes	body	0.70	0.000	...	0.200	0.000	0.100	0.000	0.000	0.000
5fa9	Modern Art	Post-Impressionism	Jozsef Rippl-Ronai	Uncle Piacsek in front of the Black Sideboard	1906	yes	face	1.60	0.000	...	0.000	0.000	0.000	0.000	0.000	0.000

WikiArt Emotions

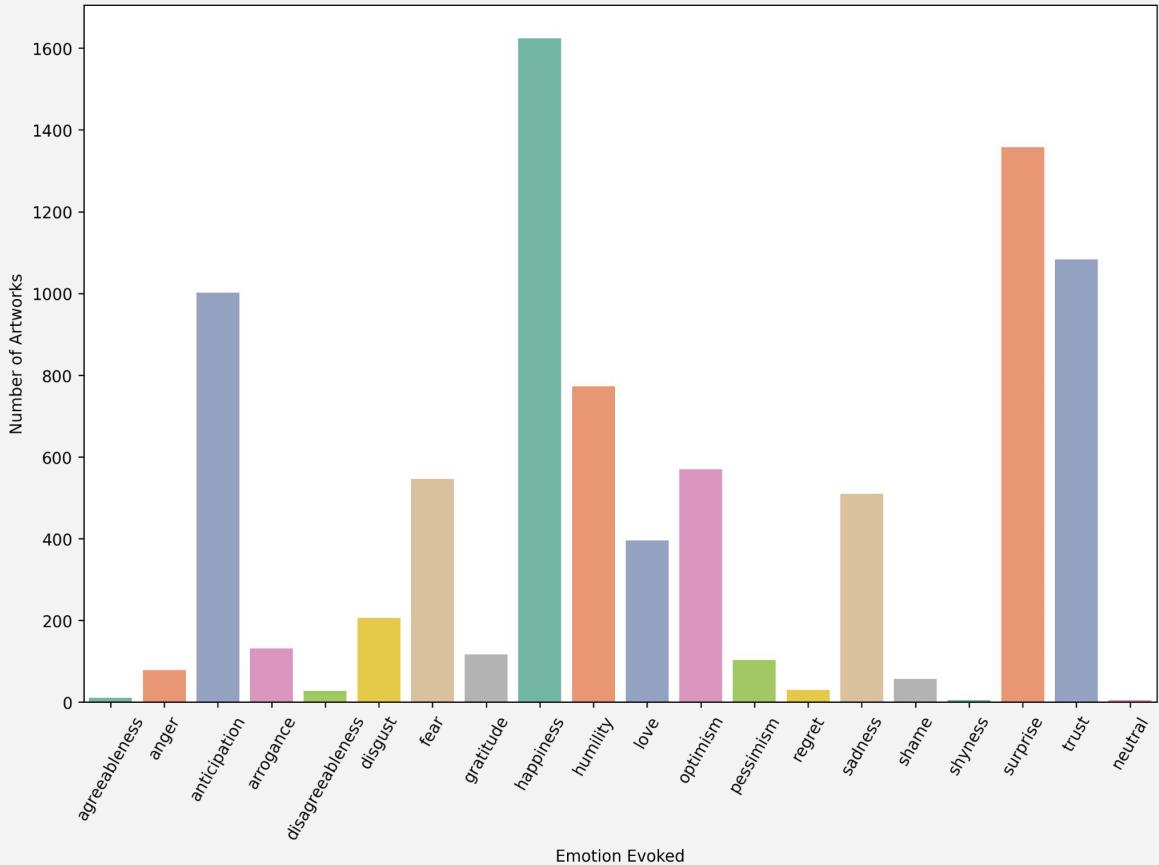
WikiArt Emotions: An Annotated Dataset of Emotions Evoked by Art.

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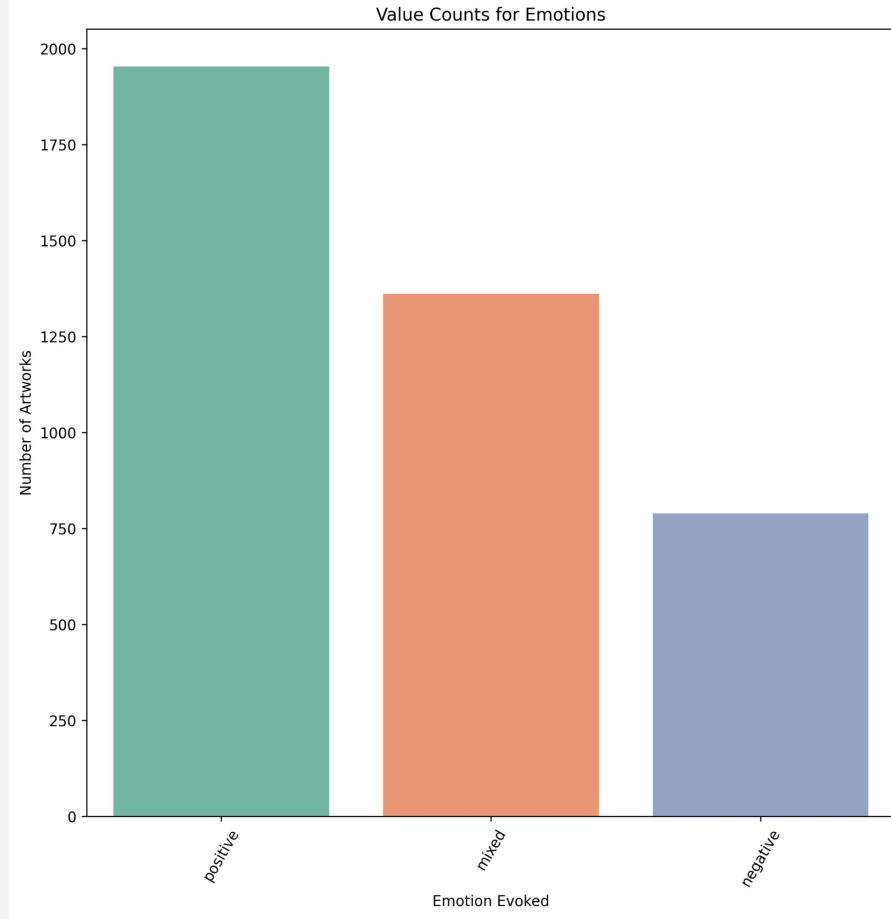
TARGET Distribution

All Emotions Evoked



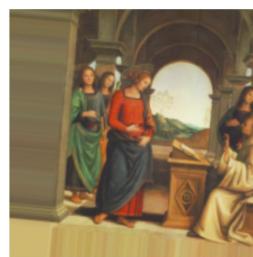
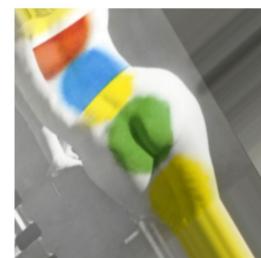
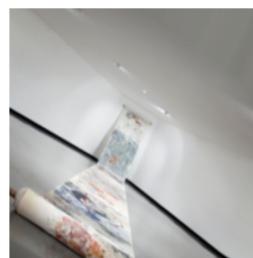
TARGET Distribution

Top Emotion Evoked (3-class)



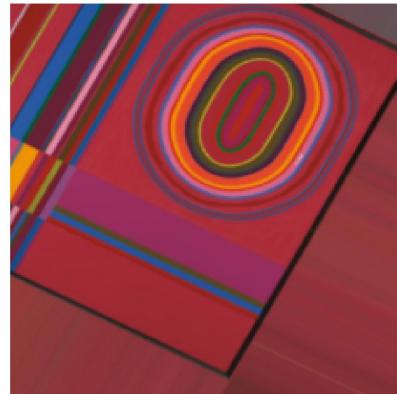
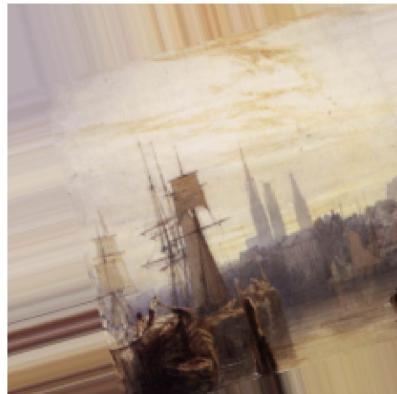
IMAGES

Distortion (3 - class)

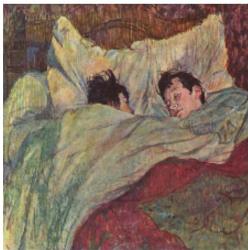


IMAGES

Distortion (3 - class)



Predicted: Negative. Actual: Positive



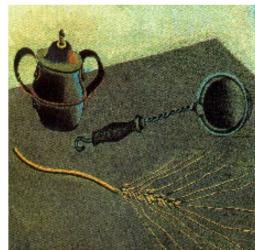
Predict **Negative**
Actual **Positive**

Predicted: Negative. Actual: Mixed



**Predict Negative
Actual Mixed**

Predicted: Mixed. Actual: Positive



**Predict Mixed
Actual Positive**

Predicted: Mixed. Actual: Negative



Predict **Mixed**
Actual **Negative**