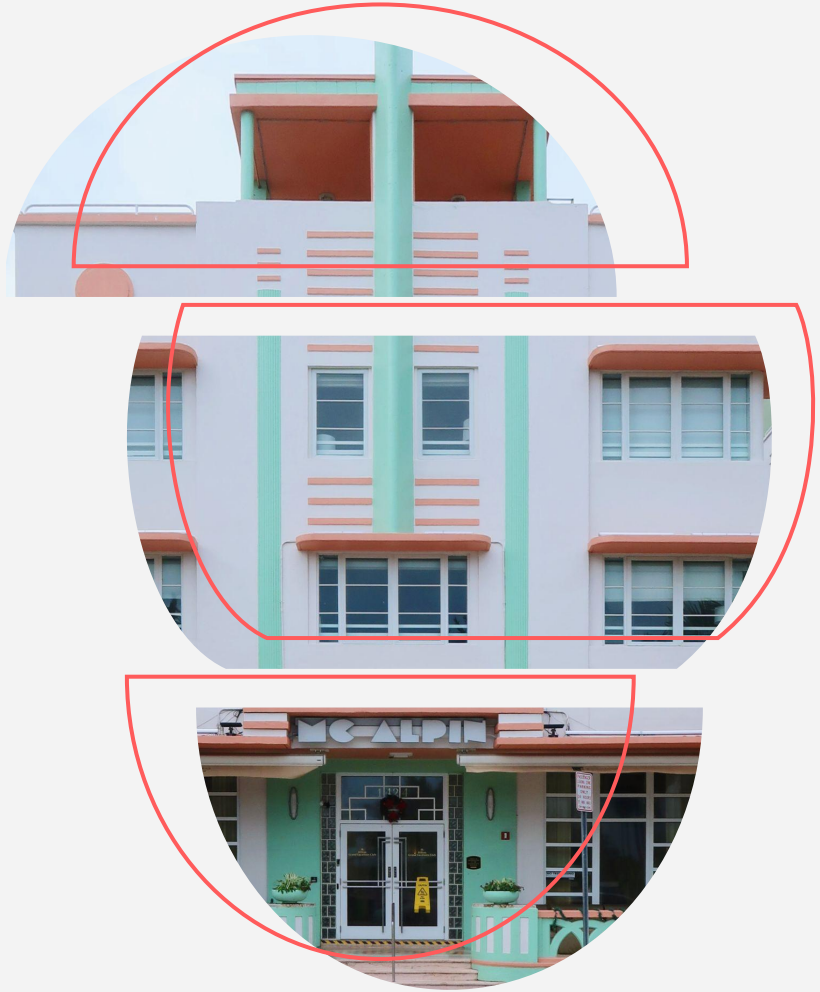
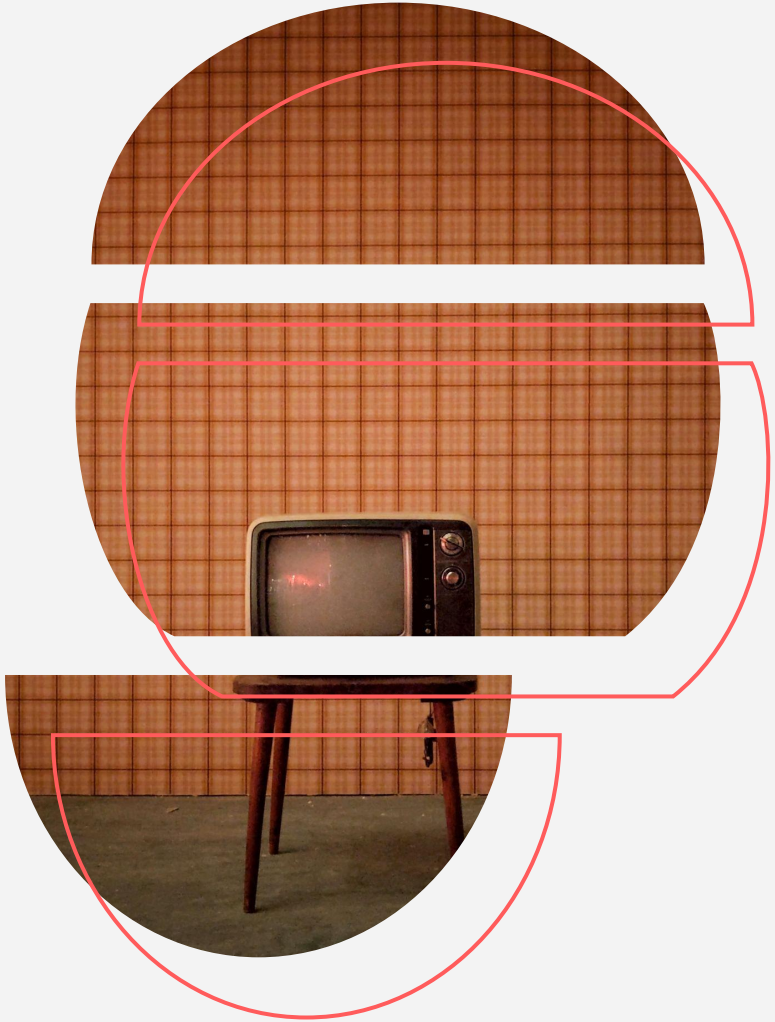
PRODUCTION/ SET DESIGN

PREDICTING EMOTION EVOKED BY AN ‘IMAGE’
&
DESIGNING AN ENVIRONMENT AROUND THE EMOTION





01

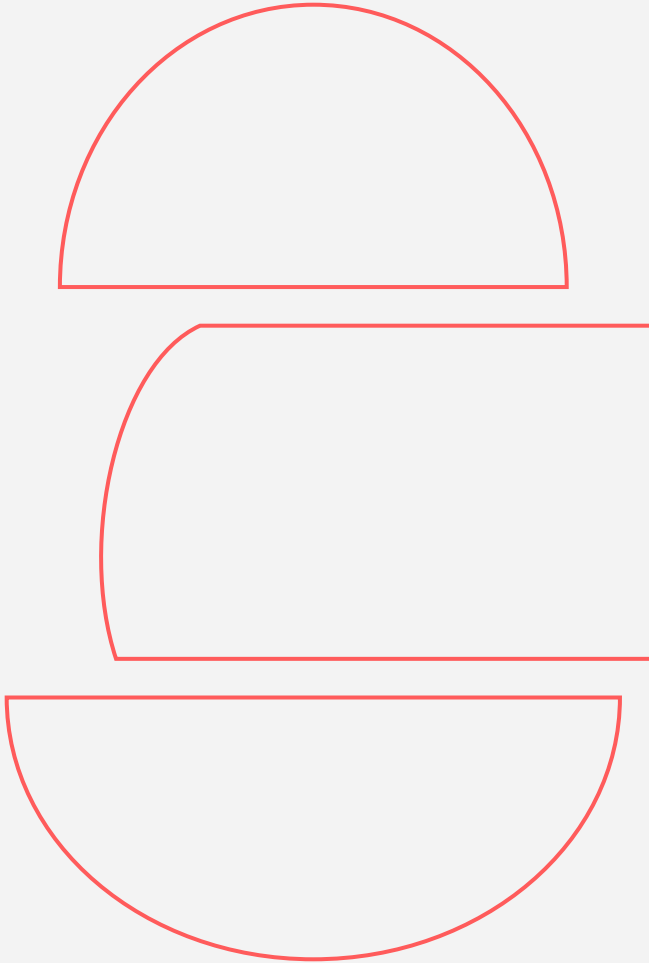
Use Case

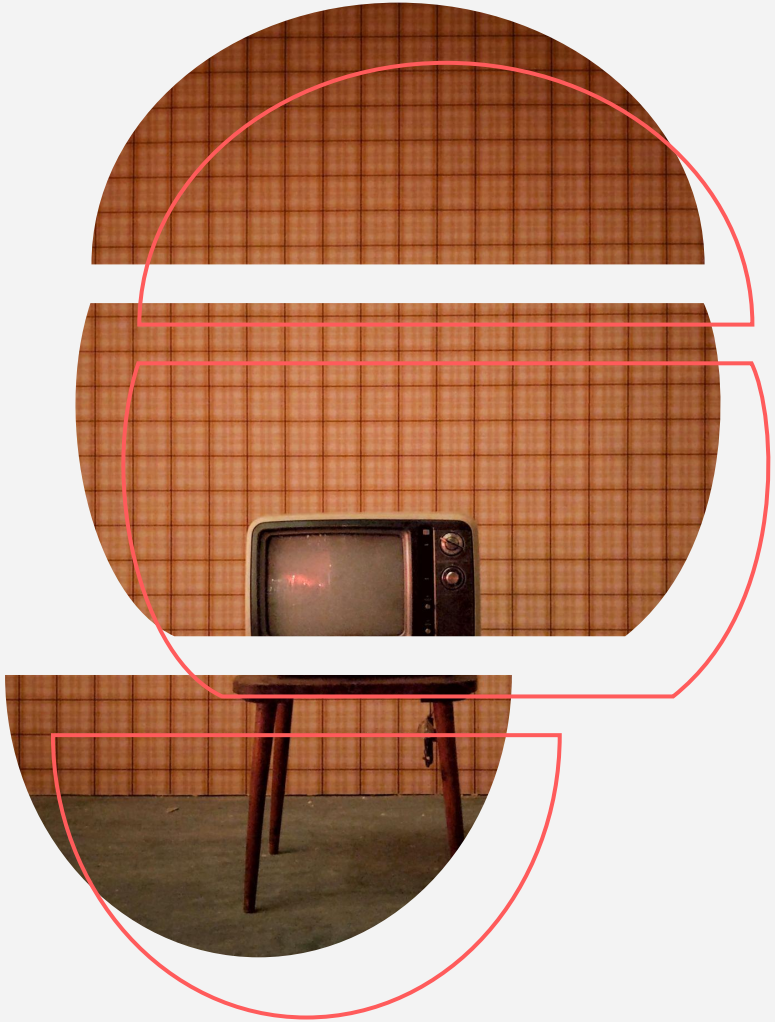
Why detect?

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

trust

surprise

fear

anticipation

disgust

trust

surprise

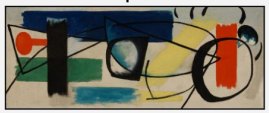
happiness

anticipation

surprise

trust

surprise

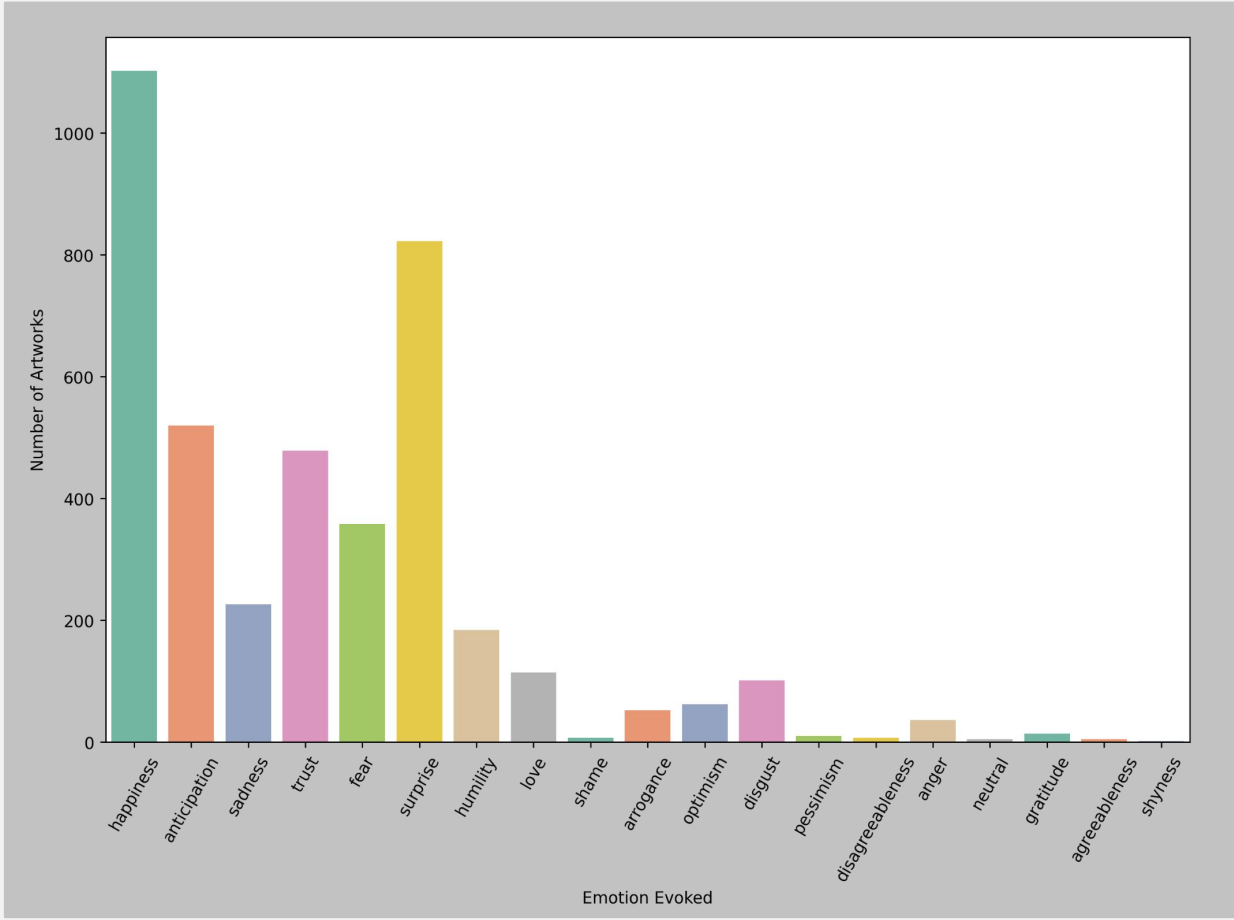


fear

happiness

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%

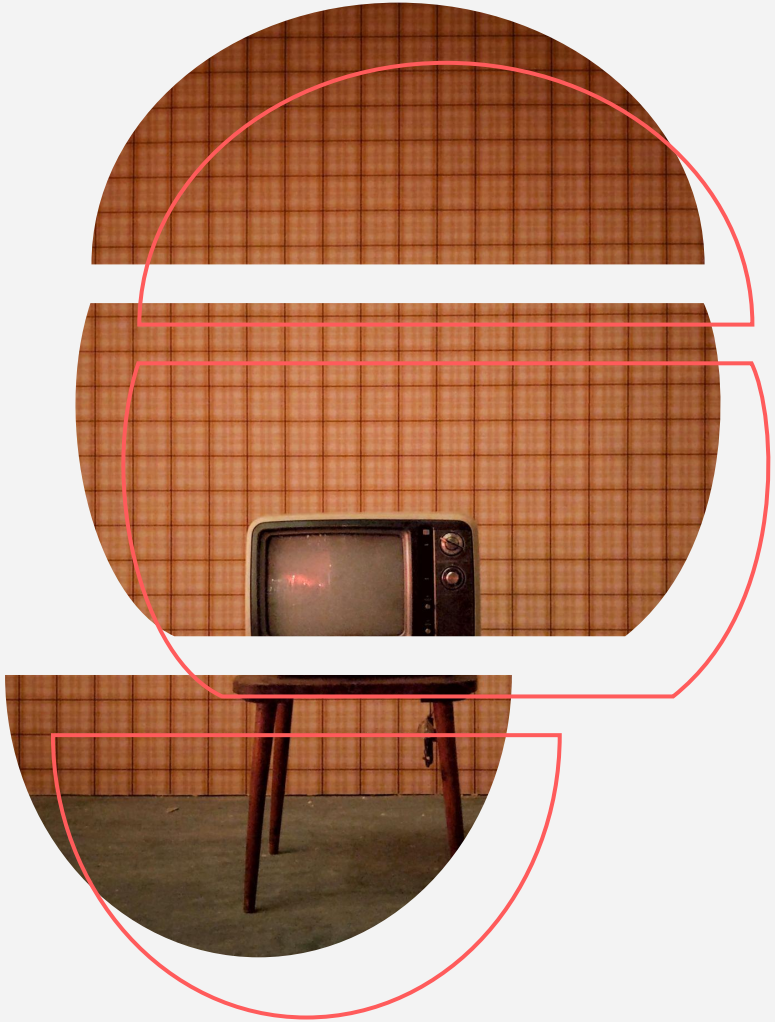
MODELS
Tools

Multi class models

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

Binary + Three class models

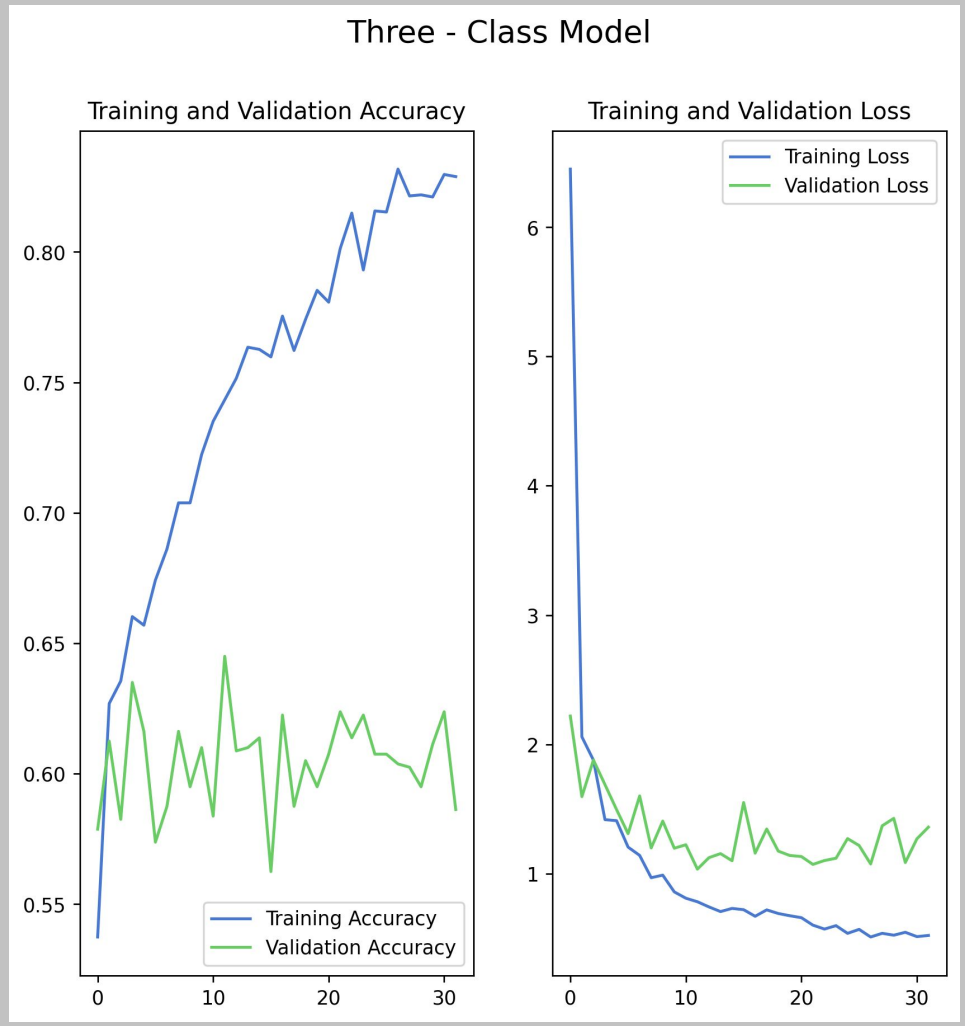
- Simple MobileNet with 2 Dense Layers, Data Aug (+EarlyStopping)



03

Results

Data/ Models



3-class Model

Baseline Accuracy: 42%
(2 Dense layers)

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

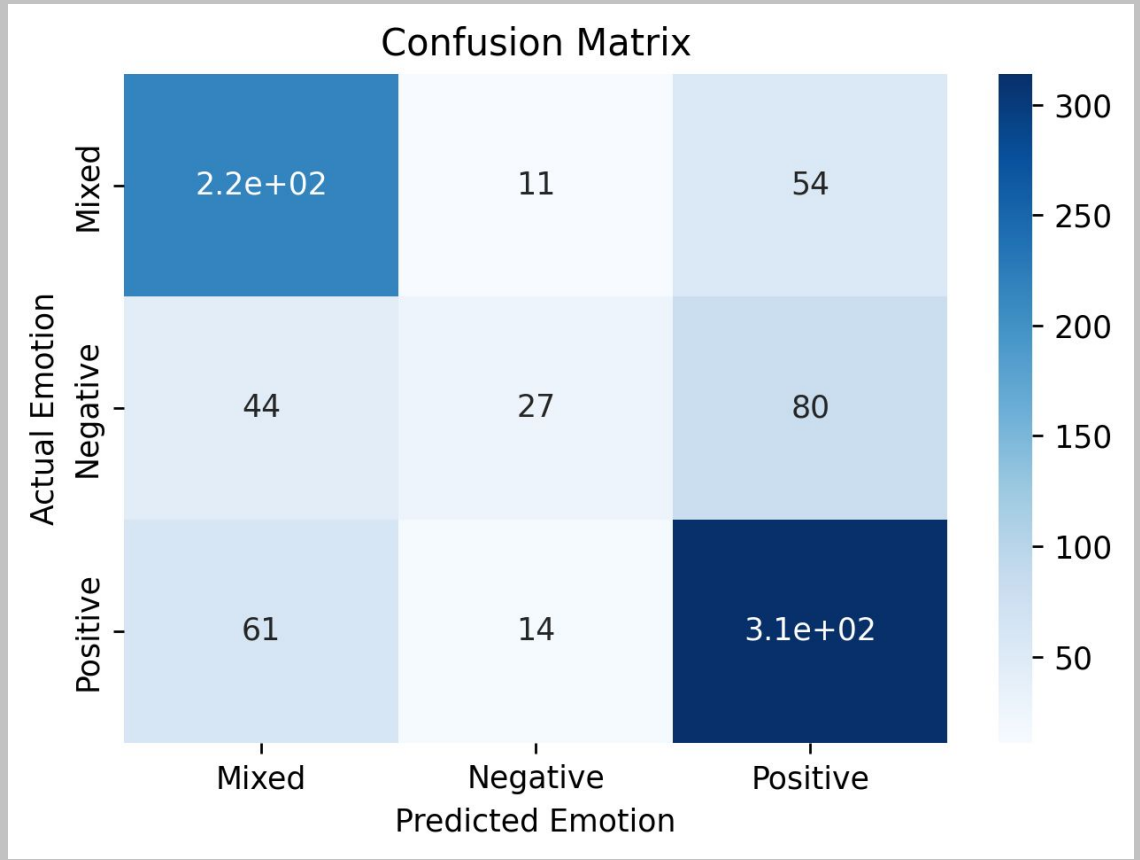
Predicted: positive. Actual: mixed

Predicted: mixed. Actual: positive

Predicted: positive. Actual: negative

Predicted: mixed. Actual: positive

Predicted: mixed. Actual: positive

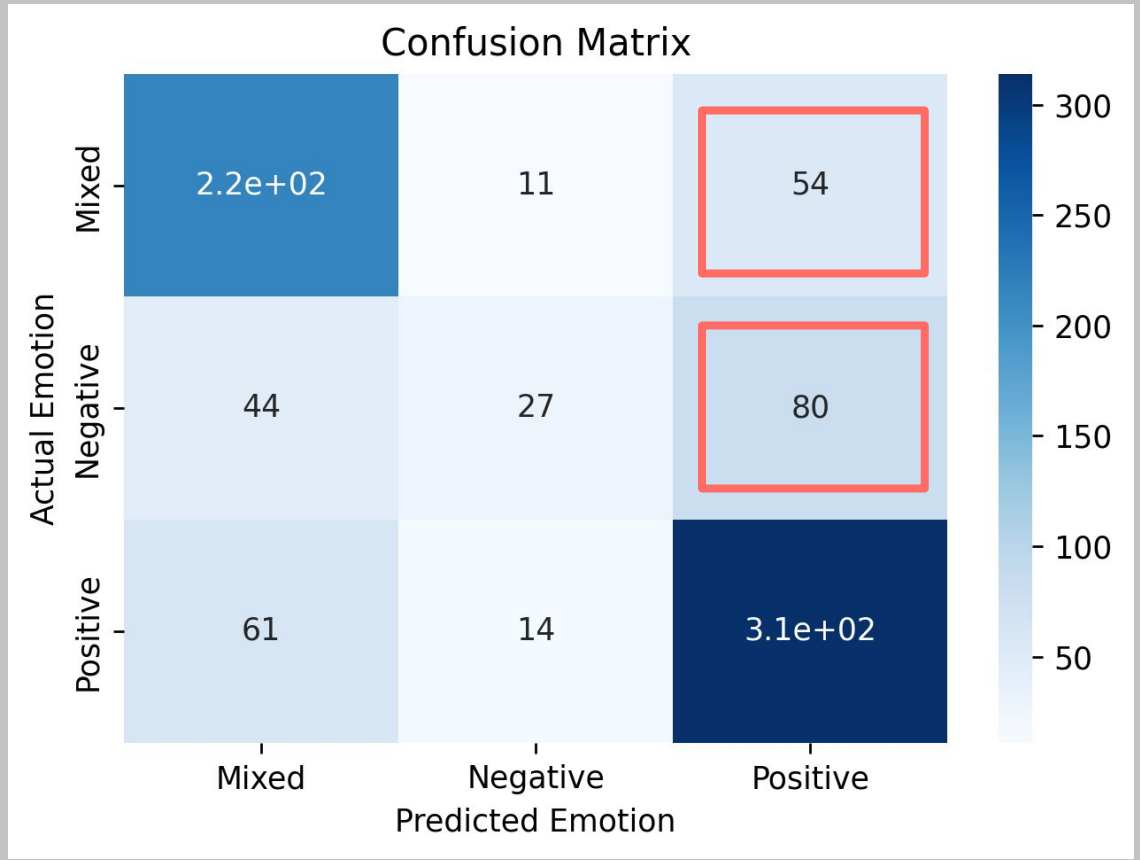


3-class Model

Confusion Matrix

METRICS

Confusion

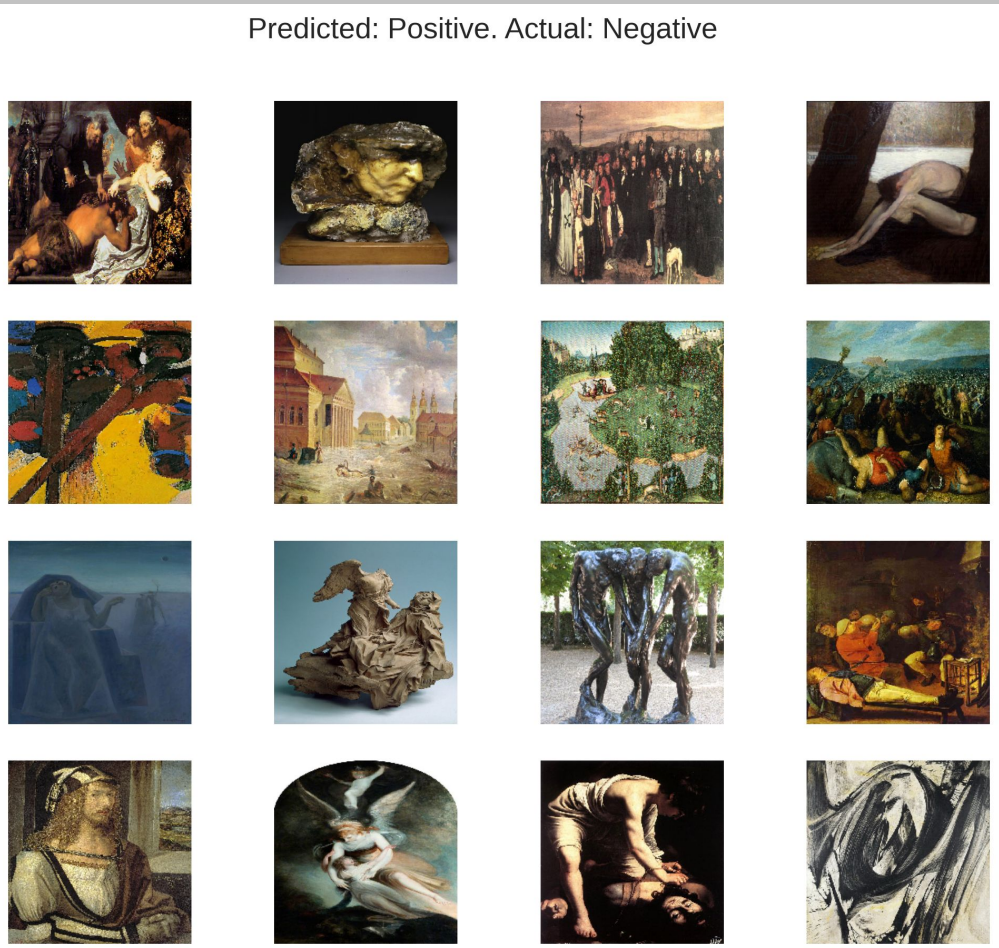


3-class Model

Confusion Matrix

METRICS

Confusion



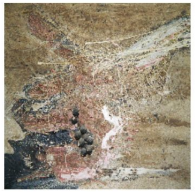
Predict **Positive**
Actual **Negative**

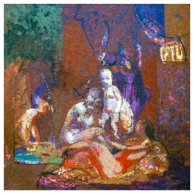
Predicted: Positive. Actual: Mixed













Predict **Positive**
Actual **Mixed**

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

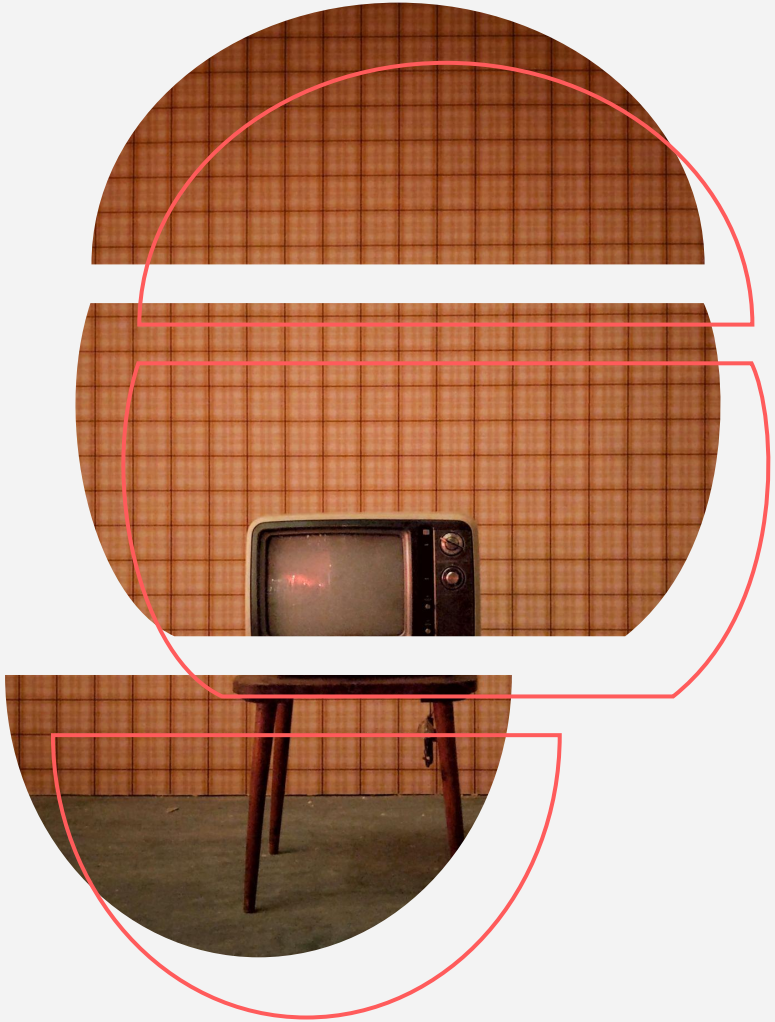
Prediction: Mixed

Orozco, Omniciencia, 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 Mestry on Unsplash

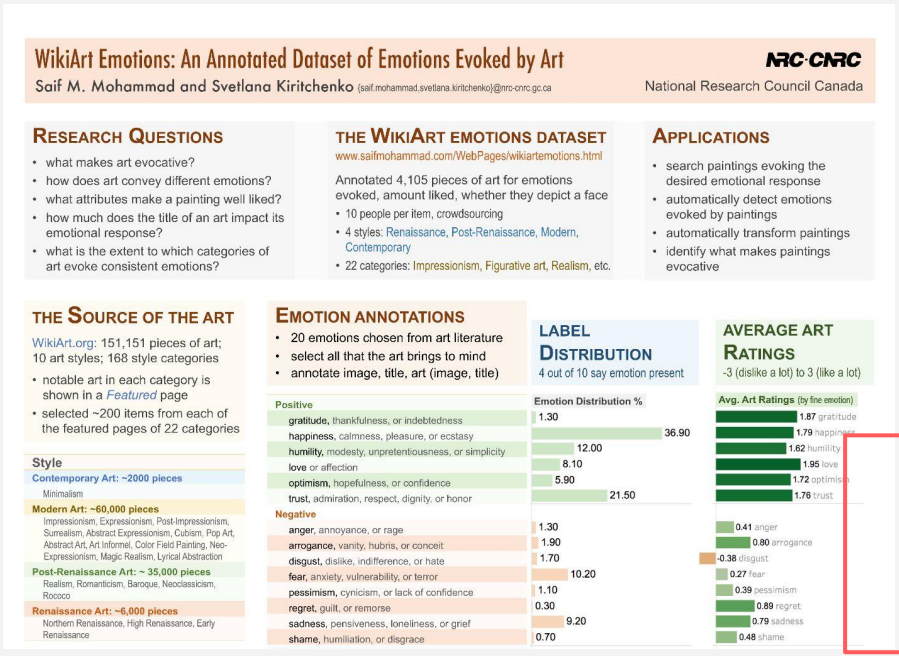
Full page photo by Viviana Rishe on Unsplash

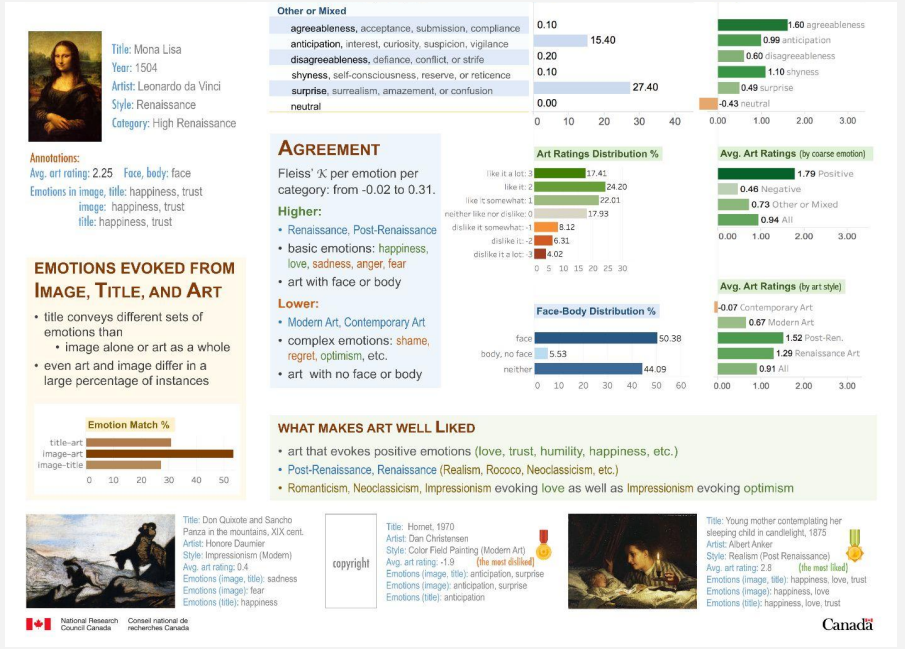
Questions? & Appendix

Presentation template by Slidesgo

Icons, infographic & images by Freepik

Research Citation





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	
Modern Art	Neo-Expressionism	Keith Haring	The Marriage of Heaven and Hell	1984	yes	body	0.70	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	

WikiArt Emotions

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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
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
e1ae	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	
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	
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	

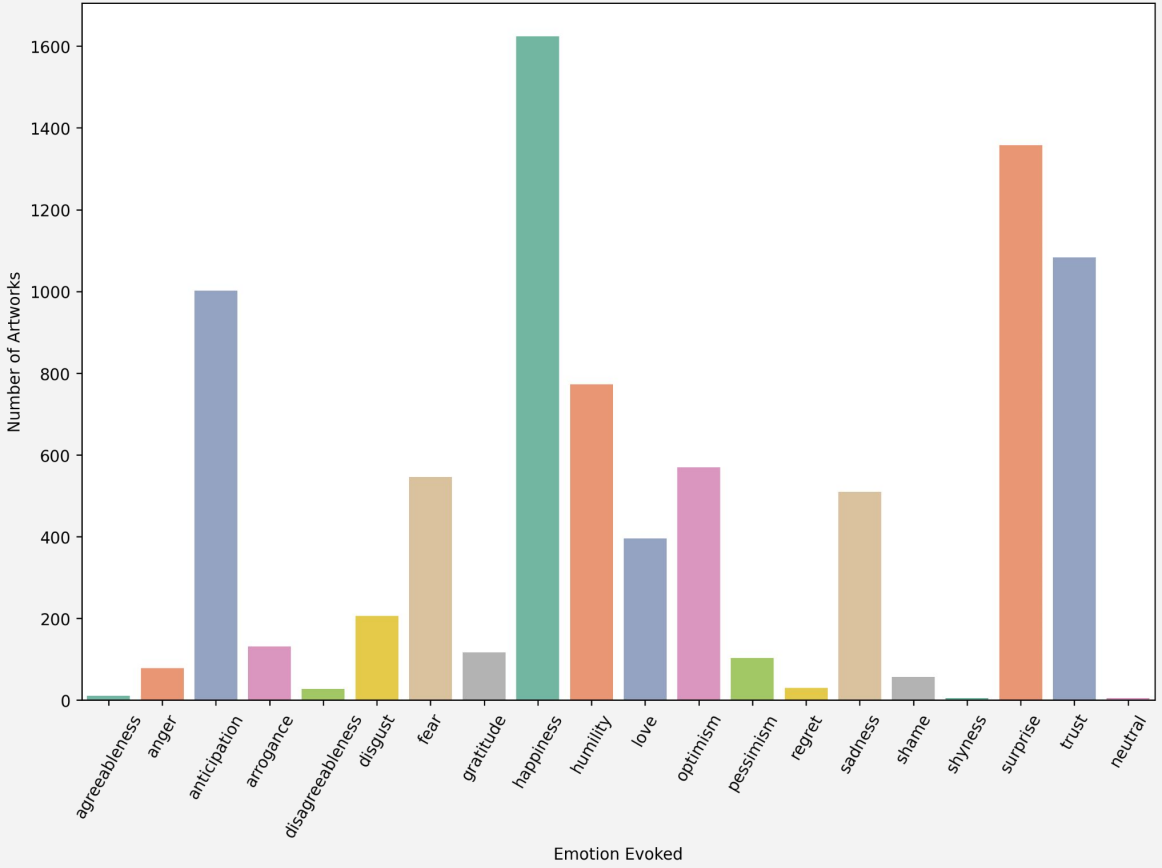
WikiArt Emotions

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

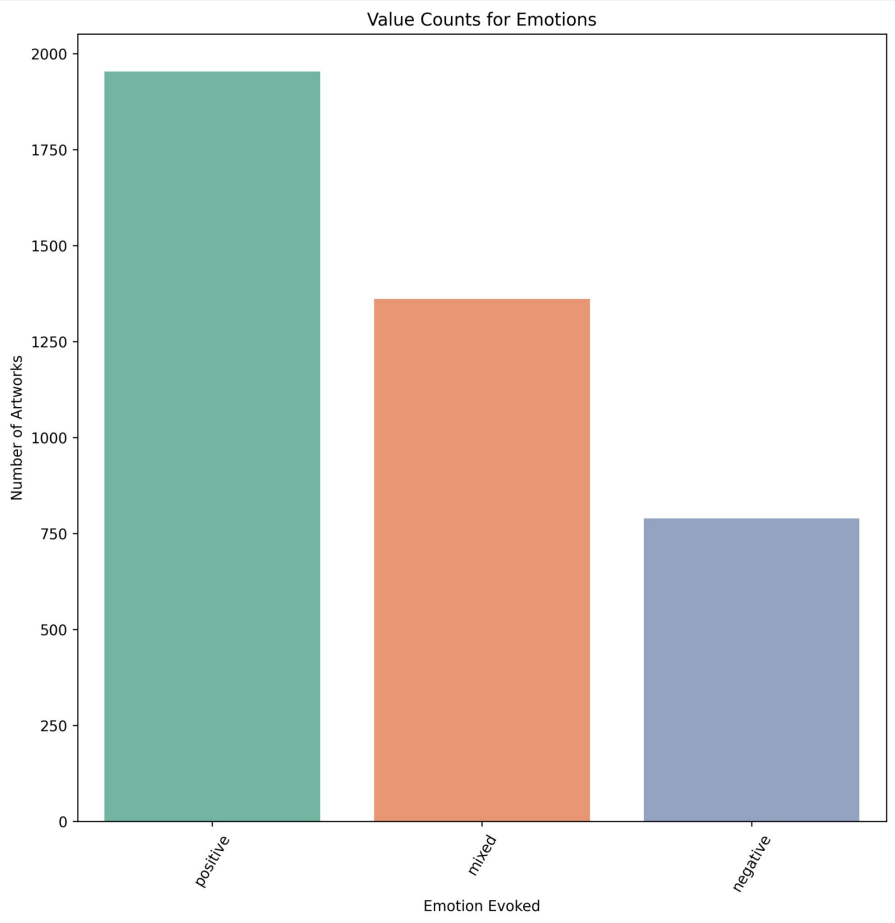
Saif M. Mohammad and Svetlana Kiritchenko.

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

TARGET
Distribution
All Emotions Evoked



TARGET
Distribution
Top Emotion Evoked (3-class)



MODEL
Architecture
Beginning

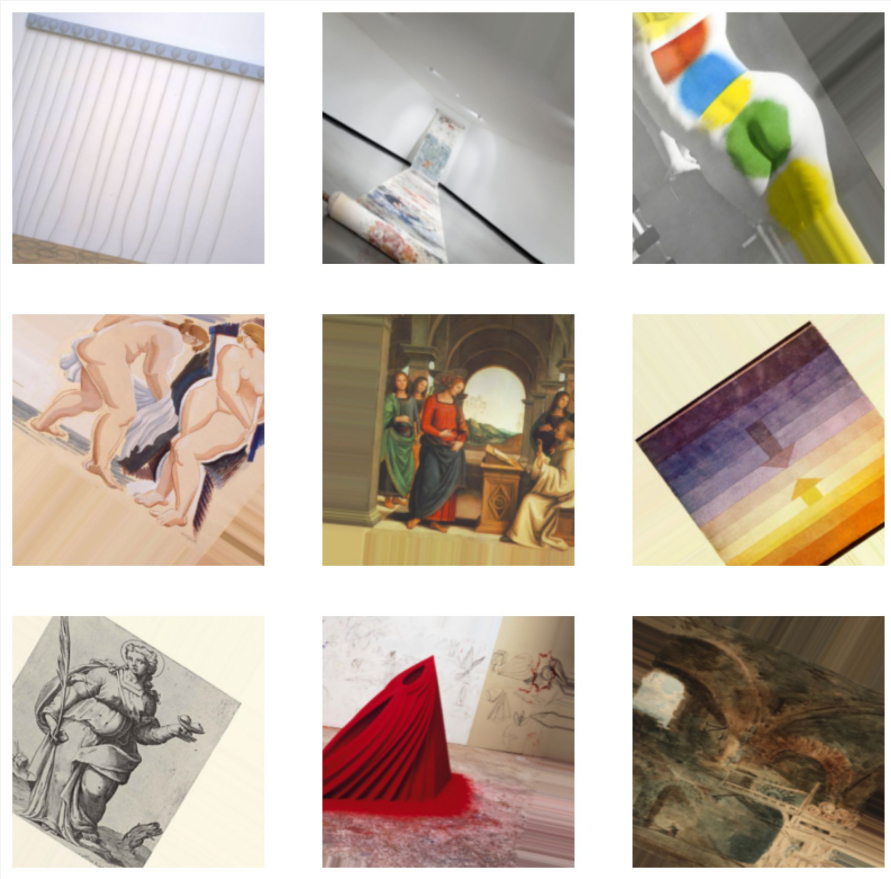
```
model_tc_mobilenet_aug = Model(inputs=base_model.input, outputs=predictions)
model_tc_mobilenet_aug.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
model_tc_mobilenet_aug.summary()
```

```
block_1_project (Conv2D)       (None, 56, 56, 24)   2304        ['block_1_depthwise_relu[0][0]']

block_1_project_BN (BatchNorma  (None, 56, 56, 24)  96          ['block_1_project[0][0]']
lization)

block_2_expand (Conv2D)        (None, 56, 56, 144)  3456        ['block_1_project_BN[0][0]']

block_2_expand_BN (BatchNormal  (None, 56, 56, 144)  576         ['block_2_expand[0][0]']
ization)

block_2_expand_relu (ReLU)     (None, 56, 56, 144)  0           ['block_2_expand_BN[0][0]']

block_2_depthwise (DepthwiseCo  (None, 56, 56, 144)  1296        ['block_2_expand_relu[0][0]']
nv2D)

block_2_depthwise_BN (BatchNor  (None, 56, 56, 144)  576         ['block_2_depthwise[0][0]']
malization)

block_2_depthwise_relu (ReLU)  (None, 56, 56, 144)  0           ['block_2_depthwise_BN[0][0]']

block_2_project (Conv2D)       (None, 56, 56, 24)   3456        ['block_2_depthwise_relu[0][0]']

block_2_project_BN (BatchNorma  (None, 56, 56, 24)  96          ['block_2_project[0][0]']
lization)

block_2_add (Add)              (None, 56, 56, 24)   0           ['block_1_project_BN[0][0]',
                                                                 'block_2_project_BN[0][0]']

block_3_expand (Conv2D)        (None, 56, 56, 144)  3456        ['block_2_add[0][0]']

block_3_expand_BN (BatchNormal  (None, 56, 56, 144)  576         ['block_3_expand[0][0]']
ization)

block_3_expand_relu (ReLU)     (None, 56, 56, 144)  0           ['block_3_expand_BN[0][0]']

block_3_pad (ZeroPadding2D)    (None, 57, 57, 144)  0           ['block_3_expand_relu[0][0]']

block_3_depthwise (DepthwiseCo  (None, 28, 28, 144)  1296        ['block_3_pad[0][0]']
nv2D)

block_3_depthwise_BN (BatchNor  (None, 28, 28, 144)  576         ['block_3_depthwise[0][0]']
malization)

block_3_depthwise_relu (ReLU)  (None, 28, 28, 144)  0           ['block_3_depthwise_BN[0][0]']

block_3_project (Conv2D)       (None, 28, 28, 32)   4608        ['block_3_depthwise_relu[0][0]']

block_3_project_BN (BatchNorma  (None, 28, 28, 32)  128         ['block_3_project[0][0]']
lization)

block_4_expand (Conv2D)        (None, 28, 28, 192)  6144        ['block_3_project_BN[0][0]']
```

MODEL
Architecture
End

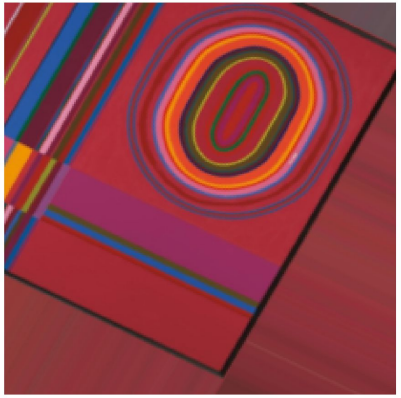
```
block_15_expand_relu (ReLU)     (None, 7, 7, 960)    0           ['block_15_expand_BN[0][0]']

block_15_depthwise (DepthwiseC  (None, 7, 7, 960)    8640        ['block_15_expand_relu[0][0]']
onv2D)

block_15_depthwise_BN (BatchNo  (None, 7, 7, 960)    3840        ['block_15_depthwise[0][0]']
rmalization)

block_15_depthwise_relu (ReLU)  (None, 7, 7, 960)    0           ['block_15_depthwise_BN[0][0]']

block_15_project (Conv2D)       (None, 7, 7, 160)    153600      ['block_15_depthwise_relu[0][0]']

block_15_project_BN (BatchNorm  (None, 7, 7, 160)    640         ['block_15_project[0][0]']
alization)

block_15_add (Add)              (None, 7, 7, 160)    0           ['block_14_add[0][0]',
                                                                 'block_15_project_BN[0][0]']

block_16_expand (Conv2D)        (None, 7, 7, 960)    153600      ['block_15_add[0][0]']

block_16_expand_BN (BatchNorma  (None, 7, 7, 960)    3840        ['block_16_expand[0][0]']
lization)

block_16_expand_relu (ReLU)     (None, 7, 7, 960)    0           ['block_16_expand_BN[0][0]']

block_16_depthwise (DepthwiseC  (None, 7, 7, 960)    8640        ['block_16_expand_relu[0][0]']
onv2D)

block_16_depthwise_BN (BatchNo  (None, 7, 7, 960)    3840        ['block_16_depthwise[0][0]']
rmalization)

block_16_depthwise_relu (ReLU)  (None, 7, 7, 960)    0           ['block_16_depthwise_BN[0][0]']

block_16_project (Conv2D)       (None, 7, 7, 320)    307200      ['block_16_depthwise_relu[0][0]']

block_16_project_BN (BatchNorm  (None, 7, 7, 320)    1280        ['block_16_project[0][0]']
alization)

Conv_1 (Conv2D)                 (None, 7, 7, 1280)   409600      ['block_16_project_BN[0][0]']

Conv_1_bn (BatchNormalization)  (None, 7, 7, 1280)   5120        ['Conv_1[0][0]']

out_relu (ReLU)                 (None, 7, 7, 1280)   0           ['Conv_1_bn[0][0]']

flatten_1 (Flatten)             (None, 62720)        0           ['out_relu[0][0]']

dense_3 (Dense)                 (None, 512)          32113152    ['flatten_1[0][0]']

dense_4 (Dense)                 (None, 50)           25650       ['dense_3[0][0]']

dense_5 (Dense)                 (None, 3)            153         ['dense_4[0][0]']

==================================================================================================
Total params: 34,396,939
Trainable params: 32,138,955
Non-trainable params: 2,257,984
```

IMAGES
Distortion (3 - class)



IMAGES
Distortion (3 - class)



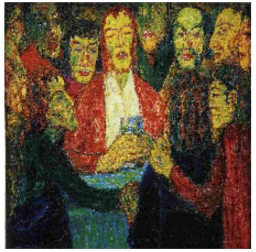



Predicted: Negative. Actual: Positive








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

Predicted: Negative. Actual: Mixed



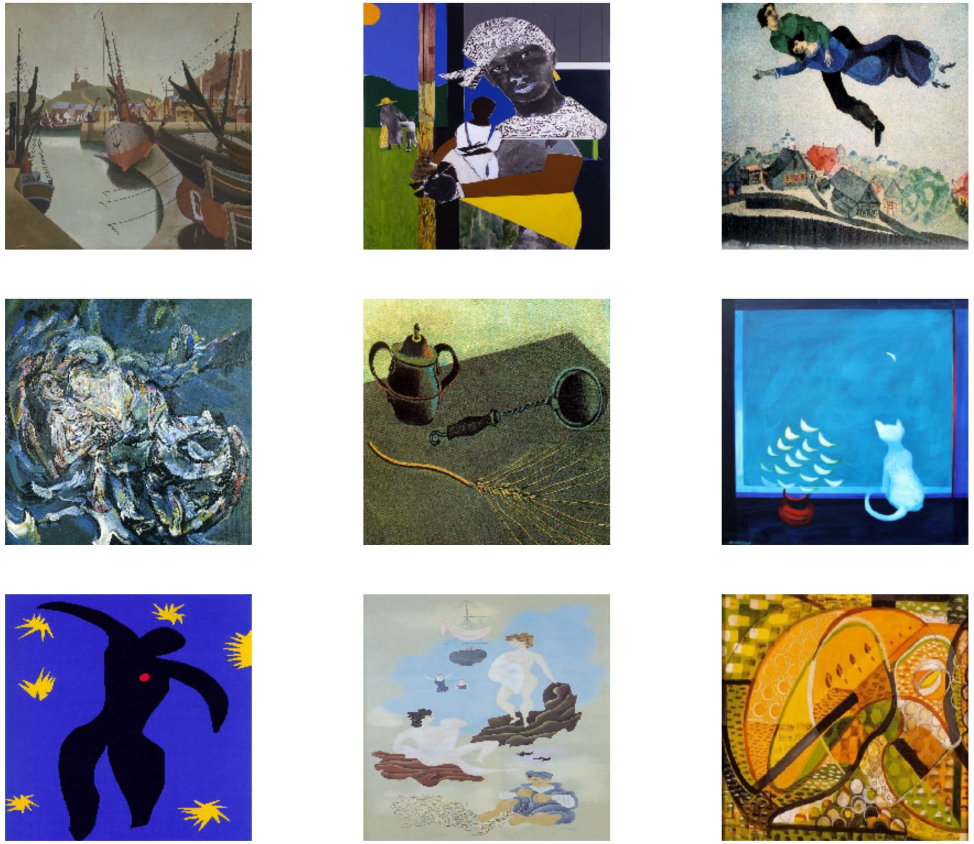






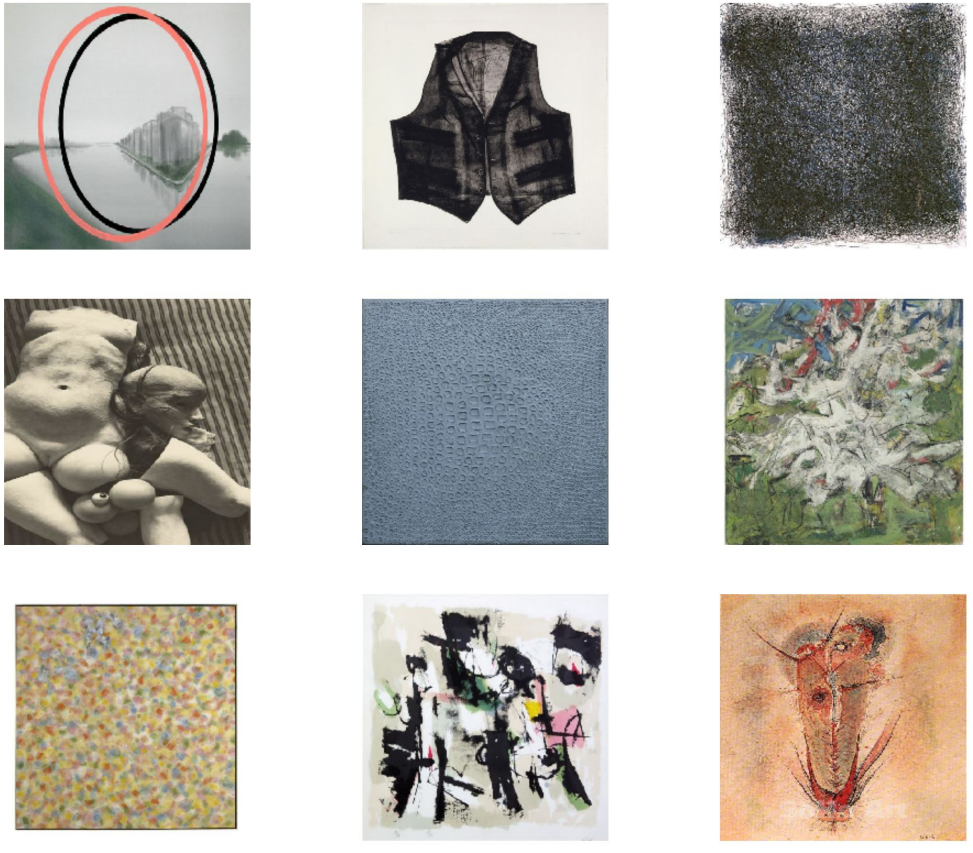
Predict **Negative**
Actual **Mixed**

Predicted: Mixed. Actual: Positive



Predict **Mixed** Actual **Positive**

Predicted: Mixed. Actual: Negative



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