Detecting Art Forgeries Using Machine Learning

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Art Forgery Detection

$$$$$$$

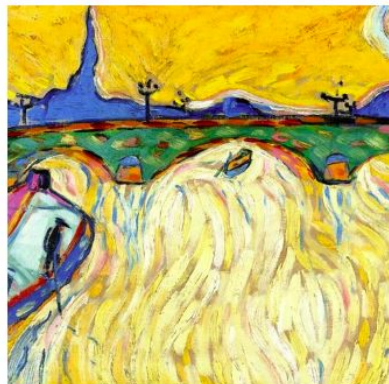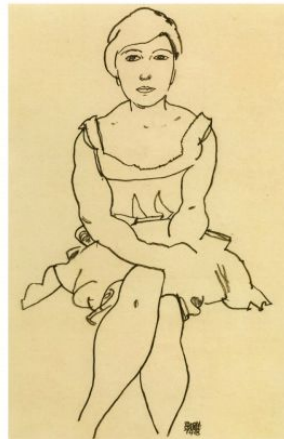**Past:**

▫ Relied on human expertise & expensive technology
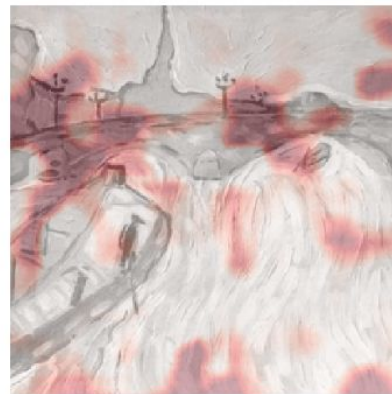
▫ Time consuming & unreliable

Machine Learning & Art Forgery

Present & Future:

▫ Machine learning analyzing artists' line/brush strokes

▫ More exact & efficient
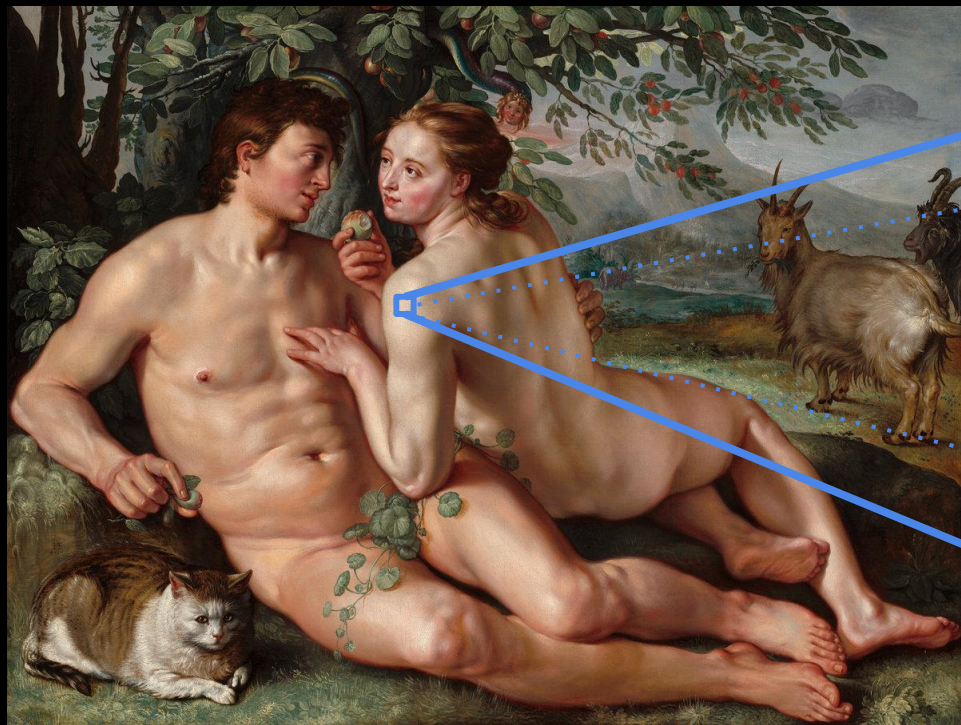

Beltracchi fake in the style of Max Pechstein

Art Recognition heat map highlighting areas of concern

This Project:
Classifying Craquelure Patterns by Region

*What is **craquelure?***

- Cracks due to old age
- Different regions (The Netherlands, Italy, France, Belgium, etc.) have different craquelure patterns due to different mediums and materials used

Hendrick Goltzius – The Fall of Man (1616)
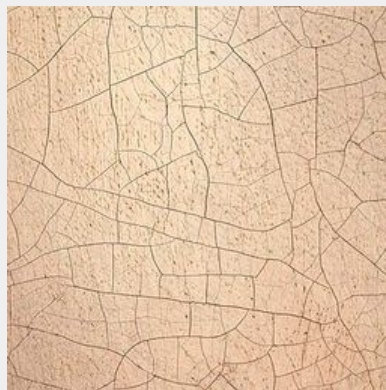(Dutch)

Flemish

Dutch

The Data

- Given the time and resource constraints, this project looked specifically at:

  - 17th century
  - Oil paintings on canvas
  - Dutch vs Flemish (Belgian)

- Models based on this data could test whether a painting claiming to be a 17th c. Dutch/Flemish is indeed from then and there

Crop of craquelure (256 x 256 px)

grayscale

color

black & white

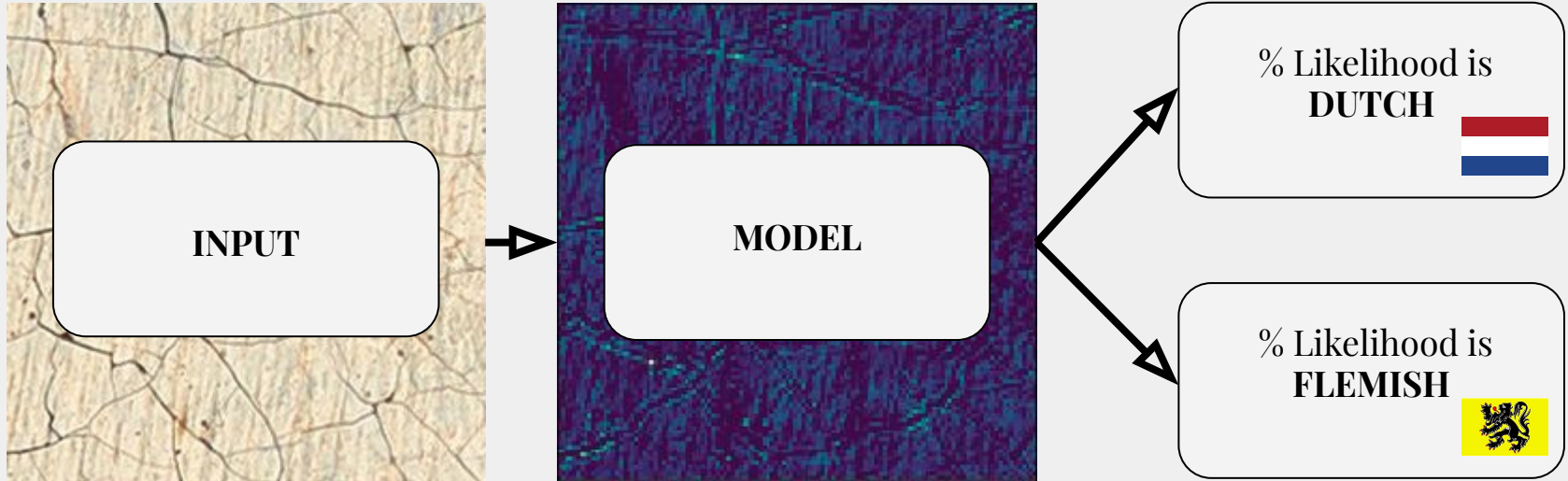Source: National Gallery of Art

Process

Model Performance

	Grayscale	Color	B&W
Training Accuracy	~ 100%	~ 97%	~ 92%
Validation Accuracy	~ 67%	~ 83%	~ 61%
Test Accuracy	~ 65%	~ 79%	TBD

Limitations & Future Directions

▣ Small & biased dataset
▣ Need automated methods for:
  ○ Collecting the craquelure images
  ○ Standardizing/scaling the images
▣ Expand model to classify more regions and centuries

Thank you!

Any questions?

You can find me at

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APPENDIX

Model: "sequential_1"

Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 124, 124, 10)	3010
max_pooling2d_1 (MaxPooling2	(None, 12, 12, 10)	0
conv2d_2 (Conv2D)	(None, 4, 4, 10)	2510
max_pooling2d_2 (MaxPooling2	(None, 1, 1, 10)	0
conv2d_3 (Conv2D)	(None, 1, 1, 10)	110
average_pooling2d_1 (Average	(None, 1, 1, 10)	0
flatten_1 (Flatten)	(None, 10)	0
dense_1 (Dense)	(None, 20)	220
dense_2 (Dense)	(None, 100)	2100
dense_3 (Dense)	(None, 200)	20200
dense_4 (Dense)	(None, 1)	201

Total params: 28,351
Trainable params: 28,351
Non-trainable params: 0

Summary of
Convolution Neural Network
(CNN)
Color Model