

Utilizing Convolutional Neural Networks to Predict Style of Paintings.

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General Assembly DSI Project 5 | 03/24/23

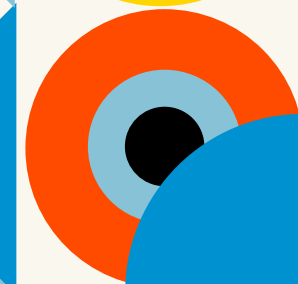
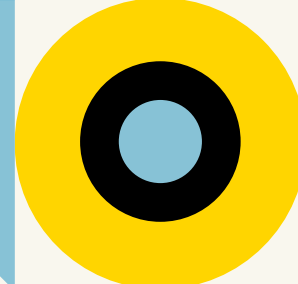
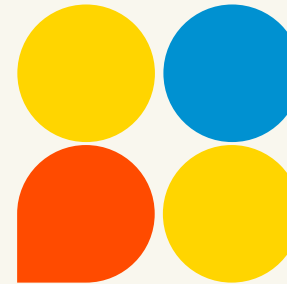
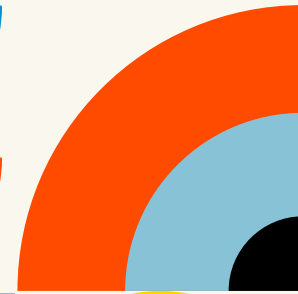
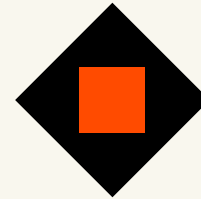
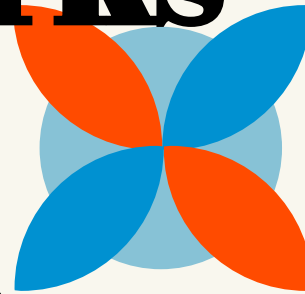
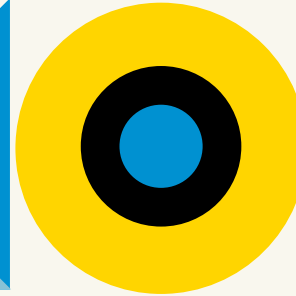
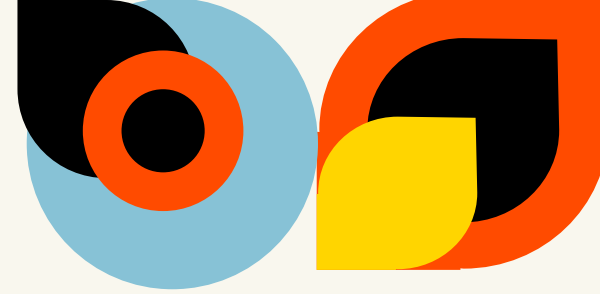
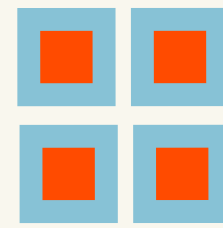
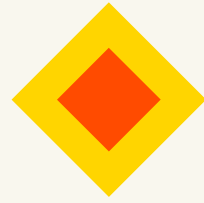
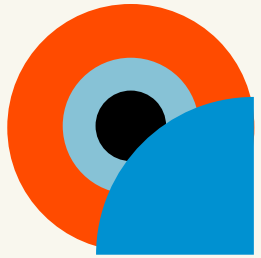


Table of Contents.



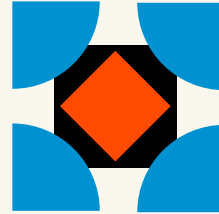
Introduction & Background

Why might
someone need
this ML model?
(The backstory)
Vocabulary



Data Collection & Cleaning

The origins of
our dataset and
our process for
preparing it.



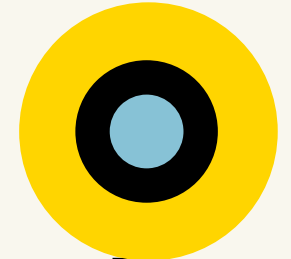
EDA & Visualization

Interesting
snippets and
statistics about
our dataset.



Modeling Process

The different
models we
evaluated (& how
they differed).



Conclusion & Next Steps

Results,
explanations,
steps forward,
and the epilogue
to our story.

BONUS: Audience
interaction!

Can a painting's art style be predicted by using the image in a CNN model?

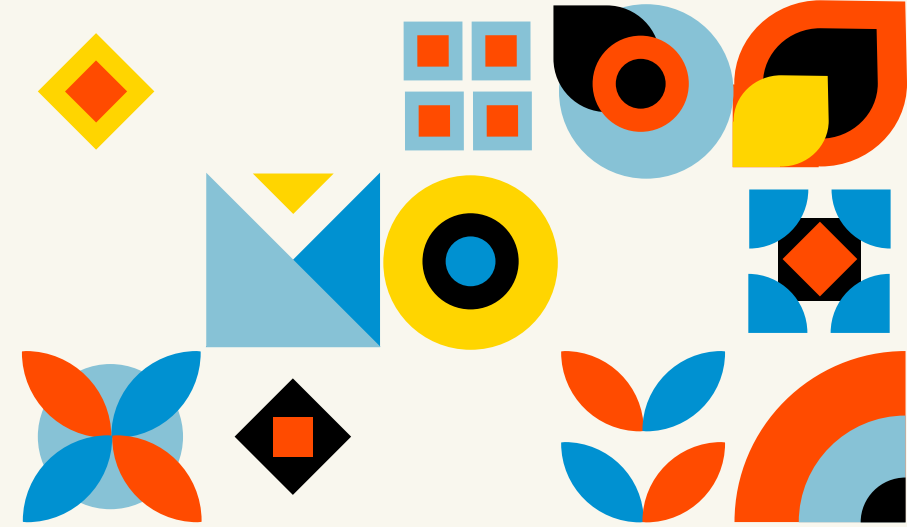


Photo by [Allef Vinicius](#) on [Unsplash](#)

- ▶ Neural networks as a “magic bullet”.
- ▶ So. Many. Art styles.
- ▶ Can be hard to distinguish between, even for art ~~experts~~ aficionados.
- ▶ CNN for predicting art style from image pixel data.

Story Introduction / Problem Statement



- ▶ **Art thieves** who pulled off the heist of the century.
- ▶ Team's resident art expert was KIA.
- ▶ No idea how to fence the stolen art without **knowing the art styles**.
- ▶ Getting a **new art expert** is too risky.
- ▶ **Train a CNN machine learning model** instead!



Neural Net Vocabulary.

- ▶ Convolutional Neural Network (CNN)
- ▶ RGB Pixel Arrays
- ▶ Convolution Filters
- ▶ Kernel Size
- ▶ Batch Normalization
- ▶ Regularization
- ▶ Dropout Layer
- ▶ Dense Layer

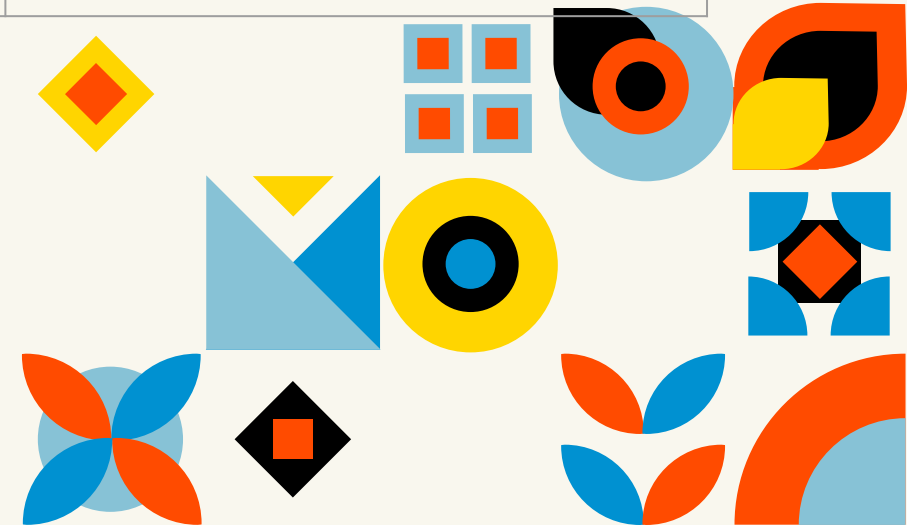


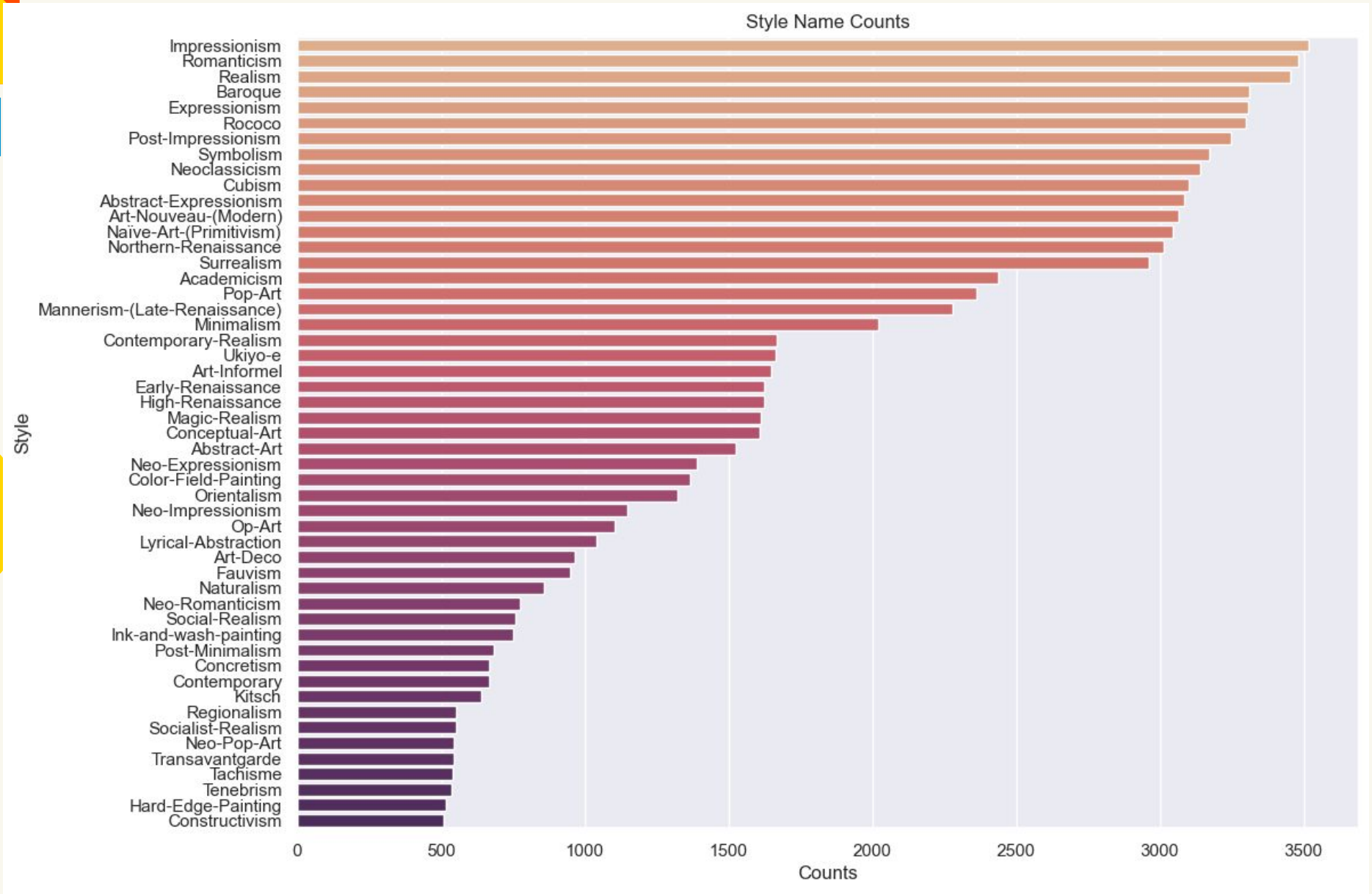
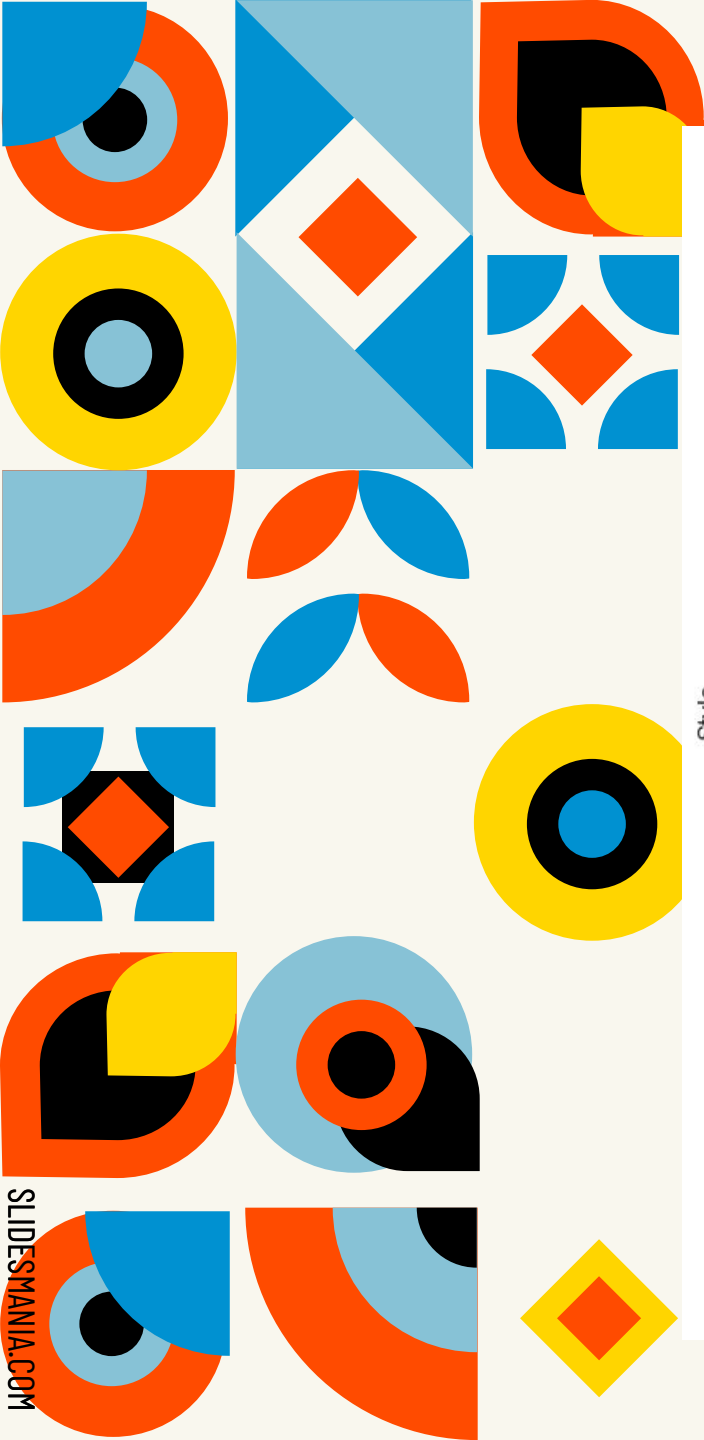
Data Dictionary.

Style - artwork style	Link - url for image	V_Sent - sentiment analysis
Artwork - art name	Language - origin language	Hex - color code
Artist	Translated - translated art name	Color - main color of work
Date	Style Num - number for style	

Data Description:

- Data Source : Kaggle
- Data Size : ~120k x 5 columns elements before cleaning
- Data Shape : 89,545 rows x 11 columns after cleaning
-

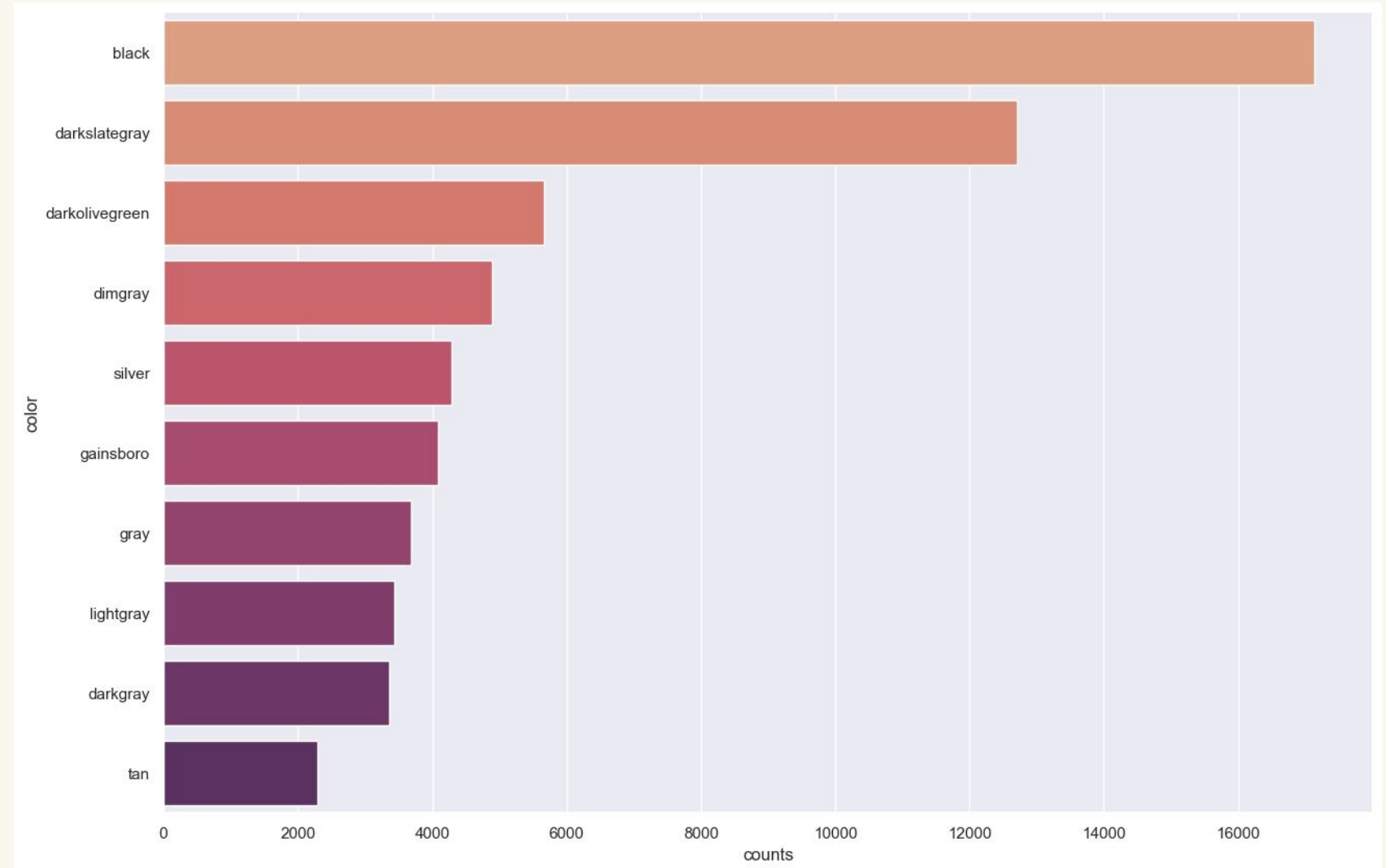


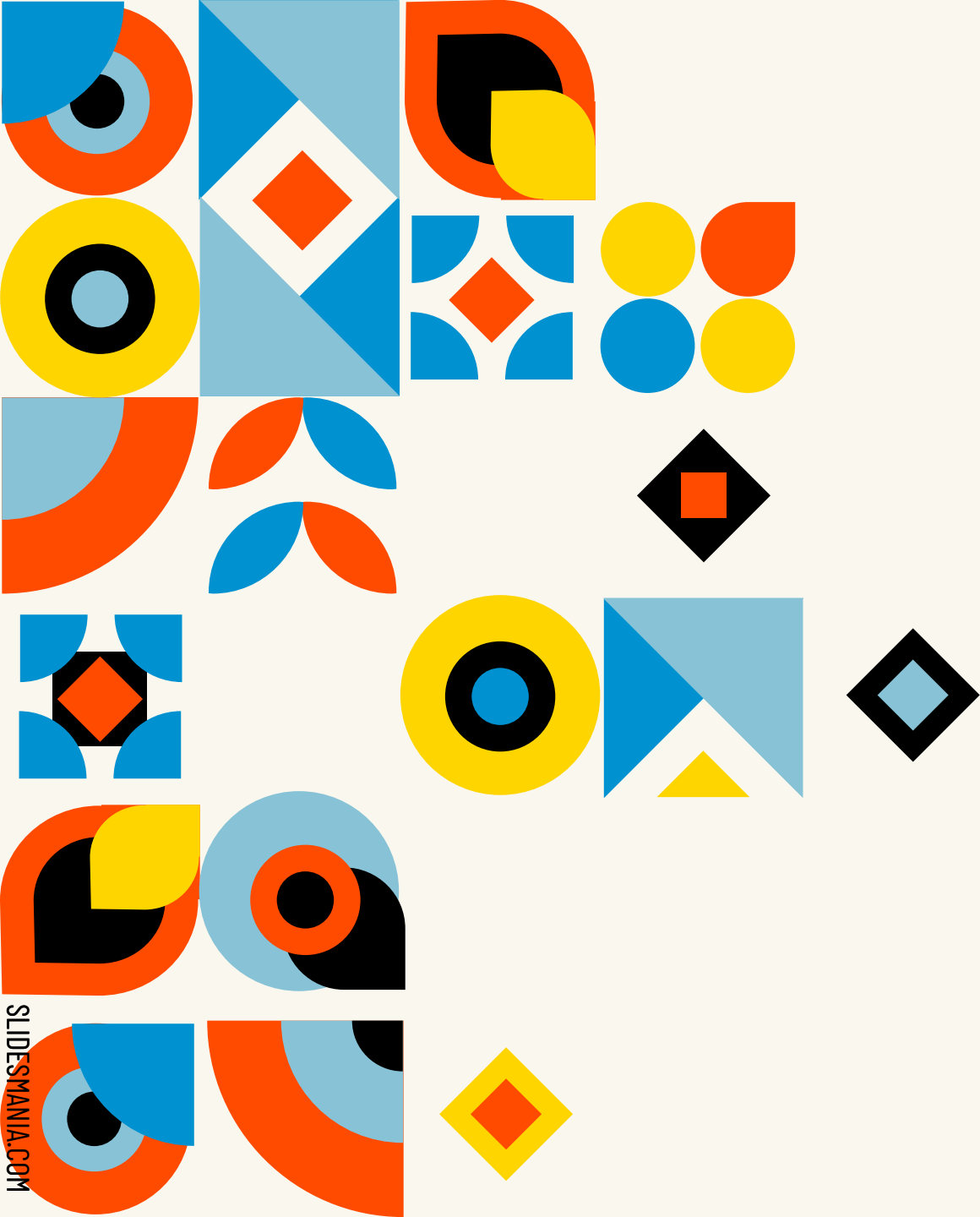


Feature Engineering



- ▶ Translated
- ▶ V_sent
- ▶ Style Number
- ▶ Color
- ▶ Language
- ▶ Hex





EDA!

Scatter of Style by Date



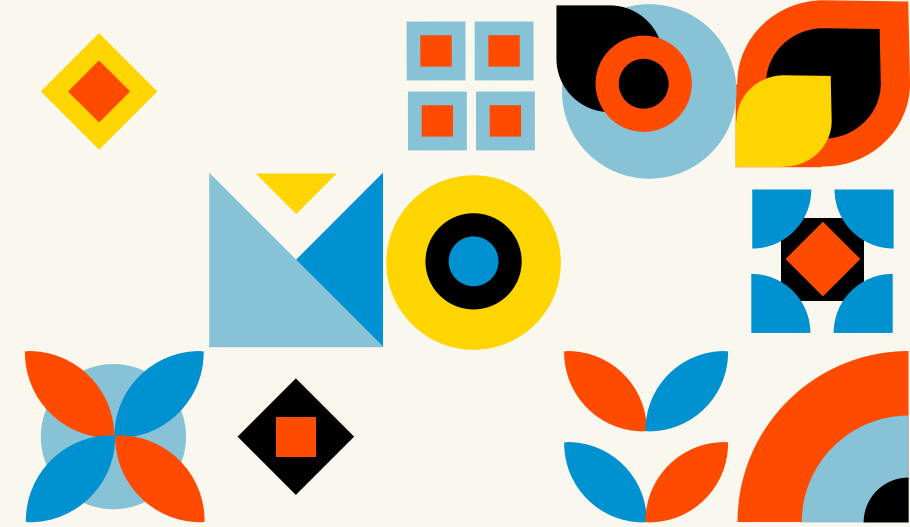


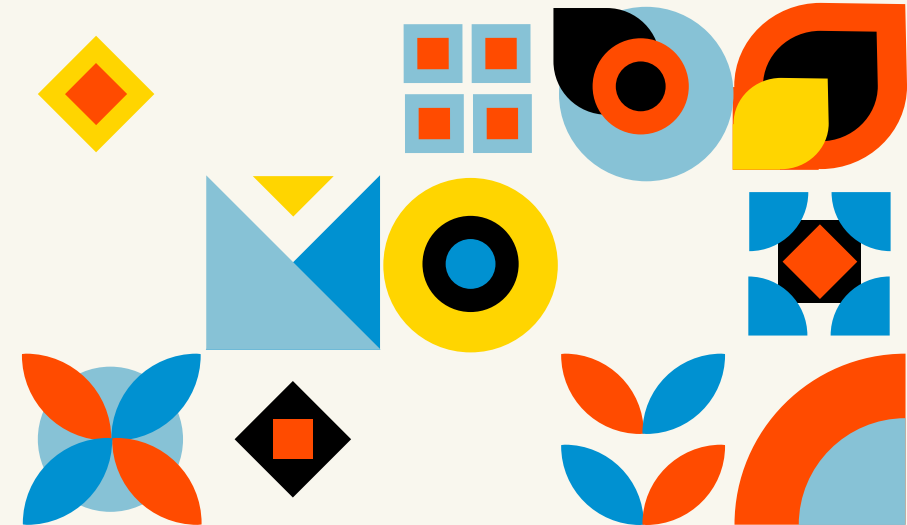
Tableau Dashboard

Preprocessing

Problems in preparing data for modeling

- Converting imgs into arrays
- Filepaths to imgs
- Creating DF of matrices

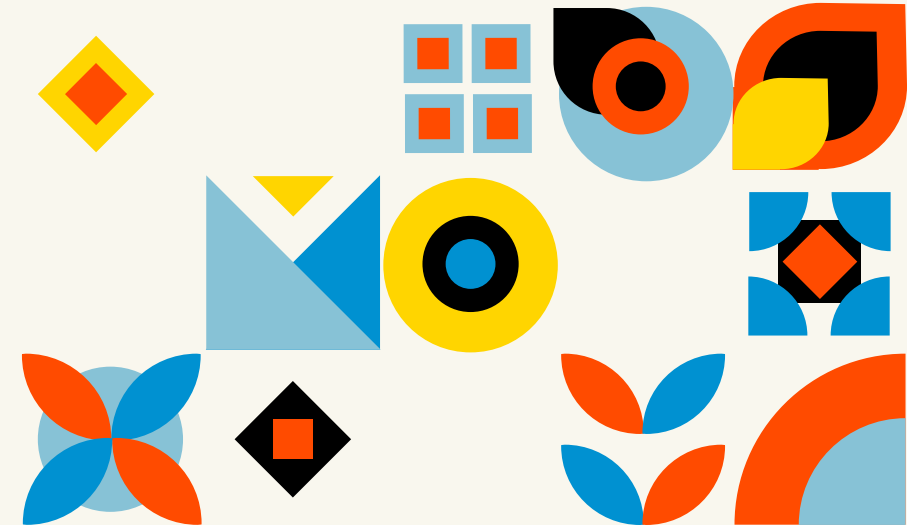
The solution?



Preprocessing Solution

Tensorflow Keras (*image_dataset_from_directory* function)

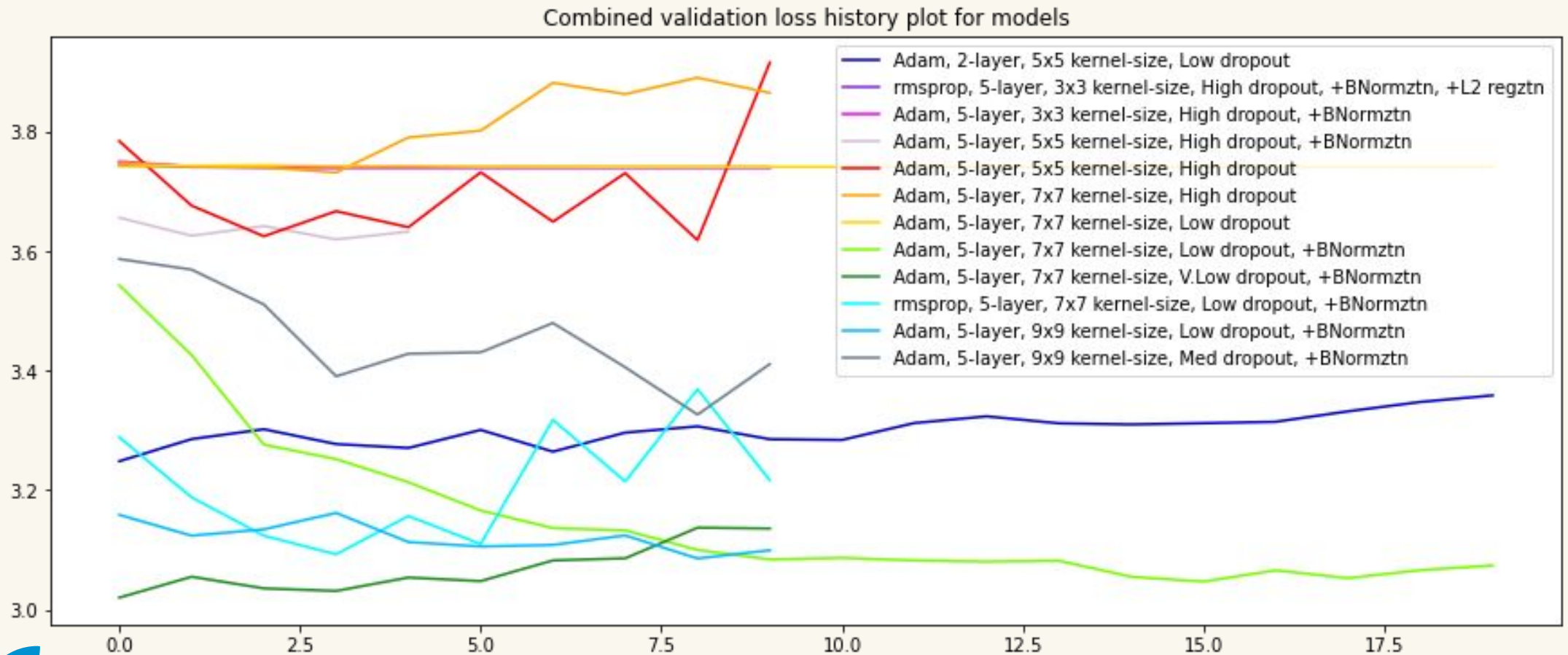
- Faster, easier, higher quality
- BatchDataset
- 250x250 pixels
- Categorical Labels





Modeling!

Sometimes, things don't always go to plan



Model Summaries.

baseline: **.0397**

Model	Train Loss	Validation Loss	Train Acc	Validation Acc
CNN with rmsprop	3.2450	3.2479	0.1456	0.1326
CNN with 3 Dense Layers	2.8841	3.079	0.1989	0.1672
CNN with 9x9 Kernel Size and Dropout (.1 - .2)	3.0910	3.0995	0.1628	0.1599
CNN with BatchNormalization and Dropout (.5-.1)	2.6489	3.159	0.2560	0.1797
CNN with 5 Filters, 7x7 Kernel Size, Dropout(.1 - .2), & BatchNormalization	3.0741	3.0341	0.1742	0.1783

A decorative pattern on the left side of the slide consisting of various geometric shapes like circles, squares, diamonds, and triangles in blue, orange, yellow, and black. Some shapes are nested or overlapping, creating a complex, abstract design.

Recommendations

- Have some prior knowledge on what you're about to steal, helps a lot
- Don't steal 100,000 artworks at one time, or at least make sure they're all the same style
- Making a machine learning model can takes more time than the cops are giving us
- The model can't direct us much, so lets hope museums have a buy-back program



Next Steps.

- ▶ More Time, More Processing Power
- ▶ Combine Classes or Reduce Them
- ▶ Less downsizing, Experiment with more Models

Expressionism or Romanticism?



**Conclusion:
Failed Model but
Successful
Experience**



Streamlit Application!



Welcome to Project Art Thieves!

Input a picture and we will try to predict which style it is from!

Upload An Image:

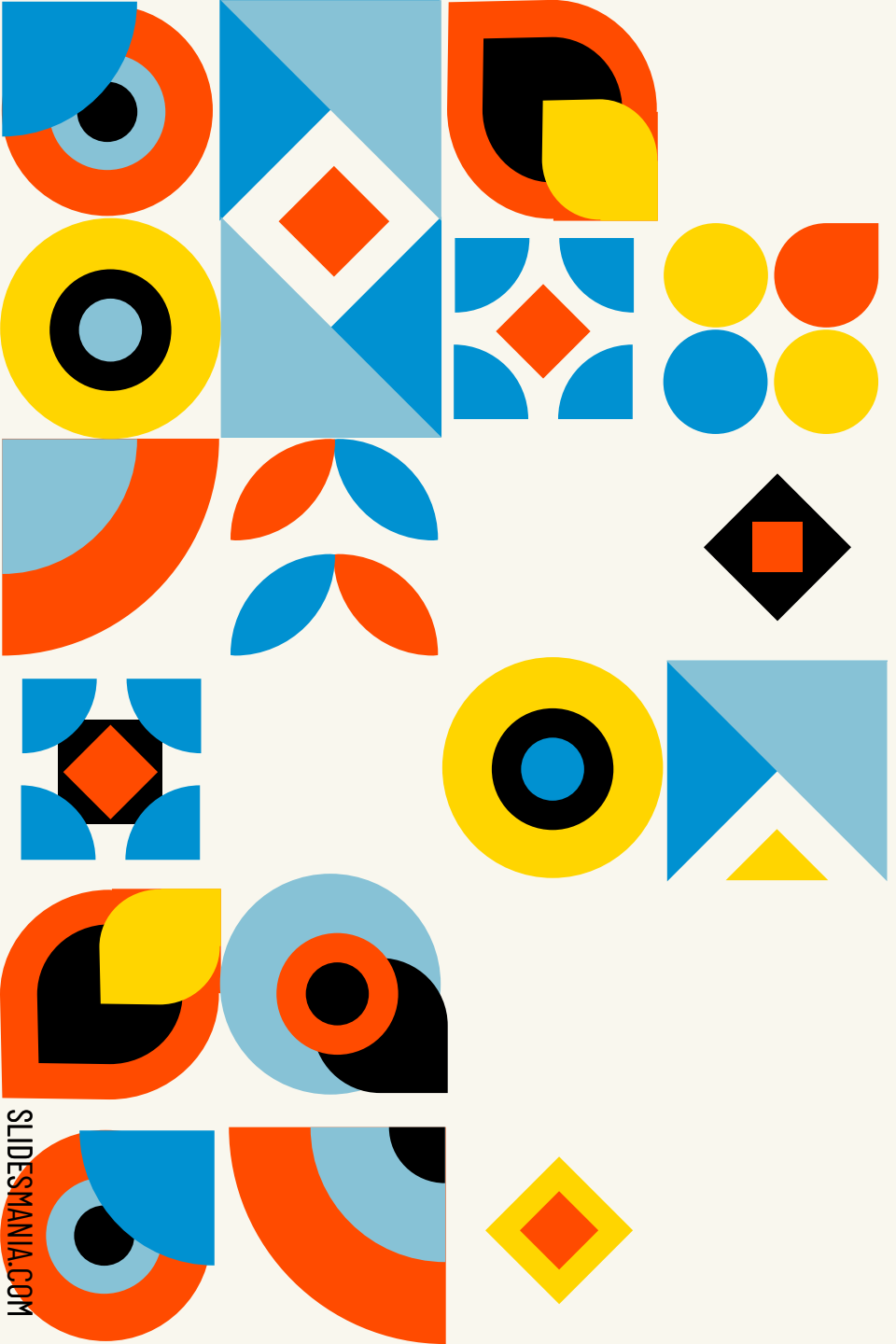


Drag and drop file here

Limit 200MB per file • JPG, PNG

Browse files





Questions ?