Image Analysis Modeling

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AGENDA

01 BACKGROUND
Project Motivation
Research Goals

03 DATA ANALYSIS
Image Resizing
ResNet Model

02 DATA ACQUISITION/PLAN
MET Museum API

04 RESULTS
Accuracy Metrics
Graphs

01
Background

Project Overview / Motivation

Goal: Build a CNN model to classify European drawings vs paintings from the MET museum (1800-1900)

Research Question: How accurately can a neural network model differentiate between drawings and paintings in the MET Museum's collection?

02

Data Acquisition / Plan

Data Acquisition and Exploration

- Source: MET Museum API (Open access) to pull images and Metadata
- Sample size: ~1000 images, resized 224 x 224
- Filters
    - European origin
    - Between the years 1800-1900
    - Color Drawings and Paintings

Field	Type	Explanation	Potential Response
Year	string	Year piece was made in	"1983"
Image URL	string	URL to the primary image of an object in JPEG format	"https://images.metmuseum.org/CRDImages/ep/original/DT1567.jpg"
Department	String	Department a given image is stored under, Drawing/Painting	"Painting"

EDA: evaluate distribution of artifact frequency across time
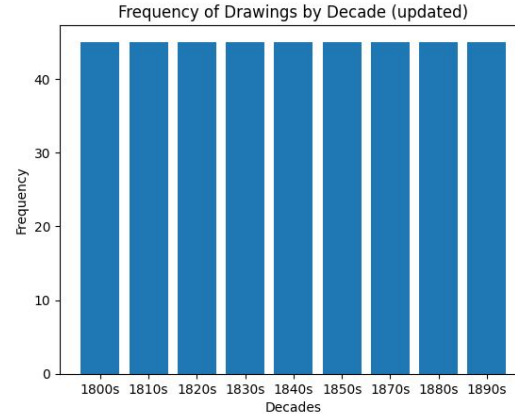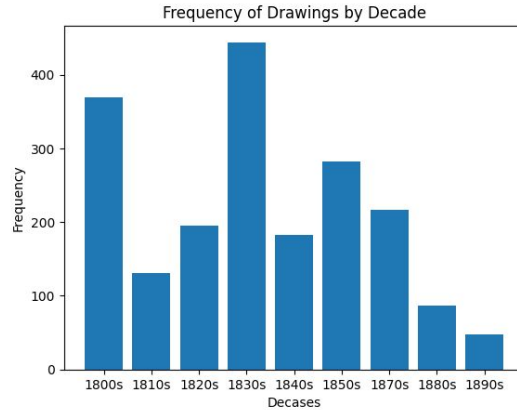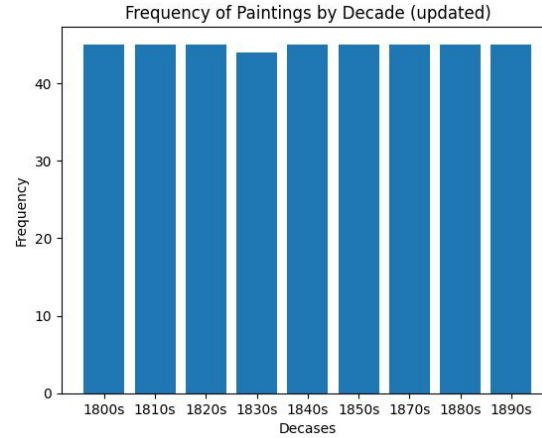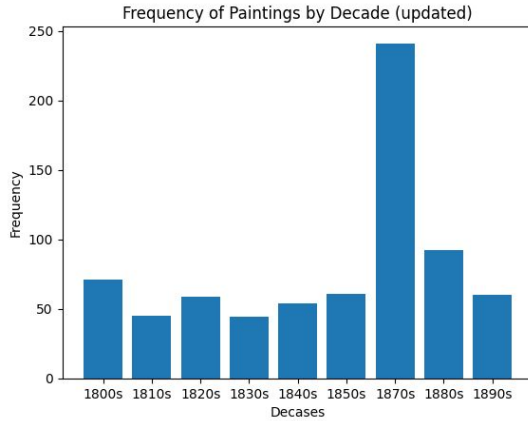
Data Analysis Plan

1. Data Cleaning	2. Image Processing	3. Model Creation	4. Testing / Results

1. Data Cleaning
- Equal number of paintings and drawings (~400 each)
- Equal number of pieces across each decade (~40)
- Binary label encoding of artwork types where 1 -> Drawing and 0 -> Painting

2. Image Processing
- Fetched images hosted at url
- Resized and standardized images to 224 x 224 resolution
- Attempted to preserve aspect ratio

3. Model Creation
- Used Pre-Trained ResNet50 Model
- Added custom classifier layer on top

4. Testing / Results
- Used 80 / 20 train test split
- Measured accuracy of CNN

03

Data Analysis

Tricky Analysis Decisions

- Switched from Photographs vs Drawings to Drawings vs paintings
  - Due to a lack of records for photos
- Time range reduced to 1800-1900 due to a lack of modern data
- Images were resized and padded to preserve aspect ratios
- Addressed class imbalances by sampling across decades
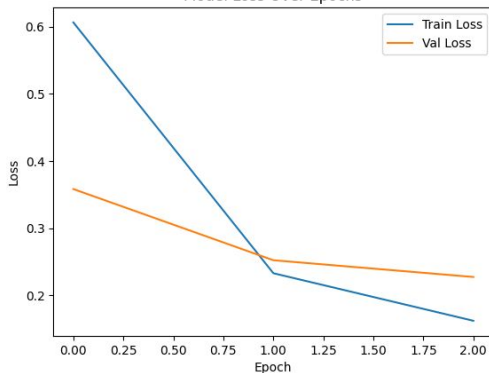
Biases & Uncertainty

- Because the model is trained on artwork from 1800-1900, to what degree might it fail to keep up with newer art trends or mediums?
- RGB conversion values differ in variation for B&W images and full-color images, which may translate to inaccurate color differences
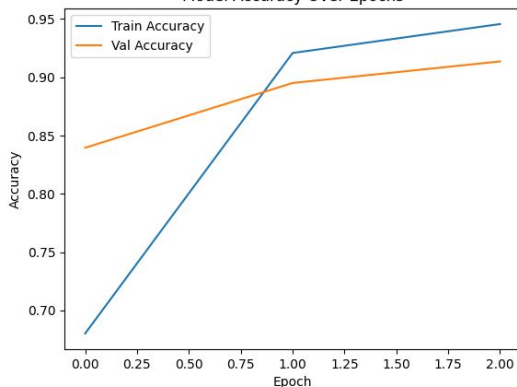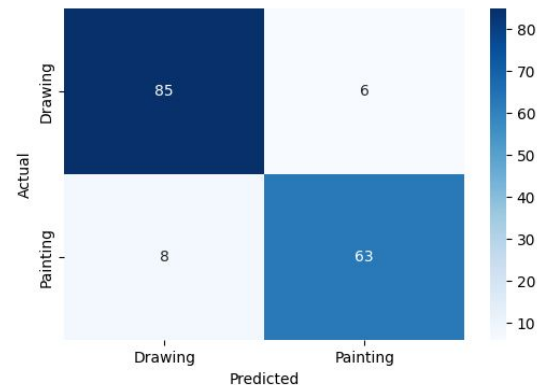
04

Results and Conclusions

RESULTS

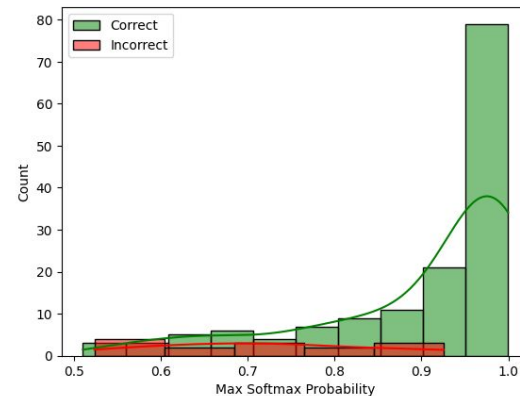Model Loss Over Epochs

Model Accuracy Over Epochs

Confusion Matrix

Prediction Confidence

- 3 Epochs was ideal balance between loss and accuracy
- Validation Accuracy: 91%
- Training Accuracy: 95%
- Slightly more accurate for Drawings than Paintings

NEXT STEPS

POTENTIAL OVERFITTING

Consider adding additional filters/layers to control extraneous variables that may account for overfitting

ADDITIONAL CLASSES

Given success of current model, consider expanding to encompass photographs or images of different sizes.

REDUCE RUNTIME?

We came across multiple issues with the size of image files causing long run time and occasionally for the kernel to crash. Would using grayscale instead of RGB images still allow for an accurate model?

SPECIFIC TO TIME PERIOD?

What is the most effective way to organize art? Decade? Art period? Artist?

References

[1]   C. Coates, "Best Practice in Making Museums More Accessible to Visually Impaired Visitors," MuseumNext, Dec. 08, 2019.
[2]   GeeksforGeeks, "Image Classification using ResNet," GeeksforGeeks, Feb. 13, 2025. https://www.geeksforgeeks.org/image-classification-using-resnet/

Questions?

Thank you!