Artist Identification with Convolutional Neural Networks

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Overview

Artist identification of paintings is traditionally performed by expert art historians. However, feature-based approaches have had some success recently [1]. We aim to outperform existing machine learning methods with CNNs and also to explore how CNN-based architectures make their decisions.

Objectives

1. Train a network to accurately identify artists
2. Explore how the trained network differentiates artists

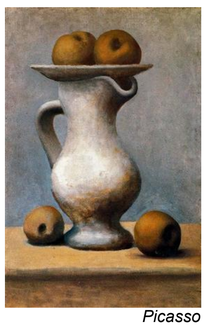
Dataset

We obtain paintings for 57 artists across a variety of styles and time periods from Wikiart [2]. We select 300 paintings per artist to ensure a balanced dataset.

Cassatt

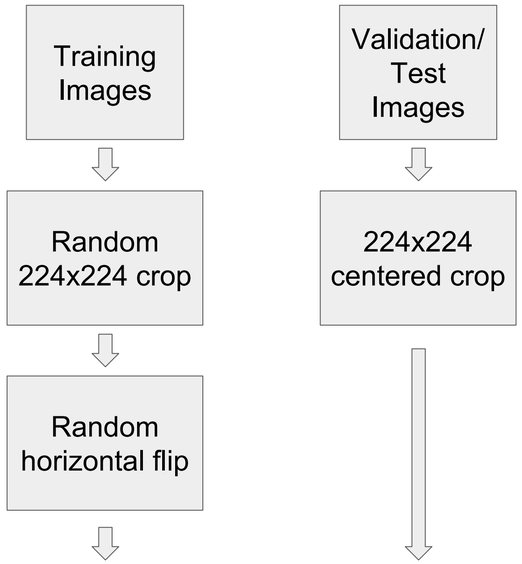
Monet

Picasso



Picasso

Methodology



3 different network architectures

Model	Details
Baseline CNN	2 3x3 CONV - 2x2 POOL, followed by 2 FC layers
ResNet-18 from scratch	Custom FC layer
ResNet-18 with transfer learning	Pre-trained on ImageNet, custom FC layer

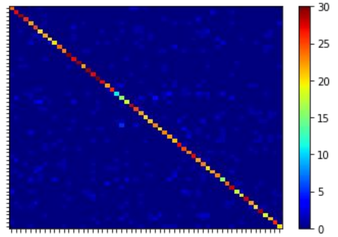
Class scores

Durer: …
Van Gogh: …
Etc. (1 score for each artist)

Results

	Test set classification Accuracy %	
Model	**Top-1**	**Top-3**
Baseline SVM [1]	57.8%	Not reported
Baseline CNN	42.2%	62.2%
ResNet-18 from scratch	51.1%	71.0%
ResNet-18 with transfer learning	**77.7%**	**89.8%**

Confusion matrix for best network



- Extensive hyperparameter optimization to maximize performance
- The transfer learning approach works best, indicating that ImageNet features are relevant for paintings as well
- A few artists are misclassified much more often than others (although they are not confused for each other)

Other explorations

Saliency maps show that our network does not focus on any particular area of paintings (e.g. objects or faces) to determine artist.

References

[1] B. Saleh and A. M. Elgammal. Large-scale classification of fine-art paintings: Learning the right metric on the right feature. CoRR, abs/1505.00855, 2015.
[2] WikiArt. https://www.wikiart.org/en/about