BEUTH HOCHSCHULE FÜR TECHNIK BERLIN
University of Applied Sciences

Artwork Style Prediction

Learning from Images WS2019/20
Prof. Dr. Hildebrand

Presented By: Shawaiz Shah

Problem

For an artwork, recognizing information like visual style, medium, creation year is still a challenging problem and requires expertise of connoisseurship. In this exercise, we investigate the application of machine learning for identification of visual style

Realism

impressionism

Related Work

The possibility of application of machine learning was previously discussed by paper titled Neural Algorithm of Artistic Style (2015) and later by RASTA (2017) where author applied CNN.

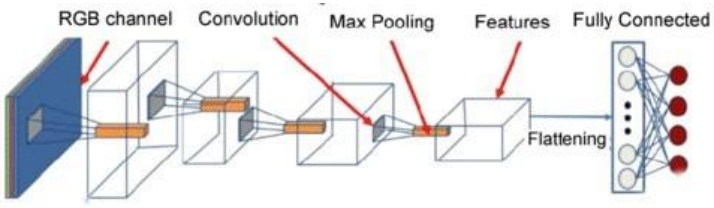
Our Approach

We evaluated RestNet50 and used transfer learning for the stated purposes. The model was trained on 5k images from WikiArt dataset which consists of 100k images of paintings of different styles, labelled with style, genre, artist and creation year

Methodology

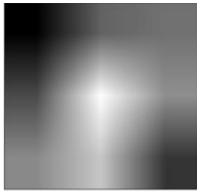
Our model was built on top of state-of-the art implementation of Deep-CNN aka RestNet50. The pre-trained model consisted of two parts; Feature extractor and classifier.

As first step, feature extractor was kept freeze, and the last layer was fine-tuned. This layer was responsible for classification; hence it was retrained with 10 most frequent classes. The results were further improved in the next step when instead of fine-tuning last layer, we tried to retrain all fully connected layers of classifier, while increasing number of neurons/filters.



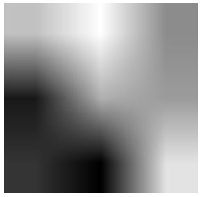
Deep-CNN Architecture

Original

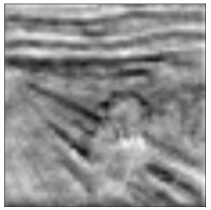


Filter res2a_branch2b

Filter Map res2b_branch2b



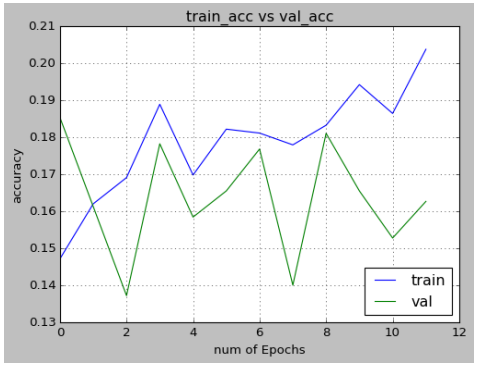
Filter res2b_branch2b



Filter Map res2b_branch2b

Results

Model was evaluated by Accuracy metric. The model in question achieved 20.3% accuracy over 12 epochs.



Accuracy per Epoch

References

- API Client for Demo - https://github.com/shahshawaiz/artwork-style-prediction
- Recognizing Art Style Automatically in painting with deep learning (2017)
- Neural Algorithm of Artistic Style (2017)
- The Shape of Art History in the Eyes of the Machine (2018)
- Visualizing Features and Activation Maps - https://machinelearningmastery.com/how-to-visualize-filters-and-feature-maps-in-convolutional-neural-networks/
- Transfer Learning - https://towardsdatascience.com/a-comprehensive-hands-on-guide-to-transfer-learning-with-real-world-applications-in-deep-learning-212bf3b2f27a