

Artist recognition with computer vision

Intermediate Presentation

Course: Applications of Image
and Video Processing
Maastricht University

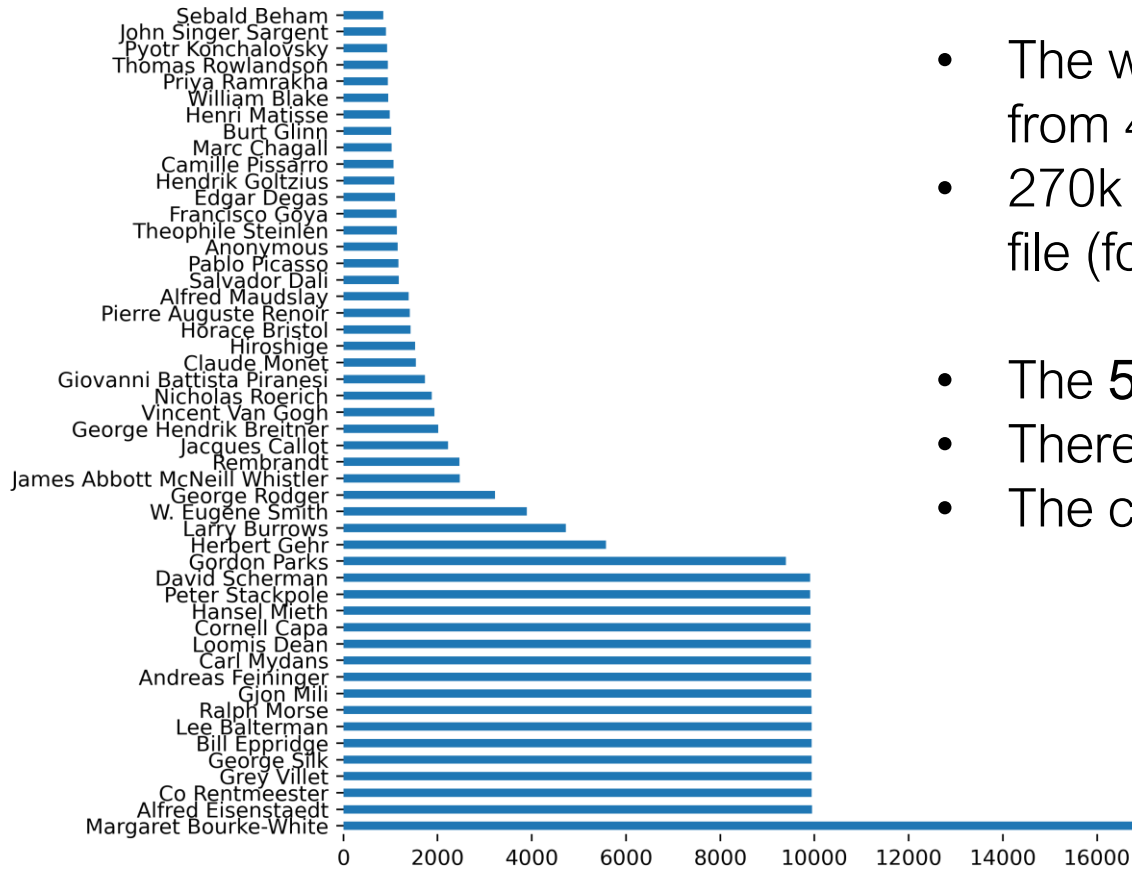


Lukas Schreiner

Overview

1. Data
 - Dataset
 - Pre-processing
2. Model
 - Set up
 - ResNet50
3. Issues & Challenges
4. Outlook

Art500k Dataset¹

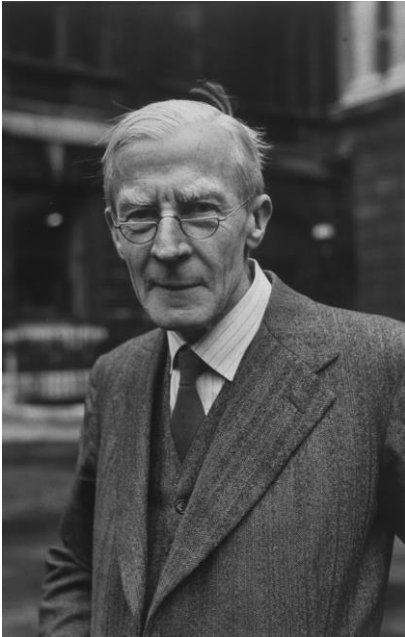


- The whole dataset set contains 767k artworks from 41k different artists
- 270k artworks from 8k artists are contained as a file (for the rest, links are provided)
- The **50 artists with the most artworks** are chosen
- There are ~500 - ~2.5k artwork per artist
- The constraint dataset includes 39'962 artworks

1: Hui Mao, Ming Cheung, and James She. Deepart: Learning joint representations of visualarts. In Proceedings of the 25th ACM international conference on Multimedia, pages 1183–1191. ACM, 2017

Data - Dataset

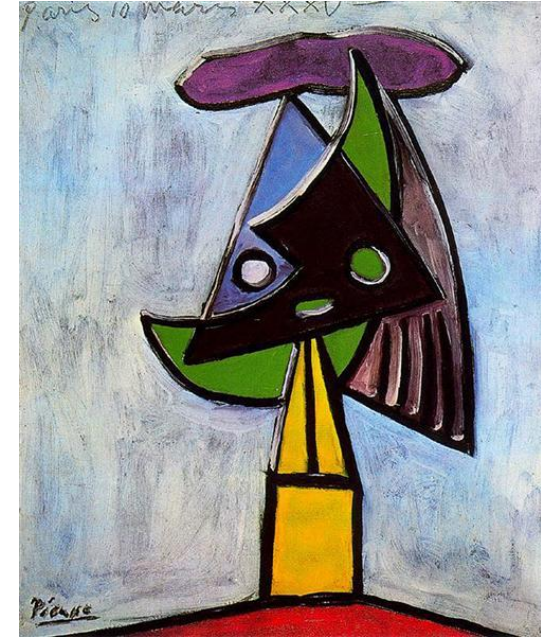
Examples



Alfred Eisenstaedt – 50S Primarily

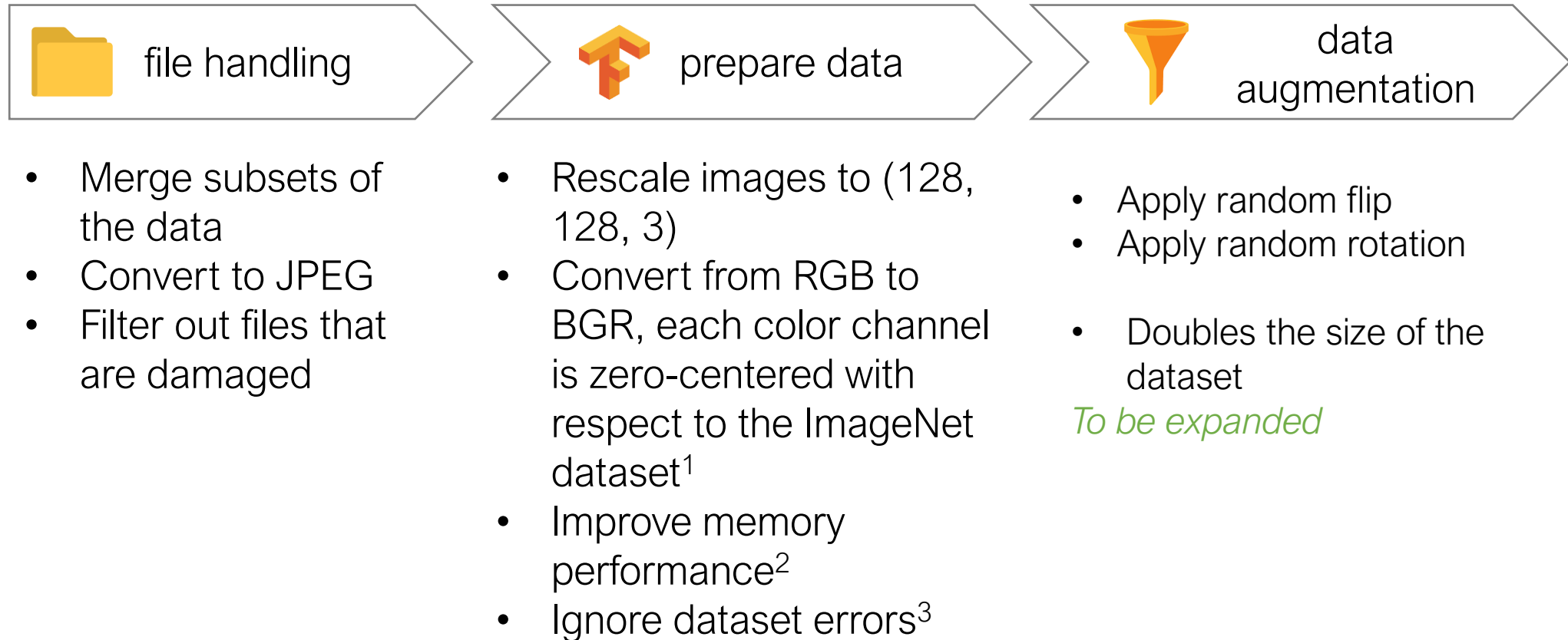


Albrecht Dürer – A young hare



Picasso – Head of a Woman

Data handling



1: https://www.tensorflow.org/api_docs/python/tf/keras/applications/resnet50/preprocess_input

2: https://www.tensorflow.org/api_docs/python/tf/data/Dataset#prefetch

3: https://www.tensorflow.org/api_docs/python/tf/data/experimental/ignore_errors



Project goals

- Train a classifier that is able to estimate
 - ➡
 - Artist
 - Year
 - Artistic Movement
- ➡
 - Test various models from the literature
 - Frequency domain filtering, sharpening filters
- ➡
 - Data augmentation

Model settings

- Adam optimizer¹
- Initial learning rate: 1e-5
- Categorical Cross Entropy Loss
- No. Epochs: 50
- Batch size: 16
- Rescale images to (128, 128, 3)
- 90% training set, 10% test set
- Data is shuffled
- Call-backs:
 - ReduceLROnPlateau²
 - ModelCheckpoint³
 - TensorBoard⁴

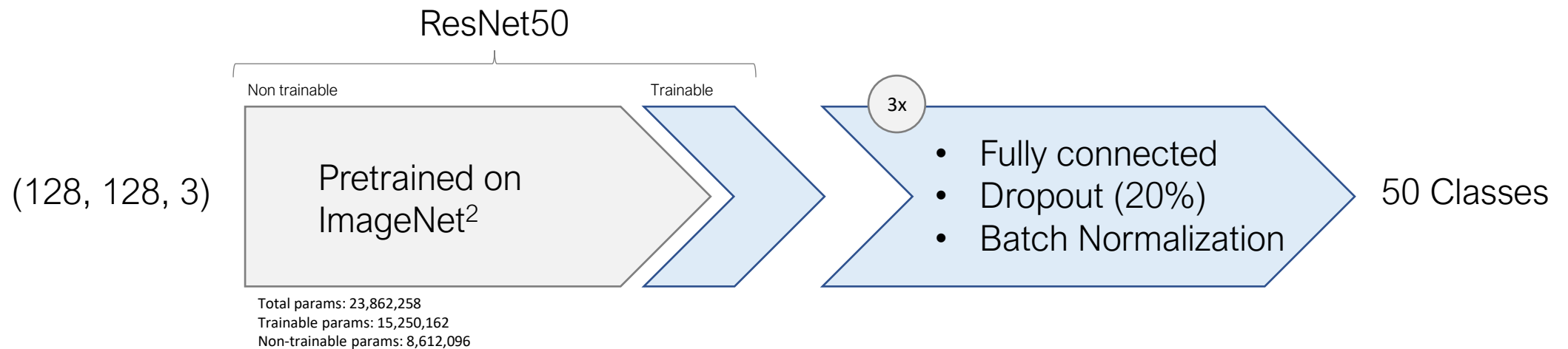
1: Kingma, Diederik P., and Jimmy Ba. "Adam: A method for stochastic optimization." arXiv preprint arXiv:1412.6980 (2014)

2: https://keras.io/api/callbacks/reduce_lr_on_plateau/

3: https://www.tensorflow.org/api_docs/python/tf/keras/callbacks/ModelCheckpoint

4: <https://www.tensorflow.org/tensorboard>

Model architecture based on ResNet50¹

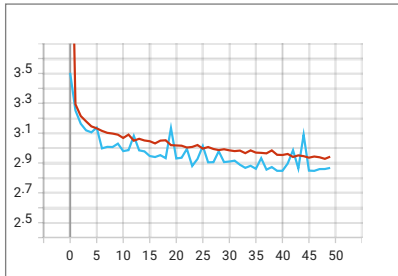


1: He, Kaiming, et al. "Deep residual learning for image recognition." Proceedings of the IEEE conference on computer vision and pattern recognition. 2016.2
2: <https://image-net.org/>

Issues & Challenges

Validation error is below training error

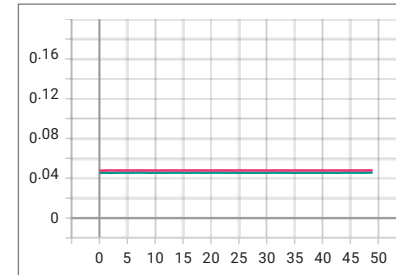
1



- Test set only contains very few “easy” examples
- Bug in when handling the image files leads to a disproportion distribution of data classes
- Use more epochs

Validation error stays constant

3



- Insufficient shuffling leads to the validation set consisting of only unknown artists

Hardware running out of memory

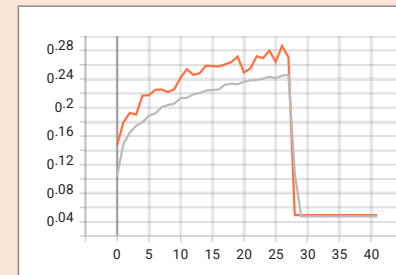
2



- Decrease image scaling
- Decrease Batch size

Validation error becomes NaN

4



- Model is diverging, exploding gradients
- Decrease learning rate, reduce it over time

Outlook

- Stabilising the model
- Increase Accuracy
- Try deeper models (ResNet150)
- Data Augmentation, Filtering
- Include more Information in the labels (year, art epoch)
- Analyse confusion matrix

