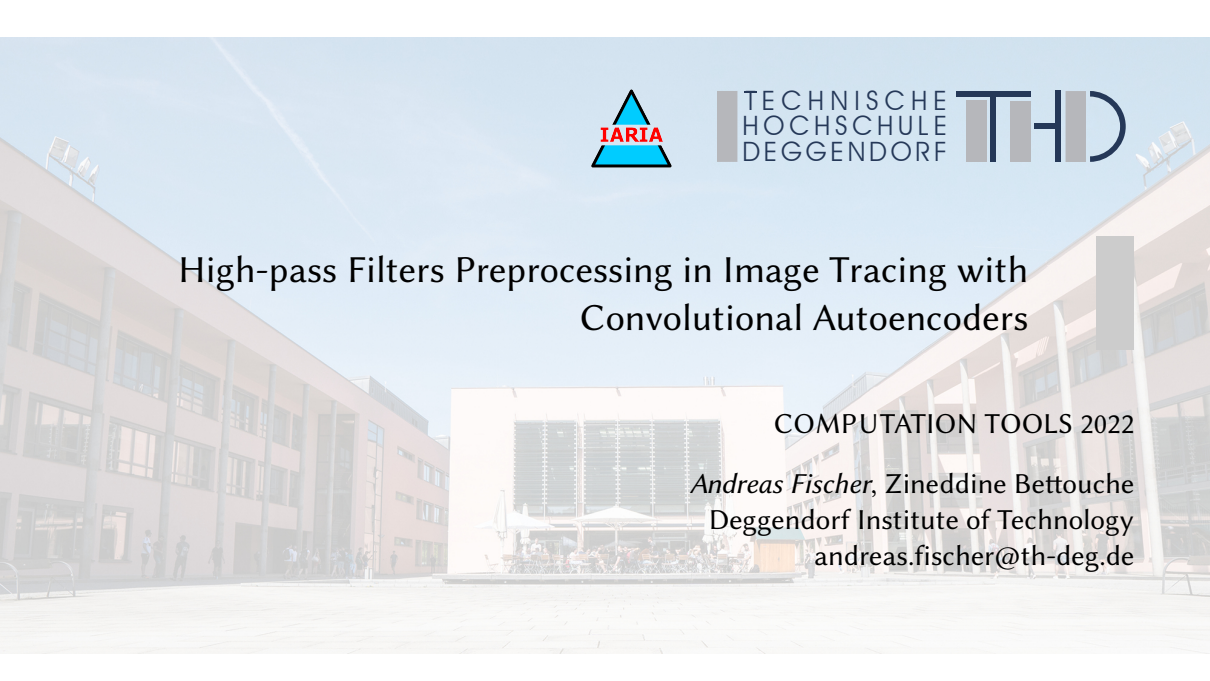


High-pass Filters Preprocessing in Image Tracing with Convolutional Autoencoders

COMPUTATION TOOLS 2022

Andreas Fischer, Zineddine Bettouche
Deggendorf Institute of Technology
andreas.fischer@th-deg.de

About the authors

Andreas Fischer

since 2020	CIO, Deggendorf Institute of Technology
since 2017	Full Professor at Deggendorf Institute of Technology.
2017	Postdoctoral researcher, Karlstad University.
2017	PhD in computer science, University of Passau.
2008–2017	Research Associate, University of Passau.

Zineddine Bettouche

since 2022	Research Associate, Deggendorf Institute of Technology
2022	Master of Science, Deggendorf Institute of Technology
2020	Bachelor of Science, Boumerdes University

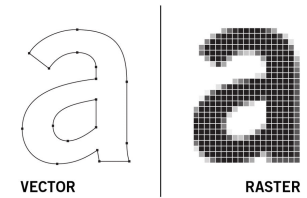
Introduction

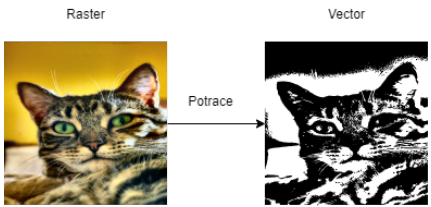
Motivation

- Improve image vectorization results
- Create smaller / more abstract vector images

Approach

- Use autoencoder for noise reduction
- Evaluate effect of high-pass filter preprocessing
- Builds on previous work by Amesberger & Fischer

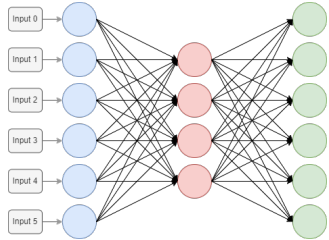




Background

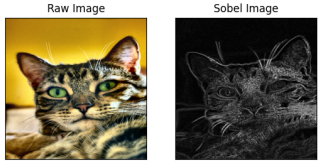
Autoencoder

- Feed-forward neural network
- Unsupervised: Try to recreate input
- Bottleneck removes noise

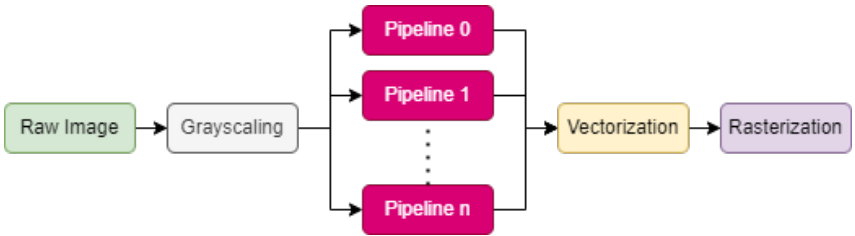


High-pass filters

- Focus on high frequencies in the image
- Commonly used for edge detection

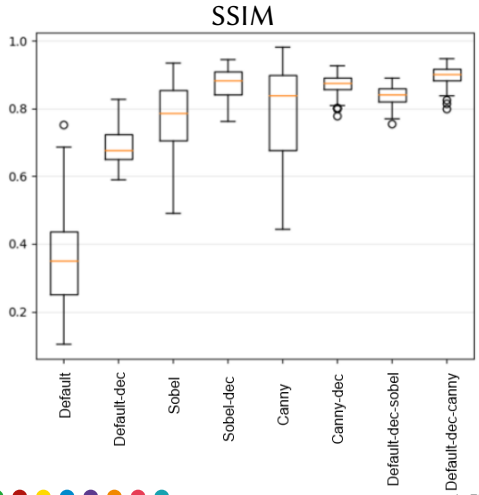


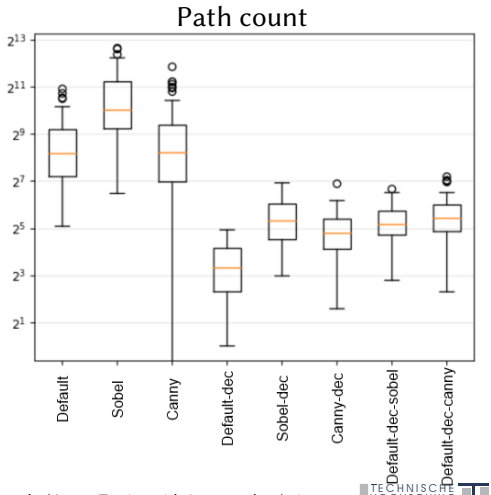
Evaluation pipeline



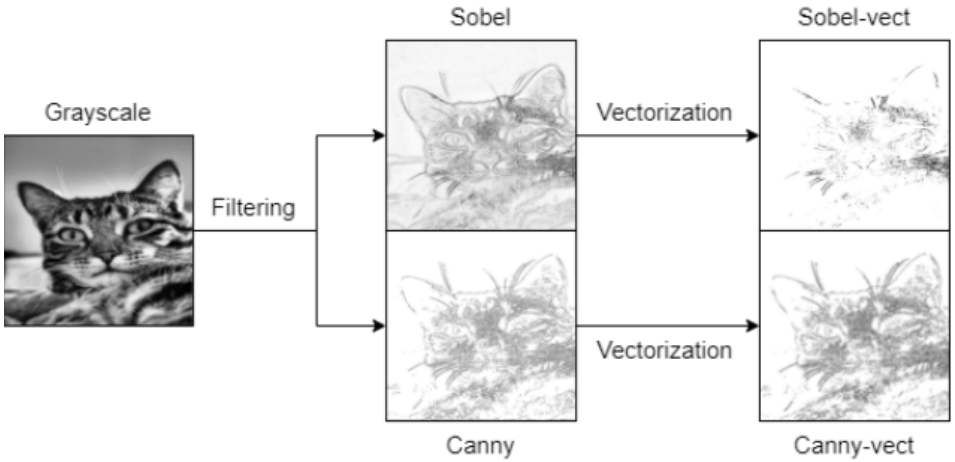
- Evaluate multiple combinations of autoencoding & filters
- Using Sobel & Canny edge-detection filters
- Quality is measured by similarity to input image
- Quantified by structured similarity index (SSIM) & SVG path count

Evaluation

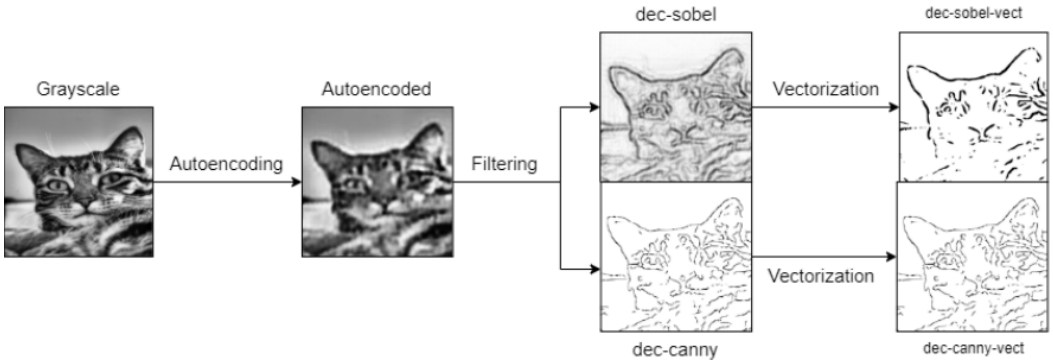




Without autoencoder



With autoencoder



Some more exemplary results

Conclusion

Investigated various improvements to image vectorization

High-pass filter highlights object, but vectorization is bad

Autoencoder removes noise, object features become clearer

Quantitative results: SSIM increases, path count decreases
$\rightarrow$ goals reached