

STEFAN KOLEK

Explainable Computer Vision Specialist

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EDUCATION

Ph.D. Computer Science, Ludwig-Maximilians-Universität München (expected) February 2026
Advisor: Prof. Dr. Gitta Kutyniok
Dissertation: Sparse Representation Methods for Explainable Image Classification

M.Sc. Mathematics, Technische Universität Berlin March 2021

B.Sc. Mathematics, Ludwig-Maximilians-Universität München August 2018

TECHNICAL SKILLS

Languages: *German (native), Spanish (fluent), English (fluent), Italian (intermediate)*

Programming Languages: *Python (advanced), C++ (basics)*

Machine Learning: *PyTorch, OpenCV, scikit-learn, Weights & Biases*

Development Tools: *Git, Bash, Vim, Sublime Text, Docker, uv*

Specialties: *Deep Learning, Image Classification, Object Detection (Yolo), Image Segmentation (UNet), Vision-Language Models (CLIP), Image Processing, Wavelets, Harmonic Analysis, Sparsity Methods, Compressive Sensing*

PROJECTS & EXPERIENCE

BigFile, *Speeding up PyTorch Training with Large Scale Datasets (Personal Project, [code](#))* July – August 2025

- Many large datasets do not fit into RAM and consist of millions of compressed files which greatly slow down the dataloader during training
- Built a general Python utility to transform the dataset from RAM to a single binary file with merged gzip streams
- It is fully compatible with `torch.utils.data.Dataset` and is up to 4X faster than ImageNet dataloader

Information Pursuit (IP), *Explainable Image Classification By-Design ([code](#))* 2023 – 2025

- IP is a promising and principled technique for explainable by-design prediction but requires large amount of hand-crafted data queries
- We apply dictionary learning techniques in latent space of large vision-language models (CLIP)
- Improved accuracy of information pursuit by > 5% across benchmark image classification datasets
- Resulted in publication at ICCV '25

CartoonX, *Explainability Method in Wavelet/Shearlet Space of Images ([code](#))* 2021 – 2023

- Understanding the decisions of deep image classifiers can be challenging
- We propose a new method to learn sparsity driven masks directly on the wavelet/shearlet coefficients to maximize target class probability
- Particularly useful to visualize and understand misclassifications
- Published in ECCV '22 (oral) and CVPR '23 and a Python package on github

PUBLICATIONS

S.Kolek, A. Chattopadhyay, K. H. R. Chan, H. Andrade-Loarca, G. Kutyniok, R. Vidal. *Learning Interpretable Queries for Explainable Image Classification with Information Pursuit*. **ICCV 2025** ([pdf](#))

G. Kaissis*, S. Kolek*, B. Balle, J. Hayes, D. Rückert. *Beyond the Calibration Point: Mechanism Comparison in Differential Privacy*. **ICML 2024** ([pdf](#))

S. Kolek, R. Windesheim, H. Andrade Loarca, G. Kutyniok, R. Levie. *Explaining Image Classifiers with Multiscale Directional Image Representation*. **CVPR 2023** ([pdf](#))

S. Kolek, D. Anh, R. Levie, J. Bruna, G. Kutyniok. *Cartoon Explanations of Image Classifiers*. **ECCV 2022 (Oral)** ([pdf](#))