



Daniel Becking (he/him)

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WORKING EXPERIENCE

- **Fraunhofer Heinrich-Hertz-Institute (HHI)** 2019-present
Ph.D. Candidate & Research Associate (full-time since 2020), Student Research Assistant (part-time 2019) Berlin
 - Efficient Deep Learning Group (Artificial Intelligence Dept.)
 - Research: Neural data compression, efficient transmission of neural data, explainable AI
 - Activities: Project management, standardization, supervision, software development and maintenance
- **Fraunhofer Institute for Reliability and Microintegration (IZM)** 2014-2019
Student Research Assistant (part-time) Berlin
 - Sensor Nodes & Embedded Microsystems Group (RF & Smart Sensor Systems Dept.)
 - Activities: System development of (wireless) multi-sensor nodes

EDUCATION


- **Technical University of Berlin** 2021-present
Doctoral Degree
“Compression Methods for Neural Network Data & Efficient Neural Compressors”
- **Technical University of Berlin** 2016-2020
M.Sc., Biomedical Engineering
 - Thesis: “Finding Storage- and Compute-Efficient Convolutional Neural Networks”
 - Project: Deep learning-based prediction of swallowing events from bioimpedance and EMG signals
 - Founding member of the student initiative “SEI - socially engaged engineers”
- **HTW Berlin** 2012-2016
B.Eng., Microsystems Technology

PROJECTS / ACTIVITIES

- **Standardization activities in the Moving Picture Experts Group (MPEG)** 2020-present
Contribution to the Neural Network Coding (NNC) ISO/IEC 15938-17 standard
 - Proponent and (co-)author of several adopted technologies and high-level syntax, including quantization parameter optimization, sparsification methods, temporal coding tools for the DeepCABAC entropy encoder, federated BatchNorm folding, filter re-scaling, parameter update tree
 - Organization and evaluation of core experiments and author of the NCTM conformance test and reference software
- **Efficient Federated Learning of Tiny Language Models for Autonomous Network Cells** 2024-present
Technology exploration project for a German telecommunications company
- **Berlin Digital Rail Operations (BerDiBa)** 2020-2024
Project leader on behalf of the consortium partner Fraunhofer HHI, Artificial Intelligence Dept.
 - Efficient semantic segmentation of photo/video recordings on the edge for autonomous trains
 - Development of XAI-assisted neural network compression methods
- **MicroNet Challenge - scored among Top-5 with “EC2T: Entropy-constrained Trained Ternarization”** 2019
Hosted at NeurIPS, organized by Google, DeepMind, OpenAI & Facebook
- **Supervision**
 - K. Ton-That’s Master Thesis, “Explainability-driven Quantization Methods for LLMs” 2024-present
 - N. Harder’s Master Thesis, “Relevant Subnets for NNC”, i.e., Relevant Expert Paths & Low-Ranks 2022-present
 - K. Kutzke’s Bachelor Thesis “Knowledge Distillation for Compression of Semantic Segmentation Networks” 2022

RELEVANT PUBLICATIONS

- [1] D. Becking, K. Müller, P. Haase, H. Kirchhoffer, G. Tech, W. Samek, H. Schwarz, D. Marpe, and T. Wiegand, “Neural network coding of difference updates for efficient distributed learning communication,” *IEEE Transactions on Multimedia*, vol. 26, pp. 6848–6863, 2024.
- [2] D. Becking, P. Haase, H. Kirchhoffer, K. Müller, W. Samek, and D. Marpe, “NNCodec: An open source software implementation of the neural network coding ISO/IEC standard,” in *ICML 2023 Workshop Neural Compression: From Information Theory to Applications [spotlight]*, 2023.
- [3] D. Becking, M. Dreyer, W. Samek, K. Müller, and S. Lapuschkin, “ECQ^x: Explainability-Driven Quantization for Low-Bit and Sparse DNNs,” in *xxAI - Beyond Explainable AI, Lecture Notes in Computer Science (LNAI Vol. 13200)*, Springer International Publishing, 2022, pp. 271–296.
- [4] D. Becking, H. Kirchhoffer, G. Tech, P. Haase, K. Müller, H. Schwarz, and W. Samek, “Adaptive differential filters for fast and communication-efficient federated learning,” in *Proc. of the IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR) Workshops [oral]*, 2022, pp. 3367–3376.
- [5] S. Wiedemann, S. Shivapakash, D. Becking, P. Wiedemann, W. Samek, F. Gerfers, and T. Wiegand, “FantastIC4: A hardware-software co-design approach for efficiently running 4bit-compact multilayer perceptrons,” *IEEE Open Journal of Circuits and Systems*, vol. 2, pp. 407–419, 2021.
- [6] P. Haase, D. Becking, H. Kirchhoffer, K. Müller, H. Schwarz, W. Samek, D. Marpe, and T. Wiegand, “Encoder optimizations for the NNR standard on neural network compression,” in *2021 IEEE Int. Conf. on Image Processing*, 2021, pp. 3522–3526.
- [7] A. Marban, D. Becking, S. Wiedemann, and W. Samek, “Learning sparse & ternary neural networks with entropy-constrained trained ternarization (EC2T),” in *Proc. of the IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR) Workshops [oral]*, June 2020.

Find the complete list including patents on Google Scholar .

Contributions to Standardization:

At MPEG, I have authored and co-authored more than 25 documents under ISO/IEC JTC1/SC29.

MISCELLANEA

• Reviewing:

- Journals:
 - * IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
 - * Elsevier Pattern Recognition
 - * IEEE Open Journal of Circuits and Systems (OJCAS)
- Conferences: IEEE International Conference on Image Processing (ICIP)

• Languages:

- German (native)
- English (C)

• Personal Interests:

- Collecting and playing records; visiting record stores around the world
- Synthesizers, sound generation & electronic music history