Daniel Becking (he/him)

Researcher in Efficient Deep Learning
Berlin, Germany

⌂ dbecking.com
✉ info@dbecking.com
in LinkedIn: @danielbecking
⌨ GitHub: @d-becking
⚲ Google Scholar

Working Experience

- **Fraunhofer Heinrich-Hertz-Institute (HHI), Berlin** — *2019-present*
  Research Associate & Ph.D. Candidate (full-time since 08/2020); previously Student Research Assistant (part-time)
  – Efficient Deep Learning Group (Artificial Intelligence Dept.)
  – Research: Neural data compression, efficient transmission of neural data, explainable AI
  – Activities: Research, software development, project management, standardization, supervision

- **Fraunhofer Institute for Reliability and Microintegration (IZM), Berlin** — *2014-2019*
  Student Research Assistant (part-time)
  – Sensor Nodes & Embedded Microsystems Group (RF & Smart Sensor Systems Dept.)
 – Activities: System development of (wireless) multi-sensor nodes

Education

- **Technical University of Berlin** — *2023-present*
  Doctoral Degree
  – Dissertation: "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"
  – Electives: Machine Learning / Intelligence, Brain-Computer-Interfacing, Neural Networks, Biopsychology, Digital Signal Processing, Bioelectromagnetism

- **HTW Berlin** — *2012-2016*
  B.Eng., Microsystems Technology
  – Electives: Bionics and Microsystem Technology, Selected Microsystems and Micro Techniques Topics

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
  – Developer and maintainer of the conformance test and reference software (NCTM)

- **Efficient Federated Learning Tiny Language Models for Mobile Network Feature Prediction** — *2024*
  Leading technology exploration project for Telekom Germany with results published at EuCNC & Globecom

- **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

- **NeurIPS MicroNet Challenge — "EC2T: Entropy-constrained Trained Ternarization"** — *2019*
  My "EC2T" entry was manually reviewed by the organizers and ranked in the top-5 out of more than 30 contestants

Relevant Publications (chronological order)

[1] D. Becking, J. Arndt, I. Friese, K. Müller, J. Ma, T. Buchholz, M. Galkow-Schneider, W. Samek, and D. Marpe, "Efficient federated learning of mixed-token transformers for cellular feature prediction," in *GLOBECOM 2025 - 2025 IEEE Global Communications Conference [oral]*, 2025.

[2] M. A. Höfler, D. Becking, K. Müller, D. Marpe, and W. Samek, "Relevance-guided activation sparsification for bandwidth-efficient collaborative inference," in *Proc. of the IEEE/CVF Int. Conf. on Computer Vision (ICCV) Workshop on Efficient Computing under Limited Resources*, 2025.

[3] D. Becking, I. Friese, K. Müller, T. Buchholz, M. Galkow-Schneider, W. Samek, and D. Marpe, "Efficient federated learning tiny language models for mobile network feature prediction," in *2025 Joint European Conf. on Networks and Communications & 6G Summit (EuCNC/6G Summit): Posters (PST)*, 2025.

[4] 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.

[5] 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.

[6] 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 Int. Publishing*, 2022, pp. 271–296.

[7] 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.

[8] 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.

[9] 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.

[10] 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 30 documents under ISO/IEC JTC1/SC29.

Miscellanea

- **Supervision:**

  - K. Ton-That's Master Thesis, "Accelerating Quantization-Aware Training of 2-bit Compact Language Models" *2024-present*
  - A. Maksimovic's Master Thesis "Enabling Foundation Models and Federated Learning for Industrial IoT: Efficient Multi-Horizon Forecasting at the Edge" *2024-2025*
  - N. Harder's Master Thesis, "Exploring Relevant Subspaces for Neural Network Compression" *2022-2025*
  - K. Kutzke's Bachelor Thesis "Knowledge Distillation for Compression of Semantic Segmentation Networks" *2022*

- **Reviewing:**
  - Journals: IEEE Transactions on Neural Networks and Learning Systems (TNNLS), Elsevier Pattern Recognition, IEEE Open Journal of Circuits and Systems (OJCAS)
  - Conferences: IEEE Int. Conf. on Image Processing (ICIP), Data Compression Conference (DCC)

- **Memberships:**
  - Deutsches Institut für Normung (DIN), Moving Picture Experts Group (MPEG), ISO/IEC JTC 1/SC 29
  - IEEE Computer Society, IEEE Computational Intelligence Society, IEEE Communications Society

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