

Haibin Zhao

haibin.zhao@kit.edu | +49 17663413624
Marienstraße 12. Karlsruhe 76137, Germany

EDUCATION

Doctor (2021-2024)

Karlsruhe Institute of Technology

The Excellence Initiative

TU9 German Universities of Technology

Research Direction

Neuromorphic Computing,

Hardware & Software

Machine Learning Acceleration

Supervisor

Prof. Dr. Mehdi B. Tahoori, IEEE Fellow

Prof. Dr. Michael Beigl

Master (2018-2020)

Karlsruhe Institute of Technology

Major: Signal Processing, Robotics

Grade: 1.7 (91%)

Supervisor: Prof. Dr. Uwe Hanebeck

Bachelor (2013-2017)

Chongqing University

Project 985 University

Project World First Class University

Major:

Mechanical Design & Automation

GPA: 3.82 (92%)

Ranking: 1/551 in the department

SKILLS

Languages

Chinese, English (C1), German (C1)

Major Domain

Machine Learning, Edge AI, Data

Science, Neuromorphic Hardware

Design and Optimization, FPGA, MCU

Links

[Github](#)

[Personal webpage](#) (more detailed introduction of me)

RESEARCH

EDA for Neuromorphic Circuits (hardware ML acceleration)

Modeling of neuromorphic AI hardware and enhancing a range of common challenges, such as reliability and practicality, for the neuromorphic circuits, including crossbars and other inverter-based nonlinear subcircuits.

TinyML & EdgeAI (software ML acceleration)

Reducing the memory requirements and inference time of machine learning models through neural network quantization, network pruning, and neural architecture search, etc.

EXPERIENCE

MERAGEM (Modeling, Design, Realization and Automation of Printed Electronics and their Materials)

Leading researcher, printed analog neuromorphic circuit, since 05.2022

ML based design and optimization of ReRAM based printed AI accelerators, including highly-reliable design, fault analysis, low-power design, low-cost design, etc. of the neuromorphic computing hardware.

JuBot – funded by the Carls Zeiss Foundation

Researcher, acceleration of human activity recognition, since 04.2023

By proposing task-specified highly-efficient data preprocessing, task-specified neural architecture design, network quantization and pruning, the inference time of human activity recognition (HAR) models can be substantially reduced.

SDIL (Smart Data Innovation Lab)

Lecturer and consultant for AI and ML, 2022- 2023

Lectured the tutorial of AI and PyTorch, developed a web-based automated feature engineering platform, and consulted ML-related projects such as training NNs with ultra-small-scale datasets through Bayesian approach.

Others

Other small and non-systematic projects that provide short-term or transitional funding, e.g., the **Fit2Ear** project that providing personalized otoplastics from smart phone depth camera funded by Software Campus, or a project about **Kalman filtered compressive sensing** funded by the DFG (German research foundation).

SELECTED PUBLICATION

- [1] Priyanjana Pal, **Haibin Zhao**, et al. Analog Printed Spiking Neuromorphic Circuits. In Proceedings of Design, Automation & Test in Europe Conference & Exhibition (DATE), IEEE, 2024. **(co-first author, top EDA conference)**
- [2] P. Pal et al. Fault Tolerant Circuit Design Analysis for Printed Neural Network Architectures. In Proceedings of the European Test Symposium (ETS), IEEE, 2024. **(top conference in circuit testing)**
- [3] **Haibin Zhao**, et al. Towards Temporal Information Processing- Printed Neuromorphic Circuit with Learnable Filters. In Proceedings of International Symposium on Nanoscale Architectures (NanoArch), ACM, 2023.
- [4] **Haibin Zhao**, et al. Power-Aware Training for Energy Efficient Printed Neuromorphic Circuits. In Proceedings of International Conference on Computer-Aided Design (ICCAD), IEEE & ACM, 2023. **(top EDA conference)**
- [5] **Haibin Zhao**, et al. Highly-dependable printed neuromorphic circuits based on additive manufacturing. Flexible and Printed Electronics (IOP-FPE), vol. 8, no. 2, p. 025018, 2023. **(impact factor 3.8)**
- [6] **Haibin Zhao**, et al. Highly-Bespoke Robust Printed Neuromorphic Circuits. In Proceedings of Design, Automation & Test in Europe Conference & Exhibition (DATE), IEEE, 2023. **(top EDA conference)**
- [7] **Haibin Zhao**, et al. Split Additive Manufacturing for Printed Neuromorphic Circuits. In Proceedings of Design, Automation & Test in Europe Conference & Exhibition (DATE), IEEE, 2023. **(top EDA conference)**
- [8] **Haibin Zhao**, et al. Aging-Aware Training for Printed Neuromorphic Circuits. In Proceedings of International Conference on Computer-Aided Design (ICCAD), IEEE & ACM, 2022. **(top EDA conference)**
- [9] Yexu Zhou, **Haibin Zhao**, et al. Deep Neural Network Pruning with Progressive Regularizer. In Proceedings of IEEE International Joint Conference on Neural Network (IJCNN), 2024. **(co-first author, top conference in machine learning)**
- [10] Yexu Zhou, et al. Enhancing Efficiency in HAR Models: NAS Meets Pruning. In Proceedings of IEEE International Conference on Pervasive Computing and Communications (PerCom), 2024. **(top conference in machine learning)**
- [11] Yiran Huang, **Haibin Zhao**, et al. Standardizing Your Training Process for Human Activity Recognition Models – A Comprehensive Review in the Tunable Factors. International Conference on Mobile and Ubiquitous Systems (Mobiquitous), Springer Nature Switzerland, 2023. **(top conference in ubiquitous computing)**
- [12] Y. Zhou, **Haibin Zhao**, et al. TinyHAR- A Lightweight Deep Learning Model Designed for Human Activity Recognition. In Proceedings of International Symposium on Wearable Computers (ISWC), ACM, 2022. **(co-first author, top conference in wearable computing, best paper award)**
- [13] **Haibin Zhao**, et al. Improving Human Activity Recognition by Learnable Sparse Wavelet Layer. In Proceedings of International Symposium on Wearable Computers (ISWC), ACM, 2022. **(top conference in wearable computing)**
- [14] Tobias Röddiger, Christopher Clarke, Paula Breitling, Tim Schneegans, **Haibin Zhao**, Hans Gellersen, Michael Beigl. Sensing with Earables: A Systematic Literature Review and Taxonomy of Phenomena. Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 6.3 (2022): 1-57. **(impact factor 4.1)**
- [15] **Haibin Zhao**, et al. Aircase: Earable Charging Case with Air Quality Monitoring and Soundscape Sonification. In Proceedings of the 2021 ACM International Conference on Ubiquitous Computing, 2021. **(top conference in ubiquitous computing)**
- [16] **Haibin Zhao**, et al. Kalman Filtered Compressive Sensing Using Pseudo-Measurements. In Proceedings of the International Conference on Multi-Sensor Fusion and Integration for Intelligent Systems (MFI), IEEE, 2021.

TEACHING

Graduation thesis

- Yiyi Wang. Inequality Constraints in Machine Learning Through Augmented Lagrangian. Bachelor, KIT, 2024.
- Xue Ma. Training Quantized Neural Networks with ADMM Approach. Master, KIT, 2023.
- Keyi Li. Automated Feature Engineering for Time Series Data. Bachelor, KIT, 2023.
- Yuhong Wang. Neural Evolution for Augmenting Topologies in Printed Neuromorphic Circuits. Master, KIT, 2023.
- Zhidong Yang. Learnable Nonlinear Circuit for Printed Neuromorphic Circuits. Master, KIT, 2022.
- Siyan Li. Weights Assimilation for Split Manufacturing of Printed Neuromorphic Circuits. Bachelor, KIT, 2022.

Proseminar

- Peter Bohner. Memory considered harmful: The Rowhammer vulnerability in DRAM. Proseminar WS 2023.
- An Ton That. Improving DRAM with regards to performance, energy-efficiency and reliability. Proseminar WS 2023.
- Quoc Anh Dang. NRAM as a potential DRAM replacement. Proseminar WS 2023.
- Felix Ferber. Quantifying Deep Convolutional Neural Networks with the DoReFa-Net. Proseminar SS 2023.
- Marc Thieme. Neural Network Quantization and Parameterized Clipping Activation. Proseminar SS 2023.
- Jan Langbecker. Wide Reduced-Precision Networks. Proseminar SS 2023.
- Tjaard Pfitzner. An Exploration of Techniques and Trade-offs. Proseminar SS 2023.
- Ilie Borsanov. Circuit Routing in Electronics Design Automation. Proseminar WS 2022.
- Viktor Iliev. Brain-inspired Computation Using Spiking Neural Networks. Proseminar WS 2022.
- Julian Heines. Nonparametric Models for Machine Learning. Proseminar WS 2022.
- Jakub Marcelli Trzcinski. Neural Architecture Search for printed Neural Networks. Proseminar WS 2021.

赵海滨

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教育经历

博士 (2021-2024)

卡尔斯鲁厄理工学院

德国精英大学

德国工科 9 校联盟

隶属于亥姆霍兹联合会, 全球

第 6 大研究机构 (自然指数 2020)

研究方向

神经态计算/类脑计算

机器学习模型的硬件和软件加速

指导老师

Prof. Dr. Mehdi B. Tahoori (IEEE 院士)

Prof. Dr. Michael Beigl

硕士 (2018-2020)

卡尔斯鲁厄理工学院

方向: 信号处理、机器人学

成绩: 1.7 (91%)

导师: Prof. Dr. Uwe Hanebeck

本科 (2013-2017)

重庆大学

双一流, 985 大学

专业: 机械设计及自动化

绩点: 3.82 (92%)

排名: 机械工程学院 1/551

技能

语言

汉语, 英语 (C1), 德语 (C1)

专业技能

机器学习, 边缘人工智能, 数据科学, 神经态计算硬件设计和优化, FPGA, 单片机和 PCB 开发

链接

[Github](#)

[个人主页](#) (包含详细的个人介绍)

科研内容

神经态计算硬件 EDA (机器学习硬件加速)

设计并基于机器学习、遗传算法等途径对神经态 (类脑) AI 硬件加速电路的可靠性 (例如对制造误差和老化的稳定性) 以及实用性 (例如能耗、成本等) 进行研究和提升。

边缘人工智能 (机器学习算法加速)

通过神经网络量化、神经网络剪枝和自动神经网络搜索等途径降低神经网络模型对于运行内存的消耗以及运行速度。通过这些途径, 轻量化的机器学习模型被允许在边缘设备上运行。

项目经历

MERAGEM (Modeling, Design, Realization and Automation of Printed Electronics and their Materials)

资助来源: 巴登符腾堡州科学、研究和艺术部及欧洲研究理事

模拟神经态 AI 加速电路子项目领导人 (2021 年 5 月至今)

负责印刷模拟神经形态电路基于机器学习方法的设计与优化, 领导 3-5 人进行包括神经形态电路的高可靠性设计、故障分析、低功耗设计、低成本设计等在内的研究。

JuBot (Stay Young with Robot)

资助来源: 卡尔蔡司基金会

人类活动识别 AI 模型加速项目研究人员 (2023 年 4 月至今)

通过专门为目标任务设计高效数据的预处理、神经架构设计、网络量化和剪枝, 来降低人类活动识别 (HAR) 模型的推理时间。

SDIL (Smart Data Innovation Lab)

讲师和顾问 (2022 年至 2023 年)

讲授人工智能和 PyTorch 的入门教程; 开发了基于网页的自动特征工程平台; 为人工智能相关项目提供顾问咨询, 如通过贝叶斯方法用超小规模数据集训练高效的神经网络等。

其他

其他短期或过渡性项目, 如由 Software Campus 资助的 Fit2Ear 项目通过智能手机深度摄像头提供个性化耳图, 以及由 DFG (德国研究基金会) 资助的关于卡尔曼滤波和压缩传感项目。

学术论文

- [1] Priyanjana Pal, **Haibin Zhao**, et al. Analog Printed Spiking Neuromorphic Circuits. In Proceedings of Design, Automation & Test in Europe Conference & Exhibition (DATE), IEEE, 2024. (共同一作, EDA 顶会)
- [2] P. Pal et al. Fault Tolerant Circuit Design Analysis for Printed Neural Network Architectures. In Proceedings of the European Test Symposium (ETS), IEEE, 2024. (电路测试顶会)
- [3] **Haibin Zhao**, et al. Towards Temporal Information Processing- Printed Neuromorphic Circuit with Learnable Filters. In Proceedings of International Symposium on Nanoscale Architectures (NanoArch), ACM, 2023.
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- [5] **Haibin Zhao**, et al. Highly-dependable printed neuromorphic circuits based on additive manufacturing. Flexible and Printed Electronics (IOP-FPE), vol. 8, no. 2, p. 025018, 2023. (影响因子 3.8)
- [6] **Haibin Zhao**, et al. Highly-Bespoke Robust Printed Neuromorphic Circuits. In Proceedings of Design, Automation & Test in Europe Conference & Exhibition (DATE), IEEE, 2023. (EDA 顶会)
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- [9] Yexu Zhou, **Haibin Zhao**, et al. Deep Neural Network Pruning with Progressive Regularizer. In Proceedings of IEEE International Joint Conference on Neural Network (IJCNN), 2024. (共同一作, conference ranking 中机器学习 A 类会议)
- [10] Yexu Zhou, et al. Enhancing Efficiency in HAR Models: NAS Meets Pruning. In Proceedings of IEEE International Conference on Pervasive Computing and Communications (PerCom), 2024. (conference ranking 中机器学习 A 类会议)
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- [15] **Haibin Zhao**, Tobias Röddiger, Michael Beigl. Aircase: Earable Charging Case with Air Quality Monitoring and Soundscape Sonification. In Proceedings of the 2021 ACM International Conference on Ubiquitous Computing, 2021. (普适计算顶会)
- [16] **Haibin Zhao**, et al. Kalman Filtered Compressive Sensing Using Pseudo-Measurements. In Proceedings of the International Conference on Multi-Sensor Fusion and Integration for Intelligent Systems (MFI), IEEE, 2021.

教学

专题研讨会

- Peter Bohner. Memory considered harmful: The Rowhammer vulnerability in DRAM. Proseminar WS 2023.
- An Ton That. Improving DRAM with regards to performance, energy-efficiency and reliability. Proseminar WS 2023.
- Quoc Anh Dang. NRAM as a potential DRAM replacement. Proseminar WS 2023.
- Felix Ferber. Quantifying Deep Convolutional Neural Networks with the DoReFa-Net. Proseminar SS 2023.
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- Julian Heines. Nonparametric Models for Machine Learning. Proseminar WS 2022.
- Jakub Marcelli Trzcinski. Neural Architecture Search for printed Neural Networks. Proseminar WS 2021.

毕业论文

- Yiyi Wang. Inequality Constraints in Machine Learning Through Augmented Lagrangian. Bachelor, KIT, 2024.
- Xue Ma. Training Quantized Neural Networks with ADMM Approach. Master, KIT, 2023.
- Keyi Li. Automated Feature Engineering for Time Series Data. Bachelor, KIT, 2023.
- Yuhong Wang. Neural Evolution for Augmenting Topologies in Printed Neuromorphic Circuits. Master, KIT, 2023.
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