Sebastian **Buschjäger**

Researcher, Post-Doc and Coordinator

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Science Career

The Lamarr Institute for Machine Learning and Artificial Intelligence, TU Dortmund — *Dortmund*

Postdoctoral Researcher and Coordinator of Resource-Aware Machine Learning — *2023 - now*

- Advacing resource-aware machine learning research
- Cross-site management of full-time and visiting researchers
- Long-term planning of the direction of resource-Aware ML in the Lamarr Institute

Artificial Intelligence Unit, TU Dortmund — *Dortmund*

Researcher and PhD Student — *2016 - 2022*

- Research on machine learning under resource-constraints, SFB876, project A1

Artificial Intelligence Unit, TU Dortmund — *Dortmund*

Research Assistant (WHF) — *2013 - 2016*

- Literature research and report writing (LaTex)
- Development and implementation in the context of streaming technologies and webcrawling (Java, Python)

Communication Networks Institute, TU Dortmund — *Dortmund*

Research Assistant (SHK) — *2010 - 2013*

- Development and implementation of tools in the context UAV and micro drones (C/C++, Matlab)

Education

TU Dortmund — *Dortmund*

Dissertation at the Artificial Intelligence Unit — *2016 - 2022*

- Dissertation “Ensemble Learning with Discrete Classifiers on Small Devices”
- Supervisor: Katharina Morik

TU Dortmund — *Dortmund*

Master Computer Science — *2013 - 2016*

- Computer Science with Minor in Electrical Engineering
- Master thesis “Online Gauß-Prozesse zur Regression auf FPGAs”

TU Dortmund — *Dortmund*

Bachelor Computer Science — *2010 - 2013*

- Computer Science with Minor in Electrical Engineering
- Bachelor thesis “Unsupervised Learning of Applied Robot Actuator Coordination”

Community Efforts

Program Committee/ Reviewer	ECML/PKDD, ICML, ICDM, AAAI, AISTATS, NeurIPS, IDA, IEEE TCAS-I, IEEE TCSVT, JDSA, Teme, KAIS, Pattern Recognition, XAI-TS Workshop@ECML/PKDD, NLDL
Appointment committee	Deputy technical member for a new professorship (2024)
Interdisciplinary Workshops	“ChatGPT Prompting for Researchers” (twice in 2024) at TU Dortmund University
Miscellaneous	Hackathon “Smartphone Clusters” (2023), SchnupperUni “Künstliche Intelligenz im Alltag” (2017)

Honors

2007 - 2010 **Earning of University Credits during Highschool**, Projekt SchülerUni der TU Dortmund
2011 - 2012 **Scholarship Dortmunder-Modell**, TU Dortmund
2012 - 2013 **Scholarship Deutschen Telekom**, TU Dortmund
2016 **Masters degree with honors**, TU Dortmund
WS 16/17 **Fachprojekt 'Deep Learning on FPGAs' was voted 'Best Fachprojekt'**, TU Dortmund
2022 **Dissertation with distinction ('summa cum laude')**, TU Dortmund
2024 **Outstanding PC**, ECML/PKDD

Invited Talks

DL4IoT Workshop@HiPeac 2024 *München, Deutschland*
Talk "A quick tour of Fully Binarized Neural Networks: From (some) Applications to (some) Theory" *Januar 2024*

eHex connect_ *Essen, Deutschland*
Talk "Eine kurze Geschichte über ML und KI in der Medizin" *Oktober 2023*

Dortmunder Digitalwoche (DiWoDo) *Dortmund, Deutschland*
Panelist "Transatlantic Fireside Chat" *Oktober 2023*

AI2GO – Sustainable AI for Sustainable Companies – Best Practices from Piedmont/Italy & NRW/Germany *Online*
Talk "Energy-Efficient Model Application" *April 2023*

Informationstechnik und Informationsmanagement Bundesanstalt für Gewässerkunde *Koblenz, Deutschland*
Talk "Machine Learning and Data Mining: A Guided Tour" *Feburar 2020*

Workshop bei Carl Zeiss AG *Oberkochen, Deutschland*
Workshop "Deep Learning auf kleinen Geräten und FPGAs" *Oktober 2017*

Publications

Rejection Ensembles with Online Calibration (RewOC)
S. Buschjäger
European Conference on Machine Learning and Knowledge Discovery in Databases, ECML PKDD, 2024

Federated Time Series Classification with ROCKET features
B. Casella, M. Jakobs, M. Aldinucci, S. Buschjäger
European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning, 2024

Stress-Testing USB Accelerators for Efficient Edge Inference (to appear)
R. Fischer, A. Staay, S. Buschjäger
ACM/IEEE Symposium on Edge Computing, 2024

MetaQuRe: Meta-Learning from Model Quality and Resource Consumption
R. Fischer, M. Wever, S. Buschjäger
European Conference on Machine Learning and Knowledge Discovery in Databases, 2024

Language-Based Deployment Optimization for Random Forests (Invited Paper)
J. Malcher, D. Biebert, K.-H. Chen, S. Buschjäger, C. Hakert, J.-J. Chen
ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems, 2024

STRATA: Random Forests going Serverless (to appear)
D. Tomaras, S. Buschjäger, V. Kalogeraki, K. Morik, D. Gunopulos
25th ACM/IFIP International Middleware Conference, 2024

Joint leaf-refinement and ensemble pruning through L_1 regularization
S. Buschjäger, K. Morik
Data Min. Knowl. Discov. pp. 1230–1261, 2023

Fast Inference of Tree Ensembles on ARM Devices

S. Koschel, S. Buschjäger, C. Lucchese, K. Morik

arXiv 2023

Ensemble learning with discrete classifiers on small devices

S. Buschjäger

Dissertation, TU Dortmund 2022

Summary Extraction from Streams

S. Buschjäger, K. Morik

Machine Learning under Resource Constraints - Volume 1: Fundamentals, 2022

Shrub Ensembles for Online Classification

S. Buschjäger, S. Hess, K. Morik

Proceedings of the Thirty-Sixth AAAI Conference on Artificial Intelligence (AAAI-22), 2022

Deep Learning Applications

W. Rhode, M. Hünnefeld, B. Spaan, V. Jevtic, L. Pfahler, S. Buschjäger

Machine Learning under Resource Constraints - Volume 2: Discovery in Physics, 2022

Monitoring and Feature Extraction

W. Rhode, T. Ruhe, M. Linhoff, J. Buss, L. Nickel, S. Buschjäger

Machine Learning under Resource Constraints - Volume 2: Discovery in Physics, 2022

Machine Learning Based on Emerging Memories

M. Yayla, S. Buschjäger, H. Amrouch

Machine Learning under Resource Constraints - Volume 1: Fundamentals, 2022

Reliable Binarized Neural Networks on Unreliable Beyond Von-Neumann Architecture

M. Yayla, S. Thomann, S. Buschjäger, K. Morik, J. Chen, H. Amrouch

IEEE Trans. Circuits Syst. I Regul. Pap. pp. 2516–2528, 2022

Margin-Maximization in Binarized Neural Networks for Optimizing Bit Error Tolerance

S. Buschjäger, J. Chen, K. Chen, M. Günzel, C. Hakert, K. Morik, R. Novkin, L. Pfahler, M. Yayla

Design, Automation & Test in Europe Conference & Exhibition, DATE 2021, Grenoble, France, February 1-5, 2021, 2021

Bit Error Tolerance Metrics for Binarized Neural Networks

S. Buschjäger, J. Chen, K. Chen, M. Günzel, K. Morik, R. Novkin, L. Pfahler, M. Yayla

arXiv 2021

Very Fast Streaming Submodular Function Maximization

S. Buschjäger, P.-J. Honysz, L. Pfahler, K. Morik

Joint European Conference on Machine Learning and Knowledge Discovery in Databases, 2021

Improving the Accuracy-Memory Trade-Off of Random Forests Via Leaf-Refinement

S. Buschjäger, K. Morik

arXiv 2021

There is no Double-Descent in Random Forests

S. Buschjäger, K. Morik

arXiv 2021

Efficient Realization of Decision Trees for Real-Time Inference

K.-H. Chen, C. Su, C. Hakert, S. Buschjäger, C.-L. Lee, J.-K. Lee, K. Morik, J.-J. Chen

ACM Transactions on Embedded Computing Systems 2021

GPU-Accelerated Optimizer-Aware Evaluation of Submodular Exemplar Clustering

P.-J. Honysz, S. Buschjäger, K. Morik

arXiv 2021

Providing Meaningful Data Summarizations Using Exemplar-based Clustering in Industry 4.0

P.-J. Honysz, A. Schulze-Struchtrup, S. Buschjäger, K. Morik

arXiv 2021

FeFET-based Binarized Neural Networks Under Temperature-dependent Bit Errors

M. Yayla, S. Buschjager, A. Gupta, J.-J. Chen, J. Henkel, K. Morik, K.-H. Chen, H. Amrouch

IEEE Transactions on Computers pp. 1–1, 2021

Towards Explainable Bit Error Tolerance of Resistive RAM-Based Binarized Neural Networks

S. Buschjäger, J. Chen, K. Chen, M. Günzel, C. Hakert, K. Morik, R. Novkin, L. Pfahler, M. Yayla

arXiv 2020

Generalized Isolation Forest: Some Theory and More Applications – Extended Abstract

S. Buschjäger, P.-J. Honysz, K. Morik

Proceedings 2020 IEEE 7th International Conference on Data Science and Advanced Analytics (DSAA 2020), 2020

Randomized outlier detection with trees

S. Buschjäger, P.-J. Honysz, K. Morik

International Journal of Data Science and Analytics 2020

Very Fast Streaming Submodular Function Maximization

S. Buschjäger, P.-J. Honysz, K. Morik

arXiv 2020

On-Site Gamma-Hadron Separation with Deep Learning on FPGAs

S. Buschjäger, L. Pfahler, J. Buss, K. Morik, W. Rhode

Joint European Conference on Machine Learning and Knowledge Discovery in Databases, 2020

Generalized Negative Correlation Learning for Deep Ensembling

S. Buschjäger, L. Pfahler, K. Morik

arXiv 2020

Gaussian Model Trees for Traffic Imputation

S. Buschjäger, T. Liebig, K. Morik

Proceedings of the International Conference on Pattern Recognition Applications and Methods (ICPRAM), 2019

Stack Usage Analysis for Efficient Wear Leveling in Non-Volatile Main Memory Systems

C. Hakert, M. Yayla, K.-H. Chen, G. v. d. Brüggen, J.-J. Chen, S. Buschjäger, K. Morik, P. R. Genssler, L. Bauer, H. Amrouch, J. Henkel

1st ACM/IEEE Workshop on Machine Learning for CAD (MLCAD), 2019

Realization of Random Forest for Real-Time Evaluation through Tree Framing

S. Buschjaeger, K.-H. Chen, J.-J. Chen, K. Morik

The IEEE International Conference on Data Mining series (ICDM), 2018

Decision Tree and Random Forest Implementations for Fast Filtering of Sensor Data

S. Buschjäger, K. Morik

IEEE Transactions on Circuits and Systems I: Regular Papers pp. 209–222, 2018

Summary Extraction on Data Streams in Embedded Systems

S. Buschjäger, K. Morik, M. Schmidt

Proceedings of the ECML Workshop on IoT Large Scale Learning From Data Streams, 2017

Big Data Science

K. Morik, C. Bockermann, S. Buschjäger

German journal on Artificial Intelligence pp. 27–36, 2017

Online Gauß-Prozesse zur Regression auf FPGAs

S. Buschjäger

Masterthesis, TU Dortmund 2016

Discovering Subtle Word Relation in Large German Corpora

S. Buschjäger, L. Pfahler, K. Morik

Proceedings of the 3rd Workshop on the Challenges in the Management of Large Corpora, 2015

Untersuchungen zur Analyse von deutschsprachigen Textdaten

K. Morik, A. Jung, J. Weckwerth, S. Rötner, S. Hess, S. Buschjäger, L. Pfahler

Tech. rep. 2, 2015

Teaching

Summerschools

- "Towards Energy-Efficient Model Application" @ Bifold/Weizenbaum Summerschool for Artificial Intelligence and Ecological Sustainability 2023
- "FastInference – Applying Large Models on Small Devices" @ SFB 876 Summerschool 2020
- "Deep Learning for small devices and FPGAs" @ 4th International Summerschool for Big Data and Machine Learning 2018
- "Introduction to Deep Learning" @ SFB 876 Summerschool 2017
- "Deep Learning on FPGAs" @ SFB 876 Summerschool 2017

Regular Courses

- SS 2023 Fachprojekt “TinyML - Machine Learning and Small Devices”
- WS 18/19 Übung “Maschinelles Lernen”
- SS 2018 Übung “Wissensentdeckung in Datenbanken”
- WS 17/18 Fachprojekt “Deep Learning on FPGAs”
- SS 2017 Übung “Wissensentdeckung in Datenbanke”
- WS 16/17 Fachprojekt “Deep Learning on FPGAs” (voted best Fachprojekt in WS 16/17)
- SS 2016 Übung “Mathematik für Informatiker II”

Supervised Theses

- Ensembles für Quantification durch Konkatenieren von Quantifier-Modellen, Merle Janssen (BA, Second Supervisor)
- Transformers for Quantized Time Series Forecasting, Dhanunjaya Elluri Thimmaraju (MA, Second Supervisor)
- Forward-Forward Algorithms for Self-Supervised Learning, Fadi Zoghlami (BA, Second Supervisor)
- Vergleich der Implementierung von Zufallswäldern mit Hilfe von tensorbasierten Hardwarebeschnleunigern, Tobias Lotz (BA, Supervisor)
- Vergleich einer einheitlichen Implementierung von QuickScorer und RapidScorer mit OpenMP, Simon Koschel (BA, Supervisor)
- Fehlererkennung durch Unsicherheitsschätzung mit Tiefen Neuronalen Netzen in Industrie 4.0, Lucas Weisse (MA, Supervisor)
- Anwendung von Ensemble-Modellen unter Ressourcenbeschränkungen: Ein Framework für Ensemble Pruning Verfahren, Henri Petuker (BA, Supervisor)
- Deep Submodular Autoencoder für Datenzusammenfassung, Minsu So (BA, Supervisor)
- Unüberwachte Ausreißererkennung mit Hilfe von Submodularen Funktionen, Philipp-Jan Honysz (MA, Supervisor)
- Optimierung von logistischer Regression auf FPGAs, Moritz Sliwinski (BA, Supervisor)
- Umsetzung einer High-Performance FPGA-Schnittstelle für maschinelles Lernen, Fabian Dillkötter (BA, Supervisor)
- Parameterschätzung mit Gütegarantie durch Bandit Models für die Regelung im Industrie 4.0 Kontext, Pierre Haritz (BA, Supervisor)
- Einsatz einer End-to-End Lösung für die Relevanzbewertung von Fragen im Question-Community-Answering, Maurice Freund (BA, Supervisor)
- DeepRacin auf FPGAs – Ein Framework zur Inferenz von DeepLearning Modellen auf FPGAs, Andreas Buehner (BA, Supervisor)
- Evolution Strategies als Trainingsmethode für neuronale Netze, Jan Kemming (BA, Supervisor)
- Datenzusammenfassungen auf Datenströmen, Mike Schmidt (BA, Supervisor)