

Bo Zhao | Assistant Professor

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Research Interest

I conduct research on efficient **data-intensive systems** that translate **data** into **value** for decision making. The scope of my research spans across multiple subfields, from **scalable reinforcement learning systems** to **distributed data stream management systems**, as well as **code optimization** techniques. That is to answer the question **“how to co-design multiple layers of the software stack to improve scalability, performance, and energy efficiency of machine learning systems”**. My long-term goal is to explore and understand the fundamental connections between data management and modern machine learning systems to make decision-making more transparent, robust and efficient.

Work Experience

09/2023–present: Assistant Professor, **Aalto University, Espoo, Finland**

01/2023–08/2023: Assistant Professor (UK Lecturer), **Queen Mary University of London, London, UK**
Honorary Research Fellow, **Imperial College London, London, UK**

07/2021–01/2023: Postdoctoral Researcher, **Imperial College London, London, UK**

02/2016–06/2021: Research Assistant in **Humboldt-Universität zu Berlin, Berlin, Germany**

06/2019–09/2019: Software Development Engineer Intern at Amazon, **AWS Redshift, Berlin, Germany**

11/2015–01/2016: Research Assistant in **Technische Universität Darmstadt, Darmstadt, Germany**

10/2013–02/2015: Student Research Assistant in **RWTH-AACHEN University, Aachen, Germany**

Education

PhD in Computer Science

Humboldt-Universität zu Berlin

Thesis: State Management for Efficient Event Pattern Detection

Supervisor: Prof. Dr. Matthias Weidlich

Honors: *magna cum laude*

Berlin, Germany

02/2016–05/2022

M.Sc. in Computer Science

Xi'an Jiaotong University

Thesis: Dependence-Based Coarse-Grained Automatic Parallelisation

Ranking: Top 1% of the university

Honors: *summa cum laude*

Xi'an, China

09/2012–07/2015

B.Sc in Computer Science

Wuhan Institute of Technology

Thesis: Energy-Aware Routing Optimizations in Wireless Sensor Networks

Ranking: Top 1% of the university

Honors: *summa cum laude*

Wuhan, China

09/2008–07/2012

Research Visits

University of Queensland

Visiting PhD Student in Computer Science, hosted by Prof. Xiaofang Zhou

Topic: Efficient Data Stream Processing

Brisbane, Australia

05/2017–06/2017

RWTH-AACHEN University

Visiting M.Sc. Student in Computer Science, hosted by Prof. Felix Wolf

Topic: High Performance Computing

Aachen, Germany

09/2013–02/2015

Honors & Awards

2019–2020: Travel Grant of the Silk Road International Symposium for Distinguished Young Scholars

2017–2018: IEEE ICDE Student Travel Grant

2015–2016: EDBT Summer School Travel Grant

2014–2015: Outstanding Graduate, ACM SIGPLAN Travel Grant, ACM SIGMICRO Travel Grant

2012–2013: China National Scholarship(top 0.2%), Creative-Master Scholarship, Excellent Master Student

2011–2012: Excellent Graduation Thesis, Outstanding Graduate

2010–2011: China National Scholarship(top 0.2%), Top Grade Scholarship, Pacemaker to Merit Student, Advanced Individual in Social Practice

2009–2010: China National Scholarship(top 0.2%), Top Grade Scholarship, Pacemaker to Merit Student

2008–2009: Top Grade Scholarship, Pacemaker to Merit Student, Outstanding League Member

Publications

- Marcel Wagenländer, Guo Li, **Bo Zhao**, Luo Mai, Peter Pietzuch: **TENPLEX: Changing Resources of Deep Learning Jobs using Parallelizable Tensor Collections**, *preprint in arXiv*, 2023
- Huanzhou Zhu*, **Bo Zhao***, Gang Chen, Weifeng Chen, Yijie Chen, Liang Shi, Yaodong Yang, Peter Pietzuch, Lei Chen (*equal contribution): **MSRL: Distributed reinforcement learning with dataflow fragments**, *In Proc. of the USENIX Annual Technical Conference (USENIX ATC'23)*, Boston, MA, USA, July, 2023
- Song Liu, Xinhe Wan, Zengyuan Zhang, **Bo Zhao**, Weiguo Wu: **TurboStencil: You Only Compute Once for Stencil Computation**, *Future Generation Computer Systems (IF=7.307)*, 2023
- Gururaghav Raman, **Bo Zhao**, Jimmy Chih-Hsien Peng, Matthias Weidlich: **Adaptive incentive-based demand response with distributed non-compliance assessment**, *Applied Energy* (IF=11.446), Volume 326, November, 2022
- **Bo Zhao** : **State Management for Efficient Event Pattern Detection**, *Dissertation*, Humboldt-Universität zu Berlin, Mathematisch-Naturwissenschaftliche Fakultät, May 2022
- **Bo Zhao**, Han van der Aa, Nguyen Thanh Tam, Nguyen Quoc Viet Hung, Matthias Weidlich: **EIRES: Efficient Integration of Remote Data in Event Stream Processing**, *In Proc. of the 47th ACM SIGMOD International Conference on Management of Data (SIGMOD'21)*, Xi'an, China, ACM, June 2021
- **Bo Zhao**, Nguyen Quoc Viet Hung, Matthias Weidlich: **Load Shedding for Complex Event Processing: Input-based and State-based Techniques**, *In Proc. of the 36th IEEE International Conference on Data Engineering (ICDE'20)*, Dallas, TX, USA, IEEE, April 2020
- Gururaghav Raman, Jimmy Chih-Hsien Peng, **Bo Zhao**, Matthias Weidlich: **Dynamic Decision Making for Demand Response through Adaptive Event Stream Monitoring**, *In Proc. of the IEEE Power & Energy Society General Meeting (PESGM'19)*, Atlanta, GA, USA. IEEE, August 2019.
- **Bo Zhao**: **Complex Event Processing under Constrained Resources by State-based Load Shedding**, *In Proc. of the 34th IEEE International Conference on Data Engineering (ICDE'18)*, Paris, France, IEEE, April 2018
- **Bo Zhao**, Zhen Li, Ali Jannesari, Felix Wolf, Weiguo Wu: **Dependence-Based Code Transformation for Coarse-Grained Parallelism**, *In Proc. of the International Workshop on Code Optimisation for Multi and Many Cores (COSMIC'15) held in conjunction with CGO'15*, San Francisco Bay Area, CA, USA, ACM, February 2015
- **Bo Zhao**, Ali Jannesari: **Dependence-Based Parallel Code Generation Using Intel CnC**, *In Proc. of the 24th International Conference on Parallel Architectures and Compilation Techniques (PACT'15)*, San Francisco Bay Area, CA, USA, October 2015 (ACM SRC poster)
- Zhen Li, **Bo Zhao**, Ali Jannesari, Felix Wolf: **Beyond Data Parallelism: Identifying Parallel Tasks in Sequential Programs**, *In Proc. of the 15th International Conference on Algorithms and Architectures for Parallel Processing (ICA3PP'15)*, Springer, November 2015

Research Talks

November 2023: Invited guest lecture at AI Day–Finnish Center for Artificial Intelligence, Espoo, Finland;

June 2023: Invited guest lecture at Humboldt-Universität zu Berlin, Berlin, Germany;

June 2023: Invited talk at the Huawei Cloud InnovWave Overseas Workshop, Munich, Germany;

June 2023: Invited guest lecture at TU Wien, Vienna, Austria;

May 2023: USENIX Annual Technical Conference (ATC'23), Boston, MA, USA;

May 2023: Invited talk at the Global Software Technology Summit, Dresden, Germany;

May 2023: Invited talk at the Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken, Germany;

March 2023: Invited talk at Aalto University, Espoo, Finland;

January 2023: Invited talk at TU Wien, Vienna, Austria;
November 2022: Invited talk at King's College London, London, UK;
December 2021: Invited talk at Xi'an Jiaotong University, Virtual Event, China;
November 2021: Invited talk at Nanjing University, Virtual Event, China;
June 2021: The 47th ACM International Conference on Management of Data (*SIGMOD'21*), Virtual Event, China;
March 2021: Invited talk at EPFL, Lausanne, Switzerland;
December 2020: Invited talk at Hasso Plattner Institute, Potsdam, Germany;
November 2020: Invited talk at ETH Zürich, Zürich, Switzerland;
November 2020: Invited talk at Imperial College London, London, UK;
November 2020: Invited talk at Technical University of Berlin, Berlin Germany;
April 2020: The 36th IEEE International Conference on Data Engineering (*ICDE'20*), Dallas, TX, USA;
April 2019: Invited talk at Xi'an Jiaotong University, Xi'an, China;
April 2018: The 34th IEEE International Conference on Data Engineering (*ICDE'18*), Paris, France;
September 2015: The 7th Annual Concurrent Collections Workshop (*with LCPC'15*), Raleigh, NC, USA;
September 2015: The 44th International Conference on Parallel Processing (*ICPP'15*), Beijing, China;
February 2015: The 2nd International Workshop on Code Optimisation for Multi and Many Cores (*COSMIC'15*), San Francisco Bay Area, CA, USA;
September 2014: The Sixth Annual Concurrent Collections Workshop, Intel Corp in Hillsboro, OR, USA;

Academic Services

Program Committees: The Conference on Information and Knowledge Management (*CIKM*) 2021, 2022, 2023
International Conference on Emerging Networking Experiments and Technologies (*CoNEXT*) 2024
International Conference on Very Large Data Bases (*VLDB*) 2025

Availability & Reproducibility Committees: The ACM International Conference on Management of Data (*SIGMOD*) 2022 2023

Demonstrations Track Program Committees: IEEE International Conference on Data Engineering (*ICDE*) 2023, 2024

Reviewers for Journals: IEEE Transactions on Parallel and Distributed Systems (*TPDS*) 2023, Journal of Systems and Software (*JSS*) 2016

Teaching Experience

Autumn 2023: CS-E4190 *Cloud Software and Systems*, Aalto University (co-teaching with Prof. Mario Di Francesco)

Semester B 2023: ECS656U *Distributed Systems*, Queen Mary University of London

Summer semester 2020: Seminar on *Distributed Data Management Systems*, Humboldt-Universität zu Berlin

Summer semester 2020: Oral exam examiner on *Process Mining*, Humboldt-Universität zu Berlin

Winter semester 2019: Oral exam examiner on *Event Process*, Humboldt-Universität zu Berlin

Winter semester 2019: Exercises (Übung) on *Data Stream Processing*, Humboldt-Universität zu Berlin

Summer semester 2018: Oral exam examiner on *Process Mining*, Humboldt-Universität zu Berlin

Summer semester 2018: Seminar on *Event Stream Processing*, Humboldt-Universität zu Berlin

Student Mentoring

- PhD dissertation on "Scalable Reinforcement Learning systems on Supercomputers", Mr. Mustapha Abdullahi, February 2024-present, Aalto University, Finland
- PhD dissertation on "Efficient Large-Scale Machine Learning Pipeline ", Mr. Cong Yu, December 2023-present, Aalto University, Finland
- Master thesis project on "Efficient GPU Resource Utilization Monitoring on the LUMI Supercomputer ", Mr. Songlin Jiang, December 2023-present, Aalto University, Finland
- Master thesis project on "Dataflow-Based MLOps for Machine Learning Pipelines", Mr. Vishnu Puramchalil, December 2022-August 2023, Queen Mary University of London, UK
- Master thesis project on "Adaptive Query Analytics over Dynamic Data Streams", Mr. Shaurya Rana, December 2022-August 2023, Queen Mary University of London, UK
- Master thesis project on "Dataflow Optimisation for Scalable Reinforcement Learning Systems", Mr. Mustapha Abdullahi, December 2022-August 2023, Queen Mary University of London, UK

- Master thesis project on “Distributed Data Stream Processing for Business Intelligence”, Mr. Chinar Amrutkar, December 2022-August 2023, Queen Mary University of London, UK
- Student intern project on “Implementing MuZero Agents Using Mindspore Computation Graphs”, Mr. Liyi Tan, June 2022-September 2022, Imperial College London, UK
- Undergraduate project on “Implementing MuZero Algorithm Using the Mindspore DL Engine”, Mr. Bartłomiej Cieślak, January 2022-May 2022, Imperial College London, UK
- Master thesis project on “Mining Constraints to Optimise CEP Load Shedding for Multiple Queries”, Mr. Xudong Zhu, 2019-2020, Humboldt-Universität zu Berlin, Germany

Projects

CloudButton: a Serverless Data Analytics Platform

Funding agency: EU Horizon 2020 Framework Programme

Duration: 2019-2022, Role: Participant (Postdoctoral researcher)

Amount: 4.2 million EUR

Process-Awareness of Event-Driven Systems: Model, Analysis and Optimisation

Funding agency: German Research Foundation (Deutsche Forschungsgemeinschaft, DFG)

Duration: 2014-2021, Role: Participant (Research Assistant)

Amount: 1 million EUR

References (with website links on names)

Name	Affiliation	Email address
Prof. Peter Pietzuch	Imperial College London, UK	prp@imperial.ac.uk
Prof. Matthias Weidlich	Humboldt-Universität zu Berlin, Germany	matthias.weidlich@hu-berlin.de
Dr. Nguyen Quoc Viet Hung	Griffith University, Australia	henry.nguyen@griffith.edu.au
Prof. Han van der Aa	University of Vienna, Austria	han.van.der.aa@univie.ac.at