

André Biedenkapp

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Personal Information

Date of birth: 13.07.1992

Nationality: German

Work experience

Position held

Machine Learning Lab
Scientific Researcher

Albert-Ludwigs-University Freiburg
Since 10.2017

Past positions

Machine Learning Lab
Student Assistant

Albert-Ludwigs-University Freiburg
10.2015 – 09.2017

Assisting in the implementation of research projects

Chair of Computer Architecture
Student Assistant

Albert-Ludwigs-University Freiburg
04.2014 – 09.2014

Maintenance of the mobile robots for the Hardware-Labcourse

Research Interests

- Dynamic Algorithm Configuration
- Learning to Learn
- Deep Reinforcement Learning
- Automated Machine Learning and Reinforcement Learning

Education

PhD. Candidate (Computer Science)
Machine Learning Lab

Albert-Ludwigs-University Freiburg
Since 02.2018

Thesis Working Title: Dynamic Algorithm Configuration by Reinforcement Learning

Summer School

Reinforcement Learning Summer SCHOOL (RLSS'19)

In: Lille, France

July 2019

Topics: *Reinforcement Learning and Bandits*

Computer Science

Albert-Ludwigs-University Freiburg

Master of Science (M.Sc.), Final Grade: 1.2

2014 – 2017

Thesis: Per Instance Algorithm Configuration (Grade 1.0)

Supervisor: Prof. Dr. Frank Hutter

Computer Science

Albert-Ludwigs-University Freiburg

Bachelor of Science (B.Sc.)

2011 – 2014

Thesis: Data Analysis for the Selection of Recording Channels on Multielectrode-Arrays (Grade 1.7)

Supervisor: Prof. Dr. Wolfram Burgard

Teaching Experience

Automated Machine Learning

Massive Open Online Course (MOOC)

Graduate course

Published 04.2021

Creation of coding exercises. Involved in setting up MOOC

Teaching Assistant.....

Automated Machine Learning <i>Graduate course</i> Creation and grading of exercises & final project.	(Flipped Classroom) 04.2022 – 09.2022
Automated Machine Learning <i>Graduate course, Virtual</i> Creation and grading of exercises & final project. Setting up online teaching through Zoom and GitHub classroom.	(Flipped Classroom) 04.2021 – 09.2021
Automated Machine Learning <i>Graduate course, Virtual</i> Creation and grading of exercises & final project. Setting up online teaching through Zoom and GitHub classroom.	(Flipped Classroom) 04.2020 – 09.2020
Automated Machine Learning <i>Graduate course</i> Creation and grading of exercises & final project	04.2019 – 09.2019
Machine Learning for Automated Algorithm Design <i>Graduate course</i> Creation and grading of exercises & final project	10.2018 – 03.2019
Machine Learning for Automated Algorithm Design <i>Graduate course</i> Creation and grading of exercises & final project	10.2017 – 03.2018
Hardware-Labcourse <i>Undergraduate course</i> Assisting students with practical exercises	04.2014 – 09.2014

Student Supervision.....

MSc Thesis <i>Baohe Zhang, Joint supervision with R. Rajan, Published at AISTATS'21</i> On the Importance of Hyperparameter Optimization in Model-based Reinforcement Learning	04.2020 – 10.2020
MSc Project & Thesis <i>Gresa Shala, Published at PPSN'20</i> Learning to Optimize CMA-ES	04.2019 – 05.2020
MSc Thesis <i>Furkan Bozkurt</i> RL-DCBO: Reinforcement Learning Guided Dynamic Control for Bayesian Optimization	03.2019 – 11.2019
MSc Thesis <i>Theresa Eimer, Follow up work published at ICML'21</i> Improved Meta-Learning for Algorithm Control through Self-Paced Learning	12.2018 – 09.2019
MSc Thesis <i>Kevin Hättig</i> Model-Based Population Based Training	12.2018 – 09.2019
MSc Thesis <i>Oliver Brunner, Joint supervision with D. Speck at GKI-Freiburg</i> Learning Domain-Independent Heuristics with Deep Neural Networks	11.2018 – 04.2019
MSc Project <i>Theresa Eimer & Kevin Hättig</i> Algorithm State Description for Algorithm Control	04.2018 – 12.2018

Publications

 Google Scholar

 DBLP

 0000-0002-8703-8559

Journal & Conference Publications.....

- [1] **A. Biedenkapp***, N. Dang*, M. S. Krejca*, F. Hutter, and C. Doerr. "Theory-inspired Parameter Control Benchmarks for Dynamic Algorithm Configuration". In: *Proceedings of the Genetic and Evolution-*

ary Computation Conference (GECCO'22). **Joint first authorship**, Conference Rating: A, Nominated for Best Paper. ACM, July 2022.

- [2] J. Parker-Holder, R. Rajan, X. Song, **A. Biedenkapp**, Y. Miao, T. Eimer, B. Zhang, V. Nguyen, R. Calandra, A. Faust, F. Hutter, and M. Lindauer. "Automated Reinforcement Learning (AutoRL): A Survey and Open Problems". In: *Journal of Artificial Intelligence Research (JAIR)* 74 (2022), pp. 517–568.
- [3] M. Lindauer, K. Eggenberger, M. Feurer, **A. Biedenkapp**, D. Deng, C. Benjamins, R. Sass, and F. Hutter. "SMAC3: A Versatile Bayesian Optimization Package for Hyperparameter Optimization". In: *Journal of Machine Learning Research (JMLR) – MLOSS* 23.54 (2022), pp. 1–9.
- [4] **A. Biedenkapp**, R. Rajan, F. Hutter, and M. Lindauer. "TempoRL: Learning When to Act". In: *Proceedings of the Thirty-eighth International Conference on Machine Learning*. Acceptance rate: 21.5%, Conference Rating: A*. July 2021, pp. 914–924.
- [5] T. Eimer, **A. Biedenkapp**, F. Hutter, and M. Lindauer. "Self-Paced Context Evaluation for Contextual Reinforcement Learning". In: *Proceedings of the Thirty-eighth International Conference on Machine Learning*. Acceptance rate: 21.5%, Conference Rating: A*. July 2021, pp. 2948–2958.
- [6] T. Eimer, **A. Biedenkapp**, M. Reimer, S. Adriaensen, F. Hutter, and M. Lindauer. "DACBench: A Benchmark Library for Dynamic Algorithm Configuration". In: *Proceedings of the Thirtieth International Joint Conference on Artificial Intelligence (IJCAI'21)*. Acceptance rate: 19.3%, Conference Rating: A*. ijcai.org, Aug. 2021, pp. 1668–1674.
- [7] D. Speck*, **A. Biedenkapp***, F. Hutter, R. Mattmüller, and M. Lindauer. "Learning Heuristic Selection with Dynamic Algorithm Configuration". In: *Proceedings of the Thirty-First International Conference on Automated Planning and Scheduling (ICAPS'21)*. **Joint first authorship**, Acceptance rate: ~30%, Conference Rating: A*. Aug. 2021, pp. 597–605.
- [8] B. Zhang, R. Rajan, L. Pineda, N. Lambert, **A. Biedenkapp**, K. Chua, F. Hutter, and R. Calandra. "On the Importance of Hyperparameter Optimization for Model-based Reinforcement Learning". In: *Proceedings of the International Conference on Artificial Intelligence and Statistics (AISTATS'21)*. Acceptance rate: 29.8%, Conference Rating: A. Apr. 2021.
- [9] J. KH Franke, G. Köhler, **A. Biedenkapp**, and F. Hutter. "Sample-Efficient Automated Deep Reinforcement Learning". In: *Proceedings of the International Conference on Learning Representations (ICLR'21)*. Published online: iclr.cc, Acceptance rate: 28.7%, Conference Rating: A*. May 2021.
- [10] G. Shala*, **A. Biedenkapp***, N. Awad, S. Adriaensen, F. Hutter, and M. Lindauer. "Learning Step-Size Adaptation in CMA-ES". In: *Proceedings of the Sixteenth International Conference on Parallel Problem Solving from Nature (PPSN'20)*. **Joint first authorship**, Conference Rating: A. Sept. 2020, pp. 691–706.
- [11] **A. Biedenkapp**, H. F. Bozkurt, T. Eimer, F. Hutter, and M. Lindauer. "Dynamic Algorithm Configuration: Foundation of a New Meta-Algorithmic Framework". In: *Proceedings of the European Conference on Artificial Intelligence (ECAI)*. Acceptance rate: 26.8%, Conference Rating: A. June 2020, pp. 427–434.
- [12] **A. Biedenkapp**, J. Marben, M. Lindauer, and F. Hutter. "CAVE: Configuration Assessment, Visualization and Evaluation". In: *Proceedings of the International Conference on Learning and Intelligent Optimization (LION'18)*. June 2018.
- [13] **A. Biedenkapp**, M. Lindauer, K. Eggenberger, C. Fawcett, H. Hoos, and F. Hutter. "Efficient Parameter Importance Analysis via Ablation with Surrogates". In: *Proceedings of the AAAI conference*. Acceptance rate: 24.6%, Conference Rating: A*. Feb. 2017, pp. 773–779.

Workshop Publications & Preprints.....

- [14] R. Sass, E. Bergman, **A. Biedenkapp**, F. Hutter, and M. Lindauer. "DeepCAVE: An Interactive Analysis Tool for Automated Machine Learning". In: *Workshop on Adaptive Experimental Design and Active Learning in the Real World (ReALML@ICML'22)*. 2022.

- [15] **A. Biedenkapp**, D. Speck, S. Sievers, F. Hutter, M. Lindauer, and J. Seipp. “Learning Domain-Independent Policies for Open List Selection”. In: *Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning (PRL@ICAPS’22)*. 2022.
- [16] C. Benjamins, T. Eimer, F. Schubert, **A. Biedenkapp**, B. Rosenhan, F. Hutter, and M. Lindauer. “CARL: A Benchmark for Contextual and Adaptive Reinforcement Learning”. In: *Workshop on Ecological Theory of Reinforcement Learning (EcoRL@NeurIPS’21)*. Sept. 2021.
- [17] S. Izquierdo, J. Guerrero-Viu, S. Hauns, G. Miotto, S. Schrod, **A. Biedenkapp**, T. Elsken, D. Deng, M. Lindauer, and F. Hutter. “Bag of Baselines for Multi-objective Joint Neural Architecture Search and Hyperparameter Optimization”. In: *Workshop on Automated Machine Learning (AutoML@ICML’21)*. May 2021.
- [18] S. Müller, **A. Biedenkapp**, and F. Hutter. “In-Loop Meta-Learning with Gradient-Alignment Reward”. In: *AAAI workshop on Meta-Learning Challenges (MetaLearning@AAAI’21)*. Feb. 2021.
- [19] N. Awad, G. Shala, D. Deng, N. Mallik, M. Feurer, K. Eggensperger, **A. Biedenkapp**, D. Vermetten, H. Wang, C. Doerr, M. Lindauer, and F. Hutter. “Squirrel: A Switching Hyperparameter Optimizer Description of the entry by AutoML.org & IOHprofiler to the NeurIPS 2020 BBO challenge”. In: *arXiv:2012.08180* (Dec. 2020). **Winning entry of the BBO Competition@NeurIPS’20 on a meta-learnable search space.**
- [20] **A. Biedenkapp**, R. Rajan, F. Hutter, and M. Lindauer. “Towards TempoRL: Learning When to Act”. In: *Workshop on Inductive Biases, Invariances and Generalization in RL (BIG@ICML’20)*. July 2020.
- [21] T. Eimer, **A. Biedenkapp**, F. Hutter, and M. Lindauer. “Towards Self-Paced Context Evaluation for Contextual Reinforcement Learning”. In: *Workshop on Inductive Biases, Invariances and Generalization in RL (BIG@ICML’20)*. July 2020.
- [22] S. Adriaensen, **A. Biedenkapp**, G. Shala, N. Awad, T. Eimer, M. Lindauer, and F. Hutter. “Automated Dynamic Algorithm Configuration”. In: *arXiv:2205.13881 [cs.AI]* (2022). Under Review.
- [23] Carolin Benjamins, Theresa Eimer, Frederik Schubert, Aditya Mohan, André Biedenkapp, Bodo Rosenhan, Frank Hutter, and Marius Lindauer. “Contextualize Me – The Case for Context in Reinforcement Learning”. In: *arXiv:2202.04500 [cs.LG]* (2022).
- [24] R. Rajan, J. L. B. Diaz, S. Guttikonda, F. Ferreira, **A. Biedenkapp**, and Frank Hutter. “MDP Playground: Controlling Dimensions of Hardness in Reinforcement Learning”. In: *arXiv:1909.07750v3* (Oct. 2020).
- [25] **A. Biedenkapp**, H. F. Bozkurt, F. Hutter, and M. Lindauer. “Towards White-Box Benchmarks for Algorithm Control”. In: *IJCAI 2019 DSO Workshop*. Aug. 2019.
- [26] M. Lindauer, M. Feurer, K. Eggensperger, **A. Biedenkapp**, and F. Hutter. “Towards Assessing the Impact of Bayesian Optimization’s Own Hyperparameters”. In: *IJCAI 2019 DSO Workshop*. Aug. 2019.
- [27] M. Lindauer, K. Eggensperger, M. Feurer, **A. Biedenkapp**, J. Marben, P. Müller, and F. Hutter. “BOAH: A Tool Suite for Multi-Fidelity Bayesian Optimization & Analysis of Hyperparameters”. In: *arXiv:1908.06756* (Aug. 2019).

Blog Posts.....

- [28] **A. Biedenkapp**, R. Rajan, F. Hutter, and M. Lindauer. “TempoRL - Learning When to Act”. In: *Personal Blog* (May 2022). URL: <https://andrebieenkapp.github.io/blog/2022/temporl/>.
- [29] **A. Biedenkapp**, N. Dang, M. S. Krejca, F. Hutter, and C. Doerr. “Theory-Inspired Parameter Control Benchmarks for DAC”. In: *Personal Blog* (May 2022). URL: <https://andrebieenkapp.github.io/blog/2022/gecco/>.
- [30] N. Lambert, B. Zhang, R. Rajan, and **A. Biedenkapp**. “The Importance of Hyperparameter Optimization for Model-based Reinforcement Learning”. In: <https://bair.berkeley.edu/blog> (Apr. 2021). URL: <https://bair.berkeley.edu/blog/2021/04/19/mbrl/>.

- [31] R. Rajan, **A. Biedenkapp**, T. F. Runge, and J. Franke. “AutoRL: AutoML in the Realm of Deep Reinforcement Learning”. In: <https://www.automl.org/automl-blog> (Apr. 2021). URL: <https://www.automl.org/blog-autorl>.
- [32] **A. Biedenkapp**. “Learning Step-Size Adaptation in CMA-ES”. In: <https://www.automl.org/automl-blog> (Aug. 2020). URL: <https://www.automl.org/learning-step-size-adaptation-in-cma-es>.
- [33] **A. Biedenkapp**. “Dynamic Algorithm Configuration”. In: <https://www.automl.org/automl-blog> (Feb. 2020). URL: <https://www.automl.org/dynamic-algorithm-configuration>.
- [34] **A. Biedenkapp** and F. Hutter. “BOHB”. In: <https://www.automl.org/automl-blog> (Aug. 2018). URL: https://www.automl.org/blog_bohb.
- [35] **A. Biedenkapp**, K. Eggensperger, M. Feurer, and F. Hutter. “2nd AutoML Challenge”. In: <https://www.automl.org/automl-blog> (Aug. 2018). URL: <https://www.automl.org/blog-2nd-automl-challenge>.

Patents

- [36] **Biedenkapp, A.**, G. Shala, S. Adriaensen, N. Awad, M. Lindauer, and F. Hutter. “Method and Device for Learning a Strategy and for Implementing the Strategy”. U.S. pat. req. 17/305,586. Robert Bosch GmbH. July 9, 2021. Filed.
- [37] S. Müller, **Biedenkapp, A.**, and F. Hutter. “Verbesserte Vorrichtung zum Anlernen von maschinellen Lernsysteme für Bildverarbeitung”. German pat. DE202021100225. Robert Bosch GmbH. Feb. 12, 2021. URL: <https://depatisnet.dpma.de/DepatisNet/depatisnet?action=bibdat&docid=DE202021100225U1>.
- [38] D. Speck, **Biedenkapp, A.**, R. Matmüller, F. Hutter, and M. Lindauer. “Device and Method for Planning and Operation of a Technical System”. U.S. pat. req. 17/242,790. Robert Bosch GmbH. Apr. 28, 2021. Filed.
- [39] D. Speck, **Biedenkapp, A.**, R. Matmüller, F. Hutter, and M. Lindauer. “Device and Method for Planning and Operation of a Technical System”. European pat. req. EP20178576.3 – 1203. Robert Bosch GmbH. *Also filed requests for US patent and CN patent*. June 1, 2020. URL: <http://v3.espacenet.com/textdoc?IDX=EP3920103>. Filed.
- [40] **Biedenkapp, A.**, H. F. Bozkurt, F. Hutter, and M. Lindauer. “Method, Device and Computer Program for Adjusting a Hyperparameter”. European pat. req. EP3748551. Robert Bosch GmbH. June 11, 2020. URL: <http://v3.espacenet.com/textdoc?IDX=EP3748551>. Filed.

Presentations

Invited Talks & Competitively-Selected Tutorials.....

Dynamic Algorithm Configuration <i>ELLIS Meetup Freiburg, Freiburg, Germany</i>	03.2022
Advances of Dynamic Algorithm Configuration <i>Bosch Center for Artificial Intelligence, Renningen, Germany</i>	06.2021
Algorithm Configuration: Challenges, Methods and Perspectives <i>IJCAI 2020 Tutorial</i> Jointly with Prof. Marius Lindauer	01.2021
Algorithm Configuration: Challenges, Methods and Perspectives <i>PPSN 2020 Tutorial</i> Jointly with Prof. Marius Lindauer	09.2020
Challenges of Dynamic Algorithm Configuration <i>Bosch Center for Artificial Intelligence, Renningen, Germany</i>	03.2020

Dynamic Algorithm Configuration

Institut für Informationsverarbeitung (TNT), University of Hannover

01.2020

Conference Presentations

The Genetic and Evolutionary Computation Conference

Online

GECCO (Joint video presentation with all authors)

07.2022

Theory-inspired Parameter Control Benchmarks for Dynamic Algorithm Configuration

International Conference on Machine Learning

Online

ICML (Poster)

07.2021

TempoRL: Learning When to Act

International Conference on Parallel Problem Solving from Nature

Leiden

PPSN (Poster), Netherlands

08.2020

Learning Step-Size Adaptation in CMA-ES

European Conference on Artificial Intelligence

Santiago de Compostela

ECAI (Oral), Spain

08.2020

Dynamic Algorithm Configuration: Foundation of a New Meta-Algorithmic Framework

Learning and Intelligent Optimization Conference

Kalamata

LION (Oral), Greece

06.2018

CAVE: Configuration Assessment, Visualization and Evaluation

AAAI Conference on Artificial Intelligence

San Francisco

AAAI (Poster), California, USA

02.2017

Efficient Parameter Importance Analysis via Ablation with Surrogates

Workshop Presentations

Bridging the Gap Between AI Planning and Reinforcement Learning

Online

PRL@ICAPS'22

06.2022

Learning Domain-Independent Policies for Open List Selection

Inductive Biases, Invariances and Generalization in Reinforcement Learning

Online

BIG@ICML'20

07.2020

Towards TempoRL: Learning When to Act

Data Science Meets Optimisation

Macau

DSO@IJCAI'19, Macau (SAR), China

08.2019

Towards White-box Benchmarks for Algorithm Control

Scholarships, Honors and Awards

Best Paper Award

GECCO'22, Theory-inspired Parameter Control Benchmarks for Dynamic Algorithm Configuration

2022

GECH Track

Best Reviewers (Top 10%)

ICML'21

2021

Black-Box Optimization Competiton@NeurIPS'20

1st place

Part of the AutoML & IOHprofiler Team, 1st place on a meta-learning friendly search space

2020

Leaderboard: <https://bbchallenge.com/altleaderboard>

Black-Box Optimization Competiton@NeurIPS'20

3rd place*

Part of the AutoML & IOHprofiler Team, Leaderboard: <https://bbchallenge.com/leaderboard>

2020

*Due to a bug the initial evaluation failed. After re-evaluation our team would have gotten the third place.

Travel Grant

to visit the Thirty-First AAAI Conference on Artificial Intelligence (AAAI-17), \$400

2017

Professional Service

Journal Reviewing.....

Computational Intelligence

2022

Journal of the Association for Computing Machinery

2022, 2021

Program Committee Membership at Conferences.....

AAAI Conference on Artificial Intelligence (AAAI)

2018

AutoML Conference (AutoML-Conf)

2022

European Conference on Artificial Intelligence (ECAI)

2020

European Workshop on Reinforcement Learning (EWRL)

2022

International Conference on Machine Learning (ICML)

2021, 2019

Neural Information Processing Systems (NeurIPS)

2022, 2021

NeurIPS Datasets and Benchmarks (NeurIPS DBT)

2021 (Track 1 & Track 2)

Program Committee Membership at Workshops.....

ICLR Workshop on Agent Learning in Open-Endedness (ALOE)

2022

ICML Workshop on Automated Machine Learning (AutoML@ICML)

2021, 2020, 2019, 2018

NeurIPS Workshop on Meta-Learning (MetaLearn@NeurIPS)

2019

Organizer.....

2nd AutoML Fall School

2022, Co-Organiser

ELLIS Unit Meetups Freiburg

2022-, Co-Organiser

Joined in July

Programming Skills

Excellent: Python, Bash, \LaTeX

Good: C, C#, C++

Basic: Matlab, Java

Selected Open-Source Projects

GitHub Page: <https://github.com/AndreBiedenkapp>

<https://github.com/automl/DAC>

DAC

Role: Developer

DAC is the first dynamic algorithm configurator which enables configuration not only to specific problem instances but also at each time-step. To gain insights into the strengths and weaknesses of this reinforcement learning based configurator DAC comes with example white-box benchmarks.

<https://github.com/automl/DACBench>

DACBench

Role: Contributor

DACBench is a benchmark library for Dynamic Algorithm Configuration. Its focus is on reproducibility and comparability of different DAC methods as well as easy analysis of the optimization process.

<https://github.com/automl/ParameterImportance>

PyImp

Role: Developer

PyImp is an easy to use tool that helps developers to identify the most important parameters of their algorithms. Given the data of a configuration run with SMAC3, PyImp allows for usage of various parameter importance methods to determine which parameters have the most influence on the algorithms behaviour.

<https://github.com/automl/SMAC3>

SMAC3

Former Role: Contributor

Python implementation of SMAC (sequential model-based algorithm configuration). SMAC is a tool for automated algorithm configuration.

Languages

Native: German

Fluent: English

Basic: French