Simon Bachhuber

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Education

Dr.-Ing. in AI in Biomedical Engineering at **FAU Erlangen-Nürnberg**, Erlangen, Germany — Sep, 2021 – Mar, 2025
Grade: Summa cum laude Thesis: *Dynamic motion state estimation and control via RNNs and sim-to-real transfer*

M.S. in Physics at **The University of Regensburg**, Regensburg, Germany — Oct, 2018 – Nov, 2020
Grade: 1.2 (GPA: 3.8/4) Thesis: *Increasing label efficiency in supervised classification for industrial application*

B.S. in Physics at **The University of Regensburg**, Regensburg, Germany — Mar, 2015 – Jul, 2018
Grade: 1.6 (GPA: 3.4/4) Thesis: *Lieb-Liniger model for relativistic particles*

Work Experience

KEEQuant GmbH, Fürth, Germany — Jun, 2025 – Present
Continuous-Variable Quantum Key Distribution, System Engineer

Institute of Mechatronic Systems, Hanover, Germany — Sep, 2024 – May, 2025
Learning Control and Inertial Motion Tracking Technology, Postdoctoral Researcher
- Proposal writing work and supervision/advising/mentoring of bachelor/master/Ph.D. students

Department Artificial Intelligence in Biomedical Engineering, Erlangen, Germany — Sep, 2021 – Aug, 2024
Learning Control and Inertial Motion Tracking Technology, Doctoral Researcher
- Developing **RNN-, Neural-ODE-, and Transformer-based** solutions for human motion capture with wearable, inertial sensors
- In three years, achieved **seven papers in first-authorship** and six papers in co-authorship; published in top-outlets (IROS, TMLR, …)
- Presented our research and re-presented our department at several international conferences in Sweden, Singapore, and Abu Dhabi
- Won Jean-Pierre Le Cadre Award (**best-paper award**) as first author (2nd runner-up) and as co-author
- Designed and delivered a highly-rated course on Explainable ML with over **300 participants**, teaching advanced concepts with clarity

German Aerospace Center, Ulm, Germany — Apr, 2021 – Jul, 2021
Battery Degradation Simulation, Scientific Staff
- Prototyped a modular, json-based experiment configuration system, improving experiment reproducibility and iteration speed

BMW AG, Regensburg, Germany — Sep, 2020 – Mar, 2021
Anomaly Detection for Predictive Maintenance, Internship
- Developed and deployed (via Azure) an anomaly detection system within months that proved so effective that it was rolled out to other production sites; received an outstanding employment reference letter

Related Projects

Plug-and-Play Inertial Motion Tracking, state-of-the-art methods **with < 5 lines of code** — simon-bachhuber/imt
- Contains sensor fusion methods of more than five papers, both constraint-based as well as ML-based methods; made portable via ONNX

Recurrent Inertial Graph-based Estimator, a novel, message-passing RNN architecture — simon-bachhuber/ring
- Contains a complete physics engine, a motion generation engine, extensive quaternion algebra, and a feature-complete deep learning stack with WandB logging, all written in JAX that automatically scales from a single CPU to multiple GPUs (SIMD)

Neural ODE Control, automatic design of feedback controllers, uses JAX and MuJoCo — simon-bachhuber/chain_control
- Automatic design of Neural-ODE-based output feedback policies via truncated backpropagation through time or Deep RL

Skills

- Programming Languages: Deep understanding of the Python language (including the interpreter itself); comfortable with Matlab, Julia, C, Bash, Cython, Zsh, Scala (random order)
- **Python: Over six years experience**, skilled in publishing and maintaining packages on PyPI, automated CI via Github Actions and flake8, pytest, mkdocs, black, mypy, pytype
- Deep Learning Frameworks: Over **five years experience in PyTorch, Tensorflow, JAX**; in general proficient in autograd and array frameworks such as Numba, MLX, PyTensor, CuPy; Personal LLM project involving finetuning Llama3 using torchtune
- High-performance Computing: SLURM, ray, optuna, multiprocessing, asyncio, TorchScript, Azure Cloud, Databricks, PySpark
- Misc: Bitbucket, Github, MuJoCo, Stable Baselines 3, OpenAI Gym, Ray RLLib, LaTeX, Typst, Jira, Simulink, WandB, Kalman filtering

Selected Publications Google Scholar

[1] S. Bachhuber, A. Pawluchin, A. Pal, I. Boblan, and T. Seel, "A Soft Robotic System Automatically Learns Precise Agile Motions Without Model Information," in *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2024. doi: 10.48550/arXiv.2408.03754.

[2] S. Bachhuber, I. Weygers, D. Lehmann, M. Dombrowski, and T. Seel, "Recurrent Inertial Graph-Based Estimator (RING): A Single Pluripotent Inertial Motion Tracking Solution," *Transactions on Machine Learning Research*, Jul. 2024, [Online]. Available: https://openreview.net/forum?id=h2C3rkn0zR

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