BENJAMIN ALT

Senior Team Lead Research at ArtiMinds Robotics / PhD Candidate at the University of Bremen

@ **benjamin.alt@uni-bremen.de** **benjaminalt.github.io** **github.com/benjaminalt** **linkedin.com/in/benjamin-alt**

EDUCATION

Ph.D. Candidate, Institute for Artificial Intelligence

University of Bremen 2020 - today Bremen, Germany

- Supervisor: Prof. Michael Beetz
- Dissertation: Neurosymbolic Robot Programming - A Framework for AI-Enabled Programming of Robot Manipulation Tasks (PDF)
- Research focus: Robot learning, differentiable programming, AI safety

M.Sc. Computer Science

Karlsruhe Institute of Technology 2017 – 2019 Karlsruhe, Germany

- Overall Grade: 1.0 ("with distinction", GPA: 4.0)
- Thesis: *"'Automatic Parameterization of Robot Programs via Learning of Neural Program Representations"'* (1.0 / GPA: 4.0), Institute of Anthropomatics and Robotics (IAR)
- Specializations: Anthropomatics & Cognitive Systems, Robotics & Automation
- Minor: Electrical Engineering

B.Sc. Computer Science

Karlsruhe Institute of Technology 2015 – 2017 Karlsruhe, Germany

- Overall Grade: 1.4 (GPA: 3.8)
- Thesis: *"'Machine Learning for Pose Optimization: An Integrated Framework for the Development and Monitoring of Adaptive Robot Programs"'* (1.0 / GPA: 4.0), Institute of Anthropomatics and Robotics (IAR)
- Minor: Electrical Engineering

B.A. Political Science

Institut d'Études Politiques de Paris (SciencesPo) 2012 – 2015 Reims, France

- Overall Grade: 17/20 ("Summa Cum Laude", GPA: 3.8)
- Minors: Law, History, Economics
- 2014-2015 at Princeton University with a focus on Mathematics & Computer Science

PUBLICATIONS

Conference Papers

- B. Alt, J. Dvorak, D. Katic, R. Jäkel, M. Beetz, and G. Lanza, "BANSAI: Towards Bridging the AI Adoption Gap in Industrial Robotics with Neurosymbolic Programming", in *57th CIRP Conference on Manufacturing Systems 2024*, arXiv, 2024. DOI: 10.48550/arXiv.2404.13652. arXiv: 2404.13652 [cs].
- B. Alt, U. Keßner, A. Taranovic, *et al.*, "Domain-Specific Fine-Tuning of Large Language Models for Interactive Robot Programming", in *European Robotics Forum 2024*, 2024. DOI: 10.48550/arXiv.2312.13905. arXiv: 2312.13905 [cs].
- B. Alt, F. Stöckl, S. Müller, *et al.*, "RoboGrind: Intuitive and Interactive Surface Treatment with Industrial Robots", in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, IEEE, 2024. DOI: 10.1109/ICRA57147.2024.10611143. arXiv: 2402.16542 [cs].
- B. Alt, J. Zahn, C. Kienle, *et al.*, "Human-AI Interaction in Industrial Robotics: Design and Empirical Evaluation of a User Interface for Explainable AI-Based Robot Program Optimization", in *57th CIRP Conference on Manufacturing Systems 2024*, arXiv, 2024. DOI: 10.48550/arXiv.2404.19349. arXiv: 2404.19349 [cs].
- C. Kienle, B. Alt, O. Celik, *et al.*, "MuTT: A Multimodal Trajectory Transformer for Robot Skills", in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2024. DOI: 10.48550/arXiv.2407.15660. arXiv: 2407.15660 [cs].
- B. Alt, F. K. Kenfack, A. Haidu, D. Katic, R. Jäkel, and M. Beetz, "Knowledge-Driven Robot Program Synthesis from Human VR Demonstrations", in *Proceedings of the 20th International Conference on Principles of Knowledge Representation and Reasoning*, IJCAI, 2023, pp. 34–43.

- B. Alt, M. D. Nguyen, A. Hermann, *et al.*, “EfficientPPS: Part-aware Panoptic Segmentation of Transparent Objects for Robotic Manipulation”, in *ISR Europe 2023*, VDE Verlag, 2023.
- J. Raible, O. Rettig, B. Alt, *et al.*, “Artificial Neural Network Guided Compensation of Nonlinear Payload and Wear Effects for Industrial Robots”, in *2023 IEEE 19th International Conference on Automation Science and Engineering (CASE)*, 2023, pp. 1–8. DOI: 10.1109/CASE56687.2023.10260559.
- F. Stöckl, M. Strand, S. Müller, *et al.*, “Autonomous Surface Grinding of Wind Turbine Blades”, in *Intelligent Autonomous Systems 18*, S.-G. Lee, J. An, N. Y. Chong, M. Strand, and J. H. Kim, Eds., Springer Nature Switzerland, 2023, pp. 451–457. DOI: 10.1007/978-3-031-44981-9_38.
- B. Alt, D. Katic, R. Jäkel, and M. Beetz, “Heuristic-Free Optimization of Force-Controlled Robot Search Strategies in Stochastic Environments”, in *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022, pp. 8887–8893. DOI: 10.1109/IROS47612.2022.9982093.
- B. Alt, C. Kunz, D. Katic, *et al.*, “LapSeg3D: Weakly Supervised Semantic Segmentation of Point Clouds Representing Laparoscopic Scenes”, in *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022, pp. 5265–5270. DOI: 10.1109/IROS47612.2022.9981178.
- B. Alt, D. Katic, R. Jäkel, A. K. Bozcuoglu, and M. Beetz, “Robot Program Parameter Inference via Differentiable Shadow Program Inversion”, in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, 2021, pp. 4672–4678. DOI: 10.1109/ICRA48506.2021.9561206.
- S. Dittus, B. Alt, A. Hermann, D. Katic, R. Jäkel, and J. Fleischer, “Localization and Tracking of User-Defined Points on Deformable Objects for Robotic Manipulation”, in *IEEE ICRA Workshop on Representing and Manipulating Deformable Objects*, IEEE, 2021. arXiv: 2105.09067.
- B. Alt, F. Aumann, L. Gienger, *et al.*, “Modulare, datengetriebene Roboterprogrammierung für die Lösung komplexer Handhabungsaufgaben in Alltagsumgebungen”, in *AAL-Kongress 2020*, VDE Verlag, 2020, pp. 17–22.

Journal Articles

- A. Schultheis, B. Alt, S. Bast, *et al.*, “EASY: Energy-Efficient Analysis and Control Processes in the Dynamic Edge-Cloud Continuum for Industrial Manufacturing”, *KI - Künstliche Intelligenz*, 2024. DOI: 10.1007/s13218-024-00868-3.

Book Chapters

- L. Kluy, L. Kölmel, B. Alt, *et al.*, “Mensch-Roboter-Kollaboration in KMU – Potenziale identifizieren, analysieren und realisieren”, in *Digitalisierung der Arbeitswelt im Mittelstand 1: Ergebnisse und Best Practice des BMBF-Forschungsschwerpunkts "Zukunft der Arbeit: Mittelstand – innovativ und sozial"*, V. Nitsch, C. Brandl, R. Häußling, J. Lemm, T. Gries, and B. Schmenk, Eds., Springer, 2022, pp. 55–97. DOI: 10.1007/978-3-662-64803-2_3.
- B. Graf, F. Jordan, G. Blume, *et al.*, “RoPHa - Robuste Wahrnehmungsfähigkeiten für Roboter zur Unterstützung älterer Nutzer im häuslichen Umfeld”, in *Autonome Roboter Für Assistenzfunktionen*, Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, 2020, pp. 118–133.

Patents

- B. Alt, R. Jäkel, and D. Katic, “Method and System for Determining Optimized Program Parameters for a Robot Program”, pat. WO2022022784A1, 2022.

Preprints

- B. Alt, C. Kienle, D. Katic, R. Jäkel, and M. Beetz, *Shadow Program Inversion with Differentiable Planning: A Framework for Unified Robot Program Parameter and Trajectory Optimization*, 2024. DOI: 10.48550/arXiv.2409.08678. arXiv: 2409.08678 [cs].
- C. Kienle, B. Alt, D. Katic, and R. Jäkel, *QueryCAD: Grounded Question Answering for CAD Models*, 2024. DOI: 10.48550/arXiv.2409.08704. arXiv: 2409.08704 [cs].

PROFESSIONAL EXPERIENCE

Senior Team Lead Research

Innovation Lab, ArtiMinds Robotics — Oct 2024 - today — Karlsruhe, Germany

- Leadership of a young team of 5-12 full-time and student researchers
- Development and operationalization of a research agenda for AI-enabled robot programming in manufacturing
- Establishment and expansion of long-term research partnerships with academic and industry partners
- Acquisition and realization of publicly funded research projects in excess of 800k € of grant volume

Senior Research Scientist

Innovation Lab, ArtiMinds Robotics — Jan 2023 - Sep 2024 — Karlsruhe, Germany

- Research on scalable, interpretable artificial intelligence for industrial robots

- Acquisition and realization of publicly funded research projects in excess of 1.5M € of grant volume
- Mentoring and in-house consulting on AI methods, applications and technology transfer
- Mentoring and supervision of graduate and undergraduate students

Research Scientist

Innovation Lab, ArtiMinds Robotics Oct 2019 - Dec 2022 Karlsruhe, Germany

- Research on semi-symbolic robot program inference with deep neural networks
- Applied research and prototype development for the data-driven optimization of industrial production processes
- Acquisition and realization of publicly funded research projects in excess of 1.5M € of grant volume
- Mentoring and supervision of graduate and undergraduate students

Junior Software Engineer

ArtiMinds Robotics Sep 2017 – Aug 2019 Karlsruhe, Germany

- Development of a solution for data-driven robot trajectory optimization
- Co-development of a platform for the aggregation, display and analysis of robot process data
- *Associate Trainer*: Training and education of industry customers

Student Engineer

ArtiMinds Robotics Jan 2017 – Sep 2017 Karlsruhe, Germany

- Bachelor's Thesis': Online pose optimization of an industrial robotic manipulator with recurrent neural networks
- Development of an algorithm for the automatic generation of safety regions from robot trajectories

Research Assistant

Institute for Process Automation and Robotics, KIT Sep 2016 – Dec 2016 Karlsruhe, Germany

- Development of a ROS-based solution for shape-from-motion force-torque sensor calibration
- Development of a Java code generator for the AutomationML ontology

Student Engineer

WIBU Systems AG Jun 2015 – Aug 2016 Karlsruhe, Germany

- Development and deployment of a virtualized software testbed with VmWare ESXi and Jenkins CI
- Development of internal web applications with HTML5/PHP/JavaScript
- Development of a graphical API guide and code generator in C++/Qt5

SCHOLARSHIPS AND AWARDS

Scholarship of the German Acad. Scholarship Foundation (Studienstiftung des deutschen Volkes) Mar 2018 – Sep 2019

e-fellows Scholarship (Deutsche Telekom, Georg v. Holtzbrinck & McKinsey) Jun 2012 – Sep 2019

SKILLS

Python	
C++	
Java	
Prolog	
Development tools	Git, DVC, Jira, CMake, Jenkins CI
Frameworks	PyTorch, NumPy, Keras, ROS, Qt

German, English	
French	
Spanish	
Latin, Italian	

Karlsruhe, November 9, 2024