

Sebastian Koch

Doctoral Researcher

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Stuttgart, Germany

Education

2022 – Now

Ulm University, Germany

PhD in Computer Science

- *Advisor*: Prof. Timo Ropinski
- *Thesis*: Open-World 3D Scene Understanding and Reasoning with 3D Scene Graphs
- *Apr 2022 – Mar 2025*: Bosch Research Doctoral Program (Sponsorship & Co-Supervision)

2020 – 2022

Tübingen University, Germany

Master of Science in Computer Science

- *Advisors*: Prof. Gerhard Neumann & Prof. Andreas Geiger
- *Thesis project*: Multi-View RGB-D Fusion for 6D Pose Estimation
- *GPA*: 1.4 (1.0 is the best)
- *Selected courses*: Computer Vision, Deep Learning, Reinforcement Learning, Mobile Robotics, Mathematics for Machine Learning, 3D Computer Vision

2016 – 2020

Baden-Württemberg Cooperative State University (DHBW), Germany

Bachelor of Science in Computer Science

- *Thesis project*: Improvement of the robustness of a SLAM system using Object Semantics
- *GPA*: 1.8 (1.0 is the best)

Experience

Bosch Center for Artificial Intelligence

Apr 2022 –
Mar 2025

Bosch Research Doctoral Program – 3D Scene Understanding for indoor robotic applications

- *Mentors*: Dr. Narunas Vaskevicius & Dr. Mirco Colosi
- *Role*: Research and development on 3D Scene Graphs for indoor 3D scene understanding, achieving over 50% reduction in labeled sample requirements through self-supervised learning, and introducing open-vocabulary relationship predictions for fine-grained inter-object reasoning. This work resulted in three first-author publications [1], [2], [3].

Oct 2021 –
Mar 2022

Industrial Master Thesis – 6D Pose Estimation

- *Mentor*: Dr. Fabian Duffhauss
- *Role*: Developed a multi-view RGB-D fusion method with a symmetry-aware keypoint voting approach, improving 6D Pose Estimation accuracy by 7.6% and achieving state-of-the-art results, resulting in a publication [5].

University of Tübingen

Sep 2020 –
Oct 2021

Research Assistant – Real-time high-resolution remote sensing

- *Mentors*: Dr. Leon-Amadeus Varga & Prof. Andreas Zell
- *Role*: Research on encoder-only region proposal techniques combined with hardware-optimized TensorRT and CUDA implementations on embedded GPUs for real-time object detection in high-resolution images. Studied the impact of on-device image pre-processing for enhanced remote sensing object detection accuracy, resulting in one publication [6].

Bosch Research

Apr 2020 –
Oct 2020

Research Intern – Object-level Semantics for SLAM

- *Mentors:* Stefan Benz
- *Role:* Integrated an object detection pipeline into a ROS system for enhanced localization and mapping. Led synthetic data generation using Unreal Engine to enable reproducible mapping runs used in the evaluation section of a published paper.

Bosch Group

Oct 2016 –
Mar 2020

Industrial Bachelor Student

- *Role:* Alongside my bachelor's in computer science at the university worked on scientific projects in different departments at Bosch, applying learned knowledge and collaborating with experienced developers and researchers.
- *Advisors:* Stefan Benz, Hanna Ziesche, Christopher Baker, Stephan Stühmer
- *Nov 2017 – Feb 2018:* Analyzed false-positive ultrasonic reflections in automotive sensors.
- *Jun 2018 – Sep 2018:* Implemented a play-back recording feature for ECU failure analysis.
- *Jun 2019 – Sep 2019:* Implemented a pedestrian simulator for ML-based human behavior prediction.
- *Sep 2019 – Mar 2020:* Researched the impact of semantic features for improved SLAM accuracy.

Qualifications

Programming: Python, C++, MATLAB, Bash

Libraries: PyTorch, Lightning, JAX, NumPy, Matplotlib, OpenCV

Software: Git, \LaTeX , ROS, GNU/Linux, Office

Languages: German (native), English (fluent)

Service

Reviewing: ICRA 2025, NeurIPS 2024, IROS 2024, CVPR 2024, ICCV 2023

Volunteering: I work as a volunteer and referee at RoboCup Junior events on a national and international level.

Invited Talks

2024 | **RWTH Aachen. Computer Vision Group, Prof. Bastian Leibe:** 3D Scene Understanding with label-efficient and open-vocabulary 3D Scene Graphs, Remote 27.02.2024.

Bosch Research Sunnyvale. 3D Scene Understanding with label-efficient and open-vocabulary 3D Scene Graphs, Remote 07.02.2024.

Honors & Awards

2024 | Accepted into International Computer Vision Summer School (ICVSS) 2024 for excellent PhDs in CV.

2021 | 1st place in the AI Chess Variant Competition conducted by the Cognitive Systems Lab of Prof. Andreas Zell.
3rd place in the RL Hockey Competition of the MPI Autonomous Learning Group of Prof. Georg Martius.

2020 | Accepted into the Students@Bosch program for students who excelled at Bosch internships.

2014 | 4th place at the RoboCup World Cup 2014 in Joao Pessoa Brazil in the Rescue Junior competition

2013 | German Champion at the RoboCup German Open 2013 in the Rescue Junior competition.
World Champion at the RoboCup World Cup 2013 in Eindhoven in the Rescue Junior competition.

Publications

For a complete list of all publications including recent pre-preprints see: kochsebastian.com/publications

- 2024 [1] **S Koch**, N Vaskevicius, M Colosi, P Hermosilla, T Ropinski, “Open3DSG: Open-vocabulary 3D Scene Graphs from Point Clouds with Queryable Objects and Open-Set Relationships”, in Conference on Computer Vision and Pattern Recognition (**CVPR**), 2024.
- [2] **S Koch**, P Hermosilla, N Vaskevicius, M Colosi, T Ropinski, “Lang3DSG: Language-based contrastive pre-training for 3D Scene Graph prediction”, *International Conference on 3D Vision (3DV)*, 2024.
- [3] **S Koch**, P Hermosilla, N Vaskevicius, M Colosi, T Ropinski, “SGRec3D: Self-Supervised 3D Scene Graph Learning via Object-Level Scene Reconstruction” in Winter Conference on Applications of Computer Vision (**WACV**), 2024.
- [4] Y Liu, L Palmieri, **S Koch**, I Georgievski, M Aiello, “DELTA: Decomposed Efficient Long-Term Robot Task Planning using Large Language Models”, arXiv preprint arXiv:2404.03275, 2024.
- 2023 [5] F Duffhauss, **S Koch**, H Ziesche, NA Vien, G Neumann, “SyMFM6D: Symmetry-aware Multi-directional Fusion for Multi-View 6D Object Pose Estimation”, in IEEE Robotics and Automation Letters (**RA-L**), 2023.
- 2022 [6] LA Varga, **S Koch**, A Zell, “Comprehensive Analysis of the Object Detection Pipeline on UAVs”, in **Remote Sensing**, 2022.

References

Prof. Timo Ropinski. Full Professor, Ulm University.

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Prof. Pedro Hermosilla. Assistant Professor, TU Wien.

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Dr. Narunas Vaskevicius. Lead Research Scientist, Perception Group, Bosch Research.

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Dr. Mirco Colosi. Research Scientist, Mapping Group, Bosch Research.

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Prof. Gerhard Pons-Moll. Full Professor, University of Tuebingen.

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