

# Ning Gao

RESEARCH SCIENTIST · SOFTWARE ENGINEER

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I'm a fourth-year PhD student in Autonomous Learning Robots (ALR) at KIT supervised by Prof. Gerhard Neumann. I'm also a doctoral researcher at Bosch Center for Artificial Intelligence (BCAI), Renningen, Germany. My research interests lie in the field of **meta-learning** and **self-supervised learning** towards **efficient** and **generalizable** representation on **novel** tasks across various robotic applications, e.g. **robotic grasping**, **6D object pose estimation**, **object segmentation** and **scene understanding**.

## Education

### Ph.D. in Computer Science

KARLSRUHE INSTITUTE OF TECHNOLOGY

- Meta-learning on robotic vision applications supervised by Prof. Gerhard Neumann

Karlsruhe, Germany

05/2020 - Exp. 05/2024

### M.Sc. in Mechanical Engineering

KARLSRUHE INSTITUTE OF TECHNOLOGY

- Major in Robotics and computer vision
- Thesis: Benchmarking Deep Learning Algorithms for 6DoF Object Pose Estimation in a Robotic System

Karlsruhe, Germany

10/2016 - 11/2019

### B.Sc. in Automotive Engineering

SHANGHAI TONGJI UNIVERSITY

- Honors & Awards: Shanghai Outstanding Graduate Award, National Student Scholarship, Infineon Scholarship

Shanghai, China

10/2011 - 07/2016

## Skills

**Language** Chinese (native), English (fluent), German (proficient), Japanese (basic)

**Machine Learning** Pytorch, Open3D, OpenCV, Blender Python API, MuJoCo, Pybullet, Numpy, Pandas, Scikit, Tensorflow

**Software Engineering** Python, Git, C/C++, Jupyter, Slurm, Ros, Docker

**Other**  $\LaTeX$ , Microsoft Office, Linux

## Research Experience

### Graduate Research Assistant

KARLSRUHE INSTITUTE OF TECHNOLOGY & BOSCH CENTER FOR AI

- Evaluated the performance of meta-learning algorithms, including **MAML**-based and those within the **Neural Processes**, on freshly designed **vision regression** tasks. Proposed a **functional contrastive** learning loss to enhance learning **efficiency** among **task representations** and facilitate **knowledge transfer** to **novel** tasks.
- Integrated **meta-learning** and **few-shot** learning approaches across a range of robotic applications, such as **robotic grasping**, **object segmentation** and **pose estimation**, and generated various synthetic dataset using **Mujoco**, **Pybullet** and **Blenderproc**.
- Implemented **adaptive** and **versatile** algorithms for 6D pose estimation of **novel** objects **across categories** without the need of **retraining** or any **object-specific information** as prior knowledge.
- Investigated **conditional** slot representation for enhancing **scene understanding** and **object abstraction**.

Karlsruhe & Renningen, Germany

05/2020 - Exp. 05/2024

### Research Intern

BOSCH CENTER FOR AI

- Benchmarked Deep Learning Algorithms (**Yolov2**, **Yolov3**, **RetinaNet**, **DOPE**, **AAE**) for 6DoF Object Pose Estimation in a robotic system.
- Generated a novel industrial data using **OpenGL** and **Blender**.

Renningen, Germany

05/2019 - 10/2019

### Research Intern

BOSCH CORPORATE RESEARCH

- Predicted driver's behavior based on **gaze estimation**.
- Built interior camera system prototype for autonomous driving and collected real-world video data for training.

Renningen & Abstatt, Germany

03/2018 - 02/2019

### Research Assistant

INSTITUTE OF MEASUREMENT AND CONTROL SYSTEMS (MRT), KIT

- Implemented **joint tracking** of multiple pedestrians and vehicles on **KITTI** dataset using **C++** and **Matlab**.

Karlsruhe, Germany

11/2017 - 05/2018

## Publications

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- [1] **Ning Gao**, Bernard Hohmann, and Gerhard Neumann. “Enhancing Interpretable Object Abstraction via Clustering-based Slot Initialization”. In: *The 34th British Machine Vision Conference (BMVC)* (2023).
- [2] **Ning Gao**, Vien Anh Ngo, Hanna Ziesche, and Gerhard Neumann. “SA6D: Self-Adaptive Few-Shot 6D Pose Estimator for Novel and Occluded Objects”. In: *7th Annual Conference on Robot Learning (CoRL)*. 2023.
- [3] **Ning Gao**, Jingyu Zhang, Ruijie Chen, Ngo Anh Vien, Hanna Ziesche, and Gerhard Neumann. “Meta-Learning Regrasping Strategies for Physical-Agnostic Objects”. In: *IEEE International Conference on Robotics and Automation (ICRA) Workshop on Scaling Robot Learning*. 2022.
- [4] Yumeng Li\*, **Ning Gao\***, Hanna Ziesche, and Gerhard Neumann. “Category-Agnostic 6D Pose Estimation with Conditional Neural Processes”. In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshop on Women in Computer Vision (WiCV)*. 2022.
- [5] **Ning Gao**, Hanna Ziesche, Ngo Anh Vien, Michael Volpp, and Gerhard Neumann. “What Matters for Meta-Learning Vision Regression Tasks?” In: *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*. June 2022, pp. 14776–14786.

## Teaching Experience

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### STUDENT SUPERVISION

2023	<b>Yifan Huo</b> , Category-Agnostic 6D Object Pose Estimation with Online Rendering. (M.Sc.)	<i>Bosch Center for AI</i>
2023	<b>Jingyu Zhang</b> , Context-Aware Active Grasping on Unseen Objects. (M.Sc.)	<i>Bosch Center for AI</i>
2022	<b>Bernard Hohmann</b> , Scene Representation and Manipulation. (2x Intern)	<i>ALR, KIT</i>
2021	<b>David Graf</b> , Multi-object and multi-view Learning (Intern)	<i>ALR, KIT</i>
2021	<b>Alex Vasilache</b> , Multi-object and multi-view Learning (Intern)	<i>ALR, KIT</i>
2021	<b>Yumeng Li</b> , Information Aggregation for 6D Pose Estimation (M.Sc.)	<i>Bosch Center for AI</i>
2021	<b>Ruijie Chen</b> , Few-shot Grasping on Physical-Agnostic Objects (M.Sc.)	<i>Bosch Center for AI</i>

## Community Service

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### Workshop Organization

- **IROS 2023**: Policy Learning in Geometric Spaces, Detroit, USA (Main Organizer)

### Reviewer

- ICRA2021, ICRA2022, IROS2022, CoRL2022, CVPR2023, CoRL2023

### Summer School

- The Machine Learning Summer School (MLSS), 2020, Tübingen, Germany
- International Workshop of Intelligent Autonomous Learning Systems (IWIALS), 2023, Kleinwalsertal, Austria