

# Axel Sauer

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## Education

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### University of Tübingen

*Ph.D. in Computer Science*

Focus on Unsupervised and Causal Representation Learning.

Advisor: Prof. Dr.-Ing. Andreas Geiger

**Tübingen, Germany**

*since 04/2020*

### Karlsruhe Institute of Technology

*M.Sc. in Mechanical Engineering (top 5% of class, with distinction)*

Focus on Advanced Mechatronics and Information Technology.

Thesis title: Learning to Drive in Urban Environments

**Karlsruhe, Germany**

*10/2015 – 04/2018*

### Karlsruhe Institute of Technology

*B.Sc. in Mechanical Engineering (top 5% of class)*

Focus on Automotive Engineering.

Thesis title: Thermo- and fluid-dynamic Analysis of the Cooling of an Electric Traction Motor

**Karlsruhe, Germany**

*10/2012 – 08/2015*

## Research Experience

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### Max Planck Institute for Intelligent Systems - Autonomous Vision

*Doctoral Researcher*

My research focuses on the unsupervised learning of an interpretable and causal state representation. This representation can be used, for example, for scalable end-to-end autonomous driving.

**Tübingen, Germany**

*since 04/2020*

### Technical University of Munich - MSRM

*Research Assistant (1 year 10 months)*

During my time in Munich, I worked on Visual Object Tracking and its integration into robotic systems. Parts of my work were shown at the Hanover Fair and during a institute visit of the German Chancellor. Another project in which I was strongly involved was the launch of TUM's AI research blog.

**Munich, Germany**

*06/2018 – 03/2020*

### ETH Zurich - Computer Vision and Geometry Group

*Visiting Researcher (6 months)*

During this visit, I developed a new approach for autonomous driving in urban areas. The approach combines methods from model-based control with deep learning for visual perception. We achieved an improvement of up to 68 % in goal-directed navigation on the challenging CARLA benchmark.

**Zurich, Switzerland**

*11/2017 – 04/2018*

### Mercedes-Benz Japan Co., Ltd. - Alternative Drivetrains

*Engineering Intern (6 months)*

During this stay, I evaluated measurement data regarding the charging and driving behavior of electric vehicles, analyzed the data, and compiled detailed reports. I also assessed test cases for a hardware-in-the-loop test bench for the CHAdeMO Quick Charging Protocol.

**Tokyo, Japan**

*03/2017 – 09/2017*

### Daimler AG - Hybrid-/E-Drive & E-Motor

*Working Student (1 year 5 months)*

To develop an optimal operating cooling strategy of an electric powertrain, I established an interface between CFD-Simulations and numerical Matlab simulations. During my stay, I filed a patent for the active cooling of electric motor windings.

**Stuttgart, Germany**

*11/2015 – 03/2017*

## Daimler AG - Hybrid-/E-Drive & E-Motor

Research Intern & Bachelor Thesis (7 months)

Stuttgart, Germany

04/2015 – 08/2015

During this internship, I researched the current state of the art cooling technologies of electric machines. To validate several design concepts, I implemented a CFD-Simulation. One of the proposed designs led to a 50 % improvement of continuous power output on a real-world test bench.

## Publications

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- [1] **A. Sauer**, E. Aljalbout, and S. Haddadin. "Tracking Holistic Object Representations". In: *British Machine Vision Conference (BMVC)*. 2019. (oral, acceptance rate: 4%)  
**Best Science Paper Award.** (1 out of 1008 submissions).
- [2] **A. Sauer**, N. Savinov, and A. Geiger. "Conditional Affordance Learning for Driving in Urban Environments". In: *Conference on Robot Learning (CoRL)*. 2018. (oral, acceptance rate: 7%)  
**Nominated for the Best Systems Paper Award.**

## Awards and Grants

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**Honorable Mention in the Poster Competition**, at the IEEE RAS International Summer School on Deep Learning for Robot Vision

**Best Science Paper Award**, at the British Machine Vision Conference 2019 (BMVC)

**Nominated for the Best Systems Paper Award**, at the Conference on Robot Learning 2018 (CoRL)

**Travel Grant**, IEEE RAS International Summer School on Deep Learning for Robot Vision

## Reviewer

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**2019:** ICANN, NeurIPS Workshops (ML4AD, ML4PS)

## Teaching

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**Winter 2019:** Teaching assistant for *Seminar on Robotics Science and Systems Intelligence*

**Summer 2019:** Teaching assistant for *Robotics and AI Seminar - Seminal Papers*

## Skills

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**Programming:** Python, C++, Matlab

**Engineering:** Data acquisition (Dewesoft, CANoe), CFD (Star-CCM+), CAD (Siemens NX, Creo)

**Languages:** German (native), English (fluent), French (intermediate)

## Extracurricular Activities

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**Software Developer at KITcar:** KITcar is a group of students from the Karlsruhe Institute of Technology that are building an autonomous model car. I evaluated the state estimation algorithm and improved the parking algorithm. KITcar won the prestigious Carolo-Cup in 2018.

**Ju-Jitsu Athlete:** Ju-Jitsu is a Japanese martial art. I was a member of the German national team from 2010 to 2012 and won the German Championship in 2009 and 2010 and the Junior World Championship (U21) in 2011.