Dr. rer. nat. Timo Oess

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Summary

Dr. Timo Oess is a highly accomplished researcher specializing in neuroinformatics, cognitive psychology, and robotics. With a doctoral degree in Neuroinformatics/Cognitive Psychology from Ulm University and a Master's degree in Robotics, Cognition & Intelligence from the Technical University of Munich. Dr. Oess possesses a solid academic foundation complemented by practical expertise in computational modeling, machine learning, and artificial intelligence. He has hands-on experience in a large variety of tools and methodology for designing, conducting and analyzing experiments and data.

Education

Ulm University — *2017-2021*

Dr. rer. nat. Neuroinformatics/Cognitive Psychology

- Dissertation: "From sound waves to locations : computational models for sound source localization in the early auditory pathway" (Magna Cum Laude)

Technical University of Munich (TUM) — *2014-2016*

M.Sc. Robotics, Cognition & Intelligence (passed with distinction)

- Focus on robotics and computational neuroscience.

Norwegian University of Science and Technology, Trondheim — *2013*

Exchange Semester

- Focus on machine learning, artificial intelligence and neuroscience.

Ulm University — *2010-2013*

B.Sc. Computer Science (passed with distinction)

- Secondary subject in medicine.

Experience

Ulm University — *2023-Present*

Postdoctoral Researcher

Researcher in the group of Prof. Dr. Marc Ernst working on auditory motion perception in humans and computational models for perception, learning and control.

- Building computational models for investigation of neural and cognitive phenomena using Python.
- Conducting human experiments and collecting behavioral data using motion tracking systems and robotic platforms.
- Data integration and wrangling of big data sets from various sources, analyzing and running statistical tests on it.
- Server administration via CLI.
- Supervising undergraduate students.
- Collaboration with different project partners.
- Teaching: "Auditory Cognition".
- Member member of the subject examination board.

University of Freiburg — *2021-2023*

Postdoctoral Researcher (Akademischer Rat)

Postdoctoral fellow in the group of Prof. Dr. Carsten Mehring investigating cognitive models of human behaviour for motor control.
- Building cognitive models based on deep learning frameworks.
- Implementing computational and data intensive projects on high performance computing clusters.
- Analyzing learning in artificial recurrent neural networks using dynamical systems and optimal control theory.
- Supervising students.
- Teaching: ”Vertiefungsfach Neurobiology”, ”Biological Learning and Control”.
- Co-Organizer of the ”Open Science Quiz” at the Bernstein Center Freiburg.
- Co-Organizer of international conference ”FRoBio” - Freiburg Robotics and Biology Conference.

Ulm University *2017-2021*

Doctoral Student

Investigating computational and neuromorphic models of multi-sensory perception within the BW-Stiftung funded project ”VA-Morph Project”. • Developing and implementing models on a neuromorphic robotic platform.
- Constructing behavioral setups and conducting experiments for auditory perception with these.
- Designing automatic data processing pipelines for large data sets.
- Collaboration with project partners and administering scientific progress to timed delivery of project milestones.
- Supervising students.
- Teaching: ”Can you hear it: Auditory cognition”.

University of California, Irvine *2015-2016*

Junior Research Specialist

Junior research assistant at the cognitive anteater robotics laboratory (CARL) working on cognitive models for navigation supervised by Prof. Dr. Jeff Krichmar.
- Implementation of a complex robotic computational framework using MATLAB.
- Investigation of neuronal and behavioral data.

Foxim - Automated Costumer Service, Cologne *2016-2017*

Co-Founder and Lead Developer

Full-stack developer for a conversational commerce SaaS chat platform based on MEAN JavaScript stack.
- Developed a web service back-end API framework to handle cross-platform requests of customers.
- Representative at pitch events and successful established a solid partner network.
- Aligning complex software development with business strategies and client projects.

Technical University of Munich (TUM) *2014-2015*

Student Research Assistant

Assistance work in the Human Brain Project at the Department of Robotics and Embedded Systems.
- Literature Research.
- Project coordination with partner universities.
- Presentation and communication skills.

Albstadtwerke, Albstadt *2012, 2014*

Internship

Working as a back-end programmer on different software packages and interfaces.
- Programming a software for regional power and water supply control at the department of information technology using action-script.
- Developing a costumer related data base at the department of information technology using Microsoft Access.
- Identification of product owner needs.

Ulm University *2012-2013*

Student Research Assistant

Assistance work at the Department of Embedded Systems/Real-Time Systems.
- Implementing a test suit for an integrated controller using C++.

Publication List

2023

D. Schmid, **T. Oess** and H. Neumann
Listen to the Brain–Auditory Sound Source Localization in Neuromorphic Computing Architectures
Sensors 2023, 23(9), 4451. https://doi.org/10.3390/s23094451

2021

T. Oess and H. Neumann,
"Brain-inspired Visual-Auditory Integration Yielding Near Optimal Performance – Modelling and Neuromorphic Algorithms
ECRIM News article, Special topic on "Brain-Inspired Computing"

T. Oess, H. Neumann, Marc O. Ernst
Two Are Better Than One: Solving the Problem of Vertical Sound Source Localization via Binaural Integration
bioRxiv https://doi.org/10.1101/2020.09.10.291468

2020

T. Oess, M.O. Ernst, and H. Neumann,
Computational principles of neural adaptation for binaural signal integration
PLOS Computational Biology 16(7): e1008020. https://doi.org/10.1371/journal.pcbi.1008020

T. Oess, M. Löhr, D. Schmid, Marc O. Ernst and H. Neumann,
From near-optimal Bayesian Integration to Neuromorphic Hardware: A neural network model of multisensory integration
Frontiers in Neurorobotics, https://doi.org/10.3389/fnbot.2020.00029

T. Oess, M. Löhr, C. Jarvers, D. Schmid, and H. Neumann,
A Bio-Inspired Model of Sound Source Localization on Neuromorphic Hardware
2nd IEEE International Conference on Artificial Intelligence Circuits and Systems, Genoa, Italy. https://doi.org/10.1109/AICAS48895.2020.9073935

2019

T. Oess, M.O. Ernst, and H. Neumann,
Computational investigation of visually guided learning of spatially aligned auditory maps in the colliculus
ISAAR'19, Auditory Learning in Biological and Artificial Systems, Nyborg, Denmark. https://proceedings.isaar.eu/index.php/isaarproc/article/view/2019-18

2017

T. Oess, J. Krichmar, and F. Röhrbein (2017),
A Computational Model for Spatial Navigation Based on Reference Frames in the Hippocampus, Retrosplenial Cortex and Posterior Parietal Cortex
Frontiers in Neurorobotics. https://doi.org/10.3389/fnbot.2017.00004

2013

M. Oubbati, **T. Oess**, C. Fischer, and G. Palm (2013).
Multiobjective Reinforcement Learning Using Actor-Critic Framework and Reservoir Computing
Workshop in: Reinforcement Learning with Generalized Feedback: Beyond Numeric Rewards PDF

Additional Training

Athens Program
2014

Warsaw University of Technology, Warsaw

• Intensive course on knowledge systems and their representations. Knowledge graphs and semantic representations.

Neuromorphic Systems Workshop
2018

Capocaccia, Italy

• Cognitive Neuromorphic Engineering Workshop with hands-on practical sessions on neuromorphic computing and deep learning.

Deep Learning Workshop
2019

Ulm University

• Hands-on workshop on pitfalls of deep learning models based on Tensorflow and Pytorch.

FENS Summer School
2022

Bertinoro, Italy

• FENS Summer School on 'Artificial and natural computations for sensory perception: what is the link?'. Development and designing of deep learning models of neural population responses to natural images.

Seminar
2022

University of Freiburg

• Time management course for post-doctoral researchers that provided insights on different time managing methods like the ”Pomodoro Technique”

Skills

Programming Languages	Python | MATLAB | Javascript | Bash
Software Development	Programming Paradigms | GIT | CLI
Frameworks	Jupyter | PyTorch | Tensorflow | Pandas | NodeJS
Hardware	Arduino | 3D Printing | Motion Tracking Systems | VR Headsets | Laser cutting
Others	Blender | Server Administration | Docker Containers | Dynos
Languages	German ***Native*** | English ***Proficient (105 points iBT)*** | French ***Beginner (A2)***

Scholarships & Grants

- Philipp-Matthäus-Hahn scholarship for talented students (1.000 €).
- DAAD scholarship for international research internship (1.200 €).
- Travelling grant from Wissenschaftliche Gesellschaft Freiburg (1.000 €).
- FRIAS Conferences Funding Program (14.000€) to organize a international conference on bio-inspired robotics.

Extra

- Co-organizer of science quiz
- Pending patent application