

Summary

Dedicated computational neuroscientist with over 6 years of experience applying a background of physics, neuroengineering and machine learning research. Proven track record of leadership in a collaborative and interdisciplinary research environment.

Selected Accomplishments

- **Peer-Reviewed Journal Articles:** Lead author in high-impact work on connectome-constrained neural networks published in *Nature* (2024).
- **Grants and Awards:** Secured an ERC Grant for DeepCoMechTome project as lead contributor, awarded to Prof. Macke. Recipient of the Karl Schlecht Stiftung scholarship for leadership excellence.
- **Teaching Innovation:** Developed and delivered a seminar on computational connectomics.

Education

since 10/2020	Doctoral candidate , University of Tübingen and International Max Planck Research School for Intelligent Systems, Group Machine Learning in Science, Committee: Prof. Macke, Prof. Bethge, Prof. Martius
10/2017 – 03/2020	M.Sc. Neuroengineering , TU Munich, High Distinction, German Grade 1.2, US GPA equivalent 3.8
10/2013 – 07/2017	B.Sc. Physics , University of Göttingen and University of La Laguna (via Erasmus), German Grade 1.5 With Distinction, US GPA equivalent 3.5

Research positions

since 10/2020	Doctoral Researcher, Machine Learning in Science, University of Tübingen , Prof. Macke
since 04/2019	Research Intern and Remote Researcher, HHMI Janelia Research Campus , Group of Dr. Turaga
10/2018 – 02/2019	Research Project, TU Munich , <i>GANs for predicting distributions of multi-agent pedestrian trajectories</i> , Group of Prof. Leal-Taixé
09/2018 – 11/2018	Research Intern, TU Munich , <i>Representational dissimilarity of stimuli in medial temporal lobe and deep neural networks</i> , Group of Prof. Macke
02/2018 – 12/2018	Research Intern, Celonis SE, Munich , Data Science and Machine Learning
10/2017 – 02/2018	Research Project, TU Munich , <i>U-nets for nerve segmentation from ultrasound imaging</i> , Groups of Prof. Nießner and Prof. Leal-Taixé
08/2013	Research Intern, Federal Institute for Materials Research and Testing, Berlin , Prof. Kreutzbrück

Publications and talks

Peer-reviewed journal articles

2024	Lappalainen J. K. , *Tschopp, F. D., Prakhya S., McGill M., Nern A., Shinomiya K., Takemura S., Gruntman E., Macke J. H., Turaga S. C., Task-optimization enables prediction of neural activity from connectivity in the fly visual system (tentative title), accepted at <i>Nature</i> , 2024.
2019	Lappalainen J. K. , Herpich, J., Tetzlaff, C., A theoretical framework to derive simple, firing-rate-dependent mathematical models of synaptic plasticity. <i>Frontiers in Computational Neuroscience</i> , vol. 13, May 2019, p. 26.

* Items share this list of co-authors with the reference for brevity.

Preprints

- 2024 Alphabetically ordered author list including **Lappalainen J. K.** and twenty others, A practical guide to statistical distances for evaluating generative models in science. ArXiv, abs/2403.12636 (preprint, under revision). *Contributions include concept, software, writing, visualization.*
- 2023 **Lappalainen et al.**, *Connectome-constrained deep mechanistic networks predict neural responses across the fly visual system at single-neuron resolution, bioRxiv, 2023 (preprint).

Conference talks

- 2021 **Lappalainen et al.**, *Connectome constrained simulations with task optimization lead to accurate predictions of tuning properties in the fruit fly visual system. Champalimaud Research Symposium 2021, Dialogues on Neural and Machine Intelligence, Lisbon.
- 2021 **Lappalainen et al.**, *Connectome and task constrained neural networks. Satellite Workshop at Bernstein Conference 2021, Machine Learning meets Neuroscience: from Spikes to Stimulation, Berlin.

Selected poster presentations

- 2024 **Lappalainen et al.**, *Connectome-constrained deep mechanistic networks enable hypothesis generation and refinement. Cosyne Abstracts 2024.
- 2023 **Lappalainen et al.**, *Connectome-constrained deep mechanistic networks predict neural responses across the fly visual system at single-neuron resolution. Bernstein Conference 2023, Berlin.
- 2022 **Lappalainen et al.**, *Cell-type specific visual selectivity emerges through connectivity and task constraints. Connectomics Conference 2022, Berlin.
- 2020 **Lappalainen J. K.**, Prakhya S., McGill M., Tschopp F., Turaga S. C., Inferring function from structure with connectome and task constrained neural networks. Cosyne Abstracts 2020.

Invited lab meeting talks

- 2023 Prof. P. Ramdya lab, EPFL, Switzerland
- 2023 Prof. Dr. J. Gjorgjieva lab, Technical University of Munich, Germany
- 2022 Dr. M. Reiser lab, HHMI Janelia, Virginia, USA

Teaching activities

Including tutoring and lecturing

- since 2020 Probabilistic machine learning; **Computational connectomics seminar (lead lecturer)**; Data literacy; ML for scientific discovery seminar; Prof. Macke, University of Tübingen
- 2019 Statistics and probability theory, Large-scale modeling and large-scale data analysis; Prof. Macke, TU Munich
- 2016 – 2017 Classical mechanics, Prof. C. A. Volkert; Classical electrodynamics, Prof. T. Salditt; University of Göttingen

Community service & outreach

- since 2023 **Healthy Minds**, Mental health in academia workshop and talk-series, Organizer with N. Effenberger, workshops are financially supported by the Excellence Cluster Machine Learning and the Tübingen AI Center, <https://talks.tuebingen.ai/>
- since 2022 **KI Macht Schule**, volunteer, <https://ki-macht-schule.de/>

Professional development activities

- 2024 Leadership Talent Academy: Self Leadership, Impact, Innovation, People Leadership, Strategy & Change, University of Tübingen
- 2023 Best Practices for Academic Teaching, Dr. Maria Wirzberger
- 2021 Conflict Management for Scientists Training, Dr. Imke Lode

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2021	Stress Management Training, Suzanne Jones
2021	Responsible Conduct in Research Training, Dr. Leila Masri

Supervision

2024	M.Sc. Machine Learning, Thesis: <i>Integrating knowledge of neural tuning into connectome-constrained and task-optimized models</i> , L. Ulmer, University Tübingen
2023	M.Sc. Machine Learning, Thesis: <i>Uncertainty estimation in connectome-constrained neural networks using Deep Ensembles</i> , P. von Bachmann, University Tübingen
2022	B.Sc. Medical Informatics Thesis, Thesis: <i>Decoding object movement from a neural circuit simulation of the Drosophila visual system</i> T. Thevururasa, University Tübingen
2021	M.Sc. Machine Learning, Essay rotation: <i>Actors and controversies around brain-computer interface development</i> , D. Schultheiß, University Tübingen
2021	<i>Mackelab meets datajoint: Data- and ML-experiment management</i> with M. Pals and T. Thevururasa, University Tübingen

Contributions to research grants

2022	Lead contributor. DeepCoMechTome: Using deep learning to understand computations in neural circuits with Connectome-constrained Mechanistic Models. ERC Grant, Prof. Macke, accepted.
2021	Lead author. Optical flow calculations with biologically realistic neural networks. Vector Stiftung Mint Innovationen, J. Lappalainen, Prof. Macke, shortlisted.
2020	Research and writing contributor. Dissociating neuronal representations along the ventral visual processing stream in the human temporal lobe. In DFG SFB "Synaptic microcircuits in health and disease", Prof. Macke (Co-PI), accepted.

Awards

2024	Karl Schlecht Stiftung (KSG) scholarship, Leadership Talent Academy
2021	Federal Ministry of Education and Research Grant via Tübingen AI Center
2019	J-1 short-term scholarship, HHMI Janelia Research Campus
2017	Elite-Network of Bavaria Membership
2016	Erasmus+ EU Grant
2012	DPG Membership for an outstanding Abitur (university admission qualification)

Technical Skills

- **Programming Languages:** Python (advanced), MATLAB, C++ (intermediate)
- **Other Tools and Software:** SQL, Bash, Git, LaTeX
- **Project Examples:**
 - *cbsp*: Small simulator for neurons with calcium-based synaptic plasticity and meta-learning synaptic plasticity rules from the simulation (using e.g. numpy, jit, numba).
 - *datamate*: A lightweight machine learning lifecycle management tool.
 - *dnnvsbrain*: Analysis of deep neural network representations and brain activity patterns (using e.g. pytorch, numpy).
 - *flyvis*: Simulator and main repository for the connectome-constrained neural network project.

Languages

- **German:** native
- **English:** C2 (TOEFL iBT 118/120)
- **Spanish:** B1
- **French:** A1