Janne Kristian Lappalainen

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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 work on connectome-constrained neural networks, provisionally accepted for publication in *Nature*.
- **Grants and Awards:** Lead contributor to ERC Grant for DeepCoMechTome project, 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**, *GANs for predicting distributions of multi-agent pedestrian trajectories*, Group of Prof. Leal-Taixé
09/2018 – 11/2018	**Research Intern, TU Munich**, *Representational dissimilarity of stimuli in medial temporal lobe and deep neural networks*, 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**, *U-nets for nerve segmentation from ultrasound imaging*, 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), provisionally accepted for publication in *Nature*, 2024.

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

2019 **Lappalainen J. K.**, Herpich, J., Tetzlaff, C., A theoretical framework to derive simple, firing-rate-dependent mathematical models of synaptic plasticity. Frontiers in Computational Neuroscience, vol. 13, May 2019, p. 26.

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/`

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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

2021 Stress Management Training, Suzanne Jones

2021 Responsible Conduct in Research Training, Dr. Leila Masri

Supervision

2024 M.Sc. Machine Learning, Thesis: *Integrating knowledge of neural tuning into connectome-constrained and task-optimized models*, L. Ulmer, University Tübingen

2023 M.Sc. Machine Learning, Thesis: *Uncertainty estimation in connectome-constrained neural networks using Deep Ensembles*, P. von Bachmann, University Tübingen

2022 B.Sc. Medical Informatics Thesis, Thesis: *Decoding object movement from a neural circuit simulation of the Drosophila visual system* T. Thevururasa, University Tübingen

2021 M.Sc. Machine Learning, Essay rotation: *Actors and controversies around brain-computer interface development*, D. Schultheiß, University Tübingen

2021 *Mackelab meets datajoint: Data- and ML-experiment management* 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