Jorin Overwiening

Curriculum Vitæ

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Education

2021–today **M.Sc. Physics**, *University of Münster*, Germany, preliminary grade: *1.2**

Master thesis: Thalamus mean-field model (see Research), grade: *1.0*
Neuroscience: *Neuronal systems and functions, neuroimaging*
Quantum field theory: *Quantum field theory, Beyond the standard model*
Theoretical nonlinear physics: *Theo. nonlinear physics I&II, Bayesian statistics*

2018–2021 **B.Sc. Physics**, *University of Münster*, Germany, grade: *1.9*

Bachelor thesis: Neutralino-Gluino coannihilation (see Research), grade *1.0*
Computer science: *Computer science I&II*
Theoretical physics: *Quantum mechanics, Statistical mechanics, Machine learning*

2010–2018 **Abitur (Grammar School)**, *Gymnasium Borken*, Germany, grade: *1.6*
Leistungskurse (advanced courses): Mathematics, physics, computer science

*Note: Grades are on the German scale (1.0–5.0), with 1.0 the highest score.

Research Experience

Research in computational neuroscience and machine learning

topic *The multi-layer tempotron: towards deep biological learning.* *2024–today*
supervisor Haim Sompolinsky *Harvard University, United States*
description Built a deep spiking neural network with a biologically plausible learning rule, called the multi-layer tempotron. Learning is done without gradient descent and with local spike-time dependent error amplitudes. The model performs close to multi-layer perceptrons on standard datasets (MNIST,CIFAR10) and outperforms them on invariant datasets (ETH80). With this we started to investigate spike-time dependent learning and representation theory. Submitted to COSYNE 2025.

Master thesis in physics and computational neuroscience

title *A biologically realistic Mean-Field model of the Thalamus.* *grade: 1.0, 2023–2024*
supervisor Alain Destexhe, Svetlana Gurevich *NeuroPSI, CNRS, France and ITP, Germany*
description Modeled the thalamus with a mean-field model of spiking networks, which incorporates detailed single-cell parameters linked to neuromodulators and measurable electrophysiological data. Reproduced significant thalamic single-cell experiment and showed their effect at the population level. Provided new insight into thalamic state-dependent responsiveness and spindle generation. See [3]. First paper accepted at PLOS CB [1]. Second paper submitted.

Research in applied maths for neuroscience

topic *Modeling human fMRI, MEG, and default mode network dynamics.* *2022–today*
supervisor Oliver Kamps, Tim Hahn *CENOS and OCC, Münster, Germany*
description Modeled the time behaviour of human fMRI and MEG data using nonlinear physics and machine learning tools. Found that the default mode network can be described with Lotka-Volterra type ODE's, and that there is a close to clinical-level accuracy of differences in the topography of those ODE's between healthy patients and patients with major depressive disorder (N=1800). First paper in draft.

Bachelor thesis in theoretical particle physics

title *Neutralino-Gluino Coannihilation in the MSSM.* *grade: 1.0, 2021*

supervisor Karol Kovařík, Michael Klasen *ITP, University of Münster, Germany*

description Introduced a phenomenological minimal supersymmetric standard model (MSSM) where a bino-wino like neutralino fulfils the role of the sole dark matter particle. Analytically calculated and numerically computated the neutralino's relic density and validated with experiments. See [3], code included in DM@NLO.

Work Experience

2024–today **Research assistant**, *CBS, Harvard University*, Cambridge, MA, United States
Deep biological learning in spiking neural networks (see Research)

2023–2024 **Intern and Research assistant**, *NeuroPSI, CNRS*, Paris, France
Mean-field modeling of the thalamo-cortical loop (see Research)

2022–today **Research assistant**, *CENOS, University of Münster*, Münster, Germany
Modeling human fMRI and MEG dynamics and artificial neural networks (see Research)

2021–2023 **Teaching assistant**, *ITP, University of Münster*, Münster, Germany
Maths for physicists, *Theoretical Physics I*, *Thermodynamics*, *Scientific programming*

2015–2019 **Private tutor**, Borken, Germany
Private maths courses for students

Skills

languages German: mother tongue, English: fluently (C1), French and Mandarin: beginner

programming Advanced: *Python*, *Fortran* Intermediate: *Java*, *C++*, *C♯*, *JavaScript*

software *PyTorch*, *huggingface*, *Mathematica*, *Matlab*, *Git*, *unity*, *LabView*

personal Creativity, critical thinking, empathy

Other

awards *Erasmus* scholarship at Université Paris-Saclay, 2023, France
Erasmus+ scholarship at NeuroPSI (CNRS), 2023, France
Erasmus scholarship at Dublin Institute of Technology, 2021, Ireland

extracurr. The *Deep Learning Specialization* at *Coursera* offered by *DeepLearning.AI*.

conferences COSYNE 2025 (Montreal, submitted), CCN 2024 (Boston), COSYNE 2024 (Lisbon), MLSS 2024 (Okinawa), EBRAINS 2023 (Kopenhagen), NFW 2023 (Paris), NeuroPSI opening conference (Paris, 2023)

interests Rock-climbing, programming games, anthropology, sailing

Publications

[1] J. Overwiening, et al. *A multi-scale study of thalamic state-dependent responsiveness*. Dec 2024. PLOS CB. doi: 10.1371/journal.pcbi.1012262

[2] J. Overwiening. Master thesis. 2024. url: `https://github.com/joverwiening/A-biologically-realistic-mean-field-model-of-the-thalamus`

[3] J. Overwiening. Bachelor thesis. 2021. url: `https://www.uni-muenster.de/imperia/md/content/physik_tp/theses/klasen/overwiening_bsc.pdf`

Cambridge, November 2024