Alexander van Meegen

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alexander-van-meegen • AlexVanMeegen

Education

EPFL Lausanne — **Lausanne**
Postdoctoral Researcher — *Since 09/2024*
Mentor: Prof. W. Gerstner.

Harvard University — **Cambridge, MA**
Swartz Postdoctoral Fellow — *09/2022–08/2024*
Mentor: Prof. H. Sompolinsky.

Jülich Research Center — **Jülich**
PhD in Computational Neuroscience — *03/2018–08/2022*
Thesis "Simulation and Theory of Large-Scale Cortical Networks", supervisors Prof. M. Helias & Prof. S. J. van Albada.

Humboldt University — **Berlin**
Master of Science in Physics — *04/2015–09/2017*
Thesis "Colored Noise Problems in Neuroscience", supervisor Prof. B. Lindner.

Paul Sabatier University — **Toulouse**
Erasmus exchange semester — *09/2015–01/2016*

Ruprecht Karl University — **Heidelberg**
Bachelor of Science in Physics — *09/2011–03/2015*
Thesis "Structure Formation of Swimming Bacteria", supervisor Prof. U. Schwarz.

Grants, Scholarships, & Prizes

Ministry of Culture and Science, North Rhine-Westphalia
NRW Return Programm — *2025–2030*
1,250,000€ startup grant; topic of the call: "Future Computing".

Jülich Research Center
Excellence award — *2023*
5,000€ awarded to internationally successful young scientists for an outstanding dissertation.

Swartz Foundation
Postdoctoral fellowship — *2022–2024*
Academic and financial support for postdoctoral research in theoretical and computational neuroscience.

German Academic Scholarship Foundation
Doctoral scholarship — *2020–2022*
Academic and financial support for doctoral studies by "Germany's largest and most prestigious scholarship foundation."

Federal Ministry for Economic Cooperation and Development
Weltwärts scholarship — *2010*
Full financial support for a one-year voluntary service in Kenya.

German Physical Society
Book prize — *2010*
Awarded for excellent performance in physics during high school.

Work Experience

Jülich Research Center **Jülich**
Research assistant *09/2017–08/2022*
Supported teaching as lecturer and teaching assistant; co-supervised students (lab rotation, Bachelor, Master); wrote parts of grant applications and reports (DFG grant SPP2041, compute time grant JINB33).

VDI/VDE Innovation + Technik GmbH **Berlin**
Working student *04/2016–08/2017*
Developed and implemented a text mining framework for analyzing research and development databases as well as newsfeeds. Results were used for political consulting of the German Federal Ministry of Education and Research.

EWC Weather Consult GmbH **Karlsruhe**
Working student *10/2014–05/2015*
Developed and evaluated a statistical method to improve energy forecasts in solar parks.

Publications

2025: A. van Meegen and H. Sompolinsky: *Coding schemes in neural networks learning classification tasks*, Nature Communications 16, 3354.

2025: J. Stubenrauch, C. Keup, A. Kurth, M. Helias, and A. van Meegen: *Fixed point geometry in chaotic neural networks*, Phys. Rev. Research 6, 023203.

2025: F. Martinelli*, A. van Meegen*, B. Şimşek, W. Gerstner, and J. Brea: *Flat Channels to Infinity in Neural Loss Landscapes*, NeurIPS (accepted).

2025: D. G. Clark, O. Marschall, A. van Meegen, and A. Litwin-Kumar: *Connectivity structure and dynamics of nonlinear recurrent neural networks*, Phys. Rev. X (accepted).

2024: J. Pronold*, A. van Meegen*, R. O. Shimoura*, H. Vollenbröker, M. Senden, C. C. Hilgetag, R. Bakker, and S. J. van Albada: *Multi-scale spiking network model of human cerebral cortex*, Cereb. Cortex, bhae409.

2024: M. Dick, A. van Meegen, and M. Helias: *Linking network- and neuron-level correlations by renormalized field theory*, Phys. Rev. Research 6, 033264.

2023: A. Morales-Gregorio*, A. van Meegen*, and S. van Albada: *Ubiquitous lognormal distribution of neuron densities in mammalian cerebral cortex*, Cereb. Cortex, bhad160.

2022: K. Segadlo*, B. Epping*, A. van Meegen*, D. Dahmen, M. Krämer, and M. Helias: *Unified field theoretical approach to deep and recurrent neuronal networks*, J. Stat. Mech. 10, 103401.

2022: M. Layer, J. Senk, S. Essink, A. van Meegen, H. Bos, and M. Helias: *NNMT: Mean-Field Based Analysis Tools for Neuronal Network Models*, Front. Neuroinform. 16, 835657.

2021: A. van Meegen, T. Kühn, and M. Helias: *Large-Deviation Approach to Random Recurrent Neuronal Networks: Parameter Inference and Fluctuation-Induced Transitions*, Phys. Rev. Lett. 127, 158302.

2021: A. van Meegen and S. J. van Albada: *Microscopic theory of intrinsic timescales in spiking neural networks*, Phys. Rev. Research 3, 043077.

2018: A. van Meegen and B. Lindner: *Self-Consistent Correlations of Randomly Coupled Rotators in the Asynchronous State*, Phys. Rev. Lett. 121, 258302.

*: Shared first authorship.

Book Chapters

2019: S. J. van Albada, J. Pronold, A. van Meegen, and M. Diesmann: *Usage and Scaling of an Open-Source Spiking Multi-Area Model of Monkey Cortex*, BrainComp 2019, Lecture Notes in Computer Science Vol. 12339.

*: Shared first authorship.

Selected Talks & Posters

Invited talk: *Symmetries in Neural Loss Landscapes and Their Consequences*, Bocconi Workshop, Milan

Invited talk: *Coding schemes in neural networks learning classification tasks*, Neurophysics Seminar, Berlin.

Plenary talk: *State space structure of random recurrent neuronal networks*, COSYNE 2023, Montreal.

Invited talk: *Statistical Physics Approach to Neuronal Dynamics*, INTheory on-line Seminar Series.

Poster: *Inferring random network parameters from continuous-time trajectories*, COSYNE 2020, Denver.

Plenary talk: *Self-consistent correlations of randomly coupled rotators*, CNS 2019, Barcelona.

Invited talk: *A bridge from large deviation theory to statistical field theory*, EITN Mean-Field Workshop, Paris.

Talk: *Self-consistent correlations of randomly coupled rotators in the asynchronous state*, DPG Meeting, Berlin.

Co-Supervision of Students

Charles-Edouard Rouault: Semester project "How does sparsity shape the solution space of neural networks?", MSc Neuro-X (2024-2025), EPFL Lausanne.

Grégoire Briolay: Semester project "How do energy constraints shape the solution space of neural networks?", BSc Communication Systems (2022-2025), EPFL Lausanne.

Jakob Stubenrauch: Thesis "Phase Space Topology of Random Recurrent Neural Networks", MSc Physics (2021-2022), RWTH Aachen.

Kai Segadlo: Thesis "Theory of Learning and Prediction by Deep and Recurrent Networks in Gaussian Process Approximation", MSc Physics (2020-2021), RWTH Aachen.

Hannah Vollenbröker: Thesis "Simulation Studies of Biological Stabilization Mechanisms in Human Cerebral Cortex", MSc & lab rotation Translational Neuroscience (2019-2021), HHU Düsseldorf.

Bastian Epping: Thesis "Neural Networks as Gaussian Processes", BSc Physics (2020), RWTH Aachen.

Michael Dick: Thesis "Renormalized Fluctuation Expansion for Non-Equilibrium Disordered Networks", MSc Physics (2019-2020), RWTH Aachen.

Georg Chechelnizki: Lab rotation Computational Neuroscience (2016-2017), HU Berlin.

Teaching

Spring 2024: Teaching fellow for Computational Neuroscience, *Harvard University*, Cambridge, MA.

Spring 2023: Teaching fellow for Statistical Mechanics of Spin Glasses and Neural Networks, *Harvard University*, Cambridge, MA.

2020, 2021 & 2022: Lectures on network models, part of the 'Introduction to Computational Neuroscience' lecture series, *RWTH Aachen University*, Aachen.

Summer 2020: Teaching assistant for Theoretical Neuroscience, *RWTH Aachen University*, Aachen.

07/2019: Introduction to the simulation of structurally detailed large-scale neuronal networks (using NEST), *CNS 2019*, Barcelona.

04/2019: NEST simulator tutorial, *EITN Spring School*, Paris.

02/2019: NEST simulator tutorial, *3rd HBP Student Conference*, Ghent.

03/2018: NEST & TVB project 'From local circuits to whole-brain models', *EITN Spring School*, Paris.

Winter 2016/17: Teaching assistant for Statistical Physics, *HU Berlin*, Berlin.

Organization of Conferences & Workshops

Python Module of the Week **Jülich**
Organizer *01/2019–05/2020*
Organized a bi-weekly workshop on Python-related topics.

4th HBP Student Conference **Pisa**
Scientific committee *01/2020*
Organized scientific program and hands-on workshop day.

3rd HBP Student Conference **Ghent**
Scientific committee *02/2019*
Organized scientific program and hands-on workshop day.

INM-6 Retreat 2018 & 2019 **Heijen**
Organizing committee *05/2018 & 05/2019*
Organized scientific and social program for the annual retreat of the institute.

Reviewing Activity

Ad hoc reviewer for Physical Review Letters, Nature Communications, Physical Review E, Biological Cybernetics, Frontiers in Neural Circuits, Communications Biology, PLOS ONE, and Entropy.

Memberships

Current: Bernstein Network Computational Neuroscience, German Physical Society.

Computer Skills

Python (data processing & analysis, scientific computing), JAX (machine learning library), NumPyro (probabilistic programming framework), C++ (scientific computing), TensorFlow (machine learning library), NEST (neural network simulator), RapidMiner (machine learning & data mining platform), Tableau (data visualisation), MySQL (databases).

Languages

German: Native speaker

English: Business proficient *Daily use, both written and spoken.*

French: Fluent *Semester abroad (France); living in Lausanne.*

Kiswahili: Intermediate *Worked in Kenya for one year.*

Dutch: Basic *Dutch family (stepfather).*

Voluntary Engagement

Jülich Research Center **Jülich**
PhD representative INM-6 *02/2019–04/2021*
Represented PhD students' interests at institute meetings, kept in touch with research center committees, and mediated in case of conflicts.

ICJA Freiwilligenaustausch weltweit e.V. **Berlin**
Chair of regional group Baden-Württemberg *09/2014–03/2015*
Helped with the first steps in Germany, organized monthly social meetings, and mediated in case of conflicts.

ICJA Freiwilligenaustausch weltweit e.V. **Berlin**
Mentor *08/2012–03/2015*
Mentored international volunteers in Germany.

ICJA Freiwilligenaustausch weltweit e.V. **Berlin**
Instructor *12/2014*
Co-organized and co-conducted a final seminar for international volunteers in Germany.

Heidelberg Institute for International Conflict Research e.V. **Heidelberg**
Voluntary staff *05/2013–12/2013*
Researched the state of violent conflicts in Eritrea for the annual 'Konfliktbarometer'.

CoWaRT and Kiptere.CH **Kiptere**
Voluntary service in Kenya *08/2010–08/2011*
- CoWaRT: HIV education in the Kiptere area.
- Kiptere.CH: Improvement of the socio-economic situation of young adults and farmers in the Kiptere area.

SV GW Vernum e.V. **Vernum**
Soccer coach and basketball referee *2008–2010*