Alexander van Meegen

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Education

Harvard University **Cambridge, MA**
Swartz Postdoctoral Fellow *Since 09/2022*
Advisor 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.

Scholarships & Prizes

Jülich Research Center
Excellence award *2023*
5000€ awarded to internationally successful young scientists for an outstanding dissertation.

Swartz Foundation
Postdoctoral fellowship *Since 2022*
Academic and financial support for postdoctoral studies 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.

Publications

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, Springer.

Preprints

2024: A. van Meegen, and H. Sompolinsky: *Coding schemes in neural networks learning classification tasks*, arXiv:2406.16689.

2023: M. Dick, A. van Meegen, and M. Helias: *Linking Network and Neuron-level Correlations by Renormalized Field Theory*, arXiv:2309.14973.

2023: J. Pronold*, A. van Meegen*, H. Vollenbröker, R. Shimoura, M. Senden, C. C. Hilgetag, R. Bakker, and S. J. van Albada: *Multi-Scale Spiking Network Model of Human Cerebral Cortex*, bioRxiv:2023.03.23.533968.

2022: J. Stubenrauch, C. Keup, A. Kurth, M. Helias, and A. van Meegen: *Phase Space Analysis of Chaotic Neural Networks*, arXiv:2210.07877.

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.

Lernzentrum CAPiTO **Heidelberg**
Tutor *09/2012–02/2015*
Tutored high school students, including preparation for high school diploma (Abitur).

EWC Weather Consult GmbH **Karlsruhe**
Intern *08/2013–10/2013*
Developed and evaluated a wake model to improve energy-forecasts in wind farms.

Co-Supervision of Students

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

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

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

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

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

Georg Chechelnizki: Lab rotation Computational Neuroscience (2016-2017), Humboldt University of 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.

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.

Reviewing Activity

Ad hoc reviewer for Physical Review Letters, Physical Review E, Biological Cybernetics, PLOS ONE, and Entropy.

Selected Talks & Posters

03/2023: A. van Meegen, J. Stubenrauch, C. Keup, A. Kurth, and M. Helias: *State space structure of random*

recurrent neuronal networks, plenary talk, COSYNE 2023, Montreal.

10/2021: A. van Meegen and M. Helias: *Statistical Physics Approach to Neuronal Dynamics*, invited talk, INTheory on-line Seminar Series.

02/2020: A. van Meegen, T. Kühn, and M. Helias: *Inferring random network parameters from continuous-time trajectories*, poster, COSYNE 2020, Denver.

02/2020: A. van Meegen, S. J. van Albada, and M. Helias: *On the path integral approach to random neural networks*, poster, Heraeus Seminar: Quantum Thermodynamics for Young Scientists, Bad Honnef.

07/2019: A. van Meegen and B. Lindner: *Self-consistent correlations of randomly coupled rotators in the asynchronous state*, plenary talk, CNS 2019, Barcelona.

04/2019: A. van Meegen, T. Kühn, and M. Helias: *A bridge from large deviation theory to statistical field theory*, invited talk, EITN Mean-Field Workshop, Paris.

07/2018: A. van Meegen and S. J. van Albada: *Intrinsic timescales in spiking neural networks – a theoretical approach*, talk, INM/ICS Retreat 2018, Jülich.

03/2018: A. van Meegen and B. Lindner: *Self-consistent correlations of randomly coupled rotators in the asynchronous state*, talk, DPG Spring Meeting, Berlin.

Memberships

Current: Organization for Computational Neurosciences, Bernstein Network Computational Neuroscience, German Physical Society, NEST Initiative.

Computer Skills

Python (data processing & analysis, scientific computing), C++ (scientific computing), NEST (neural network simulator), JAX (machine learning library), TensorFlow (machine learning library), 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).*

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*