Marius Schneider

Postdoctoral Researcher
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I am a computational neuroscientist interested in how neural circuits integrate sensory information to guide decision making and behavior. My work combines theoretical modeling of neural population dynamics with machine-learning–driven analysis of large-scale multimodal neural and behavioral data. I aim to develop computational frameworks that reveal how sensory encoding, latent internal states, and ongoing behavior shape one another in naturalistic settings.

Research Interests

Neural population dynamics · Sensory processing · Naturalistic behavior · Latent-state inference · Inter-areal communication · Machine learning for neural data

Education

Ph.D. in Neurophysics 02/2020–05/2024
Donders Centre for Neuroscience, Radboud University Nijmegen, Netherlands

Thesis: *Mechanisms of inter-areal neuronal communication*. Advisor: Prof. Dr. Martin Vinck. Graduated with highest honors (top 5%).

M.Sc. in Physics 10/2016–04/2019
Goethe University Frankfurt, Germany

Thesis: *Biological complexity facilitates tuning of the neuronal parameter space*. Advisors: Dr. Hermann Cuntz, Prof. Dr. Peter Jedlicka. Grade: 1.1 (GPA: 3.9).

B.Sc. in Physics 10/2012–10/2016
Goethe University Frankfurt, Germany

Advisor: Prof. Dr. Reinhard Dörner. Grade: 1.7 (GPA: 3.3).

Professional Experience

Postdoctoral Researcher 2024–Present
UC Santa Barbara California, USA

- Leading organizer of NeurIPS 2025 competition *Mouse vs AI - Robust Visual Foraging Challenge*, coordinating international teams to benchmark AI models against biological vision.
- Developing digital twin models of mouse visual processing during naturalistic behavior.
- Mentoring students on computational modeling and machine learning approaches to neuroscience

PhD Student 2019–2024
Ernst Strüngmann Institute for Neuroscience in Cooperation with Max Planck Society Frankfurt, Germany

- Developed theoretical framework explaining inter-areal coherence through local oscillatory power and connectivity, published in *Neuron* (150+ citations) and featured in multiple review articles.
- Led 3 multi-institutional collaborative projects resulting in 5 publications including 3 first-author papers in *Neuron* (2) and *Cell Reports*.
- Analyzed large-scale neural recordings across species (mouse, macaque) totaling 500+ recording sessions, establishing cell-type-specific principles of visual processing.
- Developed novel biophysical models and computational tools for understanding local field potential generation and neural dynamics.

Research Assistant 2018–2019
Justus Liebig University Gießen, Germany

- Developed biophysical models of degeneracy in the hippocampus.

Research Assistant 2017–2018
Frankfurt Institute for Advanced Studies Frankfurt, Germany

- Biophysical modeling of hippocampal granule cells.
- Teaching and supervision of undergraduate students.

Accelerator Operator 2017–2018
Goethe University Frankfurt, Germany

- Operated a linear particle accelerator to carry out ion beam analyses.

Research Assistant 2016–2018
Max Planck Institute for Empirical Aesthetics Frankfurt, Germany

- Conducted and preprocessed MEG recordings for studies on language perception (25+ participants).
- Managed participant recruitment and study coordination for multi-session experiments.

Awards, Fellowships, and Grants

EBBS Young Investigator Award 2024
European Brain and Behaviour Society

PhD Research Fellowship 2019–2024
International Max Planck Research School for Neural Circuits

Travel Grant for CNS Conference 2019
Organization for Computational Neurosciences

Travel Grant for Neural Dynamics Summer School 2018
University of Bristol

German National Student Scholarship 2016

Publications

* *denotes equal contribution*

1. **Schneider, M.**, Canzano, J., Peng, J., Hou, Y., Smith, S. L., & Beyeler, M. (2025). Mouse vs. AI: A Neuroethological Benchmark for Visual Robustness and Neural Alignment. *arXiv*.
2. Onorato, I., Tzanou, A., **Schneider, M.**, Uran, C., Broggini, A. C., & Vinck, M. (2025). Distinct roles of PV and Sst interneurons in visually-induced gamma oscillations. *Cell Reports*, 44(3), 115385.
3. Spyropoulos, G.*, **Schneider, M.***, van Kempen, J., Gieselmann, M. A., Thiele, A., & Vinck, M. (2024). Distinct feedforward and feedback pathways for cell-type specific attention effects. *Neuron*, 112(14), 2423–2434.e7.
4. **Schneider, M.**, Tzanou, A., Uran, C., & Vinck, M. (2023). Cell-type-specific propagation of visual flicker. *Cell Reports*, 42(5), e1011212.
5. **Schneider, M.**, Bird, A. D., Gidon, A., Triesch, J., Jedlicka, P., & Cuntz, H. (2023). Biological complexity facilitates tuning of the neuronal parameter space. *PLOS Computational Biology*, 19(7), e1011212.
6. Vinck, M., Uran, C., Spyropoulos, G., Onorato, I., Broggini, A. C., **Schneider, M.**, & Johnson, A. C. (2023). Principles of large-scale neural interactions. *Neuron*, 111(7), 987–1002.
7. Dowdall, J. R., **Schneider, M.**, & Vinck, M. (2023). Attentional modulation of inter-areal coherence explained by frequency shifts. *NeuroImage*, 277, 120256.
8. **Schneider, M.**, Broggini, A. C., Dann, B., Tzanou, A., Uran, C., Sheshadri, S., Scherberger, H., & Vinck, M. (2021). A mechanism for inter-areal coherence through communication based on connectivity and oscillatory power. *Neuron*, 109(24), 4050–4067. *[150+ citations]*
9. Cuntz, H., Bird, A., Beining, M., **Schneider, M.**, Mediavilla, L., Hoffmann, F., Deller, T., & Jedlicka, P. (2021). A general principle of dendritic constancy – a neuron's size and shape invariant excitability. *Neuron*, 109(22), 3647–3662.
10. Vinck, M., Uran, C., & **Schneider, M.** Aperiodic processes explaining rhythms in behavior: A matter of false detection or definition? *In review*.

Invited Talks and Selected Conference Presentations

- Poster: Uncovering behavioral strategies: Training mice and AI on a shared foraging task. *COSYNE 2025*. Montreal, Canada.
- Poster: A mechanism for selective attention in biophysically realistic Daleian spiking neural networks. *COSYNE 2025*. Montreal, Canada.
- Poster: A deep learning framework for center-periphery visual processing in mouse visual cortex. COSYNE 2025. Montreal, Canada.
- Poster: Mechanisms of attention in biophysiologically realistic Daleian spiking neural networks. *FENS Forum 2024*. Vienna, Austria.
- **Invited Talk:** Do neurons communicate through coherence? *Bernstein Center of Computational Neurosciences 2022*. Berlin, Germany.
- Poster: Cell-type specific entrainment during rhythmic visual flicker stimulation. *SFN 2022*. San Diego, USA.
- Poster: Cell-type specific entrainment during rhythmic visual flicker stimulation. *Bernstein Conference 2022*. Berlin, Germany.
- **Selected Talk**: A mechanism for inter-areal coherence through communication based on connectivity and oscillatory power. *Neuromatch Conference 2021*. Online.
- Poster: High dimensional ion channel composition enables robust and efficient targeting of realistic regions in the parameter landscape of neuron models. *CNS 2019*. Barcelona, Spain.

- Poster: Ion channel diversity enables robust and flexible targeting of realistic regions in the parameter landscape of dentate granule cell models. *3R Centre Kick-off Symposium 2018*. Giessen, Germany.

Teaching and Mentoring

- **Guest Lecturer Graduate Course** UC Santa Barbara, 2025
  Introduction to Computational Neuroscience
- **Master's Thesis Supervision** Jing Peng UC Santa Barbara, 2024
- **Teaching Assistant** Online, 2022
  Neuromatch Academy: Computational Neuroscience
- **Bachelor's Thesis Supervision** Aysin Yildirim Goethe University, 2019
- **Teaching Assistant** FIAS, 2019
  7th Baltic-Nordic School on Neuroinformatics
- **Teaching Assistant** Goethe University , 2018
  Computational Neurobiology Course

Academic Contributions and Services

- **Conference Organization**: Lead organizer of the NeurIPS 2025 Competition: Mouse vs AI – Robust Visual Foraging Challenge.
- **Seminar Organization**: Co-organizer of ESI-talks lecture series, Ernst Strüngmann Institute for Neuroscience (2022–2024).
- **Peer Review**: Nature Communications, PLOS Computational Biology, Journal of Neurophysiology.

Technical Skills

- **Programming**: Python (PyTorch, NumPy, SciPy, Matplotlib), MATLAB, C++, NEURON
- **Data Analysis**: Electrophysiology (spike sorting, LFP analysis, FieldTrip), time series analysis,
- **Modeling**: Biophysical neural modeling, dynamical systems analysis, deep reinforcement learning, simulation-based inference
- **Tools**: Git, LaTeX, High-performance computing clusters, Docker