

Heike Stein

École Normale Supérieure (ENS), Paris
Laboratoire de Neurosciences Cognitives & Computationnelles/Group for Neural Theory
29 Rue d'Ulm
75005 Paris, France
heike.c.stein@gmail.com

Research Interests

naturalistic behavior, motor dynamics, working memory, cerebellum, data analysis of large-scale neural data, data-driven modeling

Current Position

2020 – 24 **Postdoctoral researcher (EMBO fellow)**
ENS Paris
PI: N. Alex Cayco-Gajic, PhD
Projects: Adaptation and learning in naturalistic behavior, Covariability in neural datasets and dimensionality reduction methods

Previous Research Positions

2023 **Visiting researcher**
NYU New York
PI: Cristina Savin, PhD
Project: Switching latent variable models for multi-area neural datasets

2016 – 20 **Predoctoral researcher (Marie Skłodowska-Curie & la Caixa fellow)**
IDIBAPS Barcelona
PI: Albert Compte, PhD
Project: Working memory in anti-NMDA receptor encephalitis and schizophrenia

2013 – 15 **Research assistant**
DFG Center “Volition and Cognitive Control” Dresden
PI: Rico Fischer, PhD
Project: Adaptive regulation of cognitive control in dual-task performance

2014 – 15 **Intern**
Technische Universität Dresden
PI: Katharina Trikojat, PhD
Project: Comorbidity of atopic dermatitis and ADHD

2011 – 12 **Research assistant**
Knowledge Media Research Center Tübingen
PI: Katharina Scheiter, PhD
Project: Knowledge acquisition with multimedia

Education

- 2016 – 20 **PhD in Computational Neuroscience**
Universitat de Barcelona
Supervisors: Albert Compte, PhD & Josep Dalmau, MD
Thesis “*Synaptic and circuit mechanisms of working memory and their dysfunction in anti-NMDA receptor encephalitis and schizophrenia*”, defended with Latin honors on November 13th, 2020. Thesis award from the University of Barcelona.
- 2013 – 16 **MSc in Cognitive and Affective Neuroscience**
Technische Universität Dresden
Thesis in Computational Cognitive Neuroscience, “*A dynamic field theory approach to delayed intentions and intention deactivation*”.
- 2012 – 13 **Erasmus semester**
Universidad Pontificia Comillas Madrid
- 2009 – 13 **BSc in Psychology**
Eberhard Karls Universität Tübingen
Thesis in Knowledge and Media Psychology, “*Application of the elaboration likelihood model on learning with wikis*”.

Courses

- 2023 EMBO Lab Leadership Training (October 2023)
- 2019 MBL Methods in Computational Neuroscience, Woods Hole, MA (August 2019)
- 2017 The Computational and Cognitive Neuroscience Summer School, NYU Shanghai (July 2017)
- 2017 The Mathematics of Memory School, Centre de Recerca Matemàtica Barcelona (January 2017)
- 2016 Reviewing Core Statistics, Centre de Recerca Matemàtica Barcelona (November - December 2016)

Fellowships, Grants and Awards

- 2023 EMBO Practical Course award
Organization of BAMB! 2024 summer school
Simons Collaboration on the Global Brain conference award
Organization of BAMB! 2023 summer school
Travel grant, COSYNE
Participation at COSYNE meeting 2023
- 2022 Extraordinary thesis award, University of Barcelona
Best doctoral thesis at the Faculty of Biomedicine, 2020-21

- 2021 EMBO postdoctoral fellowship
Postdoctoral projects at ENS Paris
- 2019 Travel grant, William Randolph Hearst Foundation
Participation at the MBL Methods in Computational Neuroscience Course
- 2018 Travel grant, Universidad de Barcelona
Participation at SFN Neuroscience 2018
- 2017 Marie Skłodowska-Curie/“la Caixa”-INPhINIT fellowship
PhD studies at IDIBAPS Barcelona

Publications

- 2024 Pellegrino, A.*, **Stein, H.***, & Cayco-Gajic, N.A. Mixed classes of covariability in neural data. *Nature Neuroscience* (in press).
- Stein, H.**, Barbosa, J., Lozano-Soldevilla, D., Rosa-Justicia, M., Morató, A., Galan-Gadea, A., ..., & Compte, A. Neural signatures of reduced serial dependence in anti-NMDAR encephalitis and schizophrenia. *Psyarxiv* (2024).
- 2023 Andrianarivelo, A., **Stein, H.**, Gabillet, J., Batifol, C., Jalil, A., Cayco-Gajic, N.A., & Graupner, M. Cerebellar interneuron activity is triggered by reach endpoint during learning of a complex locomotor task. *BioRxiv* (2023).
- Barbosa, J.*, **Stein, H.***, Zorowitz, S., Niv, Y., Summerfield, C., Soto-Faraco, S., & Hyafil, A. A practical guide for studying human behavior in the lab. *Behavior Research Methods*, 55, 58-76 (2022).
- 2022 Guasp, M., Rosa-Justicia, M., Muñoz-Lopetegi, A., Martínez-Hernández, E., Armangué, T., Sugranyes, G., **Stein, H.**, ... & the Spanish anti-NMDAR Encephalitis Study Group. Clinical characterization of patients in the post-acute stage of anti-NMDA receptor encephalitis: a prospective observational cohort study and comparison with patients with schizophrenia spectrum disorders. *The Lancet Neurology* 21, 899-910 (2022).
- 2021 Ding, X., Lee, D., Grant, S., **Stein, H.**, McIntosh, L., Maheswaranathan, N., & Bacus, S. A. A mechanistically interpretable model of the retinal neural code for natural scenes with multiscale adaptive dynamics. *55th Asilomar Conference on Signals, Systems, and Computers (IEEE)*, 287-291 (2021).
- Stein, H.***, Barbosa, J.*, & Compte, A. Towards biologically constrained attractor models of schizophrenia. *Current Opinion in Neurobiology* 70, 163-170 (2021).
- Stein, H.** Why does the neocortex need the cerebellum for working memory? *The Journal of Neuroscience*, 41, 6368-6370 (2021).
- 2020 **Stein, H.***, Barbosa, J.*, Rosa-Justicia, M., Prades, L., Morató, A., Galan-Gadea, A., Ariño, H., Martínez-Hernández, E., Castro-Fornieles, J., Dalmau, J. & Compte, A. Reduced serial dependence suggests deficits in synaptic potentiation in anti-NMDAR encephalitis and schizophrenia. *Nature Communications*, 11, 4250 (2020).

Barbosa, J.*, **Stein, H.***, Martinez, R.L., Galan-Gadea, A., Li, S. Dalmau, J. Adam, K.C.S, Valls-Solé, J., Constantinidis, C. & Compte, A. Interplay between persistent activity and activity-silent dynamics in the prefrontal cortex underlies serial biases in working memory. *Nature Neuroscience*, 23, 1016–1024 (2020).

Talks and Seminars

- 2024 Talk at the French Association for Artificial Intelligence thematic day: Neurosciences and Artificial Intelligence, Bordeaux, France, "Learning coordinated gaits on complex surfaces". April, 2024.
- 2023 Talk at at the Neuroscience and Neural Networks workshop, Colegio Nacional de México (virtual), "Aparición de puntos fijos en la coordinación entre extremidades [...]". November, 2023.
- Seminar at Imperial College, Department of Bioengineering, London, UK (invited by J. Gallego). June, 2023.
- Seminar at the Neural Computation Unit, Bristol, UK (invited by R. Ponte Costa). March, 2023.
- 2022 Talk at Bernstein conference workshop, Berlin, Germany, "Variability in neural data tensors". September, 2022.
- Talk at International Conference on Mathematical Neuroscience (virtual), "Modeling the effects of NMDAR dysfunction on working memory". July, 2022.
- Talk at Iberian Conference on Perception, Barcelona, Spain, "Disrupted serial dependence in anti-NMDAR encephalitis and schizophrenia". June, 2022.
- Talk at COSYNE main meeting, Lisbon, Portugal, "The emergence of fixed points in interlimb coordination underlies the learning of stable gaits in mice". March, 2022.
- 2021 Talk at the Neuroscience Ireland Meeting (virtual), "Modeling the effects of NMDAR dysfunction on working memory". September, 2021.
- Seminar at Champalimaud Center for the Unknown, Lisbon, Portugal (virtual) (invited by Z. Mainen). April, 2021.
- 2020 Seminar at the Group for Neural Theory, École Normale Supérieure, Paris, France (invited by A. Cayco-Gajic). January, 2020.
- 2019 Seminar at Yale University, New Haven, CT (invited by J. Murray). August, 2019.
- Talk at the OCNS conference workshop, Barcelona, Spain, "Serial dependence is disrupted in anti-NMDAR encephalitis and schizophrenia" July, 2019.
- 2018 Seminar at UCSD, Department of Psychology, San Diego, CA (invited by J. Serences). November, 2018.
- Seminar at the Bernstein Center for Computational Neuroscience, Berlin, Germany (invited by J.-D. Haynes). September, 2018.

Seminar at Charité University Hospital, Berlin, Germany (invited by C. Finke).
September, 2018.

Conference Posters

- 2024 Widloski, J., **Stein, H.**, Collina, J., & Foster, D. Fast behavioral learning with an imprecise hippocampal code on a dynamic, multi-step linear maze. COSYNE, Lisbon, Portugal. March, 2024.
- 2023 **Stein, H.**, Andrianarivelo, A., Gabillet, J., Batifol, C., Cayco Gajic, N. A., & Graupner, M. Cerebellar interneurons encode single steps in locomotion. COSYNE, Montreal, Canada. March, 2023.
- 2022 Andrianarivelo, A., **Stein, H.**, Gabillet, J., Batifol, C., Cayco Gajic, N. A. & Graupner, M. Acquisition of a complex locomotor task: activity of cerebellar molecular layer interneurons and paw dynamics. SFN, Washington, D.C. November 2022.
- Stein, H.***, & Pellegrino*, A., & Cayco Gajic, N. A. SliceTCA disentangles mixed classes of covariability in large-scale neural recordings. Bernstein conference, Berlin, Germany. September, 2022.
- Stein, H.**, Andrianarivelo, A., Gabillet, J., Batifol, C., Graupner, M. & Cayco Gajic, N. A. The emergence of fixed points in interlimb coordination underlies the learning of stable gaits in mice. FENS, Paris, France. July, 2022.
- Pellegrino*, A., **Stein, H.***, & Cayco Gajic, N. A. Capturing the evolution of low-dimensional dynamics in large scale neural recordings with sliceTCA. COSYNE, Lisbon, Portugal. March, 2022.
- 2020 van Welzen, K., Munoz-Lopetegi, A., Rosa-Justicia, M., **Stein, H.**, Morato, A., Arino, H., Martinez-Hernandez, E., ..., & Compte, A. Slow-wave potentiation is age-dependent and characterizes early-night sleep in teenagers and young adults. European Sleep Research Society Conference (virtual). September, 2020.
- van Welzen, K., Munoz-Lopetegi, A., Rosa-Justicia, M., Arino, H., Martinez-Hernandez, E., Armangue, T., **Stein, H.**, ..., & Compte, A. Early-night slow-wave sleep potentiation is disrupted in anti-N-methyl-D-aspartate receptor encephalitis and schizophrenia. European Sleep Research Society Conference (virtual). September, 2020.
- 2019 **Stein, H.**, Barbosa, J., Dalmau, J., & Compte, A. NMDA-receptor dysfunction disrupts serial biases in spatial working memory. Bernstein Conference, Berlin, Germany. September, 2019.
- Stein, H.**, Barbosa, J., Dalmau, J., & Compte, A. NMDA-receptor dysfunction disrupts serial biases in spatial working memory. Cognitive Computational Neuroscience, Berlin, Germany. September, 2019.
- Stein, H.**, Barbosa, J., Galan, A., Morató, A., Prades, L., Rosa, M., Arino, H., Dalmau, J., & Compte, A. Synaptic dysfunctions underlying reduced working memory serial bias in autoimmune encephalitis and schizophrenia. OCNS, Barcelona, Spain. July, 2019.

- 2018 **Stein, H.**, Lozano-Soldevilla, D., Dalmau, J., & Compte, A. Glutamatergic modulation of working memory precision and serial biases. SFN, San Diego, California. November, 2018.
- Stein, H.**, Lozano-Soldevilla, D., Dalmau, J., & Compte, A. Glutamatergic modulation of spatial working memory. FENS, Berlin, Germany. July, 2018.
- 2016 **Stein, H.**, Walser, M., & Scherbaum, S. A dynamic field theory approach to prospective memory and intention deactivation. TeaP, Heidelberg, Germany. March, 2016.

Event Organization

- 2023 – 24 Barcelona Advanced Modeling of Behavior (BAMB!) Summer School, Barcelona, Spain (July 2023, July 2024). Co-organized with Marion Rouault, Alexandre Hyafil, Klaus Wimmer, and Chris Summerfield.
- 2022 "Distributed computations across brain regions", Bernstein Conference, Berlin, Germany (September 2022). Workshop co-organized with Joao Barbosa.

Teaching

- 2022 – 23 Barcelona Advanced Modeling of Behavior (BAMB!) Summer School, teaching assistant, Barcelona, Spain.
- 2021 – 23 Neural Data Science with Python, class on classification and decoding, supervision of final projects, Neuroscience Master's program at Université Paris Cité, France.

Supervision and Mentoring

- 2024 Mathys Marcellin (MSc Neuroscience): Modeling gait on flat vs. complex surfaces
- 2022 Paul Marcin (MSc Cognition): Capturing variability in V1 with sliceTCA
- Caroline Bouat (MSc Cognition): Modeling motor learning of coordinated gaits as a switching dynamical system
- 2018 – 20 Alba Morató (BSc Psychology, BSc Statistics): Decoding working memory from fMRI in patients with autoimmune encephalitis and schizophrenia
- 2018 – 19 Laia Prades (MSc Psychology, BSc Biomedical Science): Working memory biases in patients with schizophrenia

Science Communication

- 2022 "Growing Up in Science" Series, ENS DEC, Paris
Organization and host of talk series for early-career researchers at the Département d'Études Cognitives, ENS Paris
- 2018 – 20 "Neurochats" Seminar Series, BARCCSYN, Barcelona
Organization of talk series given by and for early-career researchers in the Barcelona Cognitive, Computational and Systems Neuroscience (BARCCSYN) community (@neurochatsbcn)
- 2019 Generació Ciència, IDIBAPS, Barcelona
Organization of neuroscience outreach activity for high-school students
- 2018 Festa de la Ciència, Parc de la Ciutadella, Barcelona
Organization of neuroscience outreach activity for the general public
- 2017 BARCCSYN Community Retreat
Organization of scientific and extra-scientific program