

Manuel Beiran

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Research Interests

Neural modeling, biophysics, neural networks, physical approaches to neurobiology, connectomics, systems neuroscience: from cell, to networks, and behavior

Education

- PhD. in Computational Neuroscience* 01/10/2017 – 31/12/2020
Ecole Normale Supérieure – Paris, France
Supervisor: Srdjan Ostojic (LNC2)
Defense date: 03/12/2020
- MSc. Computational Neuroscience* 01/09/2014 – 30/09/2016
Bernstein Center for Computational Neuroscience, Technische Universität,
Humboldt Universität – Berlin, Germany
Research supervisor: Benjamin Lindner (Humboldt University - Physics)
- BSc. Physics* 01/09/2010 – 31/08/2014
Universidad Autónoma de Madrid – Madrid, Spain
Research supervisor: Nestor Parga (UAM - Physics)

Experience

- Postdoctoral researcher* 01/09/2021 – present
Columbia University – New York City, United States
Supervisor: Ashok Litwin-Kumar (Center for Theoretical Neuroscience)
- Postdoctoral researcher (post-PhD defense wrap-up)* 01/01/2020 – 31/08/2021
Ecole Normale Supérieure – Paris, France
Supervisor: Srdjan Ostojic (LNC2)
- Graduate student lab rotations* 01/10/2016 – 30/09/2017
Ecole des Neurosciences de Paris – Paris, France
Supervisors: Srdjan Ostojic (LNC2 – ENS Paris), Romain Brette (Institut de la Vision), Yves Boubenec (LSP – ENS Paris)
- Research Assistant Internship* 10/07/2013 – 28/08/2013
Max Planck Institut for Physics of Complex Systems – Dresden, Germany
Supervisors: Franck Jülicher (Biophysics)

Publications

- 2025 **Beiran, M.**, & Litwin-Kumar, A., Prediction of neural activity in connectome-constrained recurrent networks. *Nature Neuroscience*, 1-14.
- 2025 Clark, D.G. and **Beiran, M.**, Structure of activity in multiregion recurrent neural networks. *Proceedings of the National Academy of Sciences* 122(10), e2404039122.
- 2024 Serrano-Fernández, L., **Beiran, M.**, Romo, R. and Parga, N., 2024. Representation of a perceptual bias in the prefrontal cortex. *Proceedings of the National Academy of Sciences*, 121(50).
- 2024 Serrano-Fernandez, L., **Beiran, M.**, & Parga, N., Emergent perceptual biases from state-space geometry in trained spiking recurrent neural networks. *Cell Reports*

- 2024 Kay, K., Biderman N., Khajeh R, **Beiran, M.**, Cueva, C.J., Shohamy, D., Jensen, G., Wei, X. X., Ferrera, V.P., & Abbott, L.F. Emergent neural dynamics and geometry for generalization in a transitive inference task. *PLoS computational neuroscience*, 20(4):e1011954.
- 2023 **Beiran, M.**, Spencer-Salmon, C. A., & Rajan, K. A ‘programming’ framework for recurrent neural networks. *Nature Machine Intelligence*, 1-2.
- 2023 Akitake, B., Douglas, H. M., LaFosse, P. K., **Beiran, M.**, ... Rajan, K. & Histed, M. H. Amplified cortical neural responses as animals learn to use novel activity patterns. *Current Biology*, 33(11), 2163-2174.
- 2023 **Beiran, M.**,* Meirhaeghe, N.*, Sohn, H., Jazayeri, M., & Ostojic, S., Parametric control of flexible timing through low-dimensional neural manifolds. *Neuron*, 111(5), 739-753.
- 2022 Dubreuil, A., Valente, A., **Beiran, M.**, Mastrogiuseppe, F., & Ostojic, S. The role of population structure in computations through neural dynamics. *Nature Neuroscience*, 1-12.
- 2022 Sarno, S., **Beiran, M.**, Falcó-Roget, J., Diaz-deLeon, G., Rossi-Pool, R., Romo, R., & Parga, N. Dopamine firing plays a dual role in coding reward prediction errors and signaling motivation in a working memory task. *Proceedings of the National Academy of Sciences*, 119(2), e2113311119.
- 2021 **Beiran, M.**, Dubreuil, A., Valente, A., Mastrogiuseppe, F., & Ostojic, S. Shaping dynamics with multiple populations in low-rank recurrent networks. *Neural Computation*, 33(6), 1572-1615.
- 2019 **Beiran, M.**, & Ostojic, S. Contrasting the effects of adaptation and synaptic filtering on the timescales of dynamics in recurrent networks. *PLoS computational biology*, 15(3), e1006893.
- 2018 **Beiran, M.**, Kruscha, A., Benda, J., & Lindner, B., Coding of time-dependent stimuli in homogeneous and heterogeneous neural populations. *Journal of computational neuroscience*, 44(2) 189-202.
- 2015 Werner, S., Stüeckemann, T., **Beiran, M.**, Rink, J. C., Jülicher, F., & Friedrich, B. M. (2015). Scaling and regeneration of self-organized patterns. *Physical review letters*, 114(13), 138101.

Grants and Fellowships

- 2017 - 2020 PhD Fellowship – Ecole des Neurosciences de Paris (full PhD funding) ~100k€
- 2018 Spanish Ministry of Science - Grant PGC2018-101992. Co-instructor, PI: Nestor Parga. ~32k€
- 2018 Cosyne Conference Travel Award ~1k€
- 2018 MBL Scholarship for summer school Methods in Computational Neuroscience ~2k€
- 2016 LaCaixa Scholarship (3-year full PhD funding + fees and tuition, accepted for 1 year) ~30k€
- 2014 - 2016 Mututa Madrilena Foundation Graduate Program scholarship ~30k€
- 2013 DAAD Rise Research Scholarship – Summer Internship ~4k€
- Awards*
- 2023 PhD article selected in Highlights (Faits Marquants) 2023 – Société des Neurosciences Spanish
- 2017 Honor Award (Ehrenpreis) for M.S. studies (best student in cohort)

Teaching and Mentoring

- Sep 2023 - May 2025 SURFiN Independent Mentor for Undergraduate Students
Two-year mentoring of an undergraduate student Arjun Sarker, CUNY
Research internship at Columbia University in recurrent networks.
Awarded by the Simons Foundation
- 2022, 2023, 2024 Teaching co-organizer and instructor
Course: *Advanced Tools in Theoretical Neuroscience*
Columbia University Neuroscience Graduate Program
- 2021, 2022 Teaching assistant
Tutorial of CoSyNe conference
Helped prepare exercises and assisted onsite participants
- 2017, 2018, 2019 Teaching assistant
Course: *Methods in Computational Neuroscience*, Cogmaster (ENS)
Unique instructor of a hands-on course on computational neuroscience

2018 Mentor of undergraduate interns
Mentoring of two students in a two-month internship: Lia Sela and Sophie Jaffard
Ecole Normale Supérieure (LNC2), Paris

Academic Service, Outreach and Organization

Dec 2023 CUNO Late Night Science
Outreach talk for the general community, Columbia University

Sep 2022 – Jun 2023 External seminar co-organizer
Invitation and organization of weekly guest talks at the Center for Theoretical Neuroscience, Columbia University

Sep 2020 Workshop co-organizer, Bernstein Conference (online)
Organized a pre-selected workshop on learning and dynamics of neural networks

Sep 2017 – Jun 2018 Student representative of the Ecole de Neurosciences de Paris graduate program

Dec 2016 Participant in Déclics campaign
Outreach talk about my PhD at a lycée in Paris

March 2015 Participant in Lange Nacht der Wissenschaften event
Humboldt University ambassador to lab facilities

Ad hoc reviewer:

Nature Neuroscience, Physical Review, PLoS Computational Biology, eLife, Nature Machine Intelligence, Nature Communications, Neural Computation, PCI Neuro, Cosyne Conference

Invited Talks (conferences, workshops and lab seminars)

March 2025 CUNY Graduate Center, New York, USA

Oct 2025 Integrative Neuroscience and Cognition Center, Université Paris Cité, Paris, France

May 2025 Group for Neural Theory, ENS, Paris, France

Nov 2024 Laboratory meeting, Laboratoire Jean Perrin, Paris, France

May 2024 NeuroPSI, Paris-Saclay, Paris, France

May 2024 Karalis lab meeting, ICM (Paris Brain Institute), Paris, France

May 2024 Mark Histed lab meeting, NIH Bethesda, USA

April 2024 Department Seminar, Bocconi University, Milan, Italy (virtual)

April 2024 Van Vreeswijk Theoretical Neuroscience Seminar (virtual)

Aug 2023 Mark Churchland's lab meeting, Columbia University, USA

July 2023 Workshop "Sensory prediction", Santa Fe Institute, USA

Jan 2022 Workshop "Dynamics of Biological & Artificial", Banff, Canada (virtual)

March 2022 CoSyNe Workshop "Timescales in neural systems"

March 2022 NeuRise Seminar (virtual)

Feb 2019 Theoretical Physics Postdoc Research seminar, ENS, Paris, France

Sept 2019 Henning Sprekeler lab meeting, TU Berlin, Germany

Contributed Talks and Poster Presentations

March 2025 CoSyNe, Lisbon, Portugal (poster)

June 2025 Analysis and Modeling of Connectomes Conference, Janelia, VA, USA (poster)

March 2025 CoSyNe, Montreal, Canada (poster - on parental leave, presented by co-author)

Nov 2024 GDR Neural Net meeting, Saclay (poster)

Aug 2024 Swartz Conference, Seattle, USA (talk)

March 2024 Neuronal Circuits conference, Cold Spring Harbor, NY, USA (talk)

March 2024 CoSyNe, Lisbon, Portugal (poster)

Sept 2023 Bernstein Conference, Berlin, Germany (poster)

July 2023 GRC Optogenetics meeting, Maine, USA (poster)

March 2023	CoSyNe, Montreal, Canada (poster)
March 2021	CoSyNe (virtual, poster)
Sept 2021	Bernstein Conference (online)
March 2020	CoSyne, Denver, CO, USA (poster)
Sept 2019	Neural Circuits, Coding, and Dynamcis, Capbreton, France (talk)
July 2019	CNS meeting, Barcelona, Spain (poster)
Sept 2018	Bernstein Conference, Berlin, Germany (poster)