Jesseba **Fernando**

PhD Student · Network Science Institute

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Education

Northeastern University — *Boston, MA*

PhD Network Science — *Aug. 2023 - present*

- Advisor: Dr. Samuel V. Scarpino

University of Connecticut — *Storrs, CT*

BSc & MSc Neurobiology — *Aug. 2012 - May 2018*

- Honors Thesis and MSc Advisor: Dr. Joseph LoTurco

Research Experience

Northeastern University, Network Science Institute — *Boston, MA*

Advisor: Dr. Samuel V. Scarpino — *August 2023–Present*

- Analyzing neural dynamics in biological systems during learning and adaptation using network science approaches. Developing mechanistic interpretability frameworks for transformer architectures using statistical mechanics and information theory.

Dana-Farber Cancer Institute — *Boston, MA*

Supervisor: Dr. William Lotter — *January–August 2023*

- Developed domain adaptation methods for medical imaging models analyzing chest X-rays. Published: "Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification."

Harvard Medical School, Beth Israel Deaconness Medical Center — *Boston, MA*

Supervisor: Dr. Mark L. Andermann — *2018–2022*

- Conducted longitudinal calcium imaging studies of cortical neurons during learning and reversal tasks to characterize encoding strategies in postrhinal cortex. Investigated serotonergic modulation of retinal information flow to thalamus and analyzed offline cortical reactivations in memory consolidation. Co-authored three papers in *Nature*, *Neuron*, and *Current Biology*.

University of Connecticut, Department of Physiology and Neurobiology — *Storrs, CT*

Advisor: Dr. Joseph J. LoTurco — *2013–2016*

- Honors Thesis: "Time Course of Synapse Development in Interneurons of the Disinhibitory Circuits of Somatosensory Cortex."

Publications

**equally contributing authors*

Published

Nurisso, M., **Fernando, J.**, Deshpande, R., Perotti, A., Marjieh, R., Frankland, S.M., Lewis, R.L., Webb, T.W., Campbell, D., Vaccarino, F., Cohen, J.D., Petri, G. 2026. Bound by semanticity: universal laws governing the generalization-identification tradeoff. *International Conference on Learning Representations (ICLR)*.

Fernando, J., Guitchounts, G. 2025. Transformer Dynamics: A neuroscientific approach to interpretability of large language models. arXiv:2506.14797.

Fernando, J.*, Hoebel, K.V.*, Lotter, W. 2024. Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification. *Machine Learning for Biomedical Imaging*, PMLR 250:610-640.

Nguyen, N.D., Lutas, A., Amsalem, O., **Fernando, J.**, Young-Ahn, A., Hakim, R., Vergara, J., McMahon, J., Dimidschstein, J., Sabatini, B.L., Andermann, M.L. 2024. Cortical reactivations predict future sensory responses. *Nature* 625:110-118.

Reggiani, J.D.S., Jiang, Q., Barbini, M., Lutas, A., Liang, L., **Fernando, J.**, Deng, F., Wan, J., Li, Y., Chen, C., Andermann, M.L. 2023. Brainstem serotonin neurons selectively gate retinal information flow to thalamus. *Neuron* 111:711-726.

McGuire, K.L., Amsalem, O., Sugden, A.U., Ramesh, R.N., **Fernando, J.**, Burgess, C.R., Andermann, M.L. 2022. Visual association cortex links cues with conjunctions of reward and locomotor contexts. *Current Biology* 32:1563-1576.

Presentations

*†presenting author; *equally contributing authors*

Invited Talks

May 2025. *Transformer Dynamics: A neuroscientific approach to interpretability of large language models*. Spotlight Talk: Sixth International Conference on Mathematics of Neuroscience and AI, Split, Croatia.

May 2025. *From Neurons to Networks: Unraveling Adaptive Learning Mechanisms in Mice and Machines*. Invited Participant: Foundations of Adaptive Networks Working Group, Santa Fe Institute, Santa Fe, NM.

Conference Talks

September 2025. *From Neurons to Networks: Unraveling Adaptive Learning Mechanisms in Mice and Machines*. Contributory Talk: Conference on Complex Systems, Siena, Italy.

January 2025. *From Neurons to Networks: Unraveling Adaptive Learning Mechanisms in Mice and Machines*. Contributory Talk: NetSciX, Indore, India.

Posters

Fernando, J.†, M. Gatica, G. Petri, S.V. Scarpino. March 2025. *Unraveling Adaptive Learning Mechanisms in Mice and Machines*. Poster: NetSI Student Research Symposium, Boston, MA.

Fernando, J.†, M. Gatica, G. Petri, S.V. Scarpino. September 2024. *Multi-scale Analysis of Learning Dynamics in Biological and Artificial Neural Systems*. Poster: IPAM Naturalistic Approaches to Intelligence Workshop, Los Angeles, CA.

Fernando, J.*†, K.V. Hoebel*, W. Lotter. July 2024. *Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification*. Poster: Medical Imaging with Deep Learning, Paris, France.

Awards, Fellowships, & Grants

May–July 2026	**AccelNet-MultiNet Fellowship**, AccelNet-MultiNet program	*$8,350*
March 2026	**NetSI Spring Travel Award**, Network Science Institute	*$1,000*
May 2025	**NetSI Spring Travel Award**, Network Science Institute	*$1,000*
February 2024	**Workshop Travel Award**, UCLA Institute of Pure and Applied Mathematics	*$1,725*
February 2024	**NetSI Spring Travel Award**, Network Science Institute	*$1,000*

Outreach & Professional Development

Conference & Workshop Organization

June 2026	**Neuromonster 2026**, Session Chair	*Rome, IT*
June 2026	**NetSci 2026 Workshop: TopoNets: Analysis, Inference and Prediction**, Organizer	*Boston, MA*
March 2026	**CoSyNe 2026 Workshop: Renormalization Principles in Neural Systems**, Chair	*Lisbon, PT*
Sept 2025	**CCS 2025 Satellite: Complexity in the Brain**, Chair	*Siena, IT*
March 2025	**Network Science Student Research Symposium**, Chair	*Boston, MA*

Departmental Service

2024–present	**Theoretical Neuroscience Reading Group**, Organizer	*Remote*
2024–2025	**Students, Networks, And Collaborations (SNACs) Seminar**, Organizer	*Boston, MA*
2024–2025	**Network Science Institute Graduate Student Association**, Events Coordinator	*Boston, MA*

Peer Review Cerebral Cortex

Professional Development

Santa Fe Institute Working Group: Foundations of Adaptive Networks, *invited speaker*

UCLA IPAM Workshop: Naturalistic Approaches to Intelligence, *poster presenter*

MIT CBMM Summer School: Brains, Minds, Machines, *participant*

Neuromatch Computational Neuroscience, *participant*

UCLA IPAM Workshop: Mathematical Approaches for Connectome Analysis, *participant*

Teaching & Mentoring

Teaching

2016-2018	**PNB 2275: Physiology and Neurobiology I & II**, Teaching Assistant	*UConn*
2017	**Integrative Neurobiological Imaging**, Teaching Assistant	*UConn*

Mentoring Supervised 7 undergraduate students and 1 research technician in laboratory research at Harvard Medical School and Beth Israel Deaconness Medical Center (2018–2021).

Professional Experience

2023	**Research Assistant**, Dana Farber Cancer Institute - Data Science Department
2022-2023	**Consultant**, E11 Bio
2018-2023	**Senior Research Associate**, Harvard Medical School
2016-2018	**Graduate Teaching Assistant**, Physiology and Neurobiology, University of Connecticut
2013-2016	**Undergraduate Research Assistant**, Physiology and Neurobiology, University of Connecticut