

Jesseba Fernando

PHD STUDENT · NETWORK SCIENCE INSTITUTE

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Education

Northeastern University

PHD NETWORK SCIENCE

- Advisor: Dr. Samuel V. Scarpino

Boston, MA

Aug. 2023 - present

University of Connecticut

BSc & MSc NEUROBIOLOGY

- Honors Thesis and MSc Advisor: Dr. Joseph LoTurco

Storrs, CT

Aug. 2012 - May 2018

Research Experience

Northeastern University, Network Science Institute

ADVISOR: DR. SAMUEL V. SCARPINO

- 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.

Boston, MA

August 2023–Present

Dana-Farber Cancer Institute

SUPERVISOR: DR. WILLIAM LOTTER

- 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.”

Boston, MA

January–August 2023

Harvard Medical School, Beth Israel Deaconess Medical Center

SUPERVISOR: DR. MARK L. ANDERMANN

- Analyzed calcium imaging data on cortical encoding in postrhinal cortex and serotonergic retino-thalamic modulation; performed stereotaxic surgeries for a study on offline reactivations in memory consolidation. Co-authored papers in *Nature*, *Neuron*, and *Current Biology*.

Boston, MA

2018–2022

University of Connecticut, Department of Physiology and Neurobiology

ADVISOR: DR. JOSEPH J. LOTURCO

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

Storrs, CT

2013–2016

Publications

**equally contributing authors*

PUBLISHED

Fernando, J., Guitchounts, G. 2026. Dynamics of the Transformer Residual Stream: Coupling Spectral Geometry to Network Topology. *Neural Information Processing Systems 2026*.

Nurisso, M., **Fernando, J.**, Deshpande, R., Perotti, A., Marjeh, 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 2026*.

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

Hoebel, K.V.*, **Fernando, J.***, Lotter, W. 2024. Beyond Structured Attributes: Image-Based Predictive Trends for Chest X-Ray Classification. *Medical Imaging for Deep Learning*, PMLR 300:1-31.

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 2026. *Before the Behavior: Sparse learning signals anticipate adaptation to rule changes in postrhinal cortex*. Invited participant: BraiNets Retreat, Carry-Le-Rouet, FR.

May 2026. *Information-theoretic encoding in postrhinal cortex*. Visiting Fellow: Analytics Group Seminar, Institut de Neurosciences de la Timone, Marseille, FR.

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.

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.

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

POSTERS

Fernando, J.[†], G. Guitchounts. December 2026. *Dynamics of the Transformer Residual Stream: Coupling Spectral Geometry to Network Topology*. Poster: Neural Information Processing 2026, TBD.

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

Fernando, J.[†], 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 2026	AccelNet-MultiNet Fellowship , AccelNet-MultiNet program	\$8,350
Mar 2026	NetSI Spring Travel Award , Network Science Institute	\$1,000
May 2025	NetSI Spring Travel Award , Network Science Institute	\$1,000
Feb 2024	Workshop Travel Award , UCLA Institute of Pure and Applied Mathematics	\$1,725
Feb 2024	NetSI Spring Travel Award , Network Science Institute	\$1,000

Outreach & Professional Development

CONFERENCE & WORKSHOP ORGANIZATION

June 2026	Mathematics for Neuroscience & AI 2026 , Neural Theory 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	<i>Remote</i>
2024–2025	Students, Networks, And Collaborations (SNACs) Seminar , Organizer	<i>Boston, MA</i>
2024–2025	Network Science Institute Graduate Student Association , Events Coordinator	<i>Boston, MA</i>

PEER REVIEW Cerebral Cortex

PROFESSIONAL DEVELOPMENT

- AccelNet-Multinet Program** 2026 Cohort, *Fellow*
- 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	<i>UConn</i>
2017	Integrative Neurobiological Imaging , Teaching Assistant	<i>UConn</i>

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