Luana Ruiz

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ACADEMIC WORK EXPERIENCE

Johns Hopkins University   Baltimore, MD
Assistant Professor   **Starting August 2023**

Department of Applied Mathematics and Statistics

Massachussetts Institute of Technology   Boston, MA
Postdoctoral Researcher   *Jan.-Jul. 2023*

Foundations of Data Science Institute Fellowship
METEOR Fellowship

Simons Institute for the Theory of Computing   Berkeley, CA
Research Fellow   *Aug.–Dec. 2022*

Program "Graph Limits and Processes on Networks: From Epidemics to Misinformation"

EDUCATION

University of Pennsylvania   *2017–2022*
Ph.D. in Electrical Engineering
The Dean's Fellowship
Iraj Zandi Fellowship

Supélec - Ecole Supérieure d'Electricité, Paris, France   *2013–2015*
M.Eng. in Electrical Engineering
Eiffel Excellence Scholarship, French Ministry for Europe and Foreign Affairs
Double degree program with the University of São Paulo

University of São Paulo, São Paulo, Brazil   *2011–2017*
B.Sc. in Electronics Engineering
Ensinar com Pesquisa Fellowship

RESEARCH PUBLICATIONS

Journals

Published

J. Cervino, L. Ruiz, and A. Ribeiro, "Learning by transference: training graph neural networks on growing graphs," *IEEE Transactions on Signal Processing*, vol. 71, pp. 233-247, 6 Feb. 2023.

L. Ruiz, L. F. O. Chamon, and A. Ribeiro, "Graphon signal processing," *IEEE Transactions on Signal Processing*, vol. 69, pp. 4971–4976, 24 Aug. 2021.

L. Ruiz, F. Gama, and A. Ribeiro, "Graph neural networks: Architectures, stability and transferability," *Proceedings of the IEEE*, vol. 109, pp. 660–682, 17 Feb. 2021.

——, "Gated graph recurrent neural networks," *IEEE Transactions on Signal Processing*, vol. 68, pp. 6303–6318, 26 Oct. 2020.

L. Ruiz, F. Gama, A. G. Marques, and A. Ribeiro, "Invariance-preserving localized activation functions for graph neural networks," *IEEE Transactions on Signal Processing*, vol. 68, pp. 127–141, 25 Nov. 2019.

Submitted

Z. Wang, L. Ruiz, and A. Ribeiro, "Stability to deformations of manifold filters and manifold neural networks," *arXiv:2106.03725 [cs.LG]*, 21 Oct. 2022. [Online]. Available: https://arxiv.org/abs/2106.03725. Submitted to IEEE TSP.

L. Ruiz, L. F. O. Chamon, and A. Ribeiro, "Transferability properties of graph neural networks," *arXiv:2112.04629 [cs.LG]*, 18 Oct. 2022. [Online]. Available: http://arxiv.org/abs/2112.04629. AQ in IEEE TSP.

Machine Learning Conferences/Workshops

Z. Wang, L. Ruiz, and A. Ribeiro, "Convolutional Neural Networks on Manifolds: From Graphs and Back." Accepted at NeurIPS 2022 GLFrontiers Workshop.

L. Ruiz, L. F. O. Chamon, and A. Ribeiro, "Graphon neural networks and the transferability of graph neural networks," in *34th Conference on Neural Information Processing Systems (NeurIPS)*. Virtual: NeurIPS Foundation, 7-12 Dec. 2020.

Preprints

S. Krishnagopal and L. Ruiz, "Graph Neural Tangent Kernel: Convergence on Large Graphs," *arXiv:2301.10808 [cs.LG]*, 25 Jan. 2023. [Online]. Available: https://arxiv.org/abs/2301.10808.

L. Ruiz, J. Ainslie, and S. Ontañón, "Iterative decoding for compositional generalization in transformers," *arXiv:2110.04169 [cs.LG]*, 9 Dec. 2021. [Online]. Available: https://arxiv.org/abs/2110.04169.

Signal Processing Conferences

L. Ruiz, N. Huang, and S. Villar, "Graph Neural Networks for Community Detection on Sparse Graphs". Submitted to ICASSP 2023.

Z. Wang, L. Ruiz, and A. Ribeiro, "Convolutional Filtering on Sampled Manifolds". Submitted to ICASSP 2023.

J. Cervino, L. Ruiz, and A. Ribeiro, "Training Graph Neural Networks on Growing Stochastic Graphs." Submitted to ICASSP 2023.

Z. Wang, L. Ruiz, and A. Ribeiro, "Convolutional Neural Networks on Manifolds: From Graphs and Back." Accepted at Asilomar 2022.

Z. Wang, L. Ruiz, M. Eisen, and A. Ribeiro, "Stable and transferable wireless resource allocation policies via manifold neural networks," in *2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Singapore: IEEE, 22-27 May 2022, pp. 8912–8916.

Z. Wang, L. Ruiz, and A. Ribeiro, "Stability of neural networks on manifolds to relative perturbations," in *2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Singapore: IEEE, 22-27 May 2022, pp. 5473–5477.

J. Cervino, L. Ruiz, and A. Ribeiro, "Training stable graph neural networks through constrained learning," in *2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Singapore: IEEE, 22-27 May 2022, pp. 4223–4227.

Z. Wang, L. Ruiz, and A. Ribeiro, "Transferable graph neural networks on large-scale stochastic graphs," in *Asilomar Conference on Signals, Systems, and Computers*. Asilomar, CA (Virtual): IEEE, 31 Oct.-3 Nov. 2021, pp. 1–5.

Z. Wang, L. Ruiz, and A. Ribeiro, "Stability of neural networks on Riemannian manifolds," in *29th European Signal Processing Conference (EUSIPCO)*. Dublin, Ireland (Virtual): EURASIP, 23-27 Aug. 2021, pp. 1–5. **Best Student Paper Award**.

L. Ruiz, Z. Wang, and A. Ribeiro, "Graphon and graph neural network stability," in *2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Toronto, ON (Virtual): IEEE, 6-11 June 2021, pp. 5255–5259.

L. Ruiz, F. Gama, A. Ribeiro, and E. Isufi, "Nonlinear state-space generalizations of graph convolutional neural networks," in *2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Toronto, ON (Virtual): IEEE, 6-11 June 2021, pp. 5265–5269.

B. Iancu, L. Ruiz, A. Ribeiro, and E. Isufi, "Graph-adaptive activation functions for graph neural networks," in *30th International Workshop on Machine Learning for Signal Processing (MLSP)*. Espoo, Finland (Virtual): IEEE, 21-24 Sep. 2020, pp. 1–6.

L. Ruiz, L. F. O. Chamon, and A. Ribeiro, "Graphon filters: Signal processing in very large graphs," in *28th European Signal Processing Conference (EUSIPCO)*. Amsterdam, Netherlands (Virtual): EURASIP, 18-22 Jan. 2021, pp. 1–5.

A. P. Mayorga, L. Ruiz, and A. Ribeiro, "Graphon pooling in graph neural networks," in *28th European Signal Processing Conference (EUSIPCO)*. Amsterdam, Netherlands (Virtual): EURASIP, 18-22 Jan. 2021, pp. 1–5.

L. Ruiz, F. Gama, and A. Ribeiro, "Spatial gating strategies for graph recurrent neural networks," in *2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Barcelona, Spain (Virtual): IEEE, 4-8 May 2020, pp. 5550–5554.

L. Ruiz, L. F. O. Chamon, and A. Ribeiro, "The Graphon Fourier Transform," in *2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Barcelona, Spain (Virtual): IEEE, 4-8 May 2020, pp. 5660–5664.

L. Ruiz, F. Gama, and A. Ribeiro, "Gated graph convolutional recurrent neural networks," in *27th European Signal Processing Conference (EUSIPCO)*. A Coruña, Spain: EURASIP, 2-6 Sep. 2019, pp. 1–5. **Best Student Paper Award**.

L. Ruiz, F. Gama, G. Marques, and A. Ribeiro, "Median activation functions for graph neural networks," in *2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. Brighton, UK: IEEE, 12-17 May 2019, pp. 7440–7444.

L. I. R. Ruiz, W. Beccaro, B. G. P. Evaristo, and F. J. Ramirez-Fernandez, "Tactile sensing glove-based system for objects classification using support vector machine," *IEEE Latin America Transactions*, vol. 16, no. 6, pp. 1658–1663, June 2018.

W. Becari, L. Ruiz, B. G. P. Evaristo, and F. J. Ramirez-Fernandez, "Comparative analysis of classification algorithms on tactile sensors," in *2016 IEEE Int. Symp. Consumer Electronics*. São Paulo, Brazil: IEEE, 11-14 Oct. 2016.

L. I. R. Ruiz and I. F. C. Oppenhein, "Animations for materials science and engineering introductory courses: TTT diagram, bipolar junction diodes and transistors and X-ray diffraction," in *21st SIICUSP*. São Paulo, Brazil: University of São Paulo, 21-25 Oct. 2013.

HONORS & AWARDS

METEOR Fellow   *January - July 2023*
Postdoctoral fellowship sponsored by MIT CSAIL to support exceptional researchers in computer science and artificial intelligence and to broaden participation in the field.

Highlighted Reviewer   *October 2022*
ICLR 2022.

Simons-Berkeley Google Research Fellow *August - December 2022*
Program "Graph Limits and Processes on Networks: From Epidemics to Misinformation".

EECS Rising Stars *October 2021*
2021 Rising Stars in EECS Workshop at MIT

EUSIPCO Best Student Paper Award *September 2021*
Awarded by EURASIP to 3 student finalists at the paper competition Q&A

Best ESE PhD Colloquium *December 2020*
Awarded by the ESE department at the University of Pennsylvania

Best ESE Teaching Assistant *December 2020*
Awarded by the ESE department at the University of Pennsylvania

ICASSP Travel Grant (Declined) *February 2020*
Awarded by IEEE to cover for travel expenses

EUSIPCO Best Student Paper Award *September 2019*
Awarded by EURASIP to 3 out of 13 student finalists chosen to present a poster in the paper competition

EUSIPCO Travel Grant *September 2019*
Awarded by NSF to cover for travel expenses

iREDEFINE Fellowship *March 2019*
Granted by NSF to cover travel expenses to the "Impact: Redefining Electrical and Computer Engineering Faculty" workshop

Iraj Zandi Fellowship *2017*
Excellence fellowship granted by the University of Pennsylvania in addition to The Dean's Fellowship

Eiffel Excellence Scholarship *2013 - 2015*
Granted by Campus France (Egide) and the French Ministry for Europe and Foreign Affairs
2-year fellowship for M.Sc./double degree obtention at Supélec

***Ensinar com Pesquisa* Fellowship** *2012*
Granted by the University of São Paulo
Year-long project entitled "Animations for Materials Science and Engineering Introductory Courses: TTT Diagram, Bipolar Junction Diodes and Transistors and X-Ray Diffraction"

International Science and Engineering Camp, Seoul, South Korea *August 2010*
Hosted by Seoul National University
One of the 5 high school students chosen nationwide to represent Brazil
Awarded by the science and engineering fair *Feira Brasileira de Ciência e Engenharia* (FEBRACE) and funded by the Brazilian Ministry for Science and Technology

Campinas State University Mathematics Olympiad, Campinas, Brazil *2010*
Honorable mention at high school-level mathematics olympiad

INVITED TALKS

Graph Neural Networks on Large-Scale Graphs: Graphon Neural Networks and Learning by Transference *March 10, 2023*
Khipu - Latin American Meeting In Artificial Intelligence @ Montevideo, Uruguay

Machine Learning on Large-Scale Graphs *January 4, 2023*
AMS Special Session on Mathematical Methods in Machine Learning and Optimization II @ Joint Mathematics Meeting

Graph Neural Networks on Large-Scale Graphs *November 15, 2022*
GNN Reading Group @ Stanford (with Yeganeh Alimohammadi)

Machine Learning on Large-Scale Graphs *September 30, 2022*
Graph Limits, Nonparametric Models, and Estimation Workshop @ Simons-Berkeley Institute

Machine Learning on Large-Scale Graphs *April 8, 2022*
GNN Reading Group @ TU Delft (Remote)

Machine Learning on Large-Scale Graphs *March 17, 2022*
Northeastern University

Machine Learning on Large-Scale Graphs *March 8, 2022*
Harvard University

Machine Learning on Large-Scale Graphs *February 23, 2022*
University of Minnesota

Machine Learning on Large-Scale Graphs *February 17, 2022*
Carnegie Mellon University (Remote)

Machine Learning on Large-Scale Graphs *February 14, 2022*
Texas A&M University

Machine Learning on Large-Scale Graphs *February 9, 2022*
Purdue University

Machine Learning on Large-Scale Graphs *February 8, 2022*
Johns Hopkins University (Remote)

Machine Learning on Large-Scale Graphs *January 31, 2022*
Illinois Institute of Technology (Remote)

Machine Learning on Large-Scale Graphs *January 27, 2022*
University of Texas at San Antonio

Machine Learning on Large-Scale Graphs *January 24, 2022*
California Institute of Technology (Remote)

Graphon Signal Processing *December 17, 2021*
DATA Lab @ Northeastern

THEORINET Critique *September 29, 2021*
Flatiron Institute
Critique of "Transferability of GNNs – An Extended Graphon Approach"

Large-Scale Graph Information Processing *September 21, 2021*
THEORINET Retreat (Remote)

Learning on Large-Scale Graphs *November 18, 2020*
Intel WAS ISTC Review Meeting (Remote)

Gated Graph Recurrent Neural Networks   *April 16, 2020*
Intel WAS ISTC Seminar Series (Remote)

ON-CAMPUS TALKS

Graph Neural Networks on Large-Scale Graphs   *November 4, 2022*
Jegelka Research Group Meeting, MIT

Graphon Signal Processing   *February 24, 2021*
ESE PhD Colloquium, UPenn (Remote)

Gated Graph Recurrent Neural Networks   *February 4, 2020*
ESE PhD Colloquium, UPenn
Best ESE PhD Colloquium Award

Invariance-Preserving Localized Activation Functions for GNNs   *May 1, 2019*
ESE PhD Colloquium, UPenn

TEACHING EXPERIENCE

Department of Electrical and Systems Engineering, University of Pennsylvania
Teaching Assistant

ESE 680, Graph Neural Networks   *Fall 2020*
ESE 224, Signal and Information Processing   *Spring 2019, 2020, 2021*
ESE 303, Stochastic Systems Analysis and Simulation   *Fall 2018*

School of Engineering, University of Pennsylvania
Instructor
Penn GEMS, Girls in Engineering, Math and Science Camp   *June 2019*
Led two 2-hour workshops for female students in 7-10th grades entitled "Computer technology and computer programming"

PROFESSIONAL SERVICE

Women in Data Science Cambridge Datathon Organization   *February 2023*
Annual workshop held at Microsoft NERD preceding the WiDS Cambridge Conference. Mentorship and training for those interested in participating in the WiDS Datathon Challenge, and, more generally, anyone with a strong interest in data science.

Machine Learning for Signal Processing Technical Committee   *November 2022–Present*
IEEE Signal Processing Society

Reviewer   *2017–Present*

IEEE Transactions on Signal Processing (TSP)
IEEE Signal Processing Letters (SPL)
IEEE Transactions on Signal and Information Processing over Networks (TSIPN)
IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
IEEE Access Journal
IEEE Journal on Selected Areas in Information Theory (JSAIT)
Journal of Machine Learning Research (JMLR)

Neurocomputing

Applied and Computational Harmonic Analysis

Conferences: ICASSP, NeurIPS, ICLR (Highlighted Reviewer), ICML, Asilomar

ESE PhD Colloquium Organization   *September 2018–May 2019*
University of Pennsylvania

PROFESSIONAL SKILLS

Python, PyTorch, PyTorch Geometric, Matlab, LaTeX   Proficient

Used Python and PyTorch to develop gated graph recurrent neural networks
Github: `https://github.com/luanaruiz9/gated_gcrnns`
Contributor in the Alelab graph neural network library in PyTorch
Github: `https://github.com/alelab-upenn/graph-neural-networks`

TensorFlow, Jax/Flax   Familiar

Used Jax/Flax during my internship at Google to train transformer models to iteratively decode compositionally hard datasets
Github: `https://github.com/googleinterns/compositional-generalization-2021`

HTML, R, C++, C, Java   Basic

NON-ACADEMIC WORK EXPERIENCE

Google   Philadelphia, PA (Remote)
Research Intern   *June–August 2021*

Intern with the TableTalk team

Worked on strategies to increase compositional generalization in transformer models

Co-wrote preprint "Iterative Decoding for Compositional Generalization in Transformers"

Mastercard Advisors   São Paulo, Brazil
Associate Analyst   *January–August 2017*

Team member in three consulting projects for MasterCard Advisors' clients

Performed authorization, fraud and chargeback analysis

Designed KPI dashboard for major Brazilian credit card issuer

Presented project results to Mastercard Advisors' global leadership

Sagem Avionics   Grand Prairie, TX
Engineering Technical Support Intern   *July 2015–January 2016*

Performed Entry in Service of Original Equipment Manufacturer units

Provided technical support to the workshop

PSA Peugeot Citröen   Poissy, France
Engineering Intern   *July–August 2014*

Summer internship in car manufacturer assembly line

LANGUAGES

English	Fluent
Portuguese	Native
French	Intermediate

PROFESSIONAL MEMBERSHIPS

AMS Membership   *2022–Present*
Member

IEEE Membership   *2017–Present*
Member

IEEE Signal Processing Society Membership   *2017–Present*
Member