Julia Balla

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EDUCATION

Massachusetts Institute of Technology Sep 2023 – Present
Ph.D. in Electrical Engineering and Computer Science
Advisors: Tess Smidt and Tommi Jaakkola

University of Oxford, Exeter College Oct 2022 – Aug 2023
M.Sc. in Advanced Computer Science
Advisor: Michael Bronstein
Thesis: Graph-Informed Symbolic Regression

Massachusetts Institute of Technology Sep 2018 – May 2022
B.Sc. in Mathematics with Computer Science, Minor in Economics

SCHOLARSHIPS & AWARDS

National Defense Science & Engineering Graduate (NDSEG) Fellowship 2024 – 2027
Robert M. (1941) and Jacqueline M. Fano Fellowship 2023 – 2024
DeepMind Scholarship 2022 – 2023

PUBLICATIONS

AI-Assisted Discovery of Quantitative and Formal Models in Social Science.
Julia Balla, Sihao Huang, Owen Dugan, Rumen Dangovksi, Marin Soljacic.
Nature Humanities and Social Sciences Communications, 2025.

A Cosmic-Scale Benchmark for Symmetry-Preserving Data Processing
Julia Balla, Siddharth Mishra-Sharma, Carolina Cuesta-Lazaro, Tommi Jaakkola, Tess Smidt
NeurIPS Workshop on Symmetry Geometry in Neural Representations (NeurReps), Proceedings Track, 2024.
Learning on Graphs Conference (LoG), Extended Abstract, 2024.
Oral Presentation

CodonMPNN for Organism Specific and Codon Optimal Inverse Folding
Hannes Stark*, Umesh Padia*, Julia Balla, Cameron Diao
ICML Workshop on AI for Science (AI4Science), 2024.
ICML Workshop on ML for Life and Material Science (ML4LMS), 2024.
Most Commercially Exciting Research Award

Over-squashing in Riemannian Graph Neural Networks
Julia Balla
Learning on Graphs Conference (LoG), Extended Abstract, 2023.

PrivateMail: Supervised Manifold Learning of Deep Features with Privacy for Image Retrieval.
Praneeth Vepakommma, Julia Balla, Ramesh Raskar
AAAI 2022
Oral Presentation

PREPRINTS

Splintering with distributions: A stochastic decoy scheme for private computation.
Praneeth Vepakomma, Julia Balla, Ramesh Raskar
arXiv:2007.02719, 2020.

TALKS

A Recipe for Charge Density Prediction.
ICML Workshop on ML for Life and Material Science: From Theory to Industry Applications (ML4LMS), 2024.

RESEARCH EXPERIENCE

Harvard Medical School Jun 2022 – Sep 2022
Supervisor: Marinka Zitnik
Combining symbolic regression with graph neural networks for the discovery of fundamental drug interaction laws.

Institute for AI and Fundamental Interactions, MIT Jun 2021 – Aug 2022
Supervisor: Marin Soljačić
Designed a neural symbolic regression system for the discovery of universal laws in social science and dynamical systems.

London Geometry and Machine Learning Summer School Jul 2022
Supervisor: Francesco di Giovanni
Surveyed techniques for graph-rewiring in graph neural networks from a geometric perspective.

MIT Computer Science and Artificial Intelligence Lab Feb 2021 – May 2021
Supervisors: Octavian Ganea and Tommi Jaakkola
Explored computationally tractable methods to learn Riemannian manifolds as geometric priors for graph representation learning.

MIT Media Lab Feb 2020 – May 2021
Supervisors: Praneeth Vepakomma and Ramesh Raskar
Developed algorithms for privacy-preserving machine learning with applications in distributed learning and private image retrieval.

INDUSTRY EXPERIENCE

Wellington Management Jun 2021 – Aug 2021
Data Science Intern Boston, MA
Designed a text classification algorithm to identify job postings indicating company growth.

Meta Jun 2020 – Aug 2020
Data Engineering Intern New York, NY
Created a data pipeline and dashboard for sentiment analysis of Messenger app reviews using Presto and HiveQL.

Predata Jun 2019 – Aug 2019
Data Visualization Intern New York, NY
Developed a web app using ReactJS and Django for predicting geopolitical risk by visualizing page activity for geotagged Wikipedia pages on a 3D map.

R3 Jan 2019 – Feb 2019
Research and Education Intern New York, NY
Analyzed challenges within the automotive, aerospace, and agriculture industries caused by Brexit and mapped them to potential blockchain solutions.

TEACHING

MIT High School Studies Program Jul 2022 – Aug 2022
Instructor
C15061: The Mathematics of Multi-Agent Systems

MIT Splash Nov 2020
Instructor
C14311: Minecraft Fires, Social Networks, and Quantum Complexity

OUTREACH

MIT EECS Graduate Application Assistance Program Oct 2023 – Dec 2023
Mentor

MIT Undergraduate Society of Women in Math Feb 2022 – May 2022
Mentor

REVIEWING

ICML GRaM Workshop 2024
ICML AI4Science Workshop 2024
NeurIPS AI4Science Workshop 2023

SKILLS

Programming languages: Python, Javascript, R, Julia, SQL
Deep learning: PyTorch (PyG), TensorFlow, Jax (Jraph)
Miscellaneous: Fluent in Russian