LESIA SEMENOVA

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My research advances the foundations, algorithms, and applied practice for **Safe and Trustworthy AI through model multiplicity**. I study when and why many fundamentally different models or representations achieve near-optimal performance, formalized through the **Rashomon set**, and how this multiplicity reshapes **interpretability, robustness, and personalized alignment**. I introduced a theoretical foundation for the existence of simpler and interpretable models, along with the first practical methods to characterize and exploit Rashomon sets. These contributions helped shift the field from a single-model mindset toward a multiplicity-aware perspective on machine learning. Building on this foundation, my recent work develops Rashomon-aware algorithms for recourse, robustness, and constructing and navigating sets of diverse models for decision support, **transforming epistemic uncertainty from a source of instability into a mechanism for trust**. My work increasingly informs decision-making pipelines and emerging policy discussions in high-stakes domains.

RESEARCH INTERESTS

Save and Trustworthy AI, Interpretability, Model Multiplicity, Machine Learning, Human-Centered Design, AI in Healthcare, Reinforcement Learning, Reasoning.

EMPLOYMENT HISTORY

Assistant Professor, Rutgers University, New Brunswick, NJ, USA — July 2025 – Present
Department of Computer Science

Postdoctoral Researcher, Microsoft Research, NYC, USA — July 2024 – June 2025
Machine Learning Team

Research Intern, Pinterest Labs, Palo Alto, CA, USA — Summer 2020, Summer 2021
Applied Science Team

Software Engineer, Samsung R&D Institute, Kyiv, Ukraine — 2012 – 2014
Interaction Lab, Augmented Reality Team

EDUCATION

Duke University, Durham, NC, USA
Ph.D. in Computer Science — 2016 – 2024
Advisors: Cynthia Rudin, Ronald Parr

Taras Shevchenko National University of Kyiv, Kyiv, Ukraine
MS in Applied Mathematics — 2012 – 2014
BS in Applied Mathematics — 2008 – 2012

PUBLICATIONS

Google Scholar
(* denotes equal contributions)

1 Bohdan Turbal, Iryna Voitsitska, **Lesia Semenova**. ElliCE: Efficient and provably robust algorithmic recourse via the Rashomon sets. *Neural Information Processing Systems (NeurIPS), 2025 (**Spotlight**).*

2 Ethan Hsu, Tony Cao, **Lesia Semenova**, Chudi Zhong. The Rashomon Set Has It All: Analyzing Trustworthiness of Trees under Multiplicity. *Neural Information Processing Systems (NeurIPS), 2025.*

3 Dennis Tang, Jon Donnelly, Alina Jade Barnett, **Lesia Semenova**, Jin Jing, Peter Hadar, Ioannis Karakis, Olga Selioutski, Kehan Zhao, M. Brandon Westover, Cynthia Rudin. This EEG looks like these EEGs: Interpretable interictal epileptiform discharge detection with ProtoEEG-kNN. *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2025*

— An **oral** workshop version appeared at *2023 Workshop on Medical Imaging meets NeurIPS*

4 Gaurav Rajesh Parikh, Jenny Huang, Albert Sun, **Lesia Semenova**, Cynthia Rudin. Navigating progress: Enhancing public transit for more equitable communities via interpretable causal inference. *Harvard Data Science Review, 2025*

— A workshop version appeared at *NeurIPS 2022 Workshop on Causality for Real-world Impact*

— ***Won 2022 American Statistical Association Data Challenge Expo Student Competition***

5 Chloe Qinyu Zhu, Muhang Tian, **Lesia Semenova**, Jiachang Liu, Jack Xu, Joseph Scarpa, Cynthia Rudin. Fast

and Interpretable Mortality Risk Scores for Critical Care Patients. *Journal of the American Medical Informatics Association (JAMIA), 2025*

6 Zachery Boner*, Harry Chen*, **Lesia Semenova***, Ronald Parr, Cynthia Rudin. Using noise to infer aspects of simplicity without learning. *Neural Information Processing Systems (NeurIPS), 2024.*

7 Cynthia Rudin, Chudi Zhong, **Lesia Semenova**, Margo Seltzer, Ronald Parr, Jiachang Liu, Srikar Katta, Jon Donnelly, Harry Chen, Zachery Boner. Amazing things come from having many good models. *International Conference on Machine Learning (ICML), 2024 (**Spotlight**).*

8 Siong Thye Goh*, **Lesia Semenova***, Cynthia Rudin. Sparse density trees and lists: an interpretable alternative to high-dimensional histograms. *INFORMS Journal on Data Science (IJDS), 2024.*

9 **Lesia Semenova**, Yingfan Wang, Shane Falcinelli, Nancie Archin, Alicia D Cooper-Volkheimer, David M Margolis, Nilu Goonetilleke, David M Murdoch, Cynthia D Rudin, Edward P Browne. Machine learning approaches identify immunologic signatures of total and intact HIV DNA during long-term antiretroviral therapy**.** *eLIFE, 2024*

10 **Lesia Semenova**, Harry Chen, Ronald Parr, Cynthia Rudin. A path to simpler models starts with noise. *Neural Information Processing Systems (NeurIPS), 2023.*

11 **Lesia Semenova**, Cynthia Rudin, Ronald Parr. On the existence of simpler machine learning models. *ACM Conference on Fairness, Accountability, and Transparency (FAccT), 2022.*

12 Cynthia Rudin, Chaofan Chen, Zhi Chen, Haiyang Huang, **Lesia Semenova**, Chudi Zhong. Interpretable machine learning: fundamental principles and 10 grand challenges. *Statistics Surveys, 2022.*

WORKSHOPS AND PREPRINTS

13 Ronald Parr, Cynthia Rudin, Harry Chen, Zachery Boner, Michal Moshkovitz, **Lesia Semenova**. Transition Noise Facilitates Interpretability. *Workshop on Interpretable Policies in Reinforcement Learning @RLC-2024 (**Oral**).*

14 Alex Oesterling, Angikar Ghosal, Haoyang Yu, Rui Xin, Yasa Baig, **Lesia Semenova**, Cynthia Rudin. Multitask learning for citation purpose classification. *Second Workshop on Scholarly Document Processing, ACL, 2021.*
— ***Won third place in 3C Shared Task Competition***

15 Yingfan Wang, German G Gornalusse, David A Siegel, Alton Barbehenn, Rebecca Hoh, Jeffrey Martin, Frederick Hecht, Christopher Pilcher, **Lesia Semenova**, David M Murdoch, David M Margolis, Claire N Levy, Keith R Jerome, Cynthia D Rudin, Florian Hladik, Steven G Deeks, Sulggi A Lee, Edward P Browne. NF-κB dependent gene expression and plasma IL-1β, TNFα and GCSF drive transcriptomic diversity and CD4: CD8 ratio in people with HIV on ART. *bioRxiv, 2025*.

16 Ethan Hsu, Harry Chen, Chudi Zhong, **Lesia Semenova**. The Double-Edged Nature of the Rashomon Set for Trustworthy Machine Learning. arXiv preprint arXiv:2511.21799, 2025.

17 Shihan Feng, Cheng Zhang, Michael Xi, Ethan Hsu, **Lesia Semenova**, Chudi Zhong. Many Ways to be Right: Rashomon Sets for Concept-Based Neural Networks. arXiv preprint arXiv:2511.19636, 2025.

INVITED TALKS

Rutgers, School of Arts and Sciences (New Research Frontiers in Education, Technology, and Society)	2025
Rutgers University Undergraduate Student Alliance of Computer Scientists (Invited talk)	2025
Joint Statistics Meetings (JSM)	2025
18th International Joint Conference on Computational and Financial Econometrics (CFE) and Computational and Methodological Statistics (CMStatistics)	2024
INFORMS Annual Meeting	2024
Theory of Interpretable AI Seminar	2024
The 25th International Symposium on Mathematical Programming	2024
Johns Hopkins University, Applied Physics Lab, AI/ML seminar	2024
Oden Institute, UT Austin	2024
Lawrence Livermore National Laboratory	2024
Microsoft Research	2024

Conference on Information Sciences and Systems (CISS) 2023
Joint Statistics Meetings (JSM), Near-Optimization Topic-Contributed session 2021
INFORMS Annual Meeting 2020

SELECTED AWARDS AND HONORS

Top Reviewer at ICML 2025
PhD Dissertation Award from the Department of Computer Science at Duke University 2024
Rising Stars in Computational and Data Science, University of Texas at Austin 2024
1st place in American Statistical Association Data Challenge Expo Student Competition 2023
1st place in American Statistical Association Data Challenge Expo Student Competition 2022
3rd place in 3C Shared Task Competition 2021
SAMSI Fellowship 2018
TA Award Honorable Mention 2018
Duke CS Department Fellowship 2016 – 2018
Scholarship of Mayor of Kyiv 2012 – 2014
Scholarship of Zavtra.UA competition 2012-2013 and 2013 – 2014
Scholarship of Academic Council of Taras Shevchenko National University 2011 – 2012
Scholarship of President of Ukraine 2008 – 2009

ADVISING AND MENTORING

Michael Xi, PhD Student, Rutgers University
Neil Gandhi, undergraduate, Rutgers University
Vrinda Surati, undergraduate, Rutgers University
Bohdan Turbal, undergraduate, Taras Shevchenko National University of Kyiv (now PhD at Princeton)
Damian Samus, master, Taras Shevchenko National University of Kyiv

Former Advisees
Shihan Feng, master, Duke University
Iryna Voitsitska, undergraduate, Ukrainian Catholic University
Anastasia Mazur, master, Ukrainian Catholic University
Ostap Pavlyshyn, undergraduate, Ukrainian Catholic University
Zach Boner, PhD Student, Duke University
Harry Chen, undergraduate, Duke University (now PhD student at MIT)
Ethan Hsu, undergraduate, Duke University (now at Amazon)
Tony Cao, undergraduate, Duke University
Dennis Tang, undergraduate, Duke University (now PhD student at Duke)
Chloe Zhu, undergraduate, Duke University (now PhD student at Duke)
Muhang (Tony) Tian, undergraduate, Duke University (now PhD student at NYU)
Flora Shi, undergraduate, Duke University (now PhD student at MIT)

Co-instructor for Duke Data Science teams that participated in various Data Science competitions (9 teams total, 29 Duke undergraduate students)

TEACHING

Certificate in College Teaching, Duke Graduate School
Formal pedagogical training in the college teaching.

Institute of Advanced Study
2022 Program for women and mathematics: "The Mathematics of Machine Learning"
Terng Lecture Course on Interpretable Machine Learning May 2022

SERVICE

Organizer:
Navigating Model Uncertainty and the Rashomon Effect: From Theory and Tools to Applications and Impact **Workshop @ AAAI 2026**
Interpretable AI: Past, Present and Future **Workshop @ NeurIPS 2024**

Tutorial Organizer and Presenter:
From Underspecification to Alignment: Breaking the One-Model Mindset for Reliable AI **@AAAI 2026**

Area Chair:

NeurIPS: 2025

Reviewer:

NeurIPS: 2024, 2025
ICLR: 2025
AISTATS: 2025
ICML: 2025
KDD: 2025
Journals: JMLR, Patterns, ACM Journal on Responsible Computing
Workshops: DeepMath (2022, 2023), International Workshop on Advances in Interpretable Machine Learning and Artificial Intelligence (2021, 2022, 2023)

Panelist:

Microsoft Research Undergraduate Internship 2024

Mentor:

RAI4Ukraine research program 2024-Present
Women in Machine Learning Workshop @ NeurIPS 2024, 2025
"Artificial Intelligence for Art and Fun" capstone event as a part of Duke's FEMMES+ (Females and Allies Excelling More in Math, Engineering, and Science) outreach program to introduce young female students (4^{th}-6^{th} grade) to math, science, and engineering 2021

Chair:

INFORMS Annual Meeting session "Emerging Trends in Interpretable Machine Learning" 2024
Discussion series "Controversial Topics in Precision Medicine and Learning" (collaboration between SAMSI and Duke Computer Science) 2019

Volunteer:

Procurement manager at "Razom for Ukraine" nonprofit 2022-2023
KDD 2017
ICML 2019
Study Zone tutor at King County Library System (provided homework help to K-12 students) 2015

Student Assistant:

NSF-sponsored Seamless/Seamful Human Technology Interaction (HTI) Workshop May 2021
Graduate student committee member for the Faculty Search and Prospective Student Visits for the Department of Computer Science, Duke University 2016–2019

Alumni of ComSciCon Triangle (science communication workshop for graduate students) 2018

Head of Scientific Association of Students and Postgraduates of Taras Shevchenko National University of Kyiv 2012 – 2013

SERVICE at RUTGERS

Judge at Rutgers Hackaton HackRU Fall 2025
Research advisor for the SUPER undergraduate research program Fall 2025-present

Committee member for Qualification Exam

for Rutgers CS PhD Student Zihe Ye 2025