

# Jon Donnelly

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## Summary

I develop interpretable machine learning tools for high-stakes applications, with an emphasis on medical applications. I have introduced methods with impact across many settings:

- I built new tools for interpretable neural networks [4, [CVPR](#); 10, [NeurIPS](#)], including a tool to enable domain experts to customize models in seconds [1, [CVPR](#)] and a tool-based interpretable LLM [16].;
- My tools for principled variable importance [3, [NeurIPS Spotlight](#); 8, [AAAI Oral](#)] uncovered new genes that affect HIV expression [3];
- I introduced a new image marker that interpretably predicts future breast cancer development with near-state-of-the-art accuracy through bilateral dissimilarities, thereby leveraging an interpretable neural network for scientific discovery [2, [Radiology](#)];

## Education

### Duke University

PHD IN COMPUTER SCIENCE

- [NSF Graduate Research Fellow \(2023 - Present\)](#)

*Durham, NC*

2022 - 2026

### University of Maine

BS IN COMPUTER SCIENCE, WITH HIGHEST HONORS; GPA 4.0/4.0

*Orono, ME*

2018 - 2022

## Published Papers

\* – Co-first authors; † – Mentored student

### SELECTED PAPERS

1. **Jon Donnelly**, Zhicheng Guo, Alina Jade Barnett, Hayden McTavish, Chaofan Chen, Cynthia Rudin. Rashomon Sets for Prototypical-Part Networks: Editing Interpretable Models in Real-Time. [CVPR](#), 2025. [[link](#)]
2. **Jon Donnelly**, Luke Moffett, Alina Jade Barnett, Hari Trivedi, Fides Shwartz, Joseph Lo, Cynthia Rudin. AsymMirai: Interpretable Breast Cancer Risk Prediction from Mammograms. [Radiology](#), 2024. ([Fifth most viewed paper in Radiology, 2024; highlighted in an editorial by Vivianne Freitas](#)) [[link](#)]
3. **Jon Donnelly\***, Srikar Katta\*, Cynthia Rudin, Edward P. Browne. Getting RID of Single Model Explanations: The Rashomon Importance Distribution. [NeurIPS](#), 2023 ([Spotlight](#)). [[link](#)]
4. **Jon Donnelly**, Alina Jade Barnett, Chaofan Chen. Deformable ProtoPNet: An Interpretable Image Classifier Using Deformable Prototypes. [CVPR](#), 2022. [[link](#)]

### OTHER PUBLISHED PAPERS

5. Samuel Waggoner†, **Jon Donnelly**, Rose Gurung, Laura Jackson, Chaofan Chen. Creating interpretable deep learning models to identify species using environmental DNA sequences. [Nature Scientific Reports](#), 2025. [[link](#)]
6. Luke Moffett, Alina Jade Barnett, **Jon Donnelly**, Fides Regina Schwartz, Hari Trivedi, Joseph Lo, Cynthia Rudin. Multi-site validation of an interpretable model to analyze breast masses. [PLOS One](#), 2025. [[link](#)]
7. Hayden McTavish\*, Zachery Boner\*, **Jon Donnelly\***, Margo Seltzer, Cynthia Rudin. Leveraging Predictive Equivalence in Decision Trees. [ICML](#), 2025. [[link](#)]
8. Ishaan Maitra†, Raymond Lin†, Eric Chen, **Jon Donnelly**, Sanja Šćepanović, Cynthia Rudin. How Your Location Relates to Health: Variable Importance and Interpretable Machine Learning for Environmental and Sociodemographic Data. [AAAI](#), 2025. ([Oral Presentation](#)) [[link](#)]
9. Hayden McTavish\*, **Jon Donnelly\***, Margo Seltzer, Cynthia Rudin. Interpretable Generalized Additive Models for Datasets with Missing Values. [NeurIPS](#), 2024. [[link](#)]
10. Chiyu Ma, **Jon Donnelly**, Wenjun Liu, Soroush Vosoughi, Cynthia Rudin, Chaofan Chen. Interpretable Image Classification with Adaptive Prototype-based Vision Transformers. [NeurIPS](#), 2024. [[link](#)]
11. 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. [ICML](#), 2024 ([Spotlight](#)). [[link](#)]
12. Julia Yang†, Alina Jade Barnett, **Jon Donnelly**, Satvik Kishore, Jerry Fang, Fides Regina Schwartz, Chaofan Chen, Joseph Y Lo, Cynthia Rudin. FPN-IAIA-BL: A Multi-Scale Interpretable Deep Learning Model for Classification of Mass Margins in Digital Mammography. [CVPR DEF-AI-MIA Workshop](#), 2024. [[link](#)]
13. Dennis Tang†, Frankie Willard†, Ronan Tegerdine†, Luke Triplett†, **Jon Donnelly**, Luke Moffett, Lesia Semenova, Alina Jade Barnett, Jin Jing, Brandon Westover, Cynthia Rudin. ProtoEEGNet: An Interpretable Approach for Detecting Interictal Epileptiform Discharges. [Medical Imaging Meets NeurIPS workshop](#), 2023. ([Oral Presentation](#)) [[link](#)]
14. **Jon Donnelly** and Peter Stechliniski. Analyzing the Influence of Agents in Trust Networks: Applying Nonsmooth Eigensensitivity Theory to a Graph Centrality Problem. [SIAM Journal on Matrix Analysis and Applications](#) 44 (3), 1271-1298. [[link](#)]
15. 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. [MICCAI](#), 2025. [[link](#)]

### ACCEPTED PAPERS

16. Ruixin Zhang†, **Jon Donnelly**, Zhicheng Guo, Ghazal Khalighinejad, Haiyang Huang, Alina Jade Barnett, Cynthia Rudin. It's LIT! LLMs with Interpretable Tools. [Multi-Turn Interactions in Large Language Models Workshop @ NeurIPS](#), 2025.

### SUBMITTED PAPERS

16. **Jon Donnelly\***, Srikar Katta\*, Emanuele Borgonove, Cynthia Rudin. Doctor Rashomon and the UNIVERSE of Madness: Variable Importance with Unobserved Confounding and the Rashomon Effect. Under Review, 2025.

## Honors & Awards

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- 2025 **Membership**, Sigma Xi Honor Society
- 2025 **Oral Presentation**, AAAI
- 2024 **Graduate Research Fellowship**, National Science Foundation
- 2024 **Spotlight Presentation**, ICML
- 2023 **Spotlight Presentation**, NeurIPS
- 2023 **Oral Presentation**, Medical Imaging Meets NeurIPS Workshop
- 2022 **Membership**, Phi Beta Kappa Honor Society
- 2022 **Outstanding Senior in Computer Science**, University of Maine
- 2018 **National Merit Award**, University of Maine
- 2018 **Semi-Finalist**, National Merit Scholarship

## Media

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- 2025 The CSR Journal. Hency Thacker, *AI Predicts Breast Cancer Five Years Before It Develops* [\[link\]](#)
- 2024 The Radiology Podcast. *Interpretable Deep Learning Model for Breast Cancer Risk Prediction* [\[link\]](#)
- 2024 RSNA News. *Researchers Develop Deep Learning Model to Predict Breast Cancer* [\[link\]](#)
- 2024 GreenMe. Ilaria Rosella Pagliaro, *Rivoluzione nella prevenzione: l'intelligenza artificiale prevede il cancro al seno con 5 anni di anticipo* [\[link\]](#)
- 2024 DOTmed. *AI model explains five-year risk for breast cancer in simple language* [\[link\]](#)
- 2024 OK Salute e Benessere. Francesco Bianco, *Intelligenza Artificiale prevedrà il tumore al seno con anni di anticipo* [\[link\]](#)
- 2024 Technology Networks. *Deep Learning Model Predicts Breast Cancer Risk From Mammograms* [\[link\]](#)
- 2024 Health Imaging. Chad Van Alstin, *New AI model predicts cancer risk based on breast asymmetry* [\[link\]](#)
- 2024 MedScape. Lisa Marshal, *New Transparent AI Predicts Breast Cancer 5 Years Out* [\[link\]](#)
- 2024 AuntMinnie. Amerigo Allegretto, *AI model predicts 5-year breast cancer risk from mammogram data* [\[link\]](#)

## Employment History

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### NSF EPSCor Project

STUDENT RESEARCHER II

Orono, ME

October 2021 - October 2022

- Assembled large eDNA dataset
- Implemented several exploratory classification models
- Prepared theory for an interpretable species classifier based on DNA metabarcoding data

### ASAP Media Services

SOFTWARE DESIGNER AND DEVELOPER

Orono, ME

June 2018 - April 2022

- Managed project teams and composed client-facing project proposals; conducted user and client research
- Collaborated to design and develop websites, mobile apps, and back end systems

### Southwick and Associates

CONSULTANT

Fernandina Beach, FL

April 2020 - May 2020

- Prepared educational materials about back end systems for management
- Assisted in proposal development for large scale projects

## Service

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### Pratt School of Engineering Graduate Program Bootcamp

VOLUNTEER

Durham, NC

September 2023

- Explained the key pros, cons, norms, and pitfalls of graduate school with undergraduates considering graduate school

### Duke University Computer Science Department

RECRUITMENT VOLUNTEER

Durham, NC

January 2023 - January 2025

- Presented ongoing research at Duke with prospective students, helping guide their future research directions
- Helped prospective students develop a complete and honest evaluation of life in graduate school at Duke

**Reviewer:** NeurIPS (2024, 2025), AAAI (2025), ACML (2025), ICML (2025), CVPR (2023, 2024, 2025), CVPR XAI4CV (2023, 2024, 2025), European Journal of Operational Research (2025), ACCV (2024), ECCV (2024), Proceedings of Machine Learning Research (2024), IEEE Transactions on Neural Networks and Learning Systems (2023), ISIT (2023), ICCV (2023)

# Teaching

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## Topics in AI: Explainability and Interpretability

GUEST LECTURER

- Developed and conducted two remote guest lectures around interpretable machine learning

*University of British Columbia*

*Fall 2025*

## MBS Externship Exchange Program

TEAM LEADER

- Advised a team of business school students through an applied research project

*Rutgers University*

*Summer 2024*

## CS474: Data Science Competition

TEAM LEADER

- Advised two teams of undergraduate and master students through research projects

*Duke University*

*Spring 2024*

## CS671: Theory and Algorithms for Machine Learning

TEACHING ASSISTANT

- Designed and graded exploratory homework questions
- Held regular office hours for 20+ undergraduate and graduate students
- Led weekly recitations for groups of around 30 students

*Duke University*

*Fall 2023*

## CS474: Data Science Competition

TEAM LEADER

- Advised two teams of undergraduate and master students through research projects

*Duke University*

*Spring 2023*

## CS527: Introduction to Computer Vision

TEACHING ASSISTANT

- Held regular office hours for 5-10 undergraduate and graduate students
- Tested and refined homework and test questions

*Duke University*

*Spring 2023*

# Invited Talks

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Oct, 2025 **INFORMS**, Atlanta, Georgia

Nov, 2024 **Analytic Imaging Diagnostics Arena**, Linköping University Hospital, Linköping, Sweden

Jun, 2024 **Advanced X-ray Tomographic Imaging group**, Radboud University Medical Center, Nijmegen, Netherlands

# Mentored Students

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2024-2025 **Prashanth Areddy**, MBS Student, Rutgers University

2024-2025 **Muchang Bahng**, Undergraduate, Duke University

2024-2025 **Charlie Berens**, Undergraduate, Duke University

2025 **Russel Barton**, Undergraduate, Duke University

2025 **Liam Connor**, Masters Student, Duke University

2024-2025 **Adam Costarino**, Masters Student, Duke University

2024 **Alex Katapotis**, Undergraduate, Duke University

2023-2024 **Giyoung Kim**, Undergraduate, Duke University

2024-2025 **Hung Le**, Undergraduate, Duke University

2024 **Raymond Lin**, Undergraduate, Duke University

2024-2025 **Maximilian Machado**, Masters Student, Duke University

2024 **Ishaan Maitra**, Undergraduate, Duke University

2024 **Manny Mokel**, Undergraduate, Duke University

2024-2025 **Islina Shan**, Masters Student, Duke University

2024-2025 **TJ Stammer**, MBS Student, Rutgers University

2024-2025 **Duraidd Syed**, MBS Student, Rutgers University

2023-2025 **Dennis Tang**, Undergraduate, Duke University

2023-2024 **Ronan Tegerdine**, Undergraduate, Duke University

2023-2024 **Luke Triplett**, Undergraduate, Duke University

2023-2025 **Sam Waggoner**, Undergraduate, University of Maine

2023-2024 **Frankie Willard**, Undergraduate, Duke University

2023-2024 **Julia Yang**, Masters Student, Duke University

2024 **Akshar Yeccherla**, Masters Student, Duke University

2024-2025 **Ruixin Zhang**, Masters Student, Duke University