

Varun Babbar

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Education

Duke University

PhD, Computer Science

Advisor: Cynthia Rudin

Durham, NC, USA

August 2023 – Current

University of Cambridge

BA + MEng in Information and Computer Engineering

Advisors: Adrian Weller (MBE), Umang Bhatt

Cambridge, United Kingdom

2018-2022

1st Class (BA), Distinction (MEng) - Top 5%

Discrete Optimization

[DiscreteOptimization1] **Varun Babbar***, Hayden McTavish*, Cynthia Rudin, and Margo Seltzer. Near-Optimal Decision Trees in a SPLIT Second. In *Proceedings of the 42nd International Conference on Machine Learning (ICML 2025)*. **Spotlight**—top 2.6% of submissions.

Uncertainty Quantification

[Uncertainty1] **Varun Babbar**, Umang Bhatt, and Adrian Weller. On the Utility of Prediction Sets in Human-AI Teams. In Lud De Raedt, editor, *Proceedings of the Thirty-First International Joint Conference on Artificial Intelligence, IJCAI-22*, pages 2457–2463, 7 2022. Main Track (**Oral**: Top 3% of submissions). Also accepted as a workshop paper at ICML 2022.

[Uncertainty2] **Varun Babbar**, Umang Bhatt, Miri Zilka, and Adrian Weller. Conformal Prediction for Resource Prioritisation in Predicting Rare and Dangerous Outcomes, 2022. Human in the Loop Learning (HiLL) Workshop at NeurIPS 2022 (**Top 15%** of Accepted Papers).

Deep Learning and Computer Vision

[DLPapers1] **Varun Babbar***, Zhicheng Guo*, and Cynthia Rudin. What is Different Between these Datasets?, 2024. Under Review at *Journal of Machine Learning Research (JMLR)*.

[DLPapers2] Aamir Mustafa, Aliaksei Mikhailiuk, Dan Andrei Iliescu, **Varun Babbar**, and Rafał K. Mantiuk. Training a Task-Specific Image Reconstruction Loss. In *2022 IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, pages 21–30, 2022.

[DLPapers3] Antonios Georgiadis*, **Varun Babbar***, Fran Silavong, Sean J. Moran, and Rob Otter. ST-FL: Style Transfer Preprocessing In Federated Learning For COVID-19 Segmentation. In *Medical Imaging 2022: Imaging Informatics for Healthcare, Research, and Applications*. SPIE, April 2022.

[DLPapers4] Agathe Lherondelle, **Varun Babbar**, Yash Satsangi, Fran Silavong, Shaltiel Eloul, and Sean Moran. Topical: Automatic Repository Tagging using Attention on Hybrid Code Embeddings. In *Proceedings of the 1st IEEE/ACM Workshop on Software Engineering Challenges in Financial Firms, FinanSE '24*, page 23–30. Association for Computing Machinery, 2024.

[DLPapers5] Xiaoying Zhi, **Varun Babbar**, Rundong Liu, Pheobe Sun, Fran Silavong, Ruibo Shi, and Sean Moran. Learning a consensus sub-network with polarization regularization and one pass training. In *Arxiv*, 2025.

Patents

- [Patents1] Antonios Georgiadis, **Varun Babbar**, Fanny Silavong, Sean Moran, and Rob Otter. Systems and Methods for Noise-Agnostic Federated Learning, 2023. Patent No. US20230058972A1.
- [Patents2] Peter Maciver, **Varun Babbar**, and Sean Moran. Systems and Methods for Automated Application and Platform Generation, 2025. Patent No. US20250005530.

Awards and Honours

YCombinator AI Startup School - only 2000 people selected worldwide	<i>June 2025</i>
Graduate School Fellowship @ Duke University	<i>Aug 2023</i>
JP Morgan Innovation Week AI Hackathon (<i>Runner Up</i>)	<i>June 2023</i>
MEng Project Prize (<i>For a top ranked MEng Project @ Cambridge</i>)	<i>July 2022</i>
Ruth Hendry Year Prize (<i>For exemplary academic performance</i>)	<i>June 2022</i>
Foundation Scholar (2x) (<i>For 1st class performance in exams</i>)	<i>Oct 2021, Oct 2022</i>
The James and Jean Bennet Prize (<i>For exemplary academic performance</i>)	<i>June 2022</i>
Hawkes' Trust Award (<i>For exemplary academic performance</i>)	<i>March 2021</i>
HackCambridge, Oxford Hackathon, HackBrunel (<i>Winner</i>)	<i>Jan 2022, Nov 2018, Oct 2019</i>
World Topper in IB School Exams (<i>100th percentile out of ~170000 students</i>)	<i>May 2018</i>

Conference, Industry, and Academic Presentations

New York University, Responsible Data Science Course	<i>April 2025</i>
Responsible AI Symposium, Duke University	<i>Feb 2025</i>
Duke University, Guest Lecture, MEng in AI Program	<i>Sept 2024, Feb 2025</i>
Duke University, Guest Lecture, Theory and Algorithms in Machine Learning	<i>Sept 2024</i>
JP Morgan, Innovation Week Speaker Series, London, UK	<i>June 2023</i>
NeurIPS Workshop on Human-in-the-Loop Learning, Virtual	<i>Dec 2022</i>
JP Morgan, Applied Innovation in AI Seminar, London, UK	<i>Nov 2022</i>
International Joint Conference on AI, Vienna, Austria	<i>July 2022</i>
ICML Workshop on Distribution Free Uncertainty Quantification, Virtual	<i>July 2022</i>
University of Cambridge, Department of Engineering	<i>July 2022</i>

Industry Experience

Senior Associate at JP Morgan Chase and Co Dr Sean Moran	<i>London, United Kingdom</i> <i>Sept 2022 - July 2023</i>
<ul style="list-style-type: none">Developed ML models for source code understanding, using LLMs and weakly supervised learning techniques.Won an internal hackathon, published a paper at ICSE'24, developed a unit test quality assessment tool that saved the firm ~ \$2 million, contributed to open source, and secured a patent.	
Associate Intern at JP Morgan Chase and Co Dr Sean Moran	<i>London, United Kingdom</i> <i>June 2021 - Sept 2021</i>
<ul style="list-style-type: none">Developed a federated deep learning algorithm robust to distribution shifts in client datasets. Outcome: a patent and a paper accepted at SPIE Medical Imaging 2022.	

Research Experience

Duke Interpretable Machine Learning Lab Supervisor: Dr Cynthia Rudin	<i>Aug 2023 – Current</i>
<ul style="list-style-type: none">Developed an algorithm for ϵ-optimal sparse, interpretable decision trees that is over 100x faster than current state-of-the-art. Spotlight paper at ICML 2025 (top 2.6%).	

- Developed an interpretable toolbox to explain distribution shifted datasets. Under review at JMLR.

University of Cambridge: Department of Engineering

Sept 2021 – July 2022

Supervisors: [Dr Adrian Weller \(OBE\)](#), [Dr Umang Bhatt](#)

- Developed an uncertainty quantification method with theoretical guarantees that provides confidence intervals with human preference alignment.
- Won a department prize for my thesis + **Oral** at IJCAI 2022 + workshop papers at ICML and NeurIPS 2022.

University of Cambridge: Department of Computer Science

June 2020 – Sept 2020

Supervisor: [Dr Rafal Mantiuk](#).

- Constructed and tested novel human-perceptual loss functions for image to image translation tasks (super-resolution, de-blurring, de-noising), with *state of the art performance*.
- Co-author of paper accepted at WACV'22.

Service

Research Mentorship: Tracy Sun, MS in CS @ Duke

Oct 2024-Current

Michael Thomas, Allen Yao, Chris Li - CS+Math Undergrad @ Duke

Jan 2025-Current

Program Committee: Interpretable AI Workshop @ NeurIPS

Dec 2024

Teaching Assistant: CS671: Theory and Algorithms in Machine Learning

Fall 2024

Reviewer: ECAI 2023, WANT@ICML 2024, TheWebConf2023, Journal of the ACM