

Varun Nagaraj Rao

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EDUCATION

Princeton University

Doctor of Philosophy in Computer Science

Princeton, NJ

May 2026 (Expected)

Dissertation Research: Societal Impacts of AI on Labor (Responsible AI, Tech Policy, HCI)

Committee: Andrés Monroy-Hernández (advisor), Solon Barocas, Peter Henderson, Manoel Horta Ribeiro, Arvind Narayanan

Selected Coursework: HCI, Technology Policy and Law, Privacy, Ethics of Computing, Responsible AI

Carnegie Mellon University

Master of Science in Electrical and Computer Engineering **GPA 3.96/4.0**

Pittsburgh, PA

Dec 2019

Coursework: Computer Vision (16-720B), Machine Learning (PhD) (10-701), Convex Optimization (18-660), Security and Fairness in Deep Learning (18-739), Advanced Multimodal Machine Learning (11-777), Foundations of Cloud and ML Infrastructure (18-847F)

PES Institute of Technology

Bachelor of Engineering in Computer Science and Engineering **GPA 9.97/10** (Rank 1/132)

Bangalore, India

May 2018

INDUSTRIAL RESEARCH AND PROFESSIONAL EXPERIENCE

Microsoft Research NYC Lab

Research Intern, FATE Group (Mentors: Solon Barocas, Su Lin Blodgett, Aylin Caliskan, Agathe Balayn)

New York, NY

June-Aug 2025

- Designed a conceptual framework about AI use transparency artifacts and led qualitative research with AI policy stakeholders (government, industry and civil society) to understand how uncertainty about general purpose AI model use shapes regulation.

Center for Democracy and Technology

Google Policy Fellow, Content Moderation (Mentors: Dhanaraj Thakur, Kate Ruane, Michal Luria)

Washington DC

Jan - May 2025

- Led the [design and evaluation](#) of three deterrence messaging mechanisms (informative, reductive, friction-based) to reduce NCII exposure, with feedback from a cross-sector working group of 10+ major online platforms, academics, and survivor advocates.

Amazon Web Services

Applied Scientist II Intern, AWS Bedrock (Mentors: Srikar Appalaraju, Siddharth Choudhary, Ravi Kumar Satzoda)

San Francisco, CA

May - Aug 2023

- Developed a unified retrieval augmented encoder-decoder vision-language architecture, with no pretraining and additional trainable parameters; SOTA results on image captioning (+1 CIDEr on MSCOCO, +4 CIDEr on NoCaps) and VQA (+3 % accuracy on VQA v2) tasks compared to the non-retrieval baselines.

Amazon.com Inc

Applied Scientist II, Multimodal AI - Product Assurance, Risk and Security (PARS)

Seattle, WA

Feb 2020 - July 2021

- Explainable multimodal text-in-image and classification models to help protect customers and build seller trust.
- Invited Talk "Explainable Multimodal TextVQA Models" - Amazon Machine Learning Conference (AMLC) 2020
- Outstanding Paper Award for "Misspelling Detection from Noisy Product Images" (top 2.5% - 16/644) at COLING 2020

Apple, Inc

Computer Vision Intern - Core Recognition Team

Cupertino, CA

May - Aug 2019

- Enhanced the accuracy of the OCR system by upto 28% and expanded support for handwritten text.

ACADEMIC RESEARCH EXPERIENCE

Princeton University

Research Assistant, Center for Information Technology Policy (CITP) (Advisor: Prof. Andrés Monroy-Hernández)

Princeton, NJ

Aug'22 - Present

- Building tools (e.g. FairFare, FareShare) to understand gig worker concerns, measure and mitigate AI and algorithmic system harms, generate evidence for AI policy, part of the Workers' Algorithm Observatory. ***Influenced first state-level AI transparency legislation in the U.S. for algorithmically mediated work (CO SB 24-75).***
- Design and evaluate human-AI interaction tools (e.g. QuaLLM, Digital Twins, GPTFootprint) with productivity impacts.
- Partnered with platforms in the Global South to operationalize transparency interventions and evaluate their effect on worker well-being through RCTs. (*Co-PI on Gates Foundation Funded Grant: \$100K*)
- Defined and measured a new form of discrimination through image selection by job advertisers on Facebook.

Carnegie Mellon University

Research Assistant, CyLab Security & Privacy Institute (Advisors: Prof. Camille Cobb and Prof. Lujo Bauer)

Pittsburgh, PA

Aug - Dec 2019

- Understanding the privacy needs and attitudes of incidental home IoT users by conducting in-person focus groups.

Carnegie Mellon University

Research Assistant, Robotics Institute (Advisors: Dr. Donghyun Yoo and Prof. Kris Kitani)

Pittsburgh, PA

Sept 2018 - May 2019

- Deep Learning based 6DoF Camera Pose Estimation from monocular RGB and depth images - SOTA on 7 scenes dataset.

Carnegie Mellon University

Undergraduate Research Intern, Electrical and Computer Engineering (Advisor: Dr. Tze Meng Low)

Pittsburgh, PA

June - July 2017

- Implemented an exact Triangle Counting Algorithm with a speedup of up to 2000 times the baseline miniTri algorithm.

SELECTED PUBLICATIONS

Societal Impacts of AI and Technology, HCI and Tech Policy:

1. D. Calacci*, **V. N. Rao***, S. Dalal*, C. Di, K. Pua, A. Schwartz, D. Spitzberg, A. Monroy-Hernández, “[FairFare: A Tool for Crowdsourcing Rideshare Worker Data to Empower Labor Organizers and Influence Policy](#)” *TOCHI 2025* and *CHI 2026*
2. **V. N. Rao**, S. Dalal, A. Schwartz, A. Liaqat, D. Calacci, A. Monroy-Hernández, “[FareShare: A Tool for Labor Organizers to Estimate Lost Wages and Contest Arbitrary AI and Algorithmic Deactivations](#)” *CSCW 2026* (top 6.8% - 43/637)
3. A. Balayn, **V. N. Rao**, S. L. Blodgett, A. Caliskan, S. Barocas. “They are turning to ChatGPT in nearly every aspect of life!” A Framework to Characterize the Uses of Generative AI (*in submission CHI 2026*)
4. **V. N. Rao**, S. Dalal, E. Agarwal, D. Calacci, A. Monroy-Hernández, “[Rideshare Transparency: Translating Gig Worker Insights on AI Platform Design to Policy](#)” (*CSCW 2025*)
5. **V. N. Rao**, D. Thakur “[Think Twice Before You Search: Deterrence Messaging Designs to Prevent Searches for Non-Consensual Intimate Images](#).” Center for Democracy & Technology Research Insights (2025)
6. M. Wang, E. Colby, J. Okwara, **V. N. Rao**, Y. Liu, A. Monroy-Hernández, “PolicyPulse: LLM-Synthesis Tool for Policy Researchers”, *CHI Late Breaking Work 2025 (senior author)*
7. A. Chan, C. Di, J. Rupertus, G. Smith, **V. N. Rao**, M. H. Ribeiro, A. Monroy-Hernández, “Redefining Research Crowdsourcing: Incorporating Human Feedback with LLM-Powered Digital Twins”, *CHI Late Breaking Work 2025 (senior author)*
8. N. Graves, V. Larrieu, Y. T. Zhang, J. Peng, **V. N. Rao**, Y. Liu, A. Monroy-Hernández, “GPTFootprint: Increasing Consumer Awareness of the Environmental Impacts of LLMs”, *CHI Late Breaking Work 2025 (senior author)*
9. J. Bendarkawi, A. Ponce, S. Mata, A. Aliu, Y. Liu, L. Zhang, A. Liaqat, **V. N. Rao**, A. Monroy-Hernández, “ConversAR: Exploring Embodied LLM-Powered Group Conversations in Augmented Reality for Second Language Learners.” *CHI Late Breaking Work 2025 (senior author)*
10. **V. N. Rao**, A. Korolova, “Discrimination through Image Selection by Job Advertisers on Facebook”, *ACM Conference on Fairness, Accountability, and Transparency (FAccT’23)* (Preliminary versions presented at *EAAMO’22* and *PLSC’23*)
11. C. Cobb, S. Bhagavatula*, K.A. Garrett*, A. Hoffman*, **V. N. Rao***, L. Bauer, “I would have to evaluate their objections: Privacy tensions between smart home device owners and incidental users”(*PETS 2021*)

Explainable AI and Multimodal Machine Learning:

1. **V. N. Rao**, E. Agarwal, S. Dalal, D. Calacci, A. Monroy-Hernández, “[QuaLLM: An LLM-based Framework to Extract Quantitative Insights from Online Forums](#)”, *Findings of NAACL’25 and CHI 2024 LLMs as Research Tools Workshop*
2. **V. N. Rao**, S. Choudhary, A. Deshpande, R. Satzoda, S. Appalaraju, “RAVEN: Multitask Retrieval Augmented Vision-Language Learning” (*arXiv Preprint 2024*)
3. **V. N. Rao***, X. Zhen*, K. Hovsepian, M. Shen, “A First Look: Towards Explainable TextVQA Models via Visual and Textual Explanations”, *Workshop on Multimodal Artificial Intelligence (MAI), NAACL 2021*
4. **V. N. Rao**, M. Shen, “Misspelling Detection from Noisy Product Images”, *Conference on Computational Linguistics - Industry Track (COLING 2020) - Outstanding Paper Award* (top 2.5% - 16/644)
5. S. Suresh*, **V. N. Rao***, G. Srinivasa, “Gamification of a Visual Question Answer System”, *Technology for Education (T4E) IEEE 2018*, and *VQA Challenge and Visual Dialog Workshop, Computer Vision and Pattern Recognition (CVPR) 2018*.

High Performance Computing:

1. T. M. Low, **V. N. Rao**, M. Lee, D. Popovici, F. Franchetti, and S. McMillan. “First look: Linear algebra-based triangle counting without matrix multiplication.” *High Performance Extreme Computing Conference (HPEC), IEEE 2017 (MIT/IEEE/DARPA Graph Challenge 2017 Honorable Mention)*

Computer Science Education:

1. M. Ferland*, **V. N. Rao***, A. Arora, F. Reiber, M. Luu, R. Huynh, S. Poulsen, A. Poel, M. Shindler, “Construction and Preliminary Validation of a Dynamic Programming Concept Inventory” *Technical Symposium on Computer Science Education (SIGCSE 2025)*
2. M. Luu, M. Ferland*, **V. N. Rao***, A. Arora, R. Huynh, F. Reiber, J. Wong-Ma, M. Shindler, “What is an Algorithms Course? Survey Results of Introductory Undergraduate Algorithms Courses in the U.S.”, *Technical Symposium on Computer Science Education (SIGCSE 2023)*

TECH POLICY CONTRIBUTIONS:

- Submitted [comments](#) to the National Science Foundation on the 2025 National AI Research & Development (R&D) Strategic Plan
- Work part of CITP and the WAO was cited in the [Paris AI Action Summit Consultation Report on Future of Work](#) (See Page 99)
- Submitted a [response](#) to EU Multi-stakeholder Consultation "Future-Proof AI Act: Trustworthy General-Purpose AI" [[website](#)]
- Influenced bill language of U.S. first rideshare transparency law passed in Colorado, [SB24-75](#). Released a [policy memo](#) and [blogpost](#). Influencing bill language of a federal digital labor platform transparency and accountability bill along with NELP.
- Co-author of a [report](#) to Colorado Independent Drivers United (CIDU) using rideshare trip data collected via the [FairFare tool](#) to measure platform take rate
- Co-author of CITP’s Supreme Court [Amicus Brief](#) in Gonzalez v. Google, examining scope of Section 230 of CDA for recommender systems. Contributed a technical explanation of recommendation systems operation

SERVICE

- Reviewer - CSCW'26, CHI'25, FAccT'24-25, NAACL'22-25, EMNLP'22-24, ACL'22-24, SIGCSE'23, WebConf'23, NeurIPS Ethics Review'23-24
- Registration Co-chair - FAccT 2025

ACADEMIC TEACHING EXPERIENCE

COS 324 Introduction to Machine Learning and Junior Research Workshop (Undergrad)

Princeton University

Head Teaching Assistant with Prof. Victoria Dean, Prof. Ruth Fong, Prof. Adji Bousso Dieng

Fall 2025

- Course creation and design, lecturing, office hours, grading (junior research workshop)
- Grading, incorporating AI ethics into course content e.g. lecture, precepts, assignments (main course)
- Class size: 139 (main course), 45 (junior research workshop)

EGR 371 Designing the Future of Work: Public Interest Technology Development (Undergrad)

Princeton University

Course Affiliate with Prof. Andrés Monroy-Hernández

Spring 2025

- Identify guest speakers, design AI Ethics Role Play based on my own PhD research, mentor capstone project with an external org.
- Class size: 10; Course Rating: 4/5

COS 324 Human Computer Interaction (Undergrad)

Princeton University

Teaching Assistant with Prof. Andrés Monroy-Hernández

Fall 2024

- Course design, office hours, grading, lecturing and facilitating discussion in precepts
- Defining and mentoring research projects. 4 acceptances (620/1888, 32.8% acceptance rate) at CHI Late Breaking Work 2025
- Class size: 39; Course Rating: 4.26/5

COS598I Responsible AI in Societal Deployment (Grad)

Princeton University

Teaching Assistant with Prof. Lydia Liu

Spring 2024

- Assignment design (programming + conceptual), office hours, grading
- Class size: 8; Course Rating: 4.67/5

COS350 Ethics of Computing (Undergrad)

Princeton University

Teaching Assistant with Prof. Arvind Narayanan

Fall 2023

- Assignment design, office hours, grading, lecturing in precepts
- Class size: 101; Course Rating: 4/5 (*first iteration of a new course*)

INVITED TALKS

- “The Need for Transparency in AI and Algorithmic Rideshare Platform Decisions”, Machine Learning + Society (Prof. Orestis Papakyriakopoulos), Spring 2025, TUM School of Social Sciences and Technology
- “Empirical Validation of Algorithmic Wage Discrimination in Rideshare”, Data Driven Social Science Seminar, October 2024, Princeton University
- “Making Rideshare governable”, National Employment Law Project (NELP), Sept 2024
- “On Ad Delivery Algorithms”, Course: Ethics of Computing (Prof. Arvind Narayanan), Fall 2023, Princeton University
- “Societal Impact of AI on Labor - Studies of Rideshare and Social Media Ad Platforms”, Course: Designing the Future of Work (Prof. Andrés Monroy-Hernández), Spring 2024, Princeton University
- “Societal Concerns in Targeted Ad Delivery Algorithms”, Course: Responsible AI in Societal Deployment (Prof. Lydia Liu), Spring 2024, Princeton University

WORKSHOPS AND SUMMER SCHOOLS

- Organizer: CSCW Northeast, Stevens Institute of Technology, October 2025
- Organizer: [Workshop on Worker Data Collectives](#), CSCW 2024 (Costa Rica)
- Who Counts? Sex and Gender Bias in Data - Workshop, University of California Los Angeles, July 2022
- Graduate Summer School on Algorithmic Fairness, University of California Los Angeles, July 2022
- Boston Differential Privacy Summer School, Boston University, June 2022
- Data Mining and Machine Learning Summer School, Indian Institute of Technology Gandhinagar, June 2016

ACADEMIC HONORS

- Google Policy Fellowship, Spring 2025
- Graduate Fellowship of Social Data Science at [Data Driven Social Science Initiative, Princeton University](#), Fall 2024
- FAccT 2023 Doctoral Consortium
- COLING 2020 Outstanding Paper Award
- MIT/DARPA Graph Challenge 2017 Honorable Mention
- Gold Medalist and Hamsa Kartik Alumni Award for Rank 1 in CSE Department, PES University 2018
- Prof. MRD and Prof. CNR Rao Scholarship for being in top 5 performers of CSE Department, PES University 2014-18
- Summer Research Fellowship, Indian Academy of Sciences (IAS) 2017
- Scholarship for Higher Education - INSPIRE Scheme for being in top 1% of AISSCE (Class 12), Govt. of India, 2014
- Certificate of Merit in Computer Science Class XII Examination for being in top 0.1% across India, CBSE 2014