Bhrij Patel

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RESEARCH INTERESTS

- Alignment, Personalization, and Planning for LLM-based agents
- LLM-based Judges, particularly for Text-based Optimization
- Sample Efficient Statistical Optimization for Reinforcement Learning with Sparse Rewards

EDUCATION

University of Maryland, College Park - Co-Advisors: Dinesh Manocha, Amrit Singh Bedi (UCF)
Ph.D. in Computer Science (Expected: Dec 2026)
Master in Computer Science (May 2024)

Duke University, Durham, NC - Advisors: Cynthia Rudin
Bachelor of Science in Computer Science & Mathematics, Minor in Creative Writing (May 2022)

WORK EXPERIENCE

Qualcomm
Machine Learning Research Intern (June 2025 - Present)

- Working on a research paper revolving around on-device LLM agents

Emergence AI
AI Research Intern, Mentors: Aditya Vempaty, Ashish Jagmohan (Feb. 2025 - May 2025)

- Proposed the problem of learning functionality of pre-defined APIs from demonstrations of function calls for downstream tool-based agent tasks
- Investigated self-improvement methods with LLM-generated feedback to improve agent understanding of proper API function usages and parameter information; highlighted the importance of robust error/exception handling for agent understanding of API functions

GAMMA Lab - University of Maryland, College Park
Graduate Research Assistant, Mentors: Dinesh Manocha, Amrit Singh Bedi (Aug. 2022 - Present)

- Exploring the reliability of reference-free LLM judges for prompt optimization
- Investigating memory-augmented LLM agents for personalized embodied agents
- Researching sample-efficient gradient estimation for RL algorithms and their application to robotic navigation with sparse rewards

Interpretable Machine Learning Lab - Duke University
Undergraduate Research Assistant, Mentor: Cynthia Rudin (Jan. 2019 - Mar. 2022)

- Worked on algorithm to generate an ultra hi-res portraits of a person given low-resolution image examples through unsupervised representation learning with AEs
- Cleaned and explored criminal history from a public dataset of Broward County, FL, with $\sim$ 150,000 records, and private sets from Kentucky with $\sim$3,200,000 records

Rein.ai
Data Science Intern, Mentor: Mohammed Shameer Iqbal (Mar. 2020-May 2020)

- Set up automated web extraction of truck accident records from 1975-2018 with Python and SQL
- Cleaned and integrated trucking data into database for development of risk models

PUBLICATIONS

- *Towards Global Optimality for Practical Average Reward Reinforcement Learning without Mixing Time Oracles*
  Bhrij Patel, Wesley A. Suttle, Alec Koppel, Vaneet Aggarwal, Brian M. Sadler, Amrit Singh Bedi, Dinesh Manocha
  International Conference of Machine Learning, 2024

- *Beyond Exponentially Fast Mixing in Average-Reward Reinforcement Learning via Multi-Level Monte Carlo Actor-Critic*
  Wesley A. Suttle*, Amrit Singh Bedi*, **Bhrij Patel**, Brian M. Sadler, Alec Koppel, Dinesh Manocha
  International Conference of Machine Learning, 2023

- *Interpretable, Fair and Accurate Machine Learning for Criminal Recidivism Prediction*
  Caroline Wang*, Bin Han*, **Bhrij Patel**, Cynthia Rudin
  Journal of Quantitative Criminology, 2022

  *Denotes Equal Contribution

PREPRINTS

- *Learning API Functionality from Demonstrations for Tool-based Agents*
  Bhrij Patel, Ashish Jagmohan, Aditya Vempaty
  arXiv, preprint (2025)

- *AIME: AI System Optimization via Multiple LLM Evaluators.*
  Bhrij Patel, Souradip Chakraborty, Wesley A. Suttle, Mengdi Wang, Amrit Singh Bedi, Dinesh Manocha
  arXiv, preprint (2024)

- *Multi-LLM QA with Embodied Exploration*
  Bhrij Patel, Vishnu Sashank Dorbala, Amrit Singh Bedi, Dinesh Manocha
  arXiv, preprint (2024)

- *Right Place, Right Time! Dynamizing Topological Graphs for Embodied Navigation*
  Vishnu Sashank Dorbala*, **Bhrij Patel***, Amrit Singh Bedi, Dinesh Manocha
  arXiv, preprint (2025)

- *Confidence-Controlled Exploration: Efficient Sparse-Reward Policy Learning for Robot Navigation*
  Bhrij Patel, Kasun Weerakoon, Wesley A. Suttle, Alec Koppel, Brian M. Sadler, Tianyi Zhou, Amrit Singh Bedi, Dinesh Manocha
  arXiv, preprint (2024)

  *Denotes Equal Contribution

AWARDS

- **2021 Duke DataFest**: Judges' Pick Award
- **2021 NC State Datathon**: 3rd Place Team
- **2020 COMAP Mathematical Contest in Modeling**: Meritorious Winner
- **2019 Duke University Datathon**: Runner-Up Team

PRESENTATIONS

- *In Pursuit of Interpretable, Fair and Accurate Machine Learning for Criminal Recidivism Prediction*
  Caroline Wang, Bin Han, **Bhrij Patel**, Feroze Mohideen
  Duke CS Showcase 2020

- *Comparing Black-box and Interpretable ML models for Criminal Recidivism Prediction*
  Bhrij Patel
  Duke CS+ 2019

TEACHING

- Teaching Assistant, CMSC 335: Web Application Development with JavaScript, University of Maryland, College Park (Jan 2024-Current)
- Teaching Assistant, CMSC 131: Introduction to Object Oriented Programming, University of Maryland, College Park (Aug-Dec 2023)
- Teaching Assistant, CS 671: Graduate Machine Learning, Duke University (Aug-Dec 2021)
- Teaching Assistant, CS 371: Undergraduate Data Science, Duke University (Jan-May 2021)
- Teaching Assistant, CS 371: Undergraduate Machine Learning, Duke University (Aug-Dec 2020)
- Math Help Room Tutor, Linear Algebra, Duke University (Aug 2019-May 2020)