

# Harshay Shah

Pre-doctoral Research Fellow  
Microsoft Research India

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## Research Interests

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- Foundations of robust and reliable machine learning
- Understanding deep learning phenomena through theory and experiments
- Principled and practical algorithms for modern learning frameworks

## Education

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### University of Illinois, Urbana-Champaign (UIUC)

B.S. in Computer Science and Statistics

**Summa Cum Laude** (top 3%) and **Highest Departmental Distinction**

2014 - 2019

GPA 3.97/4.00

## Papers

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### Do Input Gradients Highlight Discriminative Features?

[Harshay Shah](#), Prateek Jain, and Praneeth Netrapalli

*Preprint, arXiv:2102.12781 (2021)*

[\[pdf\]](#) [\[code\]](#)

### The Pitfalls of Simplicity Bias in Neural Networks

[Harshay Shah](#), Kaustav Tamuly, Aditi Raghunathan, Prateek Jain, and Praneeth Netrapalli

*Advances in Neural Information Processing Systems* [NeurIPS 2020]

*ICML Workshop on Uncertainty & Robustness in Deep Learning* [ICML UDL 2020]

[\[pdf\]](#) [\[poster\]](#) [\[code\]](#) [\[presentation\]](#)

### Growing Attributed Networks through Local Processes

[Harshay Shah](#), Suhansanu Kumar, and Hari Sundaram

*Proceedings of the World Wide Web Conference* [WWW 2019]

[\[pdf\]](#) [\[poster\]](#) [\[code\]](#) [\[blog post\]](#)

### Number of Connected Components in a Graph: Estimation via Counting Patterns

Ashish Khetan, [Harshay Shah](#), and Sewoong Oh

*Preprint, arXiv:1812.00139 (2018)*

[\[pdf\]](#) [\[code\]](#)

## Awards and Honors

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### CRA Outstanding Undergraduate Researcher, Honorable Mention [\[link\]](#)

2019

One of 77 undergraduate students in US and Canada recognized for research potential in computer science

### C.W. Gear Outstanding Undergraduate Student Award [\[link\]](#)

2019

One of two undergraduate students at UIUC recognized for demonstrated interest in computer science research

### UIUC Undergraduate Conference Travel Grant [\[link\]](#)

2019

Received travel funds to present my work at the World Wide Web (WWW) conference

### IMC Trading Scholarship [\[link\]](#)

2018

One of two undergraduate students at UIUC to receive the merit-based scholarship

### James N. Snyder Memorial Award [\[link\]](#)

2018

One of three undergraduate students at UIUC recognized for academic merit

## Experience

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### Microsoft Research India

Research Fellow in the Machine Learning & Optimization Group

Bangalore, India

July 2019 – Present

Advisors: **Dr. Praneeth Netrapalli** and **Dr. Prateek Jain**

**Simplicity bias:** Empirically and theoretically characterized the prevalence of implicit simplicity bias in SGD-trained neural networks. Analyzed the adverse effects of extreme simplicity bias on generalization and robustness. Demonstrated the ineffectiveness of adversarial training and vanilla ensembles in mitigating the pitfalls of simplicity bias.

**Explanation Fidelity:** Developed an evaluation framework to evaluate the fidelity of gradient-based attributions. Characterized feature inversion in input gradient attributions and analyzed the role of adversarial robustness in improving feature attribution fidelity using benchmark image classification tasks and synthetic datasets.

### Koyejo Lab at UIUC

Undergraduate Researcher

Champaign, IL

July 2018 – May 2019

Advisor: **Prof. Oluwasanmi Koyejo**

**Multi-scale networks:** Generalized the Kronecker Graph Product Model (KPGM) to infer structural properties of multi-scale brain networks. Derived distributions over KPGM graph statistics in terms of model parameters and resolution. Empirically analyzed the effect of network resolution on the structure of multi-scale brain networks.

### Coordinated Science Laboratory at UIUC

Undergraduate Researcher

Champaign, IL

May 2017 – December 2018

Advisor: **Prof. Sewoong Oh**

**Learning from comparisons:** Augmented the Multinomial Logit model to robustly learn latent user-item preferences from partially corrupted pairwise comparisons using a low-rank plus sparse approach. Established an upper bound on the sample complexity of the proposed low-rank plus sparse estimator.

**Graph algorithms:** Extended EigenAlign, a spectral graph matching algorithm using projected power iteration and analyzed its performance using correlated Erdős–Rényi graphs. Evaluated the performance of a motif-based spectral approach to estimate the number of connected components in partially observed undirected graphs.

### Crowd Dynamics Lab at UIUC

Undergraduate Researcher

Champaign, IL

July 2016 – May 2018

Advisor: **Prof. Hari Sundaram**

**Network growth:** Developed an interpretable network growth model based on random walks that unifies link formation phenomena and individual resource constraints to jointly preserve global structural properties and local attribute mixing patterns of real-world attributed networks.

### Akuna Capital

Software Engineering Intern

Chicago, IL

May 2015 – July 2015

**Trading infrastructure:** Developed modules to transfer financial instruments across databases, update metadata of queried instruments, and harness synthetic financial data for unit-testing purposes.

## Relevant Coursework

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Mathematical Statistics (Graduate)  
Nonlinear Optimization (Graduate)  
Algorithms & Models of Computation

Machine Learning  
Natural Language Processing  
Network Analysis (Graduate)

Numerical Methods  
Statistical Computing  
Data Structures

## Miscellany

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Reviewer for ICML 2021 • External reviewer for NeurIPS 2020 • Sub-reviewer for ALT 2020 • Co-organizer of the Machine Learning reading group at Microsoft Research India • Member of the **ICPC group** at UIUC