

# Ishita Dasgupta

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## EDUCATION AND TRAINING

**Princeton University**, Postdoctoral Research Associate 2020–present  
Departments of Computer Science and Psychology. Advisor: Prof. Thomas L. Griffiths

**Harvard University**, PhD in Physics 2020  
Dissertation: Algorithmic approaches to ecological rationality in humans and machines

**Indian Institute of Technology Bombay**, Mumbai, India 2014  
Bachelor of Technology in Engineering Physics, Honours in Physics

## RESEARCH EXPERIENCE

**Princeton University** Princeton, NJ 2020–present  
Postdoctoral Research Associate, Computational Cognitive Science Lab  
Advisor: Prof. Thomas L. Griffiths  
Building flexible representations in deep neural networks models, using meta learning and data augmentation.

**Harvard University** Cambridge, MA 2015–2019  
Graduate Researcher, Computational Cognitive Neuroscience Lab  
Advisor: Prof. Samuel J. Gershman  
Developed new computational models for approximate probabilistic inference in humans, and empirically tested their novel predictions with online behavioral experiments.

**DeepMind** London, UK Summer 2018  
Research Intern, Neuroscience Research Team  
Advisor: Prof. Matthew Botvinick  
Demonstrated causal reasoning in recurrent networks trained via model-free reinforcement learning.

**Stanford University** Stanford, CA Summer 2017  
Visiting Researcher, Computation & Cognition Lab  
Advisor: Prof. Noah D. Goodman  
Developed new tests for compositionality in vector-space models of natural language.

**Harvard University** Cambridge, MA Summer 2016  
Summer Research Assistant, Neurophysics Lab  
Advisor: Prof. Haim Sompolinsky  
Generalized attractor networks to follow probabilistic Markov dynamics between fixed points.

**Tata Institute for Fundamental Research** Mumbai, India 2012–2013  
Senior Thesis Researcher, Theoretical Condensed Matter Group  
Advisor: Prof. Kedar Damle  
Simulated resonating valence-bond physics on the honeycomb lattice using Monte Carlo methods.

**École Polytechnique Fédérale de Lausanne** Lausanne, Switzerland Summer 2013  
Summer Research Assistant, Laboratory for Quantum Magnetism  
Advisor: Prof. Henrik M. Rønnow  
Simulated inhomogeneous mean field theories for mixed Ising-XY ( $\text{LiHo}_x\text{Er}_y\text{Y}_{1-x-y}\text{F}_4$ ) compounds.

**Trinity College Dublin** Dublin, Ireland Summer 2012  
Summer Research Assistant, Magnetism & Spin Electronics Group  
Advisor: Prof. J. M. D. Coey  
Built a novel device to observe microwave oscillations using spin-transfer torque.

**National Centre for Biological Sciences** Bangalore, India Summer 2011  
Summer Research Assistant, Protein Folding and Stability Group  
Advisor: Prof. Jayant B. Udgaonkar  
Analyzed pH-dependent folding stability in Monellin using fluorescence spectroscopy.

## PUBLICATIONS

- **Ishita Dasgupta**, Demi Guo, Samuel J. Gershman, Noah D. Goodman. Analyzing machine-learned representations: A natural language case study (submitted).
- **Ishita Dasgupta**, Eric Schulz, Joshua B. Tenenbaum, Samuel J. Gershman. A theory of learning to infer. *Psychological Review* 127.3 (2020).
- **Ishita Dasgupta**, Zeb Kurth-Nelson, Silvia Chiappa, Jovana Mitrovic, Pedro Ortega, David Raposo, Edward Hughes, Peter Battaglia, Matthew Botvinick, and Jane Wang. Causal reasoning from meta-reinforcement learning. *Preprint arXiv:1901.08162* (2019), NeurIPS 2019 Workshop on Meta-Learning.
- **Ishita Dasgupta**, Eric Schulz, Noah D. Goodman, Samuel J. Gershman. Remembrance of inferences past: Amortization in human hypothesis generation. *Cognition* 178, 67-81 (2018).
- **Ishita Dasgupta**<sup>†</sup>, Kevin Smith<sup>†</sup>, Eric Schulz, Joshua B. Tenenbaum, Samuel J. Gershman. Learning to act by integrating mental simulations and physical experiments, *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (2018).
- **Ishita Dasgupta**, Demi Guo, Andreas Stuhlmüller, Samuel J. Gershman, Noah D. Goodman. Evaluating compositionality in sentence embeddings, *Proceedings of the 40th Annual Conference of the Cognitive Science Society* (2018).
- **Ishita Dasgupta**, Eric Schulz, Samuel J. Gershman. Where do hypotheses come from? *Cognitive Psychology* 96, 1-25 (2017).
- **Ishita Dasgupta**, Eric Schulz, Noah D. Goodman, Samuel J. Gershman. Amortized hypothesis generation, *Proceedings of the 39th Annual Conference of the Cognitive Science Society* (2017).
- Jeremy Bernstein<sup>†</sup>, **Ishita Dasgupta**<sup>†</sup>, David Rolnick<sup>†</sup>, Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *5th Workshop on Biological Distributed Algorithms* (2017).
- Jeremy Bernstein<sup>†</sup>, **Ishita Dasgupta**<sup>†</sup>, David Rolnick<sup>†</sup>, Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *Cosyne Abstracts* (2017).
- Jeremy Bernstein<sup>†</sup>, **Ishita Dasgupta**<sup>†</sup>, David Rolnick<sup>†</sup>, Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *AAAI Spring Symposium Series – Science of Intelligence: Computational Principles of Natural and Artificial Intelligence* (2017).
- Pranay Patil, **Ishita Dasgupta**, Kedar Damle. Resonating valence-bond physics on the honeycomb lattice, *Physical Review B* 90, 245121 (2014).
- Nilesh K. Aghera, **Ishita Dasgupta**, Jayant B. Udgaonkar. A buried ionizable residue destabilizes the native state and the transition state in the folding of Monellin, *Biochemistry* 51 (45), 9058-9066 (2012). This paper was highlighted on the journal’s webpage in November 2012.

<sup>†</sup>Authors contributed equally to this work.

## ACADEMIC AWARDS

**Robert J. Glushko Student Travel Award**

Learning to act by integrating mental simulations and physical experiments, *40th Annual Conference of the Cognitive Science Society* (2018).

**Mind Brain Behavior Graduate Student Award**

Full funding for a research collaboration at the Computation & Cognition Lab, Stanford University (2017).

**Student Award for Outstanding Scientific Contribution**

Stochastic Hypothesis Generation, *International Conference on Thinking* (2016).

**Amartya Sen Fellowship for Students from India**

Graduate School of Arts and Sciences, Harvard University (2014).

**Purcell Fellowship**

Department of Physics, Harvard University (2014).

**R. P. Singh Memorial Prize**

Most outstanding graduating student of the year, Department of Physics, Indian Institute of Technology Bombay (2013–2014).

## SELECTED COURSE PROJECTS

### Inference in adaptive epidemiological networks

Advisor: Prof. Edoardo Airoldi – Harvard University

STAT 221, Fall 2016

Developed and tested an inference algorithm to sample the exact posterior over underlying graph sequences in epidemic network models with adaptive re-wiring.

### Propensity score matching for non-ellipsoidally symmetric distributions

Advisor: Prof. Donald Rubin – Harvard University

STAT 186, Spring 2016

Developed and tested a method to estimate propensity scores for general multi-modal distributions (without ellipsoidal symmetry) using mixtures of Gaussians.

### Glomerular coding for olfaction in mice

Advisor: Prof. Venkatesh Murthy – Harvard University

AM 207, Spring 2015

Conducted a data-driven analysis of how olfactory information is encoded in mouse glomeruli using clustering and regression methods.

## SELECTED INVITED TALKS

- **8th International Conference on Learning Representations** Addis Ababa, Ethiopia  
*Beyond tabula rasa in reinforcement learning workshop* April 2020
- **Brown University** Providence, RI  
*Shenhav Lab* March 2020
- **Max Planck Institute for Biological Cybernetics** Tübingen, Germany  
*Computational Principles of Intelligence Lab* March 2020
- **Stanford University** Stanford, CA  
*Causality in Cognition Lab* February 2020
- **Brown University** Providence, RI  
*Cognition Seminar Series* February 2020
- **4th Conference on Reinforcement Learning & Decision Making** Montreal, Canada  
*Workshop on structure for efficient reinforcement learning* July 2019
- **Princeton Neuroscience Institute** Princeton, NJ  
*Parallel Distributed Processing seminar series* March 2019
- **Sloan-Nomis workshop, New York University** New York, NY  
*Workshop on the cognitive foundations of economic behavior* February 2019
- **Radcliffe Institute** Cambridge, MA  
*What is good and what is possible, interdisciplinary workshop* January 2019
- **40th Annual Conference of the Cognitive Science Society** Madison, WI  
*Learning as Program Induction workshop* July 2018
- **McGill University** Montreal, Canada  
*Deep Learning and Linguistics Discussion Group* April 2018
- **McGill University** Montreal, Canada  
*Reasoning and Learning Lab* April 2018
- **Massachusetts Institute of Technology** Cambridge, MA  
*Seminar series on Language and Computation* March 2018
- **New York University** New York, NY  
*Concepts and Categories (ConCats) Seminar Series* October 2017
- **University of California, Berkeley** Berkeley, CA  
*Computational Cognitive Science Lab* July 2017
- **50th Annual Meeting, Society for Mathematical Psychology** Warwick, UK  
*Rational Process Models Symposium* July 2017

## CONFERENCE PRESENTATIONS

- **40th Annual Conference of the Cognitive Science Society** Madison, WI  
Learning to act by integrating mental simulations and physical experiments (talk) July 2018
- **40th Annual Conference of the Cognitive Science Society** Madison, WI  
Evaluating compositionality in sentence embeddings (poster) August 2018
- **International Conference on Thinking** Providence, RI  
Stochastic hypothesis generation (talk) August 2016
- **39th Annual Conference of the Cognitive Science Society** London, UK  
Amortized hypothesis generation (poster) August 2017
- **AAAI Spring Symposium Series** Stanford, CA  
Markov transitions between attractor states in a recurrent neural network (poster) March 2017

## TEACHING & SERVICE

- **Supervision of researchers** 2016–present  
Harvard University, Princeton University  
Direct oversight of 1 high school student, 4 undergraduate and 2 graduate researchers.
- **Organizing academic workshops** July 2019  
Heuristics, hacks, & habits: Boundedly optimal approaches to learning, reasoning and decision making, *41st Annual Conference of the Cognitive Science Society*.
- **Mentoring undergraduate students** 2019–present  
Minds, Brains, and Behavior (MBB) Grad-Undergrad Mentorship Program  
Guiding undergraduates through MBB as a secondary field program of study.
- **Member of the Trainee Leadership Council** 2018–2019  
Center for Brains, Minds and Machines (CBMM) at MIT  
Working with students and CBMM management to identify and plan events that serve student interests.
- **Teaching Fellow** 2014–2015  
Freshman physics at Harvard University (Fall 2015) and linear algebra at IIT-Bombay (Spring 2014).

## OUTREACH

- **Volunteer for Graduate School 101 Workshop, Harvard University** 2019  
Hosted lab tours to recruit Underrepresented Minority Women+ into graduate school in STEM.
- **Member of organizing committee, Harvard Women in Physics** 2017–2018  
Organized a Communication and Negotiation Skills Seminar, with joint attendance from Harvard Women in Physics and Harvard Women in Psychology.
- **Editor at the Journal of Emerging Investigators** 2015–2017  
Reviewed research projects conducted by middle and high-school students.
- **Teaching Fellow, Teach for India** 2011–2012  
Started and organized a mentorship program for girls aged 8 to 10 at a municipal school in Mumbai, pairing them with volunteers recruited from IIT Bombay.

## INTERESTS & HOBBIES

I am trained in Odissi and have performed in Boston. I was an active member of the debate club at IIT Bombay, and participated in several national tournaments. I enjoy singing Hindustani and Bengali music.

## REFERENCES

Prof. Samuel J. Gershman  
Associate Professor, Harvard University  
gershman@fas.harvard.edu

Prof. Noah D. Goodman  
Professor, Stanford University  
ngoodman@stanford.edu

Prof. Joshua B. Tenenbaum  
Professor, Massachusetts Institute of Technology  
jbt@mit.edu

Prof. Matthew Botvinick  
Director of Neuroscience Research, DeepMind  
botvinick@google.com