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
Bachelor of Technology in Engineering Physics, Honours in Physics 2014

RESEARCH EXPERIENCE

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

Harvard University Cambridge, MA
Graduate Researcher, Computational Cognitive Neuroscience Lab 2015–2019
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
Research Intern, Neuroscience Research Team Summer 2018
Advisor: Prof. Matthew Botvinick
Demonstrated causal reasoning in recurrent networks trained via model-free reinforcement learning.

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

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

Tata Institute for Fundamental Research Mumbai, India
Senior Thesis Researcher, Theoretical Condensed Matter Group 2012–2013
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 Research Assistant, Laboratory for Quantum Magnetism Summer 2013
Advisor: Prof. Henrik M. Rønnow
Simulated inhomogeneous mean field theories for mixed Ising-XY ($LiHo_xEr_yY_{1-x-y}F_4$) compounds.

Trinity College Dublin Dublin, Ireland
Summer Research Assistant, Magnetism & Spin Electronics Group Summer 2012
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 Research Assistant, Protein Folding and Stability Group Summer 2011
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**[†], Kevin Smith[†], 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[†], **Ishita Dasgupta**[†], David Rolnick[†], Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *5th Workshop on Biological Distributed Algorithms* (2017).
- Jeremy Bernstein[†], **Ishita Dasgupta**[†], David Rolnick[†], Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *Cosyne Abstracts* (2017).
- Jeremy Bernstein[†], **Ishita Dasgupta**[†], David Rolnick[†], 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.

[†]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**
  Core organizer for Heuristics, hacks, & habits: Boundedly optimal approaches. July 2019
  41st Annual Conference of the Cognitive Science Society.
  Programming committee for Inductive Biases, Invariances and Generalization in RL . July 2020
  37th International Conference on Machine Learning.
- **Mentoring undergraduate students** 2019–present
  Minds, Brains, and Behavior Grad-Undergrad Mentorship Program.
- **Member of the Trainee Leadership Council**, Center for Brains, Minds and Machines 2018–2019
  Working with students and 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