Ishita Dasgupta

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EDUCATION

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

EXPERIENCE

DeepMind New York City, NY
Senior Research Scientist (Nov 22–present); Research Scientist (Dec 20–Oct 22) 2020–present
Leading projects in language model understanding, and using language models for embodied tasks.

Princeton University Princeton, NJ
Postdoctoral Research Associate, Computational Cognitive Science Lab Jan–Dec 2020
Advisor: Prof. Thomas L. Griiffiths
Studied 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.

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

- Theodore Sumers, Kenneth Marino, Arun Ahuja, Rob Fergus, and **Ishita Dasgupta**. Distilling Internet-Scale Vision-Language Models into Embodied Agents. *International Conference on Machine Learning* (2023).
- **Ishita Dasgupta**†, Stephanie CY Chan†, Junkyung Kim, Dharshan Kumaran, Andrew K. Lampinen, and Felix Hill. Transformers generalize differently from information stored in context vs in weights. *NeurIPS 2023 Memory in Artificial and Real Intelligence workshop* (2022).
- **Ishita Dasgupta**, Christine Kaeser-Chen, Kenneth Marino, Arun Ahuja, Sheila Babayan, Felix Hill, and Rob Fergus. Collaborating with language models for embodied reasoning. *NeurIPS 2022 Language and Reinforcement Learning Workshop* (2022). [**Best Paper award**]
- **Ishita Dasgupta** and Thomas L. Griffiths. Clustering and the efficient use of cognitive resources. *Journal of Mathematical Psychology 109* (2022).
- Sreejan Kumar, Carlos G. Correa, **Ishita Dasgupta**, Raja Marjieh, Michael Y. Hu, Robert Hawkins, Jonathan D. Cohen, Karthik Narasimhan, and Tom Griffiths. Using natural language and program abstractions to instill human inductive biases in machines. *Advances in Neural Information Processing Systems 35* (2022). [**NeurIPS Outstanding Main Track Paper**]
- Shuchen Wu, Noémi Élteto, **Ishita Dasgupta**, and Eric Schulz. Learning Structure from the Ground up—Hierarchical Representation Learning by Chunking. *Advances in Neural Information Processing Systems 35* (2022).
- Manzil Zaheer, Kenneth Marino, Will Grathwohl, John Schultz, Wendy Shang, Sheila Babayan, Arun Ahuja, **Ishita Dasgupta**, Christine Kaeser-Chen, and Rob Fergus. Learning to Navigate Wikipedia by Taking Random Walks. *Advances in Neural Information Processing Systems 35* (2022)
- **Ishita Dasgupta**†, Erin Grant†, and Tom Griffiths. Distinguishing rule and exemplar-based generalization in learning systems. *International Conference on Machine Learning*, pp. 4816-4830. PMLR, (2022).
- Andrew K. Lampinen, Nicholas Roy, **Ishita Dasgupta**, Stephanie CY Chan, Allison Tam, James Mcclelland, Chen Yan et al. Tell me why! Explanations support learning relational and causal structure. *International Conference on Machine Learning*, pp. 11868-11890. PMLR, (2022).
- Thomas Langlois, Haicheng Zhao, Erin Grant, **Ishita Dasgupta**, Tom Griffiths, and Nori Jacoby. Passive attention in artificial neural networks predicts human visual selectivity.*Advances in Neural Information Processing Systems 34* (2021).
- Shikhar Tuli, **Ishita Dasgupta**, Erin Grant, and Thomas L. Griffiths. Are convolutional neural networks or transformers more like human vision?. *Proceedings of the Annual Meeting of the Cognitive Science Society* (2021).
- Shuchen Wu, Noemi Elteto, **Ishita Dasgupta**, and Eric Schulz. Chunking as a Rational Solution to the Speed-Accuracy Trade-off in a Serial Reaction Time Task. *Proceedings of the Annual Meeting of the Cognitive Science Society* (2021).
- Sreejan Kumar, **Ishita Dasgupta**, Jonathan D. Cohen, Nathaniel D. Daw, and Thomas L. Griffiths. Meta-Learning of compositional task distributions in humans and machines. *International Conference on Learning Representations* (2021).
- **Ishita Dasgupta**, Samuel J. Gershman. Memory as a Computational Resource. *Trends in Cognitive Sciences* 25(3), 240–251 (2021).
- **Ishita Dasgupta**, Demi Guo, Samuel J. Gershman, Noah D. Goodman. Analyzing machine-learned representations: A natural language case study. *Cognitive Science* 44: e12925 (2020).
- **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). [**Elsevier student award for outstanding scientific contribution**].
- **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).
- **Ishita Dasgupta**†, Jeremy Bernstein†, David Rolnick†, Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *5th Workshop on Biological Distributed Algorithms* (2017).
- **Ishita Dasgupta**†, Jeremy Bernstein†, David Rolnick†, Haim Sompolinsky. Markov transitions between attractor states in a recurrent neural network, *Cosyne Abstracts* (2017).
- **Ishita Dasgupta**†, Jeremy Bernstein† , 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.

PREPRINTS

- Marcel Binz, **Ishita Dasgupta**, Akshay Jagadish, Matthew Botvinick, Jane X. Wang, and Eric Schulz. "Meta-Learned Models of Cognition." arXiv preprint arXiv:2304.06729 (2023).
- **Ishita Dasgupta**†, Andrew K. Lampinen†, Stephanie CY Chan, Antonia Creswell, Dharshan Kumaran, James L. McClelland, and Felix Hill. "Language models show human-like content effects on reasoning." arXiv preprint arXiv:2207.07051 (2022).

†Authors contributed equally to this work.

ACADEMIC AWARDS

Robert J. Glushko Student Travel Award
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, IIT-Bombay (2013–2014).

SELECTED INVITED TALKS

[updated Dec 2020]

- **34th Annual Conference on Neural Information Processing Systems** remote
  Biological and Artificial RL Workshop December 2020

- **8th International Conference on Learning Representations** remote
  Beyond tabula rasa in reinforcement learning workshop April 2020
- **Max Planck Institute for Biological Cybernetics** remote
  Computational Principles of Intelligence Lab March 2020
- **Stanford University** remote
  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
- **50th Annual Meeting, Society for Mathematical Psychology** Warwick, UK
  Rational Process Models Symposium July 2017

CONFERENCE PRESENTATIONS

[updated Dec 2020]

- **32nd Neural Information Processing Systems Conference** Vancouver, CA
  Causal reasoning from meta-reinforcement learning. (MetaLearn workshop poster) December 2019
- **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

[updated Dec 2020]

- **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.

- **Supervision of researchers** 2016–present
  Harvard University, Princeton University
  Direct oversight of 1 high school student, 4 undergraduate and 2 graduate researchers.
- **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

[updated Dec 2020]

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

Prof. Noah D. Goodman
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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