Tomer D. Ullman

Contact Information	Harvard University Department of Psychology William James Hall, Room 1320 33 Kirkland St., Cambridge, MA 02138 USA	(617)253-2010 tullman@fas.harvard.edu http://www.tomerullman.org

Position Assistant Professor, Harvard Department of Psychology. Member of the Center for Brains, Minds, and Machines. Co-PI for the Science of Intelligence group at Harvard.

Research Interests Computational cognitive modeling, intuitive theories, child development, probabilistic programming, folk physics, folk psychology, common sense, machine learning, theory-of-self

Education

Massachusetts Institute of Technology and Harvard University

Postdoctoral associate at the Center for Brains, Minds & Machines (CBMM, 2016-2019)

Massachusetts Institute of Technology

Ph.D. in Brain and Cognitive Sciences (2008-2015)

- Dissertation Topic: On the Nature and Origin of Intuitive Theories
- Advisor: Josh Tenenbaum

Hebrew University of Jerusalem

B.S. in Physics and Cognitive Science, (2004-2008)

- *Magna Cum Laude*

Publications

Manuscripts under Revision

Ullman, T.D., Kosoy, E., Tenenbaum J.B., and Spelke, E., Preschoolers' understanding of heavy and light: Inference and prediction.

Kryven, M., Ullman, T.D., Cowan, W., and Tenenbaum, J.B., Strategy or luck: Intuitive theories of attributed intelligence.

Sosa, F.A., Ullman, T., Gershman, S., Tenenbaum, J.B., & Gerstenberg, T. Moral Dynamics: Grounding moral judgment in intuitive physics and intuitive psychology.

Submitted Manuscripts Paul LA, Ullman, T.D., Tenenbaum, J.B., Reverse engineering a self

Manuscripts in Prep Ullman, T.D., Xu, Y., and Goodman, N.D., The pragmatics of spatial language.

Journal articles Bonawitz E., Ullman, T.D., Gopnik, A. & Tenenbaum, J.B. (2019), Sticking to the evidence? A Computational and behavioral case Study of micro-theory change in the domain of magnetism, *Cognitive Science*, 43(8), e12765.

Ullman, T.D. and McCoy, J.P. (2019), Judgments of effort for magical violations of intuitive physics. (2019) PloS one, 14(5), e0217513.

McCoy, J.P., and Ullman, T.D., A Minimal Turing Test. (2018). A Minimal Turing Test. *Journal of Experimental Social Psychology*, 79, 1-8.

Gerstenberg, T., Ullman, T.D., Nagel, J., Kleiman-Weiner, M., Lagnado, D., and Tenenbaum, J.B. (2018), Lucky or clever? From changed expectations to attributions of responsibility. *Cognition, 177* 122-141.

Liu, S., Ullman, T.D., Tenenbaum J.B., and Spelke, E. (2017) 10-month-olds infer the value of goals from the costs of actions. *Science*, *358*(6366), 1038-1041.

Ullman, T. D., Spelke, E. S., Battaglia, P., and Tenenbaum, J. B. (2017), Mind Games: Game Engines as an Architecture for Intuitive Physics. *Trends in Cognitive Science, 21*(9), 649–665.

Ullman, T. D., Stuhlmüller, A., Goodman, N.D., and Tenenbaum, J. B. (2017), Learning physical parameters from dynamic scenes. *Cognitive Psychology.*

Lake, B. M., Ullman, T. D., Tenenbaum, J. B., and Gershman, S. J. (2017), Building machines that learn and think like people. *Behavioral and Brain Sciences,* 1–101.

Hamlin, J. K., Ullman, T. D., Tenenbaum, J. B., Goodman, N. D., and Baker, C. L. (2013), The mentalistic basis of core social cognition: Experiments in preverbal infants and a computational model. *Developmental Science 16*(2), 209-226.

Ullman, T. D., Goodman, N. D., and Tenenbaum, J. B. (2012), Theory learning as stochastic search in the language of thought. *Cognitive Development 27*(4), 455–480.

Goodman, N. D., Ullman, T. D., and Tenenbaum, J. B. (2012), Learning a theory of causality. *Psychological Review, 118*(1), 110.

Book Chapters

Ullman, T. D., McCoy, J. P., and Paul, L. A., (2019), Modal Prospection. in *Metaphysics and Cognitive Science*, eds. Alvin Goldman and Brian McLaughlin. Oxford University Press (US).

Ullman, T.D. and Zimmerman, S., Models of transformative decision making, (forthcoming) in *Becoming Someone New: Essays on Transformative Experience, Choice, and Change*, eds. Enoch Lambert and John Schwenkler, Oxford University Press.

Peer Reviewed Conference Proceedings

Smith, K.*, Mei, L.*, Yao, S., Wu, J., Spelke, E., Tenenbaum, J.B., Ullman, T.D., (forthcoming), Modeling Expectation Violation in Intuitive Physics with Coarse Probabilistic Object Representations, *Advances in Neural Information Processing Systems*

Ullman, T. D., Kosoy, E., Yildrim, I., Soltani, A., Siegel, X., Tenenbaum J.B., and Spelke, E.,(2019), Draping an Elephant: Uncovering Children's Reasoning About Cloth-Covered Objects *Proceedings of the* 41^{st} *Annual Conference of the Cognitive Science Society.*

Liu, S., Ullman, T.d., and McCoy, J.P., (2019), People's perception of others' risk preferences *Proceedings of the* 41^{st} *Annual Conference of the Cognitive Science Society.*

Ullman, T. D., Alonso-Diaz, S., Ferringo, S., Zahid, S., and Kidd, C. (2017), Weight matters: The role of physical weight in non-physical language across age and culture. *Proceedings of the* 39^{th} *Annual Conference of the Cognitive Science Society.*

Liu, S., Ullman, T. D., Tenenbaum, J. B., and Spelke, E. S. (2017), What's worth the effort: Ten-month-old infants infer the value of goals from the costs of actions. *Proceedings of the* 39^{th} *Annual Conference of the Cognitive Science Society.*

Kryven, M., Ullman, T. D., Cowan, W., and Tenenbaum, J. B. (2017), Thinking and guessing: Bayesian and empirical models of how humans search. *Proceedings of the* 39^{th} *Annual Conference of the Cognitive Science Society.*

Chang, M. B., Ullman, T. D., Torralba, A., and Tenenbaum, J. B. (2017), A compositional object-based approach to learning physical dynamics. *International Conference on Learning Representations (ICLR).*

Ullman, T.D., Xu, Y. & Goodman, N.D. (2016), The Pragmatics of spatial language. *Proceedings of the* 38^{th} *Annual Conference of the Cognitive Science Society.*

Ullman, T.D., Siegel, M., Tenenbaum, J.B. & Gershman, S.J. (2016), Coalescing the vapors of human experience into a viable and meaningful comprehension. *Proceedings of the* 38^{th} *Annual Conference of the Cognitive Science Society.*

Kryven, M., Ullman, T.D., Cowan, W. & Tenenbaum, J.B. (2016), Outcome or strategy? A Bayesian model of intelligence attribution. *Proceedings of the* 38^{th} *Annual Conference of the Cognitive Science Society.*

Gerstenberg, T., Ullman, T. D., Kleiman-Weiner, M., Lagnado, D. A. & Tenenbaum, J. B. (2014), Wins above Replacement: Responsibility attributions as counterfactual replacements. *Proceedings of the* 36^{th} *Annual Conference of the Cognitive Science society.*

Ullman, T.D., Stuhlmüller A., Goodman, N.D. & Tenenbaum, J.B. (2014), Learning physics from dynamical scenes. *Proceedings of the* 36^{th} *Annual Conference of the Cognitive Science society.*

Bonawitz E., Ullman, T.D., Gopnik, A. & Tenenbaum, J.B. (2012), Sticking to the evidence? A Computational and behavioral case Study of micro-theory change in the domain of magnetism, *International Conference Developmental Learning and Epigenetic Robotics; best paper award: experiment combined with computational model.*

Ullman, T.D.*, McCoy, J.P.*, Stuhlmuller, A., Gerstenberg, T. & Tenenbaum J.B. (2012), Why blame Bob? Probabilistic generative models, counterfactual reasoning, and blame attribution. *Proceedings of the* $33rd$ *Annual Conference of the Cognitive Science Society.*

Ullman, T.D., Goodman, N.D. & J. B. Tenenbaum (2010), Theory acquisition as stochastic search. *Proceedings of the* $32nd$ *Annual Conference of the Cognitive Science Society.*

Ullman, T.D., Baker, C.L., Macindoe, O., Evans, O., Goodman, N.D. & Tenenbaum, J.B. (2010), Help or hinder: Bayesian models of social goal inference. *Advances in Neural Information Processing Systems (Vol. 22, pp. 1874-1882).*

Goodman, N.D., Ullman, T.D. & Tenenbaum, J.B. (2009), Learning a theory of causality *Proceedings of the* $31st$ *Annual Conference of the Cognitive Science Society.*

Invited Talks and Presentations

Discussant on 'Is that so? How children evaluate claims and conjectures'
Child Development Society Meeting, Louisville, KT, 2019.

Computational Models of Core Intuitive Physics,
Yale Current Works series, Yale, CN, 2019.

Neuro-symbolic Computing and Machine Common Sense
AI Research Week, IBM, MA, 2019.

Computational Models of Core Intuitive Physics,
Facebook Workshop on Understanding Human and Machine Intelligence, NYC, NY, 2019.

Reverse Engineering a Self,
Formal and Experimental Conference, Northeastern, MA, 2019

Thinking New Thoughts,
Workshop on Possibility and Value, Radcliffe Institute for Advanced Studies, MA, 2019.

Evaluating Future Selves,
Workshop on Imagination, Simulation, and the Self, Tufts, MA, 2018.

Physics Meets Development,
CVPR workshop on Vision Meets Cognition, Salt Lake City, UT, 2018.

Canonical Mass: Preschoolers Expectations of Dynamic Variables for Solid Objects,
Society for Research in Child Development, Austin, TX. 2017.

Modal Imagination,
Ranch Metaphysics Workshop, Tucscon, AZ. 2017.

People and Things,
Current Work in Developmental Psychology Colloquium. Boston College, MA. 2016.

Development, Psychology, Physics.
DeepMind Technologies, London. 2016.

Modal Prospection
Philosophy Seminar. Rutgers University, NJ. 2016.

Imagining and Evaluating Possible Future Selves,
42*nd* Meeting of the Society for Philosophy and Psychology. Austin, TX. 2016.

Computational Cognitive Science,
Interdisciplinary College on AI, Germany. 2016.

Probabilistic Programming,
Interdisciplinary College on AI, Germany. 2016.

Effort as a Bridge Across Action and Action Understanding,

The 20^{th} International Congress on Infant Studies. New Orleans, LA. 2016.

Children's Learning as Stochastic Search,
Society for Research in Child Development. Philadelphia, PA. 2015.

Theories, Imagination, and the Generation of New Ideas,
Center for Brains, Minds and Machines Summer School. Woods Hole, MA. 2015.

Probabilistic Programming Tutorial,
Center for Brains, Minds and Machines Summer School. Woods Hole, MA. 2015.

Theories of Physics,
More on Development. Columbus, OH. 2015.

Modeling a Theory of the Self,
Workshop on Transformative Experiences. Chicago, IL. 2015.

Deep Thoughts: The Value of Understanding,
Commentator at 41^{th} Meeting of the Society for Philosophy and Psychology. Duke University, NC. 2015.

Wins Above Replacement: Responsibility Attributions as Counterfactual Replacement,
40^{th} Meeting of the Society for Philosophy and Psychology. Vancouver, Canada. 2014.

Theories, Imagination, and the Generation of New Ideas,
Center for Brains, Minds and Machines Summer School. Woods Hole, MA 2014.

Probabilistic Programming Tutorial,
Center for Brains, Minds and Machines Summer School. Woods Hole, MA. 2014.

Learning Physics from Dynamic Scenes,
36^{th} Annual Meeting of the Cognitive Science Society. Quebec, Canada. 2014.

Theories, Imagination, and the Generation of New ideas,
Pre-conference debate at Child Development Society Meeting. Memphis, TN. 2013.

Help or Hinder? Bayesian Models of Social Goal Inference,
Simons Center, MIT. 2010.

Why Blame Bob? Probabilistic Generative Models and Blame Attribution,
34^{th} Annual Meeting of the Cognitive Science Society. Sapporo, Japan. 2012.

Theory Learning as Stochastic Search,
32*nd* Annual Meeting of the Cognitive Science Society. Portland, OR. 2010.

Help or Hinder? Bayesian Models of Social Goal Inference,
Machine Learning Summer School, Cambridge, UK. 2009.

Help or Hinder? Bayesian Models of Social Goal Inference,
23*rd* Annual Conference on Neural Information Processing Systems. Vancouver. 2009.

Grants

DARPA MCS (Machine Common Sense), June 2019-June 2023, $12,100,000, "Building machine common sense the human way", Co-PI with six other investigators from IBM, MIT, Stanford, and Harvard. Harvard component, supporting Ullman, Spelke, and several RAs and postdoctoral researchers, is $1,080,000.

Templeton Experience Project, June 2015-June 2017, $90,000, "Computational models of the intuitive theory of transformative experiences", with Josh Tenenbaum (PI).

Other

Teaching Experience and Outreach	2018	Guest lecturer, Harvard developmental seminars
	2017	Lecturer and Teaching Assistant, CBMM summer school
	2015	Lecturer and Teaching Assistant, CBMM summer school
	2014	Lecturer and Teaching Assistant, CBMM summer school
	2012	Teaching Assistant, Topics in early childhood cognition (MIT 9.85)
	2011	Teaching Assistant, Cognitive processes (MIT 9.65)
	2010	Planning committee member, Cambridge Science Festival
	2009	Presenter and volunteer at Neuroscience Day, Museum of Science
Honors and Awards	2012	ICDL Best Paper Award: Experiment combined with computational model
	2011	MIT Continued Dedication to Teaching award
	2010	MIT Excellence in Teaching award
	2010	National Science Foundation (NSF) Fellowship
	2009	Singleton Graduate Fellowship
	2009	National Science Foundation (NSF) honorable mention
	2004-2007	Hebrew University of Jerusalem Scholarships of Excellence

Service

Reviewer for: Cognition, Cognitive Psychology, Cognitive Development, Cognitive Science, Developmental Psychology, Developmental Science, Journal of Experiment Psychology: General, Nature Human Behavior, Psychological Review, Proceedings of the Royal Society B, Topics in Cognitive Science, Philosophical Psychology, Neural Information Processing Systems (NeruIPS), The Annual Conference of the Cognitive Science Society (CogSci), AAAI, PLOS ONE.

Co-organizer of Lorentz Center "Developing Models of the Word" Workshop, Leiden, Netherlands (2019)

Co-organizer of Cognition, Brain, Behavior lunch seminar series, Harvard (2019)

PC Member AAAI main track

Organizer of "More on Development (MOD)" (Ohio, 2015)

Co-Organizer of Child Development Society pre-conference on "computational cognitive models and cognitive development" (2014)

Students Mentored

Felix Sosa (2017)

Cameron Nieters (2017)

Michael Chang (2016, 2017)

Eliza Kosoy (2016, 2017)

Heather Tarr (2016)

Alexandra Wheeler (2016)

Samuel Zimmerman (2016)

Marta Kryven (2016)

Membership

Cognitive Science Society (CSS)

Society for Research in Child Development (SRCD)

Cognitive Development Society (CDS)

Society for Philosophy and Psychology (SPP)

Society for Personality and Social Psychology (SPSP)

Skills

Languages: English, Hebrew, some Latin

Programming: Python, Church, Webppl, Javascript, Julia, Blender, Jupyter, and R

References

Josh Tenenbaum, Professor, Brain and Cognitive Sciences, MIT, `jbt@mit.edu`

Laura Schulz, Professor, Brain and Cognitive Sciences, MIT, `lschulz@mit.edu`

Elizabeth Spelke, Professor, Psychology, Harvard, `spelke@wjh.harvard.edu`

Noah Goodman, Professor, Psychology, Stanford University, `ngoodman@stanford.edu`