Jessica B. Hamrick · Curriculum Vitæ

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Education

University of California, Berkeley August 2012 – October 2017
Ph.D. in Psychology
Thesis: *Metareasoning and Mental Simulation*
Advised by: Thomas L. Griffiths

Massachusetts Institute of Technology September 2011 – June 2012
M.Eng. in Electrical Engineering and Computer Science
Thesis: *Physical Reasoning in Complex Scenes is Sensitive to Mass*
Advised by: Joshua B. Tenenbaum

Massachusetts Institute of Technology September 2007 – June 2012
B.S. in Computer Science and Engineering
Advised by: Gerald Jay Sussman

Research Experience

Research Scientist November 2017 – present
DeepMind

Graduate Student Researcher August 2012 – October 2017
Computational Cognitive Science Lab, UC Berkeley

Intern May 2016 – August 2016
DeepMind

Graduate Research Assistant June 2011 – August 2012
Computational Cognitive Science Lab, MIT

Undergraduate Research Assistant January 2010 – June 2011
Computational Cognitive Science Lab, MIT

Undergraduate Research Assistant June 2008 – December 2009
Personal Robots Group, MIT Media Lab

Fellowships, Grants, and Awards

- 2017 ACM Software System Award for Project Jupyter. Awarded May 2018.
- 2015-2016 Outstanding Graduate Student Instructor Award. Awarded March 2016.
- Cognitive Science Society Student Travel Grant. Awarded July 2015. *Based on merit.*
- National Science Foundation Graduate Fellowship (three years, 2014–2017), tuition and stipend. Awarded April 2013.
- Berkeley Fellowship, University of California Berkeley (two years, 2012–2014), tuition and stipend. Awarded March 2012. *Berkeley's most prestigious fellowship awarded to incoming graduate students, based on merit.*

Journal Articles

- **Hamrick, J. B.**, Battaglia, P. W., Griffiths, T. L., & Tenenbaum, J. B. (2016). Inferring mass in complex scenes by mental simulation. *Cognition*, 157, 61–76.
- Gureckis, T. M., Martin, J., McDonnell, J., Rich, A. S., Markant, D. B., Coenen, A., Halpern, D., **Hamrick, J. B.**, & Chan, P. (2016). psiTurk: An open-source framework for conducting replicable behavioral experiments online. *Behavioral Research Methods*, 48(3), 829–842.
- Goodman, N. D., Frank, M. C., Griffiths, T. L., Tenenbaum, J. B., Battaglia, P. W., & **Hamrick, J. B.** (2015). Relevant and robust: A response to Marcus & Davis (2013). *Psychological Science*, 26(4), 539–-541.
- Battaglia P. W., **Hamrick J. B.**, & Tenenbaum J. B. (2013). Simulation as an engine of physical scene understanding. *Proceedings of the National Academy of Sciences*, 110(45), 18327–18332.

Refereed Conference Proceedings

- **Hamrick*, J. B.**, Allen*, K. R., Bapst, V., Zhu, T., McKee, K. R., Tenenbaum, J. B., & Battaglia, P. W. (2018). Relational inductive bias for physical construction in humans and machines. In *Proceedings of the 40th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
- Fisac, J. F., Gates, M. A., **Hamrick, J. B.**, Liu, C., Hadfield-Menell, D., Palaniappan, M., Malik D., Sastry, S., Griffiths, T. L., & Dragan, A. D. (2017). Pragmatic-Pedagogic Value Alignment. In *Proceedings of the International Symposium on Robotics Research* (ISRR 2017). **Winner of the Computing Community Consortium Blue Sky Award**.
- Callaway, F., **Hamrick, J. B.**, & Griffiths, T. L. (2017). Discovering simple heuristics from mental simulation. In *Proceedings of the 39th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
- **Hamrick, J. B.**, Ballard, A. J., Pascanu, R., Vinyals, O., Heess, N., & Battaglia, P. W. (2017). Metacontrol for Adaptive Imagination-Based Optimization. In *Proceedings of the 5th International Conference on Learning Representations (ICLR 2017)*.
- **Hamrick, J. B.**, Pascanu, R., Vinyals, O., Ballard, A. J., Heess, N., & Battaglia, P. W. (2016). Imagination-Based Decision Making with Physical Models in Deep Neural Networks. In *Proceedings of the NIPS 2016 Workshop on Intuitive Physics*.
- Fisac*, J. F., Liu*, C., **Hamrick*, J. B.**, Sastry, S., Hedrick, J. K., Griffiths, T. L., & Dragan, A. D. (2016). Generating plans that predict themselves. In *Proceedings of the 12th International Workshop on the Algorithmic Foundations of Robotics (WAFR 2016)*.
- Liu*, C., **Hamrick*, J. B.**, Fisac*, J. F., Dragan, A. D., Hedrick, J. K., Sastry, S. S., & Griffiths, T. L. (2016). Goal Inference Improves Objective and Perceived Performance in Human-Robot Collaboration. In J. Thangarajah, K. Tuyls, C. Jonker, & S. Marsella (Eds.), *Proceedings of the 15th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2016)*.
- Kluyver, T., Ragan-Kelley, B., Pérez, F., Granger, B., Bussonnier, M., Frederic, J., Kelley, K., **Hamrick, J. B.**, Grout, J., Corlay, S., Ivanov, P., Avila, D., Abdalla, S., & Willing, C. (2016). Jupyter Notebooks—a publishing format for reproducible computational workflows. In *Proceedings of the 20th International Conference on Electronic Publishing*, 87–90.
- **Hamrick, J. B.**, Smith, K. A., Griffiths, T. L., & Vul, E. (2015). Think again? The amount of mental simulation tracks uncertainty in the outcome. In *Proceedings of the 37th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.

*Contributed equally.

- Lieder, F., Plunkett, D., **Hamrick, J. B.**, Russell, S. J., Hay, N. J., & Griffiths, T. L. (2014). Algorithm selection by rational metareasoning as a model of human strategy selection. *Advances in Neural Information Processing Systems*, 27.
- **Hamrick J. B.** & Griffiths T. L. (2014). What to simulate? Inferring the right direction for mental rotation. In P. Bello, M. Guarini, M. McShane & B. Scassellati (Eds.), *Proceedings of the 36th Annual Meeting of the Cognitive Science Society.* Austin, TX: Cognitive Science Society.
- **Hamrick J. B.** & Griffiths T. L. (2013). Mental Rotation as Bayesian Quadrature. In *NIPS Bayesian Optimization Workshop.*
- Abbott J. T., **Hamrick J. B.**, & Griffiths T. L. (2013). Approximating Bayesian inference with a sparse distributed memory system. In M. Knauff, M. Pauen, N. Sebanz, & I. Wachsmuth (Eds.), *Proceedings of the 35th Annual Conference of the Cognitive Science Society.* Austin, TX: Cognitive Science Society.
- **Hamrick J. B.**, Battaglia P. W., & Tenenbaum J. B. (2011). Internal physics models guide probabilistic judgments about object dynamics. In L. Carlson, C. Hölscher, & T. Shipley (Eds.), *Proceedings of the 33rd Annual Conference of the Cognitive Science Society.* Austin, TX: Cognitive Science Society.

Non-Refereed Publications

- Battaglia, P. W., **Hamrick, J. B.**, Bapst, V., Sanchez-Gonzalez, A., Zambaldi, V., Malinowski, M., Tacchetti, A., Raposo, D., Santoro, A., Faulkner, R., Gulcehre, C., Song, F., Ballard, A., Gilmer, J., Dahl, G., Vaswani, A., Allen, K., Nash, C., Langston, V., Dyer, C., Heess, N., Wierstra, D., Kohli, P., Botvinick, M., Vinyals, O., Li, Y., & Pascanu, R. (2018). Relational inductive biases, deep learning, and graph networks. *arXiv preprint arXiv:1806.01261.*
- **Hamrick, J. B.** (2017). Metareasoning and Mental Simulation. Ph.D. thesis.
- **Hamrick, J. B.** (2016). A Rejection Sampler. In M. DiBernardo & A. Brown (Eds.), *The Architecture of Open Source Applications, Volume 4: 500 Lines or Less.*
- **Hamrick, J. B.** (2012). Physical Reasoning in Complex Scenes is Sensitive to Mass. Master's thesis.

Invited Workshop and Conference Talks

- **Hamrick, J. B.** (2018, July). Meta-reasoning for adaptive physical strategy selection and control. To be presented at the Symposium for Strategies and Representations in Physical Inference, CogSci 2018. Madison, WI.
- **Hamrick, J. B.** (2018, July). To be presented at the Workshop on Prediction and Generative Modeling in Reinforcement Learning, ICML 2018. Stockholm, Sweden.
- **Hamrick, J. B.** (2018, March). Metareasoning and mental simulation in humans and artificial agents. Presented at the Workshop on Model-Based Cognition: Hierarchical Reasoning and Sequential Planning, COSYNE 2018. Breckenridge, CO.
- **Hamrick, J. B.** (2017, July). Metacontrol for Adaptive Imagination-Based Optimization. Presented at the Workshop on Deep Learning in Computational Cognitive Science, CogSci 2017. London, UK.
- **Hamrick, J. B.** (2017, July). Think again? Adaptive allocation of resources for mental simulation. Presented at the Symposium on Bridging Levels of Analysis with Rational Process Models, MathPsych 2017. Coventry, UK.

- **Hamrick, J. B.** (2016, October). Metareasoning and mental simulation. Stanford University. Palo Alto, CA.
- **Hamrick, J. B.** (2015, December). Think again? Bounded optimality in decisions from internally generated evidence. Presented at the Bounded Optimality and Rational Metareasoning Workshop, NIPS 2015. Montreal, Canada.
- **Hamrick, J. B.** (2015, November). Teaching with Jupyter Notebooks. Presented at CodeNeuro 2015. San Francisco, CA.
- **Hamrick, J. B.** (2015, November). Mental Simulation in Humans and Robots. Presented at the Algorithms for Human-Robot Interaction Workshop. Berkeley, CA.

Conference Presentations

- Pacer, M, Avila, D., & **Hamrick, J. B.** (2017, August). The Jupyter notebook as document: from structure to application. Talk presented at JupyterCon 2017. New York, NY.
- **Hamrick, J. B.**, Bourgin, D., Langlois, T., & Griffiths, T. L. (2017, July). Exploring inductive bias of visual scenes. Poster to be presented at the 39th Annual Conference of the Cognitive Science Society. London, UK.
- **Hamrick, J. B.**, Bussonnier, M., Frederic, J., Granger, B., Page, L., & Willing., C. (2017, July). nbgrader: A Tool for Creating and Grading Assignments in the Jupyter Notebook. Talk presented at SciPy 2017. Austin, TX.
- **Hamrick, J. B.**, Ballard, A. J., Pascanu, R., Vinyals, O., Heess, N., & Battaglia, P. W. (2017, April). Metacontrol for Adaptive Imagination-Based Optimization. Poster to be presented at the 5th International Conference on Learning Representations (ICLR 2017). Toulon, France.
- **Hamrick, J. B.**, Pascanu, R., Vinyals, O., Ballard, A. J., Heess, N., & Battaglia, P. W. (2016, December). Imagination-Based Decision Making with Physical Models in Deep Neural Networks. Talk and poster presented at the NIPS 2016 Workshop on Intuitive Physics. Barcelona, Spain.
- **Hamrick, J. B.** and Griffiths, T. L. (2016, December). Metareasoning and mental simulation. Poster presented at the 11th Women in Machine Learning Workshop (WiML 2016). Barcelona, Spain.
- Suchow, J. W., Morgan, T. J. H., **Hamrick, J. B.**, Pacer, M. D., Meylan, S. C., & Griffiths, T. L. (2016, August). Wallace: Automating Cultural Evolution Experiments Through Crowdsourcing. Tutorial presented at the 38th Annual Conference of the Cognitive Science Society. Philadelphia, PA.
- **Hamrick, J. B.** (2016, July). Reproducible, One-Button Workflows with the Jupyter Notebook and SCons. Talk presented at SciPy 2016. Austin, TX.
- Liu, C., **Hamrick, J. B.**, Fisac, J. F., Dragan, A. D., Hedrick, J. K., Sastry, S. S., & Griffiths, T. L. (2016, May). Goal Inference Improves Objective and Perceived Performance in Human-Robot Collaboration. Poster presented at AAMAS 2016. Singapore.
- **Hamrick, J. B.** (2016, March). Creating and Grading Assignments in the IPython/Jupyter Notebook with nbgrader. Demo presented at SIGCSE 2016. Memphis, TN.
- **Hamrick, J. B.**, Smith, K. A., Griffiths, T. L., & Vul, E. (2015, July). Think again? The amount of mental simulation tracks uncertainty in the outcome. Talk presented at the 37th Annual Conference of the Cognitive Science Society. Pasadena, CA.
- **Hamrick, J. B.**, Ragan-Kelley, M., & Kelley, K. (2015, July). Teaching with IPython/ Jupyter Notebooks and JupyterHub. Talk presented at SciPy 2015. Austin, TX.

- **Hamrick J. B.** & Griffiths, T. L. (2014, August). What to simulate? Inferring the right direction for mental rotation. Talk presented at the 36th Annual Conference of the Cognitive Science Society. Quebec City, Canada.
- **Hamrick J. B.** & Battaglia, P. W. (2014, April). Games for Science: Creating interactive psychology experiments in Python with Panda3D. Talk presented at PyCon 2014. Montreal, Canada.
- **Hamrick J. B.** & Griffiths, T. L. (2013, December). Mental Rotation as Bayesian Quadrature. Poster presented at the NIPS Bayesian Optimization Workshop.
- **Hamrick J. B.** (2013, November). Rewriting Python Docstrings with a Metaclass. Talk presented at the San Francisco Python Meetup.
- **Hamrick J. B.**, Battaglia P. W., Griffiths T. L, & Tenenbaum J. B. (2013, August). Inferring mass in complex physical scenes via probabilistic simulation. Talk presented at the 46th Annual Meeting of the Society of Mathematical Psychology. Potsdam, Germany.
- **Hamrick J. B.**, Battaglia P. W., Griffiths T. L, & Tenenbaum J. B. (2013, August). Inferring mass in complex physical scenes via probabilistic simulation. Poster presented at the 35th Annual Conference of the Cognitive Science Society. Berlin, Germany.
- Battaglia P. W., **Hamrick J. B.**, & Tenenbaum J. B. (2012, May). Intuitive mechanics in visual reasoning about complex scenes with unknown forces. Poster presented by Peter Battaglia at Annual Meeting of the Vision Sciences Society. Naples, FL.
- **Hamrick J. B.**, Battaglia P. W., & Tenenbaum J. B. (2012, May). Physics knowledge aids object perception in dynamic scenes. Poster presented at the Annual Meeting of the Vision Sciences Society. Naples, FL.
- **Hamrick J. B.**, Battaglia P. W., & Tenenbaum J. B. (2011, July). Internal physics models guide probabilistic judgments about object dynamics. Paper presented at the 33rd Annual Conference of the Cognitive Science Society. Boston, MA.
- Battaglia P. W., **Hamrick J. B.**, & Tenenbaum J. B. (2011, May). Intuitive physics judgments guided by probabilistic dynamics model. Poster presented by Peter Battaglia at the Annual Meeting of the Vision Sciences Society. Naples, FL.

Mentoring

- Elena Ouyang (undergraduate research assistant), September 2014 – May 2016
- Crystal Chen (undergraduate research assistant), February 2013 – May 2014

Teaching

- Berkeley Review of CogSci Articles (September 14, 2016, UC Berkeley)
  `http://www.decal.org/courses/4179`
  Guest lecturer.
- COGSCI 88: Data Science and the Mind (November 24, 2015, UC Berkeley)
  `http://data8.org/connector/mind/`
  Guest lecturer.
- Software Carpentry (July 6-7, 2015, Austin, TX)
  `http://software-carpentry.org/`
  Instructor for a boot camp teaching computer skills to scientists at the SciPy 2015 conference, including Python programming, Git version control, the command line, and various scientific Python libraries.

- COGSCI 131: Computational Models of Cognition (Spring 2015, UC Berkeley)
  `http://www.jesshamrick.com/2014/03/24/deploying-jupyterhub-for-education`
  Graduate student instructor. Spearheaded an effort to convert assignments from MATLAB to IPython notebooks and maintained a deployment of JupyterHub for the 220 students to work on their IPython notebook assignments.
- Berkeley Review of CogSci Articles (October 15, 2014, UC Berkeley)
  `http://www.decal.org/courses/3192`
  Guest lecturer.
- Software Carpentry (September 22-23, 2014, Berkeley, CA)
  `http://software-carpentry.org/`
  Instructor for a boot camp teaching computer skills to scientists at the Lawrence Berkeley National Laboratory, including Python programming, Git version control, the command line, and data processing.
- Software Carpentry (April 14-15, 2014, Montreal, Canada)
  `http://software-carpentry.org/`
  Instructor for a boot camp teaching computer skills to librarians, including Python programming, Git version control, the command line, and data processing.
- COGSCI 131: Computational Models of Cognition (Spring 2014, UC Berkeley)
  Graduate student instructor.
- Berkeley Review of CogSci Articles (October 16, 2013, UC Berkeley)
  `http://www.decal.org/courses/2827`
  Guest lecturer.
- Python FUNdamentals (August 19-22, 2013, UC Berkeley)
  `https://github.com/dlab-berkeley/python-fundamentals`
  Helper for a crash course teaching introductory Python to graduate students.
- Software Carpentry (April 13-14, 2013, UC Berkeley)
  `http://software-carpentry.org/`
  Helper for a boot camp teaching scientists computer skills in Python programming, Git version control, testing, the command line, and data management.
- Python for Computational Cognitive Science (Summer 2012, MIT).
  `https://github.com/jhamrick/python-course`
  Co-instructor for a crash course in scientific Python for computational cognitive science.
- Boston Python Workshop (May, July, and December 2011, Boston, MA)
  `http://openhatch.org/wiki/Boston_Python_Workshop`
  Helper for workshops teaching Python to women and their friends.

Service and Societies

- Jupyter Steering Council (March 2015 – Present), Member
  `https://github.com/jupyter/governance`
- Cognitive Science Society (July 2011 – Present), Student Member
  `http://www.cognitivesciencesociety.org/`
- MIT Student Information Processing Board (September 2008 – June 2012)
  Volunteer student computing group, `http://sipb.mit.edu/`
  - Associate Member (June 2012 – present)
  - Full Member (February 2009 – June 2012)

- Executive Committee (February 2009 – February 2012)
- Chair (February 2010 – February 2011). While I was Chair, SIPB received the Karl Taylor Compton prize, MIT's most prestigious award given to students or student groups.

Software

Note: for a full list of projects I maintain or have contributed to, please see `https://github.com/jhamrick?tab=repositories`.

- nbgrader (primary maintainer)
  `https://github.com/jupyter/nbgrader`
  A tool to help instructors create, distribute, collect, and grade assignments in the Jupyter/IPython notebook.
- Jupyter/IPython (maintainer)
  `http://jupyter.org/`
  An architecture for interactive computing.
- nbflow (primary maintainer)
  `https://github.com/jhamrick/nbflow`
  A tool that supports one-button reproducible workflows with the Jupyter/IPython Notebook and Scons.
- Wallace (contributor)
  `https://github.com/berkeley-cocosci/Wallace`
  A platform for running iterated learning experiments on Amazon's Mechanical Turk.
- psiTurk (contributor)
  `https://github.com/NYUCCL/psiTurk`
  A platform for running psychological experiments on Amazon's Mechanical Turk.
- Gaussian Process and Bayesian Quadrature libraries for Python (primary maintainer)
  `https://github.com/jhamrick/bayesian-quadrature`
  `http://github.com/jhamrick/gaussian_processes`
  While other Python implementations of Gaussian processes exist, this library is specifically designed to expose the underlying math (e.g., log-likelihoods, derivatives of the log-likelihood, etc.).