

Joshua S. Rule

Department of Psychology
University of California, Berkeley
2121 Berkeley Way
Berkeley, CA 94704

rule@berkeley.edu
<https://joshrule.com>

Research Interests

Computational cognitive science, conceptual development, mathematical development, probabilistic modeling, program induction, programming language theory, foundations of computation

Academic Positions

- 2020–PRES. University of California, Berkeley
Postdoctoral Scholar
Advisors: Alison Gopnik, Steven T. Piantadosi
- 2013–2020 Massachusetts Institute of Technology
Graduate Student
Advisor: Joshua B. Tenenbaum
- 2010–2013 Georgetown University
Research Assistant & Lab Manager
Advisor: Maximilian Riesenhuber
- 2009 University of Illinois, Urbana-Champaign
Research Assistant
Advisor: Dan Roth

Education

- 2020 Massachusetts Institute of Technology
PhD, Brain & Cognitive Sciences, *Thesis Advisor: Joshua B. Tenenbaum*
- 2009 University of Illinois Urbana-Champaign
BS, Computer Science, *Summa cum Laude*
BA, Philosophy, *Magna cum Laude*

Awards & Honors

- 2016 Angus MacDonald Award for Excellence in Undergraduate Teaching, MIT
- 2015 Glushko Student Travel Award, Cognitive Science Society
- 2014 Graduate Research Fellowship, National Science Foundation
Eugene Stark Graduate Fellowship, MIT
- 2013 Leventhal Graduate Fellowship, MIT
- 2010 University Honors, UIUC, *top 3% of graduating class*

Journal Articles

- Piantadosi, S. T., Muller, D. C. Y., **Rule, J. S.**, Kaushik, K., Gorenstein, M., Leib, E. R., & Sanford, E. (under review). *How cognitive science (probably) figured out concepts.*
- Rule, J. S.**, Goddu, M. K., Chu, J., Pinter, V., Reagan, E. R., Bonawitz, E., Gopnik, A., & Ullman, T. (under review). *Fun isn't easy: Children choose more difficult options when "playing for fun" vs. "trying to win".*

- Rule, J. S., & Piantadosi, S. T.** (under review). *The end of radical concept nativism.*
- Rule, J. S., Piantadosi, S. T., & Tenenbaum, J. B.** (under review). *Efficient learning of symbolic concepts via metaprogram search.*
- Srivastava, A., Rastogi, A., Rao, A., Shoeb, A. A. M., Abid, A., Fisch, A., Brown, A. R., Santoro, A., Gupta, A., Garriga-Alonso, A., Kluska, A., Lewkowycz, A., Agarwal, A., Power, A., Ray, A., Warstadt, A., Kocurek, A. W., Safaya, A., Tazarv, A., ... Wu, Z. (2023). *Beyond the imitation game: Quantifying and extrapolating the capabilities of language models.* *Transactions on Machine Learning Research.*
- Rule, J. S., & Riesenhuber, M.** (2021). *Leveraging prior concept learning improves ability to generalize from few examples in computational models of human object recognition.* *Frontiers in Computational Neuroscience.*
- Rule, J. S., Piantadosi, S. T., & Tenenbaum, J. B.** (2020). *The child as hacker.* *Trends in Cognitive Sciences.*
- Glezer, L. S., Kim, J., **Rule, J.**, Jiang, X., & Riesenhuber, M. (2015). *Adding words to the brain's visual dictionary: Novel word learning selectively sharpens orthographic representations in the VWFA.* *Journal of Neuroscience*, 35(12).

Conference Papers

- Rule, J., Schulz, E., Piantadosi, S. T., & Tenenbaum, J. B.** (2018). *Learning list concepts through program induction.* *Proceedings of the Cognitive Science Society.*
- Rule, J., Dechter, E., & Tenenbaum, J. B.** (2015). *Representing and learning a large system of number concepts with Latent Predicate Networks.* *Proceedings of the Cognitive Science Society.*
- Sammons, M., Vydiswaran, V. G. V., Vieira, T., Johri, N., Chang, M.-W., Goldwasser, D., Srikumar, V., Kundu, G., Tu, Y., Small, K., **Rule, J.**, Do, Q., & Roth, D. (2009). *Relation alignment for textual entailment recognition.* *Proceedings of the Textual Alignment Conference.*

Abstracts & Posters

- Rule, J. S., & Piantadosi, S. T.** (2023). *Algorithmic foundations of mathematical development* [Symposium chair]. *Proceedings of the Mathematical Cognition and Learning Society.*
- Goddu, M. K., **Rule, J. S.**, Bonawitz, E., Gonik, A., & Ullman, T. (2022a). *Fun isn't easy: Children optimize for difficulty when "playing for fun" vs. "playing to win" in a game design task* [Talk and abstract]. *Budapest CEU Conference on Cognitive Development Programs and Abstracts.*
- Goddu, M. K., **Rule, J. S.**, Bonawitz, E., Gonik, A., & Ullman, T. (2022b). *Fun isn't easy: Children optimize for difficulty when "playing for fun" vs. "playing to win" in a game design task* [Poster and abstract]. *Cognitive Development Society Abstract Book.*
- Goddu, M. K., **Rule, J. S.**, Bonawitz, E., Gonik, A., & Ullman, T. (2022c). *Fun isn't easy: Children optimize for difficulty when "playing for fun" vs. "playing to win" in a game design task* [Poster and abstract]. *Society for Research in Child Development's Learning through Play and Imagination: Expanding Perspectives.*
- Rule, J. S., Piantadosi, S. T., & Tenenbaum, J. B.** (2022). *Learning as programming: Efficient search in models of human concept learning* [Talk and abstract]. *Proceedings of the Cognitive Science Society.*
- Rule, J. S., Piantadosi, S. T., & Tenenbaum, J. B.** (2019). *Learning a novel rule-based conceptual system* [Poster and abstract]. *Proceedings of the Cognitive Science Society.*
- Dechter, E., **Rule, J.**, & Tenenbaum, J. B. (2015). *Latent Predicate Networks: Concept learning with probabilistic context-sensitive grammars* [Poster and abstract]. *Proceedings of the AAAI Spring Symposium Series.*
- Dechter, E., **Rule, J.**, & Tenenbaum, J. B. (2014). *Unsupervised learning of probabilistic programs with Latent Predicate Networks* [Poster and abstract]. *Proceedings of the NIPS Workshop on Probabilistic Programming.*
- Glezer, L. S., Kim, J. S., **Rule, J.**, Jiang, X., & Riesenhuber, M. (2013). *Novel word learning selectively sharpens orthographic representations in the VWFA* [Poster and abstract]. *Neuroscience 2013 Abstracts.*

Dissertation

2020 *The child as hacker: Building more human-like models of learning*
Committee: Susan Carey, Steven T. Piantadosi, Laura Schulz (chair), Joshua B. Tenenbaum

Invited Talks

Apr. 2022 *The child as hacker*, UC Berkeley, CogSci C131 guest lecture
Oct. 2021 *The child as hacker*, UC Berkeley, Computational Cognitive Neuroscience Lab
Mar. 2021 *Learning as hacking*, NSF Expeditions: Understanding the world through code, Cognitive science working group
Jan. 2021 *The child as hacker*, MPI Tübingen, Computational Principles of Intelligence Lab
Oct. 2020 *The child as hacker*, UC Berkeley, Institute for Human Development & Developmental Psychology Colloquium
Feb. 2019 *Learning in a flexible language of thought*, UC Berkeley, Computation and Cognition Lab
Jul. 2018 *Learning list concepts through program induction*, Cognitive Science Society, Learning as Program Induction Workshop
May 2018 *Learning structured concepts through program induction*, MIT, Brain and Cognitive Sciences CogLunch
Jul. 2015 *Representing and learning a large system of number concepts with Latent Predicate Networks*, Cognitive Science Society

Reviewing

CogSci, Trends in Cognitive Sciences, IJCAI-ECAI Workshops, Cognition, OpenMind, eLife

Mentoring

2023 – PRES. Justine Krieger (Project Manager)
2022 Li Chenyi (BS), MSCS student at NYU Tandon
2020 – 2021 Shardul Chiplunkar (BS), PhD student at EFPL, Switzerland
2018 – 2019 Nicholas Alvarado (BS), Software Engineer, Google
2017 Benjamin Kaplan (BS), Data, Thrive Capital

Teaching

Fall 2015 9.660 - Computational Cognitive Science
Teaching Assistant with Joshua Tenenbaum, MIT
Fall 2014 9.660 - Computational Cognitive Science
Teaching Assistant with Joshua Tenenbaum, MIT
Spring 2009 CS225 - Data Structures
Teaching Assistant with Cinda Heeren, UIUC
Fall 2008 CS225 - Data Structures
Teaching Assistant with Cinda Heeren, UIUC
Spring 2008 CS225 - Data Structures
Teaching Assistant with Cinda Heeren, UIUC