Felix A. Sosa

Cambridge, MA

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Education

Harvard University *Cambridge, MA*

Ph.D. Cognitive Science *July 2019 - Present*

Department of Psychology

Harvard University *Cambridge, MA*

S.M. Computer Science *July 2019 - Present*

School of Engineering and Applied Sciences

University of Central Florida *Orlando, FL*

B.S. Computer Science with Distinction *Fall 2011 - Spring 2018*

Department of Computer Science & Electrical Engineering

Research & Training Courses

CalTech & MIT *Pasadena, CA*

Neurosymbolic Summer School *Jul 11 - Jul 13 2022*

Universtiy of Oregon *Virtual*

Oregon Programming Languages Summer School *Jun 14 - Jun 26 2021*

CIFAR & Mila *Montréal, Canada*

Deep Learning Reinforcement Learning Summer School *Aug 3 - Aug 7 2020*

MIT & Marine Biological Laboratory *Woods Hole, MA*

Brains, Minds, and Machines Advanced Research Training Course *Aug 8 - Aug 29 2019*

Fellowships & Awards

2022	Harvard Certificate of Distinction and Excellence in Teaching	*Cambridge, MA*
2022	Hodgson Fund Grant	*Cambridge, MA*
2021	Pareto Fellowship	*Miami, FL*
2021	Harvard Innovation Labs Venture Program	*Cambridge, MA*
2021	MIT Sandbox Innovation Fund	*Cambridge, MA*
2020	NSF-MIT I-Corps Spark Program	*Cambridge, MA*
2019	Harvard Travel Award	*Cambridge, MA*
2019	NeurIPS Travel Award	*Vancouver, BC*
2019	Harvard Stimson Award	*Cambridge, MA*
2019	Invited to Sigma Xi Research Honor Society	*Triangle Park, NC*
2019	Society for Philosophy and Psychology Travel Award	*San Diego, CA*
2019	MIT & Marine Biological Laboratory Brains, Minds, and Machines Training Course Fellowship	*Woods Hole, MA*
2019	National Science Foundation Graduate Research Fellowship Honorable Mention	*Alexandria, VA*
2019	Harvard Graduate Prize Fellowship	*Cambridge, MA*
2018	MIT Visiting Student Fellowship in Department of Brain and Cognitive Sciences	*Cambridge, MA*
2017	MIT Center for Brains, Minds, and Machines Summer Research Fellowship	*Cambridge, MA*
2017	UCF Knight of Distinction	*Orlando, FL*
2017	Presenter Award, Psychological and Social Sciences, SACNAS	*Salt Lake City, UT*
2017	NSF LSAMP Scholarship	*Orlando, FL*

Skills

Programming Languages

Python, R, Haskell, JavaScript, Lisp (Scheme), C, C#, CUDA, Shell, SQL, Julia, Gen, Coq

Packages

Python: Numpy, Scipy, Pytorch, Tensorflow **Julia:** Gen, Turing

Computation

Program synthesis, Generative Models, Approximate Bayesian Computation, Evolutionary Computation, Type Theory, Neurosymbolic systems, Neuroevolution, Probabilistic Programming

Hardware Prototyping and Design

Arduino, RedBoard, EagleCAD, PCB Design, Circuit Design, Raspberry Pi

Physics and Game Engines

Pygame, Pymunk, Blender, VGDL

Miscellaneous

Mechanical Turk, PsiTurk, Prolific, jsPsych, Adobe Illustrator

Experience

MIT-IBM Watson AI Lab *Cambridge, MA*

Research Scientist Intern *June 2020/21 - Aug 2020/21*

Advisors: Dan Gutfreund

Computation, Cognition, and Development Lab, Harvard *Cambridge, MA*

Graduate Researcher *July 2019 - Present*

Advisors: Tomer Ullman

Computational Cognitive Neuroscience Lab, Harvard *Cambridge, MA*

Graduate Researcher *July 2019 - Present*

Advisors: Samuel Gershman

Center for Brains, Minds, and Machines, MIT *Cambridge, MA*

Graduate Researcher *July 2019 - Present*

Advisors: Joshua Tenenbaum

Computational Cognitive Neuroscience Lab, Harvard *Cambridge, MA*

Research Assistant *Feb 2017 - July 2019*

Advisors: Samuel Gershman

Computational Cognitive Science Group, MIT *Cambridge, MA*

Research Assistant *Feb 2017 - July 2019*

Advisors: Joshua Tenenbaum

Evolutionary Complexity Lab, University of Central Florida *Cambridge, MA*

Research Assistant *Jan 2016 - May 2018*

Advisors: Kenneth Stanley

DNA Nanotechnology Lab, University of Central Florida *Cambridge, MA*

Research Assistant *Jan 2015 - Nov 2015*

Advisors: Dmitry Kolpashchikov

Working Manuscripts

Sosa, F.A., Stanley, K.O. A Novel Indirect Encoding Scheme for Evolving Arbitrary Neural Networks. (in prep)

Publications

Sosa, F.A. & Ullman, T (2022) Type theory in human-like learning and inference. Workshop on Universal Reasoning Systems at ICML (Beyond Bayes @ ICML).

Coblenz, M. & **Sosa, F.A.** (2022) Using Games to Broaden Audiences for Programming Studies. Workshop on Recruiting Participants for Empirical Software Engineering (RoPES @ ICSE).

Xu, K., Srivastava, A., Gutfreund, D., **Sosa, F.A.**, Ullman, T., Tenenbaum, J.B., & Sutton, C. (2021) A Bayesian-Symbolic Approach to Reasoning and Learning in Intuitive Physics. NeurIPS.

Sosa, F.A., Ullman, T., Gershman, S., Tenenbaum, J.B., & Gerstenberg, T. (2021) Moral Dynamics: Grounding moral judgment in intuitive physics and intuitive psychology. Cognition.

Sosa, F.A.*, Kleiman-Weiner, M.*, Thompson, B., Opheusden, B., Griffiths, T., Gershman, S., Cushman, F. (2020) Downloading Culture.zip: Social Learning by Program Induction. 42nd Annual Meeting of the Cognitive Science Society (CogSci 2020).

Sosa, F.*, Ellis, K.*, Nye, M.*, Pu, Y.*, Tenenbaum, J., Solar-Lezama, A. (2019). Write, Execute, Assess: Program Synthesis with a REPL. 32nd Conference on Neural Information Processing Systems (NeurIPS)

Sosa, F.*, Ellis, K.*, Nye, M.*, Pu, Y.*, Tenenbaum, J., Solar-Lezama, A. (2019). Write, Execute, Assess: Program Synthesis with a REPL. Workshop on Multi-Task and Lifelong Reinforcement Learning at International Conference on Machine Learning (MTLRL @ ICML).

Technical Reports

Sosa, F.A., Stanley, K.O. (2018). DeepHyperNEAT: Evolving the Size and Depth of the Substrate. Evolutionary Complexity Research Reports.

Sosa, F.A.*, Ballard, T.C.*, Patel, H.K.*, Vo A.D.*, Yooseph, Shibu. (2017). Metagenomic Taxonomic Inference (MTI). UCF Electrical Engineering and Computer Science Senior Design Reports.

Presentations

Sosa, F.A., Gershman, S., Ullman, T (2022). Combining mental simulation and abstract reasoning explains people's reaction time in an intuitive physics task. 44th Annual Meeting of the Cognitive Science Society (CogSci 2022).

Sosa, F.A. & Ullman, T (2022). Type theory in human-like learning and inference. Workshop on Universal Reasoning Systems at ICML (Beyond Bayes @ ICML 2022).

Sosa, F.A.*, Ellis, K.*, Nye, M.*, Pu, Y.*, Tenenbaum, J., Solar-Lezama, A. (2019). Write, Execute, Assess: Program Synthesis With a REPL. 32nd Conference on Neural Information Processing Systems (NeruIPS 2019).

Sosa, F.A.*, Kleimen-Weiner, M.*, Gershman, S. & Cushman, F. (2019). Social learning by probabilistic program induction with execution traces. 41st Annual Meeting of the Cognitive Science Society (CogSci 2019).

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2019). Moral Dynamics: Grounding Moral Judgment in Intuitive Physics and Intuitive Psychology. 45th Annual Meeting of the Society for Philosophy and Psychology (SPP 2019).

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2018). Moral Dynamics: A Computational Model of Moral Judgment. 40th Annual Meeting of the Cognitive Science Society (CogSci 2018).

Sosa, F.A., Kleimen-Weiner, M., Levine, S., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2018). Reverse-engineering Social and Moral Intelligence. MIT Quest for Intelligence Launch Poster Session.

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2017). Moral Dynamics: A Computational Model of Moral Judgment. Annual Biomedical Research Conference for Minority Students (ABRCMS 2017).

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2017). Moral Dynamics: A Computational Model of Moral Judgment. Society for the Advancement of Chicanos/Hispanics and Native American in Science (SACNAS 2017).

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2017). Moral Dynamics: A Computational Model of Moral Judgment. Center for Brains, Minds, and Machines Summer Program Showcase.

Sosa, F.A., Gerstenberg, T., Ullman, T., Gershman, S., & Tenenbaum, J.B. (2017). Moral Dynamics: A Computational Model of Moral Judgment. MIT Summer Research Program Showcase.

Sosa, F.A., Ballard, T., Patel, H., Vo, A., & Yooseph, S. (2017). Metagenomic Taxonomic Inference (MTI): Mixture Models for Relative Abundances. UCF Senior Design Showcase for Engineering and Computer Science.

Teaching

MIT Brains, Minds, and Machines Summer Course *Woods Hole, MA*

Teaching Assistant *Summer 2022*

Serving as a TA at MIT's Brains, Minds, and Machines Summer Course.

PSY1: Intro to Psychological Science, Harvard *Cambridge, MA*

Teaching Fellow *Fall 2021*

Served as a teaching assistant for PSY1 under Dan Gilbert.

6.86x: Machine Learning with Python, MIT *Cambridge, MA*

Teaching Assistant *Spring 2020*

Served as a teaching assistant for 6.86x (a course in MIT's Micro-Masters program in Data Science).

9.660/9.66/6.804: Computational Cognitive Science, MIT *Cambridge, MA*

Teaching Assistant *Fall 2019*

Served as a teaching assistant for 9.660/9.66[J]/6.804[J] under Josh Tenenbaum.

Evolution, Computation, and Learning, MIT *Cambridge, MA*

Instructor *Spring IAP 2019*

Designed and taught a course for the 2019 MIT IAP session. Focused on the intersection of evolutionary theory and learning theory as it relates to cognitive science and AI.

Building Machines That Learn and Think Like People, MIT *Cambridge, MA*

Teacher *Fall 2018*

Designed and gave a lecture for MIT's Educational Studies Program Splash! 2018. Lectured 143 high school students on reverse-engineering human intelligence through the study of computational cognitive science, neuroscience, and evolutionary computation.

Memory Wars: Views of Memory from Systems Neuroscience, MIT *Cambridge, MA*

Instructor *Spring IAP 2018*

Designed and taught a course for the 2018 MIT IAP session alongside Dr. Carmen Varela focusing on memory research and experimenting with complementary ways of discussing seminal literature.

Center for Brains, Minds, and Machines Quantitative Methods Workshop, MIT *Cambridge, MA*

Teaching Assistant *Spring 2017*

Invited to teach 80 students from multiple minority-serving universities how to program in python to solve common problems in biology at a week-long workshop at MIT.

Introductory Topics in Artificial Intelligence, UCF *Cambridge, MA*

Instructor *Spring 2016 - Fall 2018*

Founded, designed, and taught a lecture and workshop series at UCF focused on modern topics and methods in artificial intelligence for undergraduate and graduate students. The series is taught every semester with continuing participation and growth from UCF and CBMM.

Invited Talks, Lectures, & Workshops

Simulation and abstraction for efficient reasoning, Harvard *Cambridge, MA*

Talk *Fall 2022*

Spoke on my work on models that compose simulation engines with abstract subroutines to enable more efficient reasoning within the domain of intuitive physics.

Evolutionary Computation for the Science & Engineering of Intelligence, Harvard *Cambridge, MA*

Talk *Spring 2020*

Invited to give a lecture for Harvard's Science of Intelligence. Covered the foundations of evolutionary computation and its implications for computational cognitive science and AI.

Center for Brains, Minds, and Machines Education Workshop, MIT *Wellesley, MA*

Talk *Spring 2018*

Invited to speak about my educational series on AI and machine learning to faculty at MIT, CUNY, Yale, Howard College, Wellesley College, and University of Puerto Rico. Engaged with faculty on potential means of improving pedagogies and initiatives for undergraduates studying cognitive science or artificial intelligence.

Gradient Descent, Backprop, and Deep Learning, UCF *Orlando, FL*

Workshop *Fall 2017*

Invited to give an in-depth workshop on stochastic gradient descent, the implementation of backpropagation, and deep learning at the University of Central Florida's annual hackathon.

Introduction to Evolutionary Computation, MIT *Cambridge, MA*

Lecture *Summer 2017*

Invited by MIT faculty in the Department of Brain and Cognitive Sciences to give an introductory lecture on evolutionary computation. Focused on history of the field and recent developments in neuroevolution.

Introduction to Computational Neuroscience, Melrose Science Center *Orlando, FL*

Lecture *Spring 2016*

Invited by the Orlando Melrose Center to give a lecture to the public on general history and development of computational neuroscience and how the computational perspective might increase our understanding of the brain.

Brain-Computer Interfacing, Orlando Science Center *Orlando, FL*

Talk *Fall 2015*

Invited to speak about the development of brain-computer interfaces (BCIs) and my own work developing non-invasive BCIs to enable persons to control prosthetic devices.

Service & Outreach

Reviewing

Annual Meeting of the Cognitive Science Society (CogSci) *2019, 2020, 2021, 2022*

Organizations

Founder, Science of Intelligence at Harvard *Fall 2019 - Spring 2020*

Member, Mind, Brain, and Behavior (MBB) Graduate Steering Committee at Harvard *Fall 2019 - Spring 2020*

Member, Center for Brains, Minds, and Machines (CBMM) Young Trainee Leadership Council at MIT *Spring 2019 - Present*

Treasurer, Society for the Advancement of Chicanos/Hispanics & Native Americans in Science (SACNAS) at UCF *Spring 2017*

Director, Association for Computing Machinery (ACM) Special Interest Group for Artificial Intelligence at UCF *Spring 2016 - Fall 2018*

Founder & President, Synthetic Biology at UCF *Spring 2015 - Spring 2016*

Mentorship

Mentor, Prospective Ph.D. & RA Event in Psychology at Harvard *Fall 2020*

Mentor, Eureka Seedlings Mentor Program at UCF *Spring 2017 - Fall 2018*

Member, Student Undergraduate Research Program at UCF *Spring 2017 - Fall 2018*

Public Speaking

Guest Educator, Boston Museum of Science Health Fair *2019*

Keynote Speaker, Nerd Nite Orlando *2015, 2016, 2017, 2018*

Keynote Speaker, Orlando Science Center *2016*

Keynote Speaker, Nerd Nite Miami *2016*

Keynote Speaker, Pecha Kucha Orlando *2016*

Keynote Speaker, Orlando Maker Faire *2015*