

Laila C. Johnston

Curriculum Vitae

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Education

2018 – 2023 University of Central Florida (UCF) | Orlando, FL
Bachelor of Science (B.S.) in Mathematics
Minor in Computer Science, Minor in Philosophy

Research Experience

- Summer 2022 **Research Fellow**, MSRP Bio/Neuro, Department of Brain and Cognitive Sciences, *CoCoSci Group*, Massachusetts Institute of Technology
Advisor: Dr. Joshua B. Tenenbaum
- 2021 – 2022 **Visiting Student**, Department of Brain and Cognitive Sciences, *CoCoSci Group*, Massachusetts Institute of Technology
Advisors: Dr. Joshua B. Tenenbaum & Dr. Tobias Gerstenberg
- Building models that capture the compositional and probabilistic nature of concepts, and investigating how these models can form and reason with novel concepts
 - Using WEBPPL to build probabilistic programs and using R for data analysis
 - Started a reading group where every week we read and discuss papers related to concept learning, compositional concepts, conceptual theories, and modeling conceptual representations
- Summer 2021 **Research Fellow**, MSRP Bio/Neuro, Center for Brains, Minds, and Machines, *Computational Cognitive Neuroscience Lab*, Harvard University
Advisor: Dr. Samuel J. Gershman
- Created models of human visual working memory in the domain of human faces
 - Learned and used SCALA to generate faces using the Basel Face Model
 - Designed a change-detection experiment, collected the data, and analyzed the results
- 2020 – 2021 **Researcher**, Carnegie Mellon University
Advisor: Dr. David Danks
- Continued summer research on causal learning by modifying existing data and results
 - Wrote and submitted a research paper to the 43rd Annual Conference of the Cognitive Science Society; read paper reviews and edited paper accordingly
- Summer 2020 **Research Fellow**, Undergraduate Program in Neural Computation, *Center for the Neural Basis of Cognition*, Carnegie Mellon University
Advisor: Dr. David Danks
- Investigated individual human differences in causal learning patterns and how certain causal learning models could best describe the ways individuals make causal inferences
 - Collaborated on developing previously known causal learning models as computational models
 - Created seven novel causal learning models
 - Developed code in PYTHON to find and analyze causal learning models of best fit for a set of experimental data
- 2019 – 2020 **Undergraduate Research Assistant**, *Laboratory for Autonomy-Brain Exchange (LabX)*, University of Central Florida
Advisor: Dr. Ben D. Sawyer
- Assisted in conducting a driving simulation experiment by ensuring informed consent from participants, explaining the procedures of the experiment, and recording data

- Learned the foundations of coding an artificial neural network
- Explored representing and extending the O-Ring Theory of Economic Development as a computational simulation

Publications

Johnston, L.*, Hillman, N.*, Danks, D. (2021). [Individual Differences in Causal Learning](#). *Proceedings of the 43rd Annual Conference of the Cognitive Science Society*.

Presentations

Johnston, L.C., Siegel, M.H., Tenenbaum, J.B., Gerstenberg, T. (2022, October). Reasoning with Compositional Concepts. SACNAS Research Conference. Abstract submitted.

Johnston, L.C., Siegel, M.H., Tenenbaum, J.B., Gerstenberg, T. (2021, September). [Reasoning with Compositional Concepts](#). *MKN McNair Heartland Research Conference*. Oral presentation (15 minutes).

Johnston, L.C., Bates, C.J., Egger, B., Gershman, S.J. (2021, August). [Scaling Models of Visual Working Memory to Natural Images: A Case Study in Human Faces](#). *Center for Brains, Minds, and Machines Summer Research Poster Session*. Poster presentation.

Johnston, L., Hillman, N., Danks, D. (2021, March). [Individual Differences in Causal Learning](#). *UCF Student Scholar Symposium*. Poster presentation.

Johnston, L., Hillman, N., Danks, D. (2020, August). Individual Variation in Causal Learning. *Center for the Neural Basis of Cognition Undergraduate Summer Research Showcase*. [Poster presentation](#). [Video presentation](#).

Awards and Honors

Summer 2022	Massachusetts Institute of Technology Summer Research Fellow (NSF Funded)
Summer 2022	McNair Summer Research Institute Scholarship
2021 – 2022	Visiting Student Fellowship , Department of Brain and Cognitive Sciences, MIT
2018 – 2021	Dean's List (5 Semesters), University of Central Florida
2021	Hispanic Heritage Scholarship Fund of Metro Orlando Scholar
Summer 2021	Massachusetts Institute of Technology Summer Research Fellow (NSF Funded)
Summer 2021	McNair Summer Research Institute Scholarship
2020	Ronald E. McNair Scholar
2020	Carolyn Euliano Endowed Scholarship in Mathematics , University of Central Florida
Summer 2020	Carnegie Mellon University Summer Research Fellow (NIH Funded)
2018	EXCEL Scholar , University of Central Florida
2018	Pegasus Scholar , University of Central Florida
2018	Florida's Bright Futures Academic Scholar
2018	International Baccalaureate Diploma Recipient

Teaching and Mentorship

Jan. 2022	Teaching Assistant & Mentor , <i>Quantitative Methods Workshop</i> , Massachusetts Institute of Technology Supervisor: Dr. Mandana Sassanfar
	<ul style="list-style-type: none"> - Invited to help 80 undergraduate students understand how to solve common problems in biology and neuroscience through writing programs in PYTHON - Spoke to undergraduate students about summer research programs and shared my experiences as a Visiting Student at MIT

- Reviewed statements of purpose, CVs, and other application materials for summer research programs

2020

Undergraduate *EXCEL* Tutor, University of Central Florida

Supervisor: Sarah Evans

- Aided students in UCF's *EXCEL Program* in math and computer science topics
- Guided and supported students on their current and future academic careers

Leadership

2020 – present

Cognitive Sciences Club, University of Central Florida

Presidential Advisor (April 2022 – April 2023)

President (Dec. 2020 – April 2022)

- Schedule and supervise meetings, faculty and graduate student panels, and social events
- Delegate responsibilities to executive team

Secretary (July 2020 – Dec. 2020)

- Documented club meetings, discussions, and club attendance
- Updated members through weekly emails about meetings, events, and opportunities for research and conferences in cognitive science

2020 – present

Artificial Intelligence (AI@UCF), University of Central Florida

Discussions Director (April 2022 – April 2023)

Vice President (April 2021 – April 2022)

- Oversee decisions, activities, event planning and scheduling of club events
- Coordinated a project collaboration with the Institute of Electrical and Electronics Engineers (IEEE) on creating a robot arm that can play chess using machine learning techniques

Coordinator (Feb. 2021 – April 2021)

- Co-planned meetings through discussing topic ideas and attended presentation rehearsals
- Answered questions on coursework, scheduling, and professional development opportunities

2018 – 2020

Member, *Outlanders Club*, University of Central Florida

- Participate in outdoor activities such as hiking, camping, and kayaking
- Spread awareness of the importance of protecting the planet and spending time in nature

2019 – 2020

Secretary, *Collegiate Mathematical Society*, University of Central Florida

- Organized workshops, presentations, and events related to topics in mathematics
- Documented club meetings, discussions, and attendance
- Promoted the club by making flyers, sending emails, and tabling at expos

Invited Talks and Panels

April 2022

Collective Intelligence: Emergence, Swarms, and Cooperation; *Cognitive Sciences Club at UCF (60-minute talk)*

March 2022

Reasoning with Compositional Concepts; *CoCoSci Lab Meeting at MIT (90-minute talk)*

Feb. 2022

Concepts in a Probabilistic Language of Thought (Goodman et al. 2015); *Lead a paper discussion at AI@UCF Discussions Meeting (90 minutes)*

Feb. 2022

Representing Human Thought and Reasoning with Probabilistic Programs; *Cognitive Sciences Club at UCF & AI@UCF (60-minute talk)*

Feb. 2022

Concepts: Representational Structure, Learning, and Reasoning; *Cognitive Sciences Club at UCF (60-minute talk)*

- Oct. 2021 **Undergraduate Research Student Panelist**, *The Undergraduate Research Committee*, San Diego State University
- Spoke about why research is important and why others should get involved in research
 - Gave advice on how to apply and prepare for an undergraduate research experience
- Oct. 2020 **Summer Research Student Panelist**, *The Office of Academic Advancement Programs*, University of Central Florida
- Shared experiences from Carnegie Mellon University's Summer Undergraduate Program in Neural Computation
 - Advised prospective applicants on preparing for summer research programs
 - Discussed the advantages and disadvantages of doing research virtually

Workshops and Conferences

- Feb. 2022 **Attendee**, *Mathematics of Collective Intelligence Workshop*, Institute for Pure and Applied Mathematics, University of California Los Angeles
- Accepted and received full funding to attend this workshop
 - Attended talks on applied category theory, animal intelligence, Bayesian social learning and cooperation, how to model abstract concepts, and institutional intelligence
 - Discussed how to build a mathematical language of intelligence, what intelligence even is (and what collective intelligence is), ethical implications of modeling intelligence, and what it means for agents to be goal maximizers
- Oct. 2021 **Attendee**, *Princeton Prospective Ph.D. Preview (P3) Conference*, Princeton University
- Accepted to attend workshops on the important elements of research, the graduate school application process, CV and resume writing, and professional development
 - Networked with graduate students and learned about life at Princeton
 - Visited the psychology, neuroscience, and computer science departments
- Jan. 2021 **Attendee**, *Quantitative Methods Workshop*, Massachusetts Institute of Technology
Director: Dr. Mandana Sassanfar
- Networked with undergraduate students, graduate students, and professors
 - Attended MATLAB workshops on machine learning, neural spike analysis, analyzing fMRI data using the General Linear Model, and calcium imaging data analysis
 - Learned about and coded different data science techniques such as the k-means algorithm, support vector machine algorithm, peri/post-stimulus time histogram (PSTH), and z-scoring
 - Attended lectures on quantifying genetic variants, computer vision, functional imaging of the human brain, and convolutional neural networks
- Jan. 2019 **Attendee**, *Joint Mathematics Meetings*, Baltimore, MD
- Attended this conference as part of the *Collegiate Mathematical Society* at UCF
 - Networked with professors, post-docs, and graduate and undergraduate students
 - Learned about mathematical origami and created a stellated octahedron
 - Attended lectures on graph theory, differential geometry, coding theory, and topology

Skills

- Programming PYTHON, WEBPPL, R, JAVA, C
Certifications CITI Program Human Subjects Research

Relevant Coursework

- Mathematics Calculus I – III, Ordinary Differential Equations I, Logic and Proof in Mathematics, Linear Algebra, Probability Random Processes and Applications, Mathematical Modeling I, Mathematical

	Foundations of Machine Learning and Artificial Intelligence, Introduction to Graph Theory, Advanced Calculus I, Abstract Algebra I, Introduction to Topology
Comp Sci	Computer Logic and Organization*, Computer Science I, Object Oriented Programming, Computer Science II*
Other	Physics I, Formal Logic I, Philosophy of Love, Philosophy of Mind, Philosophy of Science, Minds and Machines: Philosophy of Cognitive Science, Metaphysics

**To be completed by December 2022*