

# 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

- 2021 – present    **Visiting Student**, Department of Brain and Cognitive Sciences, *CoCoSci Group*, Massachusetts Institute of Technology  
Advisors & Mentors: Dr. Joshua B. Tenenbaum, Dr. Tobias Gerstenberg, Dr. Max H. Siegel
- 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 43<sup>rd</sup> 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 43<sup>rd</sup> Annual Conference of the Cognitive Science Society*.

## Presentations

**Johnston, L.C.**, Siegel, M.H., Gerstenberg, T., Tenenbaum, J.B. (2022, March). Reasoning with Compositional Concepts. *UCF Student Scholar Symposium*. Abstract accepted.

**Johnston, L.C.**, Siegel, M.H., Gerstenberg, T., Tenenbaum, J.B. (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 Variation 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.

## Awards and Honors

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

## Teaching and Mentorship

Jan. 2022	<b>Teaching Assistant &amp; Mentor</b> , <i>Quantitative Methods Workshop</i> , MIT Supervisor: Dr. Mandana Sassanfar <ul style="list-style-type: none"><li>- Invited to help 80 undergraduate students understand how to solve common problems in biology and neuroscience through writing programs in PYTHON</li><li>- Spoke to undergraduate students about summer research programs and shared my experiences being a Visiting Student at MIT</li><li>- Reviewed statements of purpose, CVs, and other application materials for summer research programs</li></ul>
2020	<b>Undergraduate EXCEL Tutor</b> , University of Central Florida Supervisor: Sarah Evans <ul style="list-style-type: none"><li>- Aided students in UCF's <i>EXCEL Program</i> in math and computer science topics</li><li>- Guided and supported students on their current and future academic careers</li></ul>

## Leadership

- 2020 – present **Cognitive Sciences Club**, University of Central Florida  
Advisor: Dr. Luis Favela  
**President** (Dec. 2020 – present)
  - 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 Club**, University of Central Florida  
**Vice President** (April 2021 – present)
  - 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 – present **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

- March 2022 **Reasoning with Compositional Concepts; CoCoSci Lab Meeting at MIT (90 minutes)**
- Feb. 2022 **Concepts in a Probabilistic Language of Thought; AI@UCF Discussions Meeting (90 minutes)**
- Feb. 2022 **Representing Human Thought and Reasoning With Probabilistic Programs; Cognitive Sciences Club at UCF (60 minutes)**
- Feb. 2022 **Concepts: Representational Structure, Learning, and Reasoning; Cognitive Sciences Club at UCF (60 minutes)**
- 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 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, Mathematical Foundations of Machine Learning and Artificial Intelligence, Probability Random Processes and Applications, Advanced Calculus I, Introduction to Topology, Introduction to Graph Theory\*, Mathematical Modeling I\*, Abstract Algebra I\*

Comp Sci      Computer Science I, Object Oriented Programming

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 May 2022*