

Sean Paul Anderson

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Ann Arbor, MI

Education

University of Michigan

Computer Science

M.S., expected Dec 2022

University of Michigan *High Distinction*

Cognitive Science: Computation, with Highest Honors
Minor in Computer Science

B.S., Aug 2020

French Horn Performance, with Highest Honors

B.M., Aug 2020

Research Experience

Cognitive and Data Science Lab

Research Assistant

Sep 2020—Present

Dr. Patrick Shafto

Rutgers Newark, NJ

Dr. Scott Cheng-Hsin Yang, postdoc

For DARPA's Explainable AI (XAI) project, I built experimental interfaces using JavaScript to assay the effectiveness of Bayesian Teaching (Yang, Vong, Sojitra, Folke, & Shafto, 2021) in explaining a pneumothorax classifier's performance to radiologists.

I also analyzed data from DARPA's Artificial Social Intelligence for Successful Teams (ASIST Study 1) project. We investigated how state abstraction impacts Theory-of-Mind inference, using ideal-observer models. In an additional experiment (Study 2), I led the software development of a model of cooperation between teammates. We used Bayesian inference to infer differences in starting knowledge higher than chance, leading to a poster at *CogSci*. I repurposed this model for a new line of experiments more directly investigating Theory-of-Mind inference in maze navigation environments.

Recently, I am working on generating explanations of deep Reinforcement Learning agents with pedagogical reasoning.

The Cognitive Foundations of Social Minds Research Assistant

Jul 2021—Present

Dr. Richard Lewis

Ann Arbor, MI

Dr. Max Kleiman-Weiner

I am prototyping Reinforcement Learning models, currently by developing across Unity/ML-Agents, Ray-RLlib, and OpenAI Gym. We are studying the ecological and evolutionary nature of cooperation and group intentionality across apes and humans. Our computational agents will enable fine-grained analysis of behavior in naturalistic virtual reality environments.

Undergraduate Research Experience

Cognition, Control, and Action Lab

Research Assistant

May 2017—Aug 2020

Dr. Taraz G. Lee

My work focused on the interacting roles of incentives and knowledge in skilled motor performance. After analyzing data from two experiments, I wrote a journal article on explicit knowledge and rewards in sequence tasks with other lab members. Before this project, I assisted a grad student in designing an experiment on attentional focus in athletic performance and implemented tasks for fMRI experiments using PsychoPy. My time in the lab taught me valuable skills in programming, data analysis, technical writing, experimental design, and working on a team.

Generative Linguistics And Music Project

Research Assistant

Sep 2019—Aug 2020

Dr. Somangshu Mukherji

Thesis title: A linguistic model of minimalist syntax composes *tebe poem*

My undergraduate thesis project produced a computational model of Western tonal harmony using Minimalist linguistic theory. There is evidence that the computational structures driving human language and human music are the same (Mukherji, 2014). This could be leveraged to build more successful and interpretable artificial composition systems. I presented my work in a public-facing talk in a data science for artists workshop.

Language and Cognitive Architecture Lab Research Assistant Jun 2019—Sep 2019
Dr. Richard L. Lewis
Dr. Pyeong Whan Cho, postdoc

I assisted Dr. Cho in a computational modeling project investigating sentence comprehension using information theory. In order to generate data for model training and design human experiments, I designed and implemented a tool in Python that efficiently generates sentences from a user-defined Probabilistic Context-Free Grammar (PCFG) and summarizes information theoretic metrics of interest.

Laboratory of Dr. Chandra Sripada Research Assistant Jun 2018—Dec 2018
After proposing an automated pipeline for speech analysis, I was invited to Dr. Sripada's lab to assist with an fMRI study on spontaneous thought and the default-mode network. I used a combination of correlation-subtraction and spectral noise gating to remove fMRI beeps from speech recordings in MATLAB. This reduced the need for time-consuming hand dictation of transcripts.

Music Theory @ MIDAS Project Research Assistant Sep 2018—Dec 2018
Dr. René Rusch
I assisted Professor Rusch in analyzing tonal structures in 19th century German part-song using Voice-Leading-Strands (VLS). My work enabled exciting interdisciplinary work with data science and music theory.

Awards

<i>University of Michigan</i>	Arthur Miller Creative Arts Award 1/9 prizes for exceptional honors theses in liberal arts	April 2021
<i>Weinberg Institute for Cognitive Science University of Michigan</i>	Samuel D. Epstein Award for outstanding honors thesis in theoretical cognitive science	April 2021
<i>University of Michigan</i>	James B. Angell Scholar seven consecutive terms of all A's	Feb 2021
<i>Weinberg Institute for Cognitive Science University of Michigan</i>	Research Spotlight (web)	Jan 2019
<i>University of Michigan</i>	University Honors	2016-2020

Funding

<i>University of Michigan - Rackham William R. and Flora Hewlett Foundation Award</i>	Conference Travel Grant	ICCC '22
<i>Association for Computational Creativity</i>	Student Registration Scholarship	ICCC '22
<i>National Academy of Sciences Arthur M. Sackler Colloquium '19</i>	Student Travel Award	May 2019
<i>Weinberg Institute for Cognitive Science University of Michigan</i>	Conference Travel Grant	CogSci '19 ICCM/MathPsych '19

Conference Travel Grant

NeurIPS 2019

Student Fellowship

Winter 2019

Student Fellowship

Summer 2018

Student Fellowship

Winter 2018

Student Fellowship

Fall 2017

Student Fellowship

Summer 2017

University of Michigan

Regents Merit Scholarship

Sep 2016

Publications

Anderson, S. P., Adkins, T. J., Gary, B. S., & Lee, T. G. (2020). Rewards interact with explicit knowledge to enhance skilled motor performance. *Journal of Neurophysiology*, 123(6), 2476-2490. doi: <https://doi.org/10.1152/jn.00575.2019>

Conference Proceedings

Folke, T., Yang, S. C.-H., Anderson, S., & Shafto, P. (2021, April). Explainable AI for medical imaging: explaining pneumothorax diagnoses with Bayesian teaching. *Proc. SPIE 11746, Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications III* (p. 117462J). International Society for Optics and Photonics. doi: <https://doi.org/10.1117/12.2585967>

Invited Talks

Anderson, S. P. (2021, October). When is machine learning not enough? Capturing common structures across music and language. Presented at “Building equitable ecologies of artificial intelligence and machine learning: A mini-symposium with artists & data scientists,” Data Science and Machine Learning for Artists Workshop. Ann Arbor, Michigan.

Presentations

Anderson, S. P. (2022, June). A proposal for automatic harmony analysis with Minimalist syntax. Presented at the 13th International Conference on Computational Creativity, Doctoral Consortium. Bolzano, Italy.

Yang, S. C.-H., Anderson, S., Wang, P., Rank, C., Folke, T., Shafto, P. (2021, July). Inferring knowledge from behavior in search-and-rescue tasks. Poster presented at the 43rd Annual Conference of the Cognitive Science Society. Vienna, Austria.

Anderson, S. P., Adkins, T. J., Gary, B. S., & Lee, T. G. (2019, July). Explicit cues lead to reward-related enhancements in motor skill performance. Poster presented at the 41st Annual Conference of the Cognitive Science Society. Montréal, Québec, Canada.

Anderson, S. P., Adkins, T. J., Gary, B. S., & Lee, T. G. (2019, March). Explicit cues lead to reward-related enhancements in motor skill performance. Poster presented at the 2019 CogSci Community Undergraduate Cognitive Science Colloquium. Ann Arbor, Michigan.

Anderson, S. P. (2018, October). Studying creativity. Presented during the CogSci Community Weekly Discussion. Ann Arbor, Michigan.

Anderson, S. P., Kamper, D. (2018, April). College admissions: Making the most of high school. Presented at the 3rd Refugees to College Seminar Series at Central Academy. Ann Arbor, Michigan.

Kamper, D., Anderson, S. P. (2018, February). College admissions: An overview for parents. Presented at the 1st Refugees to College Seminar Series at Central Academy. Ann Arbor, Michigan.

Teaching

UARTS 260: Telemann Chorale Project Teaching Assistant Fall 2021
Dr. Somangshu Mukherji
Served as a TA in one of several Faculty Engineering+Arts Student Teams at University of Michigan. Advised a team of 10 undergraduates in developing a computational model (constraint satisfaction) of Baroque chorale structure and part-writing.

Skills

Activities

Programming, Data Analysis, Writing/editing, Experimental design

Tools

Python (pandas, numpy, Matplotlib, seaborn, OpenAI Gym, PsychoPy), C++, JavaScript/HTML (JSPsych), Git, Jupyter, JASP, Adobe Illustrator

Languages

English (native), Spanish (moderately fluent)

Volunteering

<i>NeurIPS 2019</i>	Student Volunteer	Dec 2019
<i>Refugees to College</i>	Vice-Director	Oct 2016–Sep 2018
	Volunteer Case Worker	Oct 2016–Aug 2020

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Please email me for references.