Chelsea Zou

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EDUCATION

Binghamton University Sep 2019- Dec 2023
B.A. Quantitative Neuroscience, *summa cum laude* **3.95/4.00**
B.S. Business, Management Information Systems, *summa cum laude* **3.90/4.00**

RESEARCH EXPERIENCE

California Institute of Technology Summer 2023
Summer Undergraduate Research Fellow (SURF)
Shimojo Lab - Cognitive and Perceptual Neuroscience

- Investigated the role of cross-modal sensory integration on visual processing by examining auditory-induced perceptual filling-in of scotomas under **professor Shinsuke Shimojo**
- Developed audio-visual experiments using Python and wrote custom scripts to integrate the Eyelink 1000 eye-tracker to map participant's scotomas and monitor pupillometry responses in participants
- Analyzed the temporal dynamics of perceptual filling-in using mixed-effects models and visualized scotoma filling-in patterns using heat maps and time-series plots using Python
- Selected for an oral presentation at the 2023 Caltech Summer Undergraduate Research Seminar

NASA - National Aeronautics and Space Administration Fall 2022
Heliophysics Division, Statistics Intern

- Quantified demographical biases in Heliophysics research under **Dr. Arik Posner and Dr. Esayas B. Shume**
- Conducted non-parametric analysis on demographic data and assessed the impacts of panel review scores and proposal funding rates using ordinal regression models
- Received formal invitations from NASA's Science Mission Directorate and Parker Solar Probe to present findings and collaborate with NASA's Minority University Research & Education Project (MUREP)

Learning And Representation in Cognition Lab Fall 2020 - Dec 2023
Undergraduate Researcher, Machine Learning

- Primary: Undergraduate honors thesis for one-shot learning using generative Gaussian Mixture Models (GMMs) and Variational Autoencoders (VAEs) under **Dr. Kenneth J. Kurtz**
- Secondary: Developed a novel evolutionary-inspired genetic algorithm for an ensemble clustering model using Support Vector Machine (SVM) based hyper-sphere receptive fields
- Tertiary: Developed a Bayesian concept learning experiment using Psychopy to investigate the role of Bayesian inference in the categorization of number properties (e.g., even, odd, prime, negative, etc.)

Autonomous Intelligent Robotics Lab Fall 2020 - Dec 2023
Undergraduate Researcher, Human Robot Collaboration

- Developed a novel multi-modal human-robot collaboration (HRC) system integrating augmented reality (AR), eye gaze, and natural language to estimate human intention for decision making under uncertainty tasks under **Dr. Shiqi Zhang**
- Formulated a joint decision policy using a partially observable Markov decision process (POMDP) based on the SARSOP planner algorithm
- Developed the AR environment using Unity 3D Game Engine, implemented a dialogue system using TTS and STT using Google Cloud Speech API, and worked with ROS to integrate system with a UR5e robotic arm for object stacking tasks
- Recipient of the 2022 Undergraduate Summer Fellowship Award sponsored by The Research Foundation for SUNY

Laboratory of Consciousness, Cognition, and Psychopathology Fall 2021 - Dec 2023
Undergraduate Researcher, Psychology

- Researched human creativity by quantifying divergent thinking using a verbal association task (the Divergent Association Task) that measures semantic distance between word embeddings in N= 324 participants under **Dr. Steven Jay Lynn**
- Ran factor analyses to measure the significance of correlations to analyze theoretical relationships between creativity, affect intensity, transliminality, and cognitive and personality variables

RESEARCH PAPERS, POSTERS, & TALKS

International Conference on Machine Learning (ICML 2024) (*Under Review*)
Zou, C., Kurtz, K. (2023). Abstracted Gaussian Prototypes for One-Shot Concept Learning.

ACM/IEEE International Conference on Human-Robot Interaction LBR (HRI 2024) (*Accepted*)
Zou, C., Chandan, K., Ding, Y., & Zhang, S. (2023). A Decision Framework for AR, Dialogue and Eye Gaze to Enhance Human-Robot Collaboration.

Cognitive Science Society Annual Conference (CogSci 2024) *(Poster) (Submitted*)
Zou, C., Kurtz, K. (2023). Abstracted Gaussian Prototypes for One-Shot Concept Learning.

IEEE International Conference on Robotics and Automation (ICRA 2023) CoPerception Workshop (*Accepted*)
Zou, C., Chandan, K., Ding, Y., & Zhang, S. (2023). ARDIE: AR, Dialogue, and Eye Gaze Policies for Human-Robot Collaboration.

Caltech Summer Undergraduate Research 2023 Oral Presentation (*Talk*)
Zou, C. (2023). Cross-modal Multisensory Integration in Visual Filling-in. "*Sensory Deception: Unveiling Audio-Visual Illusions within Blind Spots"*.

Association for Psychological Science (APS 2023) Annual Convention (*Poster*)
Zou, C., Kobryn, S. (2023). Assessing Creativity: Transliminality, Personality, Affect, and Psychopathology.

NASA Science Mission Directorate Invited Presentation 2022 (*Talk*)
Salim, A., **Zou, C**. (2022). Quantifying Bias in Heliophysics Research Review and Selection Process

National Honors Society in Psychology Annual Symposium 2022 (*Poster*)
Zou, C., W, Xinni. (2022). An Evolutionary Partitioning Approach for an Ensemble Classifier.

WORK EXPERIENCE

Dow Jones Summer 2022
Summer Intern
- Designed and implemented automated workflows and conducted trend analysis to measure the impact of Barron's Group and MarketWatch's media coverage on financial markets

MAX-VIM (Startup) Spring 2019 - Fall 2021
Founder
- Worked with an international manufacturer to design and produce 12.8V/200Ah and 48V/100Ah Lithium-ion phosphate ($LiFePO_4$) batteries for efficient and compact solar-energy storage

ADDITIONAL INFORMATION

Awards & Honors: Individualized Major Program with Highest Honors (IMP Honors), Summer 2022 Autonomous Intelligent Robotics Undergraduate Fellowship Award (Sponsored by The Research Foundation for SUNY), National Honors Society in Psychology (Psi Chi), 2022 Binghamton Undergraduate Conference Presentation Grant (UCPF) Recipient, Summa Cum Laude Latin Honors

Research Questions:
- What are the symbolic and computational underpinnings of learning, inference, and reasoning?
- How can we disentangle complex and high-dimensional black-box models in AI to improve interpretability and explainability?
- How can we integrate more casually informed mathematical frameworks into ML architectures?

Interests & Hobbies: Dynamical systems, chaos theory, neurotechnology, theoretical neuroscience, philosophy of mind, creative writing, startups, poker, classical piano (impressionism), melodic trance, kitesurfing, skiing, snowboarding, paragliding, and currently learning speedriding (skiing with a paraglide)!