Zirui (Ray) Chen

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EDUCATION

Johns Hopkins University   2023-presnet
Ph.D. Cognitive Science
Advisor: Michael F. Bonner

Johns Hopkins University   2022-2023
M.A. Cognitive Science
Advisor: Michael F. Bonner

Emory University   2018-2022
B.S. Neuroscience & Behavioral Biology, B.A. Computer Science (GPA=3.94)
Summa cum laude
Honors thesis: The global color of a scene is relevant for human visual scene discrimination.
Advisor: Daniel D. Dilks

PUBLICATIONS

Cheng, A., **Chen, Z.**, & Dilks, D. D. (2023). A stimulus-driven approach reveals vertical luminance
gradient as a stimulus feature that drives human cortical scene selectivity. *NeuroImage*, 269,
119935.

PRESENTATIONS

Chen, Z., & Bonner, M.F. (2023), Canonical Dimensions of Neural Visual Representation. Talk:
Annual Meeting of the Vision Sciences Society 2022.
Elmoznino, E., **Chen, Z.**, & Bonner, M.F. (2022), Latent dimensionality scales with the
performance of deep learning models of visual cortex. Poster: *Conference of Cognitive
Computational Neuroscience 2022.*
Chen, Z., Cheng, A., & Dilks, D.D. (2021), Uncovering the visual features relevant to human visual
scene discrimination. Poster: *Summer Undergraduate Research Experience (SURE) Virtual
Symposium 2021.*
Chen, Z., Cheng, A., & Dilks, D.D. (2020), Characterizing an image property relevant for human
cortical scene processing. Talk: *Summer Undergraduate Research Experience (SURE) Virtual
Symposium 2020.*

AWARDS

- Summer Undergraduate Research Experience Award (~$3000)   2020

RESEARCH EXPERIENCE

Graduate Researcher, Bonner Lab, Johns Hopkins University   2022–present
Advisor: Michael F. Bonner

Canonical strength of visual representations
Characterized the shared "canonical" representations among artificial neural networks and studied how the alignment of visual features to such representations reflects their likelihood of being represented in visual cortex.
- Analysis via dimensionality reduction and regression methods.

Research Assistant, Dilks Lab, Emory University   2019–2022
Advisor: Daniel D. Dilks

Global color as a cue for scene discrimination
Investigated the association between the global color information of natural scene stimuli and both the behavioral scene discrimination pattern and fMRI voxel-wise pattern in the scene-selective cortical region, parahippocampal place area (PPA).
- Hypothesis formulation, behavioral and fMRI experiment design and data collection, fMRI data preprocessing, representational similarity analysis.

Diagnostic image features for cortical scene selectivity
Analyzed the effect of vertical luminance gradient of images on neural responses to scenes in human scene-selective regions such as PPA.
- Stimulus design, image processing, univariate analysis of fMRI data.

Research Trainee, Psychology in the British Isles Program, Emory University   2019
Advisors: Irwin D. Waldman, Stephan Hamann

Demographic effects on cognitive development
Investigated how the development of executive functions in elementary school children is influenced by demographic factors.
- Behavioral data collection (e.g., Stroop test), statistical analysis.

RELEVANT COURSEWORK

Computer Science
Analysis of Algorithms; Artificial Intelligence; Computational Linguistics; Data Structure and Algorithms; Machine Learning.

Mathematics
Differential Equations; Linear Algebra; Linear Optimization; Nonlinear Optimization; Multivariable Calculus; Numerical Analysis; Real Analysis.

Psychology/Neuroscience/Cognitive Science
Bayesian Inference; Behavioral Neuroscience; Brain Imaging; Cognition; Neurobiology; Neuroeconomics: Decision Making; Perspectives in Neuroscience & Behavior; Predictive Modeling; Theory and Modeling of Information Coding in Neural Activity.

SKILLS

Programming languages
Python, MATLAB, R, Java, Bash, C, JavaScript, HTML/CSS, Swift.

Methods and tools
Machine learning (Sklearn), deep learning (PyTorch, TensorFlow), fMRI pre-processing (FSL, fMRIPrep), image processing, experiment interface design (Psychtoolbox, MTurk).

TEACHING EXPERIENCE

Teaching Assistant, Emory University   2021
Course: Non-Linear Optimization
Professor: Elizabeth Newman

Teaching Assistant, Emory University   2021
Course: Computer Architecture/Machine Level Programming
Professor: Shun Cheung

PROGRAMMING PROJECTS

TenTOS, Emory University   2021
Course project for Computational Linguistics
- Developed a website to scrape Terms of Service (TOS) from URLs and examine if the TOS contains phrases or sentences that potentially harm users' rights to privacy or property, etc. using fine-tuned transformer models.

Pheme, Emory University   2021
Course project for Computer Science Practicum
- Developed an iOS app that sends messages via a decentralized relay network of Bluetooth communication in the absence of internet or cell service.