Gabriel Sarch

gsarch@andrew.cmu.edu
www.gabesarch.me

Education

Carnegie Mellon University, Pittsburgh, USA
Ph.D. in Machine Learning and Neural Computation   2020 – present
    Advisors: Dr. Katerina Fragkiadaki and Dr. Michael Tarr

Carnegie Mellon University, Pittsburgh, USA
Master of Science in Machine Learning   2023

University of Rochester, Rochester, USA
Bachelor of Science in Biomedical Engineering, *magna cum laude*   2016 – 2020

Publications

Sarch, G., Wu, Y., Tarr, M., & Fragkiadaki, K. (2023). Open-Ended Instructable Embodied Agents with Memory-Augmented Large Language Models. *Findings of the Association for Computational Linguistics: EMNLP 2023.* [Project Page]

Sarch, G., Tarr, M., Wehbe, L., & Fragkiadaki, K. (2023). Brain Dissection: fMRI-trained Networks Reveal Spatial Selectivity in the Processing of Natural Images. *37th Advances in Neural Information Processing Systems (NeurIPS) 2023.* [Project Page]

Sarch, G., Tung, H., Wang, A., Prince, J., Tarr, M. (2023). 3D View Prediction Models of the Dorsal Visual Stream. *Conference on Cognitive Computational Neuroscience (CCN) 2023.*

Yates, J., Coop, S., **Sarch, G.**, Wu, R., Butts, D., Rucci, M., Mitchell, J. (2023). Beyond Fixation: detailed characterization of neural selectivity in free-viewing primates. *Nature Communications.* 2023.

Sarch, G., Fang, Z., Harley, A. W., Schydlo, P., Tarr, M., Gupta, S., & Fragkiadaki, K. (2022). TIDEE: Tidying Up Novel Rooms using Visuo-Semantic Common Sense Priors. *European Conference on Computer Vision (ECCV) 2022.* [Project Page]

Sarch, G.*, Fang, Z.*, Jain, A.*, Harley, A. W., & Fragkiadaki, K. (2021). Move to See Better: Self-Improving Embodied Object Detection. *British Machine Vision Conference (BMVC) 2021. (*equal contribution).* [Project Page]

Presentations

Amy Bucklaew, Coop SH, **Sarch GH**, Mitchell JF (2023). Laminar and cell type distinctions for pre-saccadic attention in marmoset MT/MTC. Journal of Vision 2023. Poster.

Coop SH, **Sarch GH**, Bucklaew A, Yates JL, Mitchell JF (2022). Laminar Organization of Pre-Saccadic Attention in Marmoset Area MT. Journal of Vision 2022. Poster.

Coop SH, **Sarch GH**, Bucklaew A, Yates JL, Mitchell JF (2022). Laminar Organization of Pre-Saccadic Attention in Marmoset Area MT. Journal of Vision 2022. Poster.

Sarch GH, Yates JL, Coop SH, Mitchell JF (2019) Identification of cortical layers from current source density (CSD) analysis and two local field potential (LFP) band-power measures in marmoset V1. Society for Neuroscience. Chicago, IL, 2019. Poster.

Sarch GH, Pavindra PH, Smith JC (2018) Computational Modeling of Respiratory Neural Circuits. NIH Bethesda, MD, 2018.

Invited Talks

Vision Sciences Society symposium invited speaker "Using brain-to-img reconstruction and img-to-brain encoding models to investigate visual mechanisms and individual differences." VSS 2024. St. Pete Beach, Florida.   2024

brAIn Seminar talk titled "Spatial Processing during Natural Scene Viewing: Insights from Artificial Neural Network Modeling." Carnegie Mellon University.   2023

Invited Lecture Biologically Intelligent Exploration (CMU 85-435)
"How do you use evidence to make a decision?" Carnegie Mellon University.   2023

Selected Grants & Awards

National Science Foundation Graduate Research Fellowship   2020 – 2025
Funding three years of interdisciplinary graduate research in machine learning and neuroscience

Runner-Up in Amazon Alexa Prize SimBot Embodied Dialogue Challenge   2022
Developed multimodal instruction following agent as a member of CMU Symbiote Team

2020 Biomedical Engineering Outstanding Award for Academic Excellence   2022
Awarded to the top student in the Biomedical Engineering class for academic excellence

Tau Beta Pi Engineering Honor Society   2020
Awarded to undergraduate students in the top eighth of their engineering class

University of Rochester Center for Visual Science (CVS) Research Fellowship   2019
Funded neural recording and analysis research at the Active Vision Laboratory

National Institutes of Health Ruth L. Kirschstein National Research Service Award   2019
Funded neural modeling research at the Computational Neurobiology Laboratory, NIH

Experience

Carnegie Mellon University   Aug 2020 - present
PIs: Katerina Fragkiadaki and Michael Tarr
PhD Student
- Research topics: household robotics, embodied learning & planning, spatial perception
- Mentoring undergraduate and master's students
- Serving on the MLD PhD Peers Committee to help guide new MLD PhD students

Active Vision Laboratory, University of Rochester   Aug 2018 - Aug 2020
PI: Prof. Jude Mitchell
Research Assistant
- Studied cortical laminar differences in pre-saccadic attention
- Led primate electrophysiology recordings and neural data analysis

Neurobiology Laboratory, National Institutes of Health (NIH)   May 2018 - Aug 2018
     PI: Dr. Jeffrey Smith
     Internship Program
- Researched computational models of the pre-Bötzinger respiratory generator

Cognitive Neurophysiology Laboratory, University of Rochester   Jan 2018 - May 2018
     PI: Prof. Edmund Lalor
     Research Assistant
- Researched contextualized semantics for speech comprehension decoding in EEG

Skills

Computer Languages and Other Tools: Python, Matlab, Unix shell/bash, Git, common cluster computing tools, HTML/CSS

ML/AI Tools & Simulation Environments: Pytorch, TensorFlow, PyCortex, Ai2thor, Habitat AI, Carla, Open AI Gym

General laboratory methods: reinforcement learning, representation learning, computer vision, language model prompting, multiple view geometry, search, probabilistic inference, statistical machine learning, density estimation, learning theory, signal processing, electrophysiology

Relevant coursework: Deep Reinforcement Learning (CMU 10-703), Advanced Machine Learning (CMU 10-715 & 10-716), Intermediate Statistics (CMU 36-705), Graduate Artificial Intelligence (CMU 15-780), Statistical Models of the Brain (CMU 36-759), Cognitive Neuroscience (CMU 85-0765 & 03-763)

Teaching Assistantships: Deep Reinforcement Learning (CMU 10-403), Biologically Intelligent Exploration (CMU 85-435)