

# Gabriel Sarch

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## 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.**, We, Y., Tarr, M., & Fragkiadaki, K. (2023). HELPER: Instructable and Personalizable Embodied Agents with Memory-Augmented Context-Dependent LLM Prompting. *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](#). 37<sup>th</sup> *Advances in Neural Information Processing Systems 2023*. [\[Project Page\]](#)

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

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 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

**brAI**n 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 (Machine Learning Dept.) and Michael Tarr (Psychology Dept.)  
*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
- Assisted with primate electrophysiology recordings and neural data analysis

**Neurobiology Laboratory**, National Institutes of Health

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)