Gabriel Sarch

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Current Research

Embodied intelligence

- Developing continually learning, multi-task embodied agents that make use of multi-modal information for effective navigation and manipulation in 3D scenes.
- Improving 2D and 3D perception through active learning, interaction, and self-supervised learning.

Probing the internals of deep neural network

- How does embodied learning shape visual representations in the brain? Examining neural predictivity of models that incorporate embodied learning objectives.
- What role does self-supervision play in primate visual learning? Examining neural predictivity of deep learning networks with differing self-supervised training objectives.

Education

Carnegie Mellon University, Pittsburgh, USA 2020 – exp. 2025
Neuroscience Institute & Machine Learning Department
Ph.D. Student, Machine Learning and Neural Computation Joint Ph.D. Program
- Advisors: Dr. Katerina Fragkiadaki and Dr. Michael Tarr

University of Rochester, Rochester, USA 2016-2020
Department of Biomedical Engineering
B.S., Biomedical engineering, *magna cum laude*

Grants & Awards

2nd Place Amazon Alexa Prize SimBot Embodied Dialogue Challenge (TEACh)	2022
Amazon Alexa Prize SimBot Challenge Selected Team	2022
National Science Foundation Graduate Research Fellowship (NSF-GRFP)	2020
Tau Beta Pi Engineering Honor Society	2020
2020 Outstanding Award for Academic Excellence in Biomedical Engineering	2020
2019 Outstanding Award for Academic Excellence in Biomedical Engineering	2019
University of Rochester Center for Visual Science (CVS) Research Fellowship	2019
National Institutes of Health Ruth L. Kirschstein National Research Service Award	2019
University of Rochester Dean's Scholarship	2016-2020

Experience

Carnegie Mellon University Aug 2020 – present
PIs: Dr. Katerina Fragkiadaki and Dr. Michael Tarr
PhD Student
- See Current Research above
- Serving on the MLD PhD Peers Committee to help guide new MLD 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

Computational Neurobiology Laboratory, National Institutes of Health May 2018 – Aug 2018
PI: Dr. Jeffrey Smith
Internship Program

- Researched computational models of the pre-Bötzinger respiratory rhythm 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

Publications

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

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: https://tidee-agent.github.io/

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: https://ayushjain1144.github.io/SeeingByMoving/

Posters

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 Marmoset Symposium 2019. Chicago, IL, 2019. Poster.

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

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, Tensorboard, PyCortex, Ai2thor, Habitat, Carla

General laboratory methods: self-supervised learning, reinforcement learning, multiple view geometry, convex optimization, 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)