Zachary S. Siegel

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EDUCATION

Princeton University, Princeton, New Jersey, USA — Aug 2021 – May 2025
B.S.E. in Computer Science, Minor in Philosophy (3.9/4.0)

PUBLICATIONS

[1] **CORE-Bench: Fostering the Credibility of Published Research Through a Computational Reproducibility Agent Benchmark**
Zachary S. Siegel, Sayash Kapoor, Nitya Nagdir, Benedikt Stroebl, Arvind Narayanan
Preprint (2024)

[2] **BRIGHT: A Realistic and Challenging Benchmark for Reasoning-Intensive Retrieval**
Hongjin Su, Howard Yen, Mengzhou Xia, Weijia Shi, Niklas Muennighoff, Han-yu Wang, Haisu Liu, Quan Shi, **Zachary S. Siegel**, Michael Tang, Ruoxi Sun, Jinsung Yoon, Sercan O Arik, Danqi Chen, Tao Yu
Preprint (2024)

[3] **AI Agents That Matter**
Sayash Kapoor, Benedikt Stroebl, **Zachary S. Siegel**, Nitya Nadgir, Arvind Narayanan
Preprint (2024)

[4] **Language Guided Operator Learning for Goal Inference**
Zachary S. Siegel, Jiayuan Mao, Nishanth Kumar, Tianmin Shu, Jacob Andreas
Workshop on Learning Effective Abstractions for Planning @ CORL (2024)

[5] **Learning Grounded Action Abstractions from Language**
Lionel Wong, Jiayuan Mao, Pratyusha Sharma, **Zachary S. Siegel**, Jiahai Feng, Noa Korneev, Joshua B Tenenbaum, Jacob Andreas
The Twelfth International Conference on Learning Representations (ICLR 2024)

[6] **Characterizing the Implicit Bias of Regularized SGD in Rank Minimization**
Tomer Galanti, **Zachary S. Siegel**, Aparna Gupte, Tomaso Poggio
Workshop on Mathematics of Machine Learning @ NeurIPS (2024)

[7] **Superimposing height-controllable and animated flood surfaces into street-level photographs for risk communication**
Zachary S. Siegel, Scott A Kulp
Weather and Climate Extremes, Volume 32 (2021)

RESEARCH EXPERIENCE

Senior Thesis — May 2024 – Present
Department of Computer Science, Princeton University
Modeling Open-Ended Goal Inference. I am working with Professors Tom Griffiths and Jacob Andreas to model how people infer the goals of others in open-ended goal spaces. We hypothesize that people use a learned transition model of the environment to assist with predicting goals, which we will validate by creating a new domain, running human experiments, and building a computational model.

Undergraduate Researcher — Nov 2023 – Present
Center for Information Technology Policy, Princeton University
Building and Evaluating Agent Benchmarks. I am working with Professor Arvind Narayanan to evaluate and build agent benchmarks for automating aspects of scientific research. I released CORE-Bench, which evaluates how agents can computationally reproduce existing scientific papers, and I am building a new benchmark to evaluate how agents can implement research ideas in code given a high-level description.

Visiting Undergraduate Researcher — May 2023 – Sep 2023
Language & Intelligence Group, MIT
Learning Grounded Abstractions from Language. I worked with Professors Jacob Andreas and Josh Tenenbaum to use large language models (LLMs) to learn operators for task and motion planning systems (TAMP). I implemented policy learning approaches for low-level motion planning in the Alfred domain and integrated the pipeline of using LLMs for TAMP.

Undergraduate Researcher — Apr 2024 – May 2024
Department of Computer Science, Princeton University

Building Retrieval Benchmarks. I worked with Professor Danqi Chen to build a retrieval benchmark for tasks where semantic similarity is not sufficient for matching queries to documents. I helped select a domain and developed a pipeline, from the Art of Problem Solving wiki, to scrape questions for use in the retrieval benchmark.

Junior Independent Work Sep 2023 – May 2024

Department of Computer Science, Princeton University

Training LLMs on Podcasts. I worked with Professor Danqi Chen to use podcasts for improving the conversational abilities of LLMs. I found podcast data sources, developed methods to transcribe hundreds of thousands of hours of audio in parallel, fine-tuned LLaMA-2-7B, and compared performance to base models. Additionally, I investigated the quality of podcast audio as a training source.

Visiting Undergraduate Researcher May 2022 – Aug 2022

Center for Brains, Minds, and Machines, MIT

Investigating the Low-Rank Bias of Neural Networks. I worked with Professors Tomer Galanti and Tomaso Poggio to investigate why the ranks of weight matrices of neural networks are minimized during stochastic gradient descent. I helped develop a theoretical bound on the rank and ran extensive experiments with different network architectures to investigate the rank and singular values of weight matrices.

Summer Intern May 2019 – Jun 2021

Climate Central

Visualizing Flood Surges for Risk Communication. I worked with Dr. Scott Kulp to build a system that superimposes water surfaces on street view images to communicate the risk of flood surge risk to vulnerable communities. From LIDAR depth maps and RGB images, the method uses depth completion techniques to generate a 3D model of the environment, and then superimposes a flood surface using Blender. The system is now being deployed across the country to communicate risk.

SELECTED COURSES

- MAT 203: Advanced Vector Calculus — Fall 2021
- MAT 204: Advanced Linear Algebra — Spring 2022
- ORF 309: Probability and Stochastic Systems — Fall 2022
- PSY 255: Cognitive Psychology — Fall 2022
- COS 484: Natural Language Processing — Spring 2023
- ORF 307: Optimization — Spring 2023
- COS 597Q: AI Safety and Alignment — Fall 2023
- COS 345: Robotics — Fall 2024

TEACHING EXPERIENCE

- COS 226 (Algorithms) Precept Assistant — Spring 2022
- MAT 203 (Multivariable Calculus) Course Assistant — Fall 2022
- MAT 204 (Linear Algebra) Course Assistant — Spring 2023
- COS 484 (Natural Language Processing) Course Assistant and Grader — Spring 2024
- COS 426 (Computer Graphics) Course Assistant — Fall 2024

CAMPUS ACTIVITIES

Service and Outreach

- Center for Jewish Life – *VP of Shabbat, Education, and Holiday Planning* — Jan 2022 – Jan 2024
- Splash Princeton – *Board Member* — Sep 2022 – May 2023
- The American Whig-Cliosophic Society – *Deputy President of the Senate* — Sep 2022 – May 2023

[*CV compiled on 2024-11-08*]