NEELAY VELINGKER

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EDUCATION

University of Pennsylvania, Ph.D. Computer and Information Science (Spring 2024 - Present)
- Focus: Foundation models for program synthesis, neurosymbolic reasoning, and multimodal learning.
- Fellowships: Amazon Web Services Fellowship for Trustworthy AI
- Highlighted Coursework: Large Language Models (created the course), Special Topics in Natural Language Processing, Special Topics in Deep Learning, Accelerating Research with Generative AI, AI for Health, Compilers, Machine Learning

University of California, Berkeley, B.S. Electrical Engineering & Computer Science (2019 - 2022)
- Highlighted Coursework: Machine Learning, Artificial Intelligence, Convex Optimization, Operating Systems and System Programming, Formal Methods, Computer Security, Algorithms and Intractable Problems

SKILLS

Programming Languages: Python, C, Java, JavaScript, Rust, Scallop, Go, OCaml, X86 Assembly, RISC-V Assembly, XML
Databases: PostgreSQL, MongoDB, AWS RDS
Libraries: OpenCV, PyTorch, bitsandbytes, transformers, accelerate, ROS, gym, sklearn, cvxpy, pandas, gdb
Operating Systems: Windows, macOS, Linux (Ubuntu, WSL), FreeBSD

WORK EXPERIENCE

Ph.D. Student, ASSET Lab, University of Pennsylvania (June 2022 - Present)
- KardiaLLM (Current): Training LLMs to understand and reason over the ECG signal modality via late latent fusion
- PIPS (**NeurIPS '25**): Improving zero-shot per-example program synthesis with LLMs via iterative refinement
- ESCA (**NeurIPS '25 Spotlight**): Improving VLM agents with a new foundation model for spatio-temporal scene graphs
- ISED (**NeurIPS '24**): blending neural networks with black-box APIs through sampling-based gradient estimation
- DISCRET (**ICML '24 Spotlight**): an RL-based program synthesizer for explainable treatment effect estimation
- Viera (**AAAI '24**): a new programming language designed for neuro-symbolic reasoning with LLMs

Undergraduate Research Intern, Model Predictive Control Laboratory, UC Berkeley (September 2021 – May 2022)
- Applying deep learning algorithms to imitate human decision-making in mixed-autonomy driving environments
- Developing control algorithms for self-driving vehicles based on imitation learning and vehicle-to-vehicle communication

Robotics and Machine Learning Intern, Tortuga AgTech (May 2021 – August 2021)
- Designed and implemented deep reinforcement learning models for semi-autonomous robot decision making
- Finetuned convolutional neural network models on the robots for improved arm-movement accuracy
- Architected and project-managed the development of a Python library, from scratch, designed to retrieve and visualize data from fleet robots in real time, powering nearly all current and planned company data tools

Quantum Software Engineering Intern (Part-Time), QuSecure (March 2021 – May 2021)
- Building out the quantum key management service, a C-based networking system that serves as the backbone for nearly all other quantum software products in the cybersecurity suite
- rewriting, reorganizing, and debugging past software code to be more modular and functional

Software Engineering Intern, Lockheed Martin (June 2018 – August 2018)
- Full-stack development on an internal training platform used by thousands of employees
- Led agile planning sessions for sub-team and continuously searched for ways to engage new and current users

PUBLICATIONS

Neelay Velingker*, Adam Stein*, Mayur Naik, Eric Wong. 2025. Once Upon an Input: Reasoning via Per-Instance Program Synthesis. *Advances in Neural Information Processing Systems, 2025.*

Jiani Huang, Mayank Keoliya, Matthew Kuo, **Neelay Velingker**, Amish Sethi, JungHo Jung, Ziyang Li, Ser Nam Lim, Mayur Naik. 2024. ESCA: Contextualizing Embodied Agents via Scene-Graph Generation. *Advances in Neural Information Processing Systems, 2025.*

Alaia Solko-Breslin, Ziyang Li, Seewon Choi, **Neelay Velingker**, Rajeev Alur, Mayur Naik, Eric Wong. 2024. Beyond Differentiability: Neurosymbolic Learning with Black-Box Programs. *Advances in Neural Information Processing Systems, 2024.*

Wu, Y., Keoliya, M., Chen, K., **Velingker, N**., Li, Z., Getzen, E. J., … Wong, E. (2024). DISCRET: Synthesizing Faithful Explanations For Treatment Effect Estimation. *Forty-First International Conference on Machine Learning.*

Bergquist, Timothy et al. "Crowd-sourced machine learning prediction of long COVID using data from the National COVID Cohort Collaborative." *EBioMedicine 108 (2024).*

Ziyang Li, Jiani Huang, Jason Liu, Felix Zhu, Eric Zhao, William Dodds, **Neelay Velingker,** Rajeev Alur, Mayur Naik. 2024. Relational Programming with Foundation Models. In Conference on *Association for the Advancement of Artificial Intelligence (AAAI).*