Skye Gunasekaran

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Education

University of California, Santa Cruz — Santa Cruz, CA
Bachelor of Science in Computer Science; ***GPA: 3.63*** — *Sep. 2022 – Jun. 2026*

Awards: Goldwater Nominee, NSF REU, Mantey Leadership Award, Koret Scholarship x2, Deans Award

Selected Publications

A. Kembay, **S. Gunasekaran**, R.-J. Zhu, Y. Zhang, and J. K. Eshraghian, "Efficient knowledge distillation via salient feature masking," APL Mach. Learn. 4, 016104 (2026).

S. Gunasekaran, A. Kembay, H. Ladret, R. J. Zhu, L. Perrinet, O. Kavehei, and J. Eshraghian, "A predictive approach to enhance time-series forecasting," Nat. Commun. **16**, 8645 (2025).

- **Impact**: 6 citations, 29K accesses, coverage in 6 news outlets, 97th Percentile of Nature-tracked Articles.

R. J. Zhu, **S. Gunasekaran**, and J. Eshraghian, "Bridging the gap between artificial intelligence and natural intelligence," Nat. Comput. Sci. **4**, 559 (2024).

S. Gunasekaran, J. Eshraghian, R. Zhu, and Z. Kuncic, "Knowledge distillation through time for future event prediction," in *The Second Tiny Papers Track at ICLR* (2024).

Experience

Neuromorphic Computing Group — Jan. 2023 – Present
Undergraduate Researcher (Advisor: Prof. Jason Eshraghian) — *UC Santa Cruz*

Focus I: Scalable & Efficient LLM Infrastructure

- **Engineered a pretraining pipeline** for Llama-2 on TB-scale datasets (FineWeb), utilizing custom tokenization, sharded storage, and Distributed Data Parallel (DDP) to maximize I/O efficiency and training velocity.
- **Optimized large-scale model convergence** via Global Batching and custom LR scheduling, validating model quality through zero-shot benchmarks (MMLU, ARC, HellaSwag) using LM-Eval-Harness.

Focus II: Transformer Optimizations At Scale

- Introduced "Value Residual" connections to **resolve performance degradation in Multi-Query Attention (MQA)**, a simple optimization that allows models to maintain high-speed inference without sacrificing accuracy.
- **Established a new pareto-frontier** for 760M-parameter models, achieving **60% better loss reduction** than standard industry architectures while preserving the superior memory and processing speed.

Focus III: Biologically Inspired AI

- **Developed "Future Guided Learning" (FGL)**, a predictive coding framework that transfers future uncertainty distributions into causal student models to improve time-series forecasting. FGL achieves a **44.8% increase in AUC-ROC** for seizure prediction and a **23% MSE reduction** in chaotic systems.
- Co-developed "Salient Feature Masking", a knowledge distillation module that filters noisy teacher signals via information bottleneck; achieved top-1 accuracy gains of **+6.39% on CUB-200 and +3.57% on ImageNet**.
- Drafted a Nature News & Views feature analyzing the trade-off between endogenous (neuronal) and exogenous (network) complexity, advocating for biologically plausible neuron models to **maximize AI energy efficiency**.

UCSC Baskin Engineering — Sep. 2024 – Present
Lead Tutor — *UC Santa Cruz*

- Architected and **scaled a grassroots ML research curriculum** into a 150+ student program, filling a gap in undergraduate research by bridging theoretical coursework with low-level PyTorch implementations.
- Managed a research incubator for undergraduate cohorts, directing original projects that yielded preprints in BayLearn and built a talent pipeline for UCSC research labs.

Technical Skills

AI & Machine Learning: LLM Pretraining & Fine-tuning, Distributed Training (DDP/FSDP), KV-Cache Optimization, Knowledge Distillation, Time-Series Forecasting
Infrastructure: High Performance Computing, Linux (RHEL/Ubuntu), Bash Scripting
Languages & Frameworks: Python, C++, Git, Hugging Face, WandB, NumPy, LaTeX