Hrithik Ravi

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EDUCATION

University of Wisconsin – Madison *Madison, WI*
Ph.D. in Computer Sciences *(Aug. 2026 –)*

University of Michigan *Ann Arbor, MI*
M.S. in Elec. and Comp. Engineering (focus in Machine Learning, GPA: 4.0/4.0) *(Aug. 2023 – Dec. 2024)*
B.S.E. in Computer Science and Engineering (Minor in Mathematics, Magna cum laude) *(Aug. 2019 – April 2023)*
Honors: Dean's List/University Honors (Fall 2019, Fall 2022, Winter 2023)

PUBLICATIONS

H. Ravi, C. Scott, D. Soudry, Y. Wang. *The Implicit Bias of Gradient Descent on Separable Multiclass Data*. NeurIPS 2024.

RESEARCH EXPERIENCE

Q Labs – Research Intern *San Francisco, CA*
Regularizers for Data-efficient LLM Pretraining – Advised by Prof. Andrew Gordon Wilson *(April 2026 – Aug. 2026)*

- Pretrained ~10,000 GPT-2–style language models on FineWeb, spanning multi-epoch training regimes and ~6,000 H100 GPU-hours. Constructed a large-scale zoo to collect model statistics and discover measures of LLM generalization.
- Engineered the run-selection, measurement, and checkpointing strategy under computational constraints. Calibrated training-loss thresholds to achieve sufficient successful runs within fixed epoch budgets, and selectively collected model, optimization, and spectral statistics when retaining full checkpoints was infeasible.
- Designed large-scale sweeps over hyperparameters and model capacity to induce substantial diversity in validation performance and maximize signal for downstream generalization analysis.
- Developed a meta-network that successfully predicts generalization of large models from statistics of smaller models, achieving Kendall tau with validation loss of up to 0.8.
- Discovered a new regularization method that reduced minimum pretraining validation loss by 0.16 nats on average, demonstrating benefits from data repetition substantially beyond previously established regimes.

University of Michigan AI Laboratory – Graduate Student Research Assistant *Ann Arbor, MI*
Theoretical ML, LLMs – Advised by Profs. Ambuj Tewari, Rada Mihalcea, Clayton Scott *(Aug, 2023 – April 2026)*

- Project 1: Designed synthetic reasoning task testbed to demonstrate brittle nature of existing post-training algorithms for frontier LLMs (GPT-4o). Implemented simple in-context learning scheme to surpass data-efficiency of supervised fine-tuning.
- Project 2: Investigated efficient, interpretable methods for steering CLIP away from biased representations; traced apparent model bias largely to artifacts of restrictive evaluation metrics.
- Project 3: Proved that, on linearly separable multiclass data, gradient descent continues to implicitly regularize after achieving zero training error, directionally converging to the minimum norm hard-margin SVM. First-author, NeurIPS 2024.

Google DeepMind – Google Summer of Code, Accepted Project *Remote*
Multimodal Long-Context Benchmark for Gemini – Advised by Paige Bailey *(May 2025)*

- Designed an open-source multimodal long-context benchmark extending DeepMind's Michelangelo framework to evaluate retrieval and reasoning capabilities of Gemini; developed the research proposal, benchmark design, and implementation plan.
- Proposal accepted to Google DeepMind (Google Summer of Code, 5% acceptance rate).

UofM Transportation Research Institute – Temp. ML Research Engineer *Ann Arbor, MI*
3D Object Detection for Self-Driving Cars – Advised by Dr. Arpan Kusari *(May 2023 – Aug. 2023)*

- Implemented a computer vision 3D IOU algorithm in OpenCV to evaluate performance of Detectron2 object detection model.
- Designed the algorithm to penalize false negatives harshly resulting in a model optimized for maximal passenger safety.
- Implemented a sensor fusion algorithm in MATLAB to provide a 360° view and enable safe path-planning in self-driving cars.
- Used Hungarian algorithm to fuse LIDAR and camera tracks, programmatically adding new tracks and discarding stale ones.

WORK EXPERIENCE

University of Michigan – Computer Science Graduate Student Instructor (TA) *Ann Arbor, MI*
EECS 281: Data Structures and Algorithms *(Aug. 2023 – Dec. 2024)*

- Received full tuition waiver to teach undergraduates foundations of data structures and algorithms.
- Held lectures, office hours to walk through example problems and to help students implement and debug C++ project solutions.

Amazon Web Services – Software Engineering Intern *Herndon, VA*

Security and Networking; Time-series Analysis for Predictive Managed Scaling *(June 2023 – Sept. 2023)*

- ❖ Built an iptables firewall with a token-bucket algorithm to fortify DNS servers against request floods, ensuring QoS for 3MN clients per region.
- ❖ Leveraged AWS Python API to implement an ML time-series pipeline in AWS Forecast, S3 to predict city-wide electricity consumption.

Amazon Web Services – Software Engineering Intern *Austin, TX*

Full-Stack Mobile and Web Development for Supply Chain Analytics *(May 2022 – Aug. 2022)*

- ❖ Mobile: Built notification UI in React Native, Typescript; backend in Expo, Firebase, Apple Notification Service, and NodeJS.
- ❖ Web: Developed interface to configure analytics, implementing frontend in React, backend in Kotlin and AWS DynamoDB.

INVITED TALKS

"A Theoretical Overview of Test-time Scaling", STATS 700 Guest Lecture (invited by Prof. Ambuj Tewari). *Sept. 2025*

"Is AI Changing Who We Are?", Michigan Friday Night AI, Invited Panelist (along with Prof. Rada Mihalcea and Prof. Jonathan R. Brennan). *Sept. 2025*

"Chain-of-Thought Reasoning: Trends and Directions", UMich Language and Information Technologies Lab. *May 2024*

"Multiclass Implicit Regularization", Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS). 3rd place. *March 2024*