Ethan L. Haarer

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EDUCATION

Georgia Institute of Technology, *College of Computing*

M.S in Computer Science **Class of Fall 2025**

Specialization: Machine Learning*, GPA: 4.00*

B.S. in Computer Science **Class of Spring 2024**

Concentrations: Intelligence and Devices*, Summa Cum Laude*

Coursework: Machine Learning, Vision Language Models, Advanced Computer Vision, Conversational AI, Artificial Intelligence, Deep Learning, Human and Machine Learning, Robotics and Perception, Mobile and Ubiquitous Computing, Modeling Simulation and Military Gaming, Prototyping Intelligent Devices, Data Structures and Algorithms

TECHNICAL SKILLS AND PROFICIENCIES

Technical Skills: Python, C, C++, Java, SQL, R, PySpark, PyTorch, NumPy, Tensorflow, LangChain, Transformers, HuggingFace,, SciPy, Matplotlib, d3.js, Weights & Biases, Pandas, Plotly, CUDA, Scikit-learn, Linux, WSL, Bash, Conda, Git, LaTeX, Arduino, FPGA, ESP-32, Netlogo, JS, HTML5/CSS, React, ELT, Medallion Architecture, Docker

Software Skills: MS Azure, Databricks, Azure Datalake, MS Data Factory, MS Fabric, CAD, AWS Services, S3, Elasticsearch

EXPERIENCE

AI/ML Software Engineering Intern, *L3 Harris Technologies, Inc.* **May – August 2025**

- Worked within the Space and Airborne Systems Division under the Intel and Cyber sector on the L3 AI Concept Incubator (LACI) team to support cross-sector internal research and development opportunities on emerging LLM and ML technologies.
- Prototyped LHX Intelligence (LHXi) for a L3 Harris-common voice controlled intelligent AI assistant that supports ISR missions at the edge to reduce operator cognitive load.
- Developed LLM-based multi-agentic framework that organizes and schedules task topologies to objectively evaluate reliability and improve explainability & trust in products integrating LLMs and statistical ML Models.
- Demonstrated integration and capabilities of ML and extensible LLM technologies into CI/CD workflow to shareholders at Q2 Demo to communicate how new advances are reliable and scalable, improving confidence in customers.
- Experimented with MCP integrations to evaluate integration techniques on varying model sizes and capabilities and orchestrated dockerized solutions for ideation handoff.

Graduate Research Assistant, *Teachable AI Lab, Georgia Tech* **August 2024 – Ongoing**

- Achieved state-of-the-art results with our Deep Taxonomic Network on Fashion MNIST dataset in unsupervised classification, beating pervious architectures by over 10% by leveraging contrastive learning and a custom neural Hierarchical topology.
- Working on Cobweb and DTN ML architectures, an unsupervised clustering architecture which supports incremental concept learning from fewer examples. The Structure can continually learn symbolic prototypes, modelling human cognition.
- Conducting experiments to benchmark Cobweb against traditional neural networks and other clustering models on common benchmark vision classification datasets like MNIST, MNIST Fashion and CIFAR.
- Implementing a supervised variation of the architecture that leverages Neural Net strategies like backpropagation to improve model performance, while utilizing hyperparameter search to optimize resultant model performance.

EDS AI Data Engineering Intern, *KPMG* **June – August 2024**

- Implemented code optimization pipeline that utilized generative AI to find, document, and integrate efficiency upgrades into existing codebase, particularly in converting ELT framework from spark SQL to pySpark.
- Optimized FOT pipeline time complexity from O(n^2) to O(n log n) across 30% of the codebase, reducing overall runtime by 20% while improving code documentation and readability by generating comments and blocking out code by section.
- Working alongside the Data Excellence and Delivery team to implement new data pipelines and utilize ELT framework to filter and provision trusted data into the company with Databricks, Data Factory, and MS Fabric.

Data Engineering Intern, *Homesteaders Life Company* **May – August 2022**

- Developed and implemented an IT Asset Management system to reduce missing and orphaned assets, maximized useful life and ROI, providing greater insights into asset utilization, capacity management and asset depreciation.
- Reduced mean repair time by approximately 20% through Asset management system which maintained accurate REST API to facilitate cross-organizational active updates to inventory and tracking, leading to an increase in ROI for 1,300 assets.

RESEARCH PUBLICATIONS

Zekun Wang, Ethan Haarer, Zhiyi Dai, Tyanyi Zhu, Christopher J. MacLellan "Deep Taxonomic Networks for Unsupervised Hierarchical Prototype Discovery" Neural Information Processing Systems – NeurIPS '25 (Accepted, Dec 2025)

Sneh Gupta, Ethan Haarer, May Kalnik, Amogh Mellacheruvu, Nikhita Vasan, Sashank Varma "Cross Cultural Typicality Effects in a Multilingual Large Language Model" Cognitive Science Society – CogSci '25 (Accepted, August 2025)

Zekun Wang, Ethan Haarer, Nicki Barari, Christopher J. MacLellan "Taxonomic Networks: A Representation for Neuro-Symbolic Pairing" Conference on Neurosymbolic Systems 2025 – NEUS '25 (Accepted, May 2025)

PROGRAMMING & RESEARCH PROJECTS

NLP - Georgia Tech Class Registration LLM Chatbot **October – December 2024**

- Developed a conversational AI chatbot for Georgia Tech registration support using OpenAI's GPT-3.5 and Gradio library, enhancing the onboarding experience for students and alleviating potential overwork of advisor staff during registration.
- Implemented Retrieval-Augmented Generation (RAG) with LangChain for efficient document retrieval, improving accuracy in multi-turn conversations by 35% compared to the base language model through relevant and specific model responses.
- Integrated APIs, including Canvas, RateMyProfessor, and OSCAR, to provide real-time course availability and personalized student insights, enabling dynamic interactions and achieving a 40% increase in user satisfaction during testing.

Cog Sci - Analyzing Cross Cultural Typicalities in Multilingual LLMs **November – December 2024**

- Conducted a cross-cultural analysis of multilingual large language models (LLMs) using gpt-4o-mini to evaluate typicality judgments across five languages, leading to insights into their alignment with human cognition and prototypes.
- Implemented a robust methodology using Likert scales and numerical ratings for exemplar evaluation for priming and rating model responses from different languages including American English, French, Spanish, German and Portuguese.
- Developed a multilingual evaluation framework employing Spearman Correlation and Min-Max scaling to assess the congruence of LLM-generated typicality judgments with human data from 8 different prototype categories.

Embodied AI – Outpost: Wearable Edge AI Assistant **January 2025 – May 2025**

- Developing a handheld companion utilizing a modified Raspberry Pi 5 to create a mobile, wearable AI companion that can work offline by locally running a pretrained language model, further informed on specific topic information with RAG.
- Wake word and Speech Detection enables hands-free interaction to generate insights on location, environmental hazards, and general conversation using a locally hosted instance of a quantized LLaMA 3-70B to work without network reliance.
- Utilized a fine-tuned version of YOLO v10 to run with integrated TPU-enhanced AI camera to identify animals and fauna and provide insights, uses and warn of potential dangers they may pose.

Modeling and Simulation – Alternative Offensive Strategies in the Yom Kippur War **January 2025 – May 2025**

- Utilizing agent-based modelling in Net Logo to investigate how changes in communication to commanders on either side of the Battle of the Chinese Farm in 1973 could have led to decreased bloodshed and alternative troop formations.
- Implementing different unit troops including infantry, tanks and air support as different agents to investigate how the interactions of unique and new positioning of these troops lead to new insights to new and more effective battle formations

Generative AI – Inspiration: Generative Storytelling Website for D&D **July – August 2024**

- Developed a generative AI website using stable diffusion models and large language models (LLMs) to create dynamic story settings for D&D players while connecting to the D&D 5e API to maintain consistent use of game rules and context.
- Collaborated with a team to conduct iterative testing and improve the user interface for better accessibility, incorporating user feedback to enhance the UX design utilizing React and NextUI.
- Designed and implemented a backend architecture to support large-scale inference requests, using Python and containerized the application with Docker for scalable server deployment.

Computer Vision - Translating POV Images to BEV Maps **February – April 2024**

- Created a pipeline that converts perspective single shot RGB images into top-down view of pedestrian maps in Python utilizing pretrained weights and models compared to a custom deep learning vision model to estimate coordinates with pixel projection.
- Utilized pretrained weights from YOLOv5 for individual identification and tracking alongside collected LiDAR data to estimate relative angle and distance from camera using minimal intrinsic data from camera itself.
- Achieved 94% accuracy in coordinate estimation by implementing custom pixel project deep learning network to estimate distance using only RGB images while excluding LiDAR ground truth data.

Prototyping - Arduino Web-Enabled Bartending Robot **March – May 2024**

- Developed a multimodal drink mixing machine, utilizing an Arduino Uno R4 to handle user drink requests either by RFID card and decoding card data, or through a web server to make custom drink combinations, accessible via a displayed QR code.
- Modified peristaltic pumps with IR sensor module to implement custom rotary encoding signal processing to ensure consistent and reliable liquid flow, regardless of viscosity and internal water pressure.
- Utilized different communication protocols to communicate sensor inputs and microcontroller data including I2C and SPI.

Analysis - Interactive Geospatial Data Visualization Website Capstone **August 2022 – May 2023**

- Developed a website using React to map historical data of violent crimes in Italy for researchers at George Mason University alongside Georgia Tech students as a junior capstone project to aid researchers in analyzing historical criminal datasets.
- Implemented custom data visualization and analysis tools to track changes and continuities of crime level and severity.

COMMUNITY ENGAGEMENT

The HIVE, Georgia Tech's Electrical Engineering Makerspace, *Peer Instructor* **January 2022 – May 2024**

- Assisted and instructed hundreds of electrical engineers in prototyping and configuring projects from ideation to engineering, fabrication, testing and deployment. Frequently focused on rapid integration into existing project goals and accomplishments to aid end users in project development, troubleshooting and ad-hoc solutions.
- Led and facilitated hands-on workshops for over 150 electrical engineering students, focusing on advanced circuit design, PCB fabrication, and prototyping techniques which resulted in a 15% increase student engagement in makerspace utilization.