

Alec Carruthers

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SUMMARY

I am an AI research engineer developing self-supervised and generative methods to solve problems in healthcare. My current research spans representation learning for multimodal physiological signals (wearables, clinical sensors), unsupervised dataset distillation, and medical vision-language foundation models for radiology. I aim to build systems that generalize and support early detection / preventative care with clinical impact.

EDUCATION

Georgia Institute of Technology <i>M.S. Computer Science</i> GPA: 4.00/4.00 Focus: Human-Computer Interaction Relevant Coursework: Deep Learning, Artificial Intelligence, AI Ethics, Reinforcement Learning, Computer Vision, AI & Robotics, Network Science, Cognitive Science	Atlanta, GA 12/2022
University of Texas at Austin <i>M.S. Environmental Engineering</i> GPA: 3.96/4.00 Thesis: The assessment, improvement, and application of the GeoFlood flood inundation mapping framework Relevant Coursework: Scientific Computing, High-Performance Computing, Optimal Control, Image Processing	Austin, TX 12/2020
University of California, Irvine <i>B.S. Aerospace Engineering</i> GPA: 3.80/4.00	Irvine, CA 06/2018

SKILLS

Programming Languages: Python, C++, CUDA, Java, Matlab, Slurm, Bash
AI / Deep Learning: PyTorch, Tensorflow, vLLM, Huggingface, DeepSpeed, onnx, TensorRT, Transformers, FSDP, DDP
Software Engineering: Git, DVC, Amazon AWS, Google Cloud Compute Engine

RESEARCH EXPERIENCE

MIT Lincoln Lab <i>AI Research Engineer</i> Supervisor: Dr. Molly Crane, Dr. Brian Telfer	Lexington, MA 01/2023 -
<ul style="list-style-type: none">Pretrained and fine-tuned a 10B-parameter medical foundation model with PyTorch FSDP on 48x NVIDIA V100 GPUs, achieving breast cancer and heart disease classification performance of 0.85 AUROC.Developed multimodal models leveraging physiological and hypnogram data from wearable devices to improve fatigue classification by ~20% compared to existing foundation models and ODE-based baselines.Developed an ultrasound diffusion model and used classifier-free guidance to generate images with underrepresented anatomical features, resulting in a 10% improvement in object detection precision-recall performance.Optimized and curated a dataset used for pretraining medical foundation models with hierarchical feature clustering, reducing pretraining compute cost by ~30% without impacting downstream performance.	
Apel Sciences <i>Data Scientist</i> Advisor: Dr. Richard Pattison	Santa Barbara, CA 06/2021 – 12/2022
<ul style="list-style-type: none">Developed a hyperspectral imaging machine learning and robotics product (featured by Fast Company) that predicted the health of fruits with 91% accuracy.Designed a self-supervised learning model that reduced the number of images needed for a disease classification model by 80%.	

University of Texas at Austin

Graduate Research Associate

Advisor: Dr. David Maidment, Dr. Paola Passalacqua

Austin, TX

06/2019 – 12/2020

- Created a computer vision model to extract features from terabytes of satellite lidar image data and transform them into high resolution flood inundation maps for eight counties in Texas, yielding a 30x improvement over the baseline.

TEACHING EXPERIENCE

University of Texas at Austin

Austin, TX

Teaching Assistant

06/2019 – 12/2020

- Instructed: Linear Algebra and Differential Equations
 - Held eight hours of lecture per week, along with two office hours
- Lab: Rocket Engineering Practicum

PUBLICATIONS

1. Gjesteby L, Werblin J, Malka R, **Carruthers A**, et al. Towards Single-operator Tracheotomy: AI-Assisted Robotic Device for Rapid and Safe Airway Management, *The International Journal of Medical Robotics and Computer Assisted Surgery* (In Review)
2. Prakash S, Waugh M, Priya A, **Carruthers A**, et al. Validating The Use of Machine Learning Assisted Ultrasound Image-Guided Rapid Vascular Catheterization System by Intended Device Users, 2025 (In Preparation)
3. **Carruthers, A.** The Assessment, Improvement, and Application of the GeoFlood Flood Inundation Mapping Framework. *University of Texas*, December 2020.

HONORS AND AWARDS

Honor List, *University of Texas at Austin*

01/2019 – 12/2020

Texas Venture Labs Entrepreneurship Champion, *University of Texas at Austin*

05/2019

Magna Cum Laude Graduate (3rd in class), *University of California, Irvine*

06/2018

Dean's Honor List, *University of California, Irvine*

09/2014 - 06/2019

ABSTRACTS, POSTERS, AND PRESENTATIONS

1. Gjesteby, L, Roop, B, **Carruthers, A** et al. Radiology Foundation Model Development to Accelerate Medical Image Interpretation for Field Forward Care, *Recent Advances in AI for National Security*, Lexington, MA. (In Submission)
2. **Carruthers, A**, Gjesteby, L, Roop, B, et al. Automated Detection of Porcine Femoral and Sciatic Nerves for Ultrasound-Guided Peripheral Nerve Blocks, *Military Health System Research Symposium*, Kissimmee, FL. August 2025, Poster
3. Scott, J, **Carruthers, A**, et al. Improving Schedule-Driven Fatigue Models with Wearables and Machine Learning, *Military Health System Research Symposium*, Kissimmee, FL. August 2025, Poster
4. Roop, B, **Carruthers, A**, Gjesteby, L et al. Ultrasound Foundation Model Development to Accelerate Medical Image Interpretation for Field-Forward Care, *Recent Advances in AI for National Security*, Lexington, MA. December 2024. Invited Talk.
5. **Carruthers, A.** Lower-Body Cumulative MSKI Prediction with a Single-IMU, *Biotechnology and Resilient Human Systems*, Lexington, MA, June 2024, Invited Talk
6. **Carruthers, A.** Lower-Body Cumulative MSKI Prediction with Accelerometry Data from a Single IMU, *Military Health System Research Symposium*, Kissimmee, FL. August 2024, Poster

PATENTS

1. Lars A. Gjesteby, Joshua Werblin, Ronit Malka, **Alec Ryan Carruthers**, Nancy DeLosa, Sam Benjamin Kesner, Shawn T. Moynihan, Laura J. Brattain, and Gregory R. Dion. 2024. Towards Single-operator Tracheotomy: AI-assisted Robotic Device for Rapid and Safe Airway Management. MIT-LIN-PFR-3594. Unclassified