

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

Atlanta, GA

M.S. Computer Science

12/2022

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

University of Texas at Austin

Austin, TX

M.S. Environmental Engineering

12/2020

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

University of California, Irvine

Irvine, CA

B.S. Aerospace Engineering

06/2018

GPA: 3.80/4.00

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

Lexington, MA

AI Research Engineer

01/2023 -

Supervisor: Dr. Molly Crane, Dr. Brian Telfer

- 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.

Apeel Sciences

Santa Barbara, CA

Data Scientist

06/2021 – 12/2022

Advisor: Dr. Richard Pattison

- 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

Teaching Assistant

Austin, TX

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. Gjestebly 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. Gjestebly, 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**, Gjestebly, 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**, Gjestebly, 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. Gjestebly, 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