

MATTHEW WALMER

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EDUCATION

UNIVERSITY OF MARYLAND, COLLEGE PARK, College Park, MD
Pursuing a PhD in Computer Science, focused on Computer Vision, 2019 – Present (GPA 3.97)

JOHNS HOPKINS UNIVERSITY, Baltimore, MD
Master of Science in Engineering (MSE) in Biomedical Engineering, 2017 (GPA 4.00)
Bachelor of Science in Biomedical Engineering, 2016 (GPA 4.00, Dean's List)
With Minor Degrees in Computer Science and Mathematics
Received the Richard J. Johns Award for Academic Excellence

SKILLS

Tools & Libraries: Python, PyTorch, TensorFlow, LaTeX, OpenCV, Scikit-learn
Deep Learning: Transformers/ViTs, CNNs, GANs, Trojan Networks, Adversarial Examples

WORK EXPERIENCE

PERCEPTION AND INTELLIGENCE LAB (UMD) - **PhD Student Research Assistant** Apr 2020 – Present

- Computer Vision PhD Student working with Professor Abhinav Shrivastava.
- Performing research on transformer network interpretability and representation learning for object detection.

OMNISPEECH - **Machine Learning Consultant** Jul 2022 – Aug 2022

- Consulted on the development of machine learning algorithms for hearing assistance.
- Optimized training pipelines for faster training and design iteration.

SRI INTERNATIONAL - **Summer Internship** Jun 2021 – Aug 2021

- Studied backdoor attacks in multimodal neural networks as part of the TrojAI program.
- Wrote and published “Dual-Key Multimodal Backdoors for Visual Question Answering” at CVPR 2022.

THE MITRE CORPORATION Mar 2018 – Aug 2019 (full-time)
Computer Scientist, Computer Vision Specialty Aug 2019 – Sep 2020 (part-time)

- Co-PI of a MITRE Innovation Program research project that developed a publication accepted to ECCV 2020.
- Programmed on a team to develop, refine, and improve a modular framework for multimedia analysis.

NEUROMEDICAL CONTROL SYSTEMS LAB (JHU) - **Student Researcher** Nov 2016 – Jul 2017

- Studied single unit recordings of human neural circuits by applying various modeling techniques.
- Wrote and published a research paper and presented it at EMBC 2017.

PUBLICATIONS

Teaching Matters: Investigating the Role of Supervision in Vision Transformers CVPR 2023

- Conducted an in-depth comparison of Vision Transformers (ViTs) trained with different supervision methods.
- Identified distinct patterns in multi-headed attention layer behavior depending on supervision group.
- Studied trends in learned representation similarity and usability for downstream tasks.

Dual-Key Multimodal Backdoors for Visual Question Answering CVPR 2022

- Performed the first exploration of backdoor attacks in multimodal neural networks.
- Developed a novel attack strategy for multimodal models and released a large dataset for defense research.

APRICOT: A Dataset of Physical Adversarial Attacks on Object Detection ECCV 2020

- Developed and released a dataset to study the “in-the-wild” effectiveness of physical adversarial patch attacks on object-detecting neural networks, available at apricot.mitre.org.
- Investigated defensive strategies for detector models to combat real-world patch attacks.
- The APRICOT dataset is also included as a benchmark in the DARPA GARD program.

Neuronal Activity in Human Anterior Cingulate Cortex Modulates with Internal Cognitive State During Multi-Source Interference Task EMBC 2017

- Formulated Poisson point process models for single-unit recordings taken in human subjects.
- Created a behavioral model based on experiment stimulus and subject reaction times and showed that the activity of some neurons correlated with this model with high statistical significance.