

# Kyle Buettner

Pittsburgh, PA, USA | Email: [buettnerkr@gmail.com](mailto:buettnerkr@gmail.com) | Phone: 412-973-9166 | LinkedIn: [kyle-robert-buettner](https://www.linkedin.com/in/kyle-robert-buettner) | GitHub: [krbuettner](https://github.com/krbuettner) | Website: <https://krbuettner.github.io/> | [Google Scholar](https://scholar.google.com/citations?user=KvYUwv4AAAAJ) (7 publications, 48 citations as of 9/2/24)

## RESEARCH INTERESTS

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- Vision-language modeling, foundational AI models, model robustness under domain shift, object detection, model efficiency, AI robustness for diverse cultures and languages

## EDUCATION

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### University of Pittsburgh – Pittsburgh, USA

Doctor of Philosophy, Intelligent Systems

Sep 2021 – Aug 2025 (Expected)

Master of Science, Electrical and Computer Engineering

Sep 2019 – Apr 2021

- **Graduate GPA:** 3.99/4.00

- **Coursework:** Artificial Intelligence, Machine Learning, Natural Language Processing, Vision-Language Modeling, Theory of Computation, Statistical Methods, Information Retrieval, Computer Architecture

Bachelor of Science, Computer Engineering

Sep 2015 – Apr 2019

- **Undergraduate GPA:** 3.94/4.00

- **Coursework:** Computer Vision, Digital Design, Software Engineering, Algorithms

- **Award:** Honorable Mention for Top Computer Engineering Student

## INDUSTRY EXPERIENCE

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### Amazon – Seattle, USA

Applied Science Intern

June 2024 – August 2024

- Improved precision ( $>5\%$ ) and coverage ( $>40\%$ ) of million-scale classification with design of vision-language system
- Devised, proposed, and executed research plan while communicating process to multiple levels of company leadership
- Constructed datasets through querying and manipulating large databases with billions of entries using Spark
- Acquired skills with Amazon Cloud infrastructure (EMR, SageMaker, S3)

### GatherAI – Pittsburgh, USA

Machine Learning Intern

May 2021 – Aug 2021; May 2022 – Aug 2022

- Enhanced company's drone-derived insight offerings through R&D on new vision pipeline (+20% accuracy inc. for beta)
- Devised an image filtering pipeline that resulted in  $>3x$  reduction in error for customer-facing inventory analytics
- Orchestrated full model lifecycles, with frequent error analysis and manual annotation ( $>1k$  size) for detection/segmentation

### UPMC Enterprises – Pittsburgh, USA

Software Engineering Intern on the NLP Team

June 2018 – Aug 2018

- Engineered visualization tool for EHR domain ontologies (process time for knowledge dept. moved from hours to minutes)

### EQT Corporation – Pittsburgh, USA

Reservoir Engineering Intern

May 2017 – Aug 2017

- Created decline curve modeling tool with Excel for predictive analysis of region-based economics

## RESEARCH EXPERIENCE

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### University of Pittsburgh – Pittsburgh, USA

Ph.D. Student Researcher, Intelligent Systems

Sep 2021 – Present

Advisor: Adriana Kovashka

- **Current Project:** adaptation of vision-language models for robustness across geographies and languages
- **Notable Past Projects:** object detection robustness following contrastive pretraining, measuring and enhancing the use of attribute information in vision-language pretraining, modeling climax of video advertisements
- **Accomplishments:** 1st author in CVPR24, WACV24, AAAI23 PracticalDL workshop; 2nd author in BMVC18
- Pretrained/finetuned powerful models (BERT, CLIP, Faster R-CNN) on large datasets ( $>100k$  size - COCO, ImageNet)
- Projects frequently entailed prompt engineering (chain-of-thought, exemplar design) with large-language models (ChatGPT)

M.S. Student Researcher, Electrical & Computer Engineering

Sep 2019 – Apr 2021

Advisor: Alan George

- **M.S. Thesis:** Analyzing energy, latency, and accuracy of neural networks for heartbeat classification across AI hardware (neural hardware such as Google Coral Edge TPU, neuromorphic hardware such as Intel Loihi)
- **Accomplishments:** 1st author ISVLSI21, 3rd author HPEC20

## SKILLS

- **Areas:** Artificial Intelligence, Computer Vision, Natural Language Processing, Machine Learning, Deep Learning, Statistics, Data Analysis, Large Language Models, Prompt Engineering, Software Development, High-Performance Computing
- **Programming:** Python, SQL, R, C++, C, Java, MATLAB, Spark, CUDA, OpenCL, OpenMP, MPI, VHDL, Linux
- **Machine Learning Libraries:** PyTorch, TensorFlow, OpenCV, SciKit-Learn, SpaCy, NLTK, Pandas, NumPy, Matplotlib, Whoosh, Nengo, SNN-Toolbox, Detectron2, MMDetection, NetworkX
- **Software Engineering:** Git, Jupyter Notebook, Agile, Scrum

## PEER-REVIEWED PUBLICATIONS

- Kyle Buettner, Sina Malakouti, Xiang Lorraine Li, and Adriana Kovashka. "Incorporating Geo-Diverse Knowledge into Prompting for Increased Geographical Robustness in Object Recognition." *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, June 2024.
- Arushi Rai\*, Kyle Buettner\*, and Adriana Kovashka. "Strategies to Leverage Foundational Model Knowledge in Object Affordance Grounding." *What is Next in Multimodal Foundation Models? Workshop at IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR-W)*, June 2024. (\*=co-1st authors)
- Kyle Buettner and Adriana Kovashka. "Investigating the Role of Attribute Context in Vision-Language Models for Object Recognition and Detection." *Winter Conference on Applications of Computer Vision (WACV)*, 2024.
- Kyle Buettner and Adriana Kovashka. "Contrastive View Design Strategies to Enhance Robustness to Domain Shifts in Downstream Object Detection." *AAAI Workshop on Practical Deep Learning in the Wild*, 2023.
- Kyle Buettner and Alan D. George. "Heartbeat Classification with Spiking Neural Networks on the Loihi Neuromorphic Processor." *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, 2021.
- David Langerman, Alex Johnson, Kyle Buettner, and Alan D. George. "Beyond FLOPs: CNN Performance Prediction with Critical Datapath Length." *IEEE High Performance Extreme Computing Conference (HPEC)*, 2020.
- Keren Ye, Kyle Buettner, and Adriana Kovashka. "Story Understanding in Video Advertisements." *British Machine Vision Conference (BMVC)*, 2018.

## LEADERSHIP, TEACHING, AND SERVICE ROLES

*Conference Paper Reviewer*, Various Conferences 2023-2024

- Reviewed submissions to EMNLP23, CVPR24, ECCV24

*Sports Coach*, **OpenField - Pittsburgh, USA** Apr 2024 - Present

- Volunteering in OpenField's youth development soccer program that aims to positively impact people from around the world

*Computer Vision Instructor*, **Pitt HexAI Research Laboratory – Pittsburgh, USA** July 2023

- Volunteered in the 2023 IEEE Mini Summer Camp on Object Detection/Localization in Medical Images using AI
- Delivered various lessons to high-school students about the fundamentals of object detection/localization

*Video Game Design Instructor*, **Pitt School of Computing & Information Outreach – Pittsburgh, USA** Oct 2021 – July 2022

- Taught Scratch video game design lessons to kids as part of neighborhood commitment program
- Composed 6-week Python curriculum to provide practical computer science skills

*Sports Coach*, **West Mifflin Soccer – West Mifflin, USA** Aug 2018 – Aug 2021

- Served as soccer coach in community, running practices and offseason workouts (at youth and high school levels)

*Teaching Assistant in Various Courses*, **University of Pittsburgh – Pittsburgh, USA** Sep 2016 – Present

- Dependable Computer Architecture, Business Calculus, Precalculus, Java, Human-Robot Interaction, Machine Learning

## NOTABLE PROJECTS

[COVID-19 Search Engine Prototype](#) Spring 2022

- Contributed to design of information retrieval system to search for relevant info about COVID-19 pandemic
- Leveraged query likelihood statistical language model and Boolean model for text matching with CORD-19 corpus
- Designed UI through Tkinter, implemented indexing through Whoosh library, used NLTK for text processing

[Paint-By-Numbers Canvas Generator](#) Spring 2021

- Engineered image processing pipeline with OpenCV and Python for creation of a "paint-by-numbers" canvas
- Evaluated GPU/PyCUDA acceleration of color quantization, median filtering, and edge/contour detection (2.6x app speedup)

*Last Updated: 9-2-2024*