Kyle Buettner

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PROFILE

- Machine learning engineer and researcher currently studying how to make computer vision algorithms and systems more robust as part of Ph.D. in Intelligent Systems (Applied AI) program at the University of Pittsburgh
- Over 4 years of experience as part of AI-focused companies and research groups, with impactful contributions made through machine learning research, software engineering, and data analysis projects
- Seeking a 2024 summer internship opportunity to solve unique and important problems in applied artificial intelligence

INDUSTRY EXPERIENCE

GatherAI – Pittsburgh, USA

Machine Learning Intern *May 2021 – Aug 2021, May 2022 – Aug 2022*

- Expanded company's drone-derived, inventory analysis offerings through significant R&D on new vision-based TiHi counting pipeline (*beta improved from 70% to 90% accuracy on evaluation sets*)
- Designed a Python-based image filtering and merging pipeline that resulted in *>3x reduction in error of box detection analytics* delivered to customers
- Frequently deployed improved machine learning models to production; monitored performance with statistical analysis
- Regularly labeled and created datasets for vision tasks (object detection, instance and semantic segmentation)

UPMC Enterprises – Pittsburgh, USA

Software Engineering Intern on the NLP Team *June 2018 – Aug 2018*

- Engineered NLP word cloud tools in Java to visualize electronic health record domain ontologies and enhance the productivity of the company's knowledge engineering department (*process time moved from hours to minutes*)

EQT Corporation – Pittsburgh, USA

Reservoir Engineering Intern *May 2017 – Aug 2017*

- Composed predictive economic decline curve modeling tool with Excel, providing new analysis to engineering team

RESEARCH EXPERIENCE

University of Pittsburgh – Pittsburgh, USA

Ph.D. Student Researcher, Intelligent Systems *Sep 2021 – Present*

Advisor: Adriana Kovashka

- Primarily studying model robustness in object detection, with focus on vision-language models and contrastive learning
- Research into how to design contrastive views to make object detectors robust to domain shifts accepted as 1st author paper in AAAI 2023 PracticalDL Workshop
- Current research into the role of attribute context in vision-language models accepted as Extended Abstract in O-DRUM Workshop @ CVPR 2023
- Published BMVC paper as 2nd author with feature exploration that enhanced climax and sentiment prediction models for story understanding in video advertisements
- Gained significant familiarity with prevalent training paradigms (image-caption pretraining, contrastive pretraining, detection finetuning), models (Faster R-CNN, BERT, CLIP), and datasets (COCO Objects/Captions, VOC, ImageNet)

M.S. Student Researcher, Electrical & Computer Engineering *Sep 2019 – Apr 2021*

Advisor: Alan George

- Completed M.S. thesis; research focus on analyzing and optimizing neural network performance on various hardware devices
- Conducted a heartbeat classification case study with analysis of spiking neural network accuracy, latency, and energy efficiency on the Intel Loihi neuromorphic chip, resulting in 1st author conference publication at ISVLSI 2021
- Served as NSF SHREC (Space, High-Performance, and Resilient Computing) rep to Intel Neuromorphic Research Community

SKILLS

- **General Areas:** Artificial Intelligence, Computer Vision, Machine Learning, Deep Learning, Natural Language Processing, Statistical Data Analysis, Software Development, High-Performance Computing, Parallel Programming, Predictive Modeling

- **Programming Languages:** Python, R, C++, C, Java, MATLAB, 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

LEADERSHIP AND TEACHING ROLES

Computer Vision Instructor, **Pitt HexAI Research Laboratory – Pittsburgh, PA** *July 2023*
- Served as a volunteer in the 2023 IEEE Mini Summer Camp on Object Detection/Localization in Medical Images using AI
- Developed various lessons for high-school students and taught the fundamentals of object detection/localization

Video Game Design Instructor, **Pitt School of Computing & Information Outreach – Pittsburgh, USA** *Oct 2021 – July 2022*
- Taught video game design lessons to kids as part of the University of Pittsburgh's neighborhood commitment program
- Designed a new Python curriculum, further expanding kids' familiarity with 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*
- Taught Dependable Computer Architecture, Business Calculus, Precalculus, Java, Human-Robot Interaction, Machine Learning

EDUCATION

University of Pittsburgh – Pittsburgh, USA *Sep 2021 – Present (Expected Graduation: Apr 2025)*
Doctor of Philosophy, Intelligent Systems GPA: 3.97/4.00

University of Pittsburgh – Pittsburgh, USA *Sep 2019 – Apr 2021*
Master of Science, Electrical and Computer Engineering

University of Pittsburgh – Pittsburgh, USA *Sep 2015 – Apr 2019*
Bachelor of Science, Computer Engineering GPA: 3.94/4.00
**Honorable Mention for Top Computer Engineering Student*

COURSEWORK

Graduate Coursework: Artificial Intelligence, Machine Learning, Natural Language Processing, Theory of Computation, Statistical Methods I/II, Information Storage & Retrieval, Computer Architecture (Dependable, Parallel, GPU, Neuromorphic)
Undergraduate Coursework: Computer Vision, Digital Design, Software Engineering, Algorithms

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

PEER-REVIEWED PUBLICATIONS

- Buettner, Kyle 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.
- Buettner, Kyle, and Alan D. George. "Heartbeat Classification with Spiking Neural Networks on the Loihi Neuromorphic Processor." *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, 2021.
- Buettner, Kyle. A Case Study in Practical Neuromorphic Computing: Heartbeat Classification on the Loihi Neuromorphic Processor. Master's Thesis. University of Pittsburgh, 2021.
- Langerman, David, 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.
- Ye, Keren, Kyle Buettner, and Adriana Kovashka. "Story Understanding in Video Advertisements." *British Machine Vision Conference (BMVC)*, 2018.