Aaron Moseley

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Education

August 2020 – May 2024 **University of Kentucky - Bachelor of Science in Computer Science and Mathematics**
- GPA: 3.96 / 4.0
- Lewis Honors College, Competitive Programming Team, Undergraduate Science Journal Club
- Dean's List Fall 2020-Spring 2023, Provost Scholarship, Lester Engineering Scholarship

August 2016 – May 2020 **Henry Clay High School**
- GPA: 3.97 / 4.0

Research Experience

January 2023 – Current **Medical Imaging/Machine Learning Research Assistant**
- Worked with Dr. Abdullah-Al-Zubaer Imran on novel training techniques and architecture improvements for medical image segmentation models
- Created innovative contrastive learning strategy shown to significantly improve performance over baselines in segmenting the liver from CT scans
- Awarded an Undergraduate Engineering Research Fellowship for Fall 2023 by the University of Kentucky College of Engineering
- Used PyTorch, Google Colab, D2L, and Weights and Biases to create and evaluate imaging models

August 2022 – Current **Nuclear Physics Research Assistant**
- Worked with Dr. Christopher Crawford as part of the Neutron Optics Parity and Time Reversal Experiment (NOPTREX)
- Utilized C++, ROOT framework, and HDF5Lib to create high-speed data acquisition system for NOPTREX experiment investigating gamma radiation emissions from decaying neutrons
- Firmware and software validated in successful test at Japan Proton Accelerator Research Complex, will be used in future experiment at Los Alamos National Laboratory

Research Presentations and Publications

PolyCL: Context-Aware Contrastive Learning for Image Segmentation
- A new contrastive learning framework based on an example selection strategy leveraging the known presence of organs
- Evaluations show improved performance over supervised baseline models and other contrastive learning techniques on multiple datasets
- Presented as a poster at the Commonwealth Computational Summit 2023
- Submitted as a 4-page paper to ISBI 2024

Context-Aware Multitasking for Medical Image Segmentation
- A project investigating a novel form of joint training to combine organ detection and organ segmentation
- Shown to significantly improve performance in Dice coefficient and Hausdorff distance over baseline models
- Oral presentation at the University of Kentucky 5 Minute Fast Track 2023 undergraduate research event

Developing a Readout Software for the NOPTREX Experiment
- A poster presentation covering the data acquisition system I developed for the NOPTREX experiment
- Presented at APS April Meeting 2023, NCUR 2023, and the University of Kentucky Undergraduate Research Showcase 2023

Teaching Experience

January 2024 – May 2024
University of Kentucky - Machine Learning Grader (CS460G)
- Will grade assignments for undergraduate and graduate students on topics covering classical machine learning, neural networks, and deep learning
- Will regularly hold office hours for students

August 2022 – May 2023
University of Kentucky - Intermediate C++/Linux Teaching Assistant (CS216)
- Regularly lectured multiple lab sections on topics including intermediate C++, Unix, Bash, and Vim
- Provided individualized help for students during lab and outside of class time
- Held weekly office hours and graded classwork and exams for more than 30 students

May 2022 – August 2022
University of Kentucky - Introductory C++ Teaching Assistant (CS215)
- Provided lab instruction covering introductory C++ in conjunction with course instructor
- Held office hours and graded coursework and exams for over 25 students

Professional Experience

May 2023 – August 2023
Infineon Technologies - Computer Engineering Intern
- Developed physical verification rules in SVRF and designed transistor-level validation cells for unit testing using Cadence Virtuoso
- Created comprehensive Vim syntax highlighter for SVRF using Vimscript
- Utilized computer engineering expertise to resolve physical verification discrepancies in new hardware devices

May 2022 – August 2022
Lockheed Martin - Software Engineering Intern
- Built data analysis and report automation tools using .NET framework and Microsoft Excel
- Completed projects creating $33,000 in annual savings and reducing time spent generating reports by 90%
- Held secret-level US security clearance (renewable until August 6, 2024)

Featured Projects

Hyperbolic Relevance Estimation for Improved Semantic Search
- Semantic search model developed in Pytorch leveraging SentenceBERT embeddings and hyperbolic geometry
- Can better represent and calculate the similarity between sentences when compared to baseline models
- Results in improvement over standard Euclidean models by a factor of 2

Hydraulic Erosion Simulation
- Realistically simulates hydraulic erosion on randomized or user-defined terrain
- Implements a Perlin noise procedural generation algorithm that allows for user customization
- Visualizes gradual erosion in real-time and creates a report detailing its effects on the terrain

Phantom Mansion - First Place Winner MLH Hackathon
- Roguelike game that uses graph traversal algorithms to randomly generate levels and control enemy AI
- Includes multiple difficulty levels that impact level generation and enemy behavior
- Presented at University of Kentucky E-Day 2023

Skills

Languages: C++, C#, Python, Java, C, HTML, CSS, JavaScript, PHP, LaTeX, AMPL, Bash, MATLAB, SVRF
Frameworks/Libraries: .NET, PyTorch, TensorFlow, sklearn, D2L, H5py/HDF5Lib, NiBabel, ROOT
Tools: Google Colab, Git/GitHub, Linux, Unity, Arduino, Anaconda, RapidAPI, Vim, Weights and Biases