

EDUCATION

- **Saint Louis University** St. Louis, MO
Master of Science in Engineering, Emphasis in AI/ML; GPA: 3.85 *Jan. 2017 – Dec. 2022*
- **Southern Illinois University of Edwardsville** Edwardsville, IL
Bachelor of Science in Mechanical Engineering; GPA: 3.89 *Aug. 2012 – May 2016*

EXPERIENCE

- **Boeing Research & Technology - Product and Cyber Security** Berkeley, MO
Senior Machine Learning Researcher *Dec. 2021 - Present*
 - **Generative Modeling for Anomaly Detection:** Led a \$2.25M Generative Modeling research effort tasked with bolstering platform cybersecurity through Time-series, Multivariate Prediction and Anomaly Detection utilizing Sensor-Fusion fed Bayesian DNN structures to detect operational deviations. My success in this field was critical in winning customer capture opportunities that cumulatively returned 7x ROI.
 - **Ensemble Modeling with NLP:** I wrote, proposed, and led a team of three engineers to execute a research effort focused on augmenting the performance of PredAI aviation anomaly classifiers by ensembling NLP classifiers that ingested software flight logs from commercial aircraft. Developed a tech stack based on LogRobust, Drain, and PyTorch that improved our anomaly detection F1 scores ~ 5-10%
 - **Adversarial Machine Learning:** Spearheaded the Exploitable AI and Adversarial Machine Learning portion of BR&T's Product Security's realignment. I focused on researching, proposing, and maturing scalable and deployable strategies to mitigate the effects of backdoor training data poisoning for aviation which, once prototyped, resulted in a novel research derivative and \$200k of funding.
 - **Proposal Writing and Funding Capture:** Utilized AI/ML expertise to author research proposals to capture customer interest culminating in a total of \$17M successful funding and another \$10M in potential future projects.
 - **Mentoring and Knowledge Sharing:** Formally mentored a team of five early-career engineers in ML/AI, Software Development, and Proposal Writing. This involved leading a hands-on, brown bag ML workshop bi-monthly to discuss state-of-the-art, solidify fundamentals, promote cross-team communication, and eliminate knowledge silos amongst the team.
- **Boeing Defense, Space, & Security - Virtual Warfare Center** Hazelwood, MO
AI and Autonomy Engineer *Dec. 2020 - Dec. 2021*
 - **Reinforcement Learning:** Architected and implemented DQN, A2C, and TD3 Reinforcement Learning algorithms to solve path-planning and refueling missions and encode this learning into a general solution. Optimal solution finding accelerated mission planning exercises by at least a factor of five (5) in laboratory settings as compared to traditional analyst approaches.
 - **Autonomy/AI:** Designed and implemented traditional AI agents to execute automated behaviors such as "search and rejoin", "wingman follow", and "reroute around area" in the Aerospace Simulation environment AFSIM. Solutions involved algorithms spanning Rules-based, Optimal Search (A*), and Finsite State Machines.
 - **Data Pipelining and Experimentation:** Developed methodologies to interact with AFSIM simulation data to effectively create a high-fidelity, robust AI gym capable of supporting sophisticated experimentation with 100's of platforms in wargaming scenarios. Designed mechanisms to transfer, consolidate, and archive the large amounts of data utilizing common machine learning optimization techniques, like quantization, to reduce the resource consumption and minimize latency.
- **Boeing Global Services - Training Simulations** Berkeley, MO
Software Engineer - Simulation *Feb. 2019 - Dec. 2020*
 - **Real-time Simulation:** Developed capabilities for real-time RHEL Linux training platforms specializing in IFF, ILS, Weapons, Electronic Warfare/Cybersecurity, and Radar functionality. This work spanned over two different platforms, each with technology stacks ranging multiple languages (primarily C++) with >50k LoC.
 - **Constructive Simulation:** Primary development lead for integrating maritime simulation capabilities into the industry standard simulation tool AFSIM. Through this effort, I expanded the operational domain of this software by 33% and enabled novel experimentation that was published at BTEC.
 - **Standard Aircraft Communication Protocols:** Experience with aircraft protocols including MIL-1553-STD, Link-16, ARC-231, and RS-232 protocols.
 - **DevSecOps and CI/CD:** Implemented containerized Docker solutions to enable AWS cloud capabilities for a variety of enterprise use-cases. Championed proper software development and design practices (Git, Jenkins, Jira).

EXPERIENCE - CONTINUED

- **Saint Louis University** St. Louis, MO
Robotics and AI Researcher *Jan. 2017 - Feb. 2019*
 - **Academic Research and Publications:** Research grant funded position to lead research relevant to NSF Cyber-Human Systems programs which included fields such as Robotics, AI, and Machine Learning.
 - **Robotics:** Designed, machined, and programmed a 5-DOF anthropomorphic arm manipulator for a two wheeled telerobot that was actuated and controlled to mimic the trajectory and posture of an operator's arm.
 - **Perception Systems:** Leveraged video data from a Microsoft Xbox Kinect to implement inverse kinematic solutions that solved operator arm pose angles transposed on a telerobotic arm.
 - **Supervised Learning:** Implemented Tensorflow LSTM networks to learn tactile and kinematic features on robotic platforms to predict payload contents in the absence of visual validation.
 - **Reinforcement Learning:** Explored Reinforcement Learning algorithms to control the telerobotic platform using rewards to guide the robot's state to improve computationally expensive Modern Control techniques.
- **Dynamic Controls** Maryland Heights, MO
Autonomy Engineer *Jan. 2016 - Sep. 2017*
 - **Closed-Loop Control:** Implemented complete automation solutions necessary for closed-loop PID control of commercial Building Automation Systems.
 - **HMI Programming:** Programmed custom GUI applications to allow customers to interface and tune control parameters.
- **Emerson - White Rodgers** Ferguson, MO
Computer Science Engineer - Co-op *Dec. 2014 - Sep. 2015*

PERSONAL PURSUITS

- **RNN, LSTM, and Transformer Decomposition:**
 - Educational effort to construct sophisticated Deep Neural Network Generational AI structures from scratch without the assistance of utility functions provided in popular ML stacks (Autograd).
 - Pytorch implementations of LSTM and Multi-head Attention networks with fully defined forward and back-propagation functions.
 - Project is trained on natural language corpuses (mainly Jules Vernes and Shakespeare ~13M and ~1M characters respectively) and is capable of generating text characteristic of the source.
- **Multivariate Time-Series Prediction with Neural ODE's:**
 - Exploratory effort to better understand the cutting edge developments in de-discretizing the latent space trajectory inherent in SOTA RNN structures by defining ODE's in terms of Neural Networks.
 - Reproduced the results in MTGODE, Jin 2022, particularly the 3-5% increase in performance across all datasets and prediction horizons from the benchmark LSTNet architecture.
- **Software Vulnerability Detection using DNN:**
 - Defensive project motivated by recent developments rapidly finding vulnerability exploits in Open Source Software, and the lack of tools capable of securing these systems at scale.
 - Implemented a computer vision inspired vulnerability detection system based on the VulCNN, Wu 2022 architecture which performs a four step, Graph Extraction, Sentence Embedding, Image Generation, and Classification workflow to determine when source code matches known exploitable patterns at a function-by-function granularity level.
 - Extended original paper's capabilities by incorporating Python detection capabilities analogous to the original author's C++ detection capabilities. Currently, slightly under-performing static analysis tools by about 5% but I believe this could be greatly improved with coding examples and increased development resources.

TECHNICAL SKILLS AND UTILITY

- **Languages - Fluent:** Python, C++ **Competent:** Bash, C, Fortran, Rust, Latex, Matlab
- **Technologies:**
 - **Development Environments -** Linux/Ubuntu: 10yrs, Windows: 5yrs
 - **Development Utilities -** Vim/Tmux: 10yrs, gcc/g++: 5yrs, Visual Studio: 5yrs, Azure: 1yr
 - **Tech Stacks -** Pandas/Numpy: 8yrs, Tensorflow/Pytorch/Sklearn: 7yrs, Docker: 7yrs, CMake: 3yrs, SQL: 3yrs, Kubernetes: 1yr, Mojo: 1yr