Ryan Melzer

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Work Experience

Machine Learning and Software Engineer (Member of Technical Staff, DOE Q clearance)   01/2021 - 10/2022
Machine Learning Engineering Graduate Intern   05/2019 - 01/2021
Sandia National Laboratories | Albuquerque, NM (Remote)

- Developed deep neural network (DNN) models, neural architecture search (NAS) techniques, and training/inference techniques for achieving accurate and robust domain adaptation between synthetically generated and real radar imagery for synthetic aperture radar (SAR) automatic target recognition (ATR). Several of these models exceeded current state-of-the-art accuracy on public ATR benchmark datasets and yielded profound new insights on the behavior of DNN models for SAR ATR. Deployed trained models to 8-bit EdgeTPU devices for inference. Co-authored two leading publications as first author detailing these techniques.
- Built a Python library of DNN models, NAS methods, explainability algorithms, data augmentation routines, and training/inference pipelines for ATR and pose estimation in SAR imagery. This became a foundational resource for internal SAR ATR research.
- Led development on a high-fidelity, GPU-bound hypersonic vehicle simulation application. Implemented control systems, dynamics models, and machine learning capabilities in CUDA C++, developed and implemented C++ performance optimizations which substantially increased the speed and accuracy of the simulations, co-authored a publication on the application, and architected a transition from CUDA C++ to JAX, greatly simplifying the development process while maintaining high performance.
- Implemented reinforcement learning algorithms within an in-house multi-agent reinforcement learning Python library. These became the standard internal implementations used for reinforcement learning research across multiple teams.

Software Engineer I   06/2017 - 04/2018
Software Engineering Intern   05/2016 - 08/2016
Optiver | Chicago, IL

- Spearheaded and launched a real-time, post-trade analysis tool in C# to evaluate the behavior of a novel automated trading strategy, enabling the team to test and deploy the strategy at scale while guaranteeing safe behavior.
- Implemented and deployed a high-frequency trading application in C++ on a previously unsupported exchange, and extended an in-house end-to-end Python testing framework to cover the new application and the exchange. This provided a notable increase in trading volume for the team.
- Identified a novel use-case for a microsecond-timescale trading strategy. Implemented and deployed this strategy in a C application. This strategy was able to identify and execute a class of easily profitable trades that the team was not exploiting.
- Implemented, tested, and deployed a safety mechanism in C across the entire trading system to prevent fast automated trades from going outside of algorithmically predetermined price limits, ensuring fast automated transactions remain within algorithmically set price boundaries, thus providing critical safety guarantees for certain trading strategies.
- Created a C# server that simulated and broadcasted forecasts of option price fluctuations based on anticipated market movements, supplying the team with vital insights for auto-trading application configurations.
- Developed a C# server for real-time monitoring of work queues in the data collection system. The server identified throughput bottlenecks across each component of the system in real-time.

Software Engineering Intern   05/2015 - 09/2015
Rincon Research Corporation | Tucson, AZ

- Engineered and implemented a distributed geolocation algorithm deployed in C on an autonomous drone cluster. This allowed multiple drones in a network to coordinate geolocating a target via triangulation.

Skills

- Python, C/C++, PyTorch, Unix/Bash, CUDA, Computer Vision, Deep Learning, Neural Networks, Machine Learning, C#, Java, git, numpy/scipy, Parallel Computing

Education

The University of Arizona | Tucson AZ

- **M.S. Computer Science** with a focus in Machine Learning (4.0 GPA)   2018 - 2020
  - Conducted research on a diverse set of Machine Learning projects under Prof. John Kececioglu and Prof. Roberto Furfaro.
  - Designed and implemented an unsupervised learning algorithm in C++ for real-time outlier detection in large-scale streaming astronomical data from the Large-aperture Synoptic Survey Telescope (LSST).
  - Implemented and successfully trained deep reinforcement learning algorithms for control of hypersonic aircraft.
  - Independently built a third-party Unix-like file system for macOS from scratch with over 13,000 lines of C and C++.
  - T.A. for Software Development in C++, Theory of Computation, Data Structures & Algorithms, Intro. to Computer Science.
- **B.S. Computer Science** (4.0 major GPA)   2013 - 2017
- **B.S. Mathematics**   2013 - 2017