

ALEC A. REED

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Background:

I am a second-year computer science PhD student at CU Boulder with 4 years of full-time work experience as a network design engineer at Boeing. I am looking for an opportunity to contribute to the development of planning, prediction, and control methods for autonomous systems.

Education:

- PhD – Computer Science – University of Colorado Boulder: 2021 - Current
- MS – Electrical Engineering – University of Washington: 2017 - 2019
- BS – Electrical Engineering – Gonzaga University: 2013-2017

Relevant Work Experience:

- **University of Colorado Boulder**, June 2021 – Present, PhD Student, Research Assistant
- **Boeing, Full-time**, Everett WA, June 2017- June 2021, Network Design Engineer.
- **Boeing, Intern**, Everett WA, May 2016- August 18th, 2016- Electro-Magnetic Effects Engineering Intern

Skills

Expert Skills

- Deep Learning (Feedforward, Transformer, LSTM, Pytorch, Pytorch Lightning and TF)
- Autonomous Control (MPC, Stanley Controller, MPPI)
- Python, C++
- Network Design (Ethernet, CANBUS, network troubleshooting)

Course Work & Other Skills

- Localization (EKF, PF)
- Path Planning (a*, RRT, RRT*)
- Machine Learning
- Reinforcement Learning (DQN, MCTS)
- Other Languages: Julia, Kotlin, Java
- Hardware Design (Power systems, wire harnesses, general troubleshooting)

Relevant Technical Projects

- **StateFormer: A Transformer based method for learning model dynamics** (current)
 - Development of state prediction model using a transformer network.
 - OOM improvement over current inertial based state estimation methods
- **Verified Path Following using Neural Control Lyapunov Functions** (2021 - 2022)
 - This paper outlines a framework for developing Lyapunov functions using deep learning and extracting executable controls from these special functions.
 - Link: https://openreview.net/forum?id=JErNvd_IKHr
 - Use of:
 - Neural network function shaping
 - automated theorem provers (DREAL/Z3)
 - Novel control extraction algorithm (Dynamics constrained gradient descent)
 - Real-world robot construction and implementation
- **Error Detection Simulation using Parallel Processing** (2020-2021)
 - Developed, optimized for parallelization, and validated error simulation C code to characterize aircraft network integrity.
 - Developed and conducted testing to characterize EME induced errors on aircraft wiring.
 - Led a cross functional team of Network Architects, Engineers and Statisticians to generate and evaluate results of simulation.

Publications

- Reed, A., Berger, G., Sankaranarayanan, S., Heckman, C. (2022) Verified Path Following Using Neural Control Lyapunov Functions. Proceedings of the 6th Conference on Robot Learning (In preparation).
- Reed, A., Albin, D., Pasricha, A., Heckman, C., an Examination of Attention Based Methods for Learning System Dynamics. *Under Preperation*