Jorge Chavez

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EDUCATION

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN　　　　　　　　　　　May 2025
Master of Science in Electrical and Computer Engineering　　　　　　　　　GPA: 3.8/4.0
Concentration in Machine Learning Verification

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN　　　　　　　　　　　May 2023
Bachelor of Science in Computer Engineering　　　　　　　　　　　　　　　GPA: 3.8/4.0

PROJECTS

$\alpha\beta$-CROWN, Neural Network Verification　　　　　　　　　　　Jan 2024 – Present
- Participated in the 5th International Verification of Neural Networks Competition (VNN-COMP), contributing to the $\alpha\beta$-CROWN team's first place finish.
- Developed a novel framework to enhance the $\alpha\beta$-CROWN, verification tool in PyTorch, which enabled up to 85% speedup in verification time and 64% reduction in the domains visited in branch-and-bound based on benchmarks from VNN-COMP.
- Contributed invaluable features such as projected gradient descent to perform soundness checks on the verifier, enhancing parallelism to reduce time on certain benchmarks by 2x, and providing extensive documentation on existing and newly implemented features.

Autonomous Lane-Tracking　　　　　　　　　　　　　　　　　　Dec 2022 – May 2023
- Built an autonomous driving pipeline for lane-tracking and collision detection using Python and ROS.
- Employed computer vision techniques such as homography transformations and edge detection to perceive and extract waypoints.
- Implemented a Stanley controller for closed loop steering control, additionally using LiDAR to perceive obstacles.
- Performed simulations in Gazebo before successfully deploying on the Polaris GEM Vehicle for real word testing.

INTERNSHIP EXPERIENCE

Motorola Solutions | Embedded Systems Engineer　　　　　　　　　May 2022 – Aug 2022
Schaumburg, IL

- Designed a multi-threaded application in Python to monitor and predict radio activity, replaying decoy signals to mislead adversaries without revealing real transmissions.
- Engineered the application to monitor radio activity, predict signal recurrence, and optimize data capture thus significantly reducing processing latency on the team's custom-manufactured radio.
- Gained expertise in digital signal processing, multi-threaded architecture, and predictive analytics for communication systems.

RSO INVOLVEMENT

Illini Space Society | Controls Programmer and Project Lead　　　　　Jan 2025 – Present
- Led a team of 3 students to deploy feedback controllers on various systems via LQR and neural network methodologies.
- Designed and trained neural network feedback controllers for low-dimensional systems (e.g. inverted pendulum and cart-pole) with Lyapunov stability guarantees, verified using $\alpha\beta$-CROWN. Mentored and assigned system examples to the team.
- Implemented LQR for a high-dimensional quadrotor system to stabilize said system towards an arbitrary equilibrium point.
- Presented educational sessions on state-space models, state feedback, and Kalman filter theory to a broader audience, contributing to the organization's understanding of fundamental topics in control systems.

Research and Scholarly Work

A Linear Constraint Driven Approach to Efficiently Enhancing Branch and Bound in Neural Network Verification
Master's Thesis, Graduate College of the University of Illinois Urbana-Champaign, 2025

Clip-and-Verify: Linear Constraint-Driven Domain Clipping for Accelerating Neural Network Verification
Jorge Chavez*, Duo Zhou*, Hesun Chen*, Huan Zhang, Grani Adiwena Hanasusanto　　　(* for equal contribution)
NeurIPS [under review], 2025

SKILLS

Programming: C/C++, Python, Matlab, Verilog, CUDA
Deep Learning: PyTorch, OpenCV, Pandas, ROS