

EMERSON VARGAS NIÑO

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EXPERIENCE

ASTROFORGE

Greater Los Angeles, USA

Apr 2024 – Present

Spacecraft Guidance, Navigation and Control (GNC) Engineer

- Delivered the GNC system for AstroForge's first deep-space asteroid-mining spacecraft from concept to flight-ready in nine months as one of three GNC engineers (launched in 2025); now building its asteroid-rendezvous successor
- Design and implement robust GNC flight software in Rust from algorithm development through software- and hardware-in-the-loop testing, while also developing the Python/C++ simulation environment used for its validation
- Architected Python/C++ 6-DOF Monte Carlo simulator running flight software closed-loop at 380-990× real time with deterministic replay
- Implemented and validated a multiplicative extended Kalman filter in Rust for spacecraft orientation estimation, handling asynchronous and delayed star-tracker/gyro measurements, online bias estimation, and fault recovery; achieved error below 0.055° in 99.7% of cases
- Built a real-time least-squares/null-space optimizer in Rust, allocating torque across redundant reaction wheels to minimize peak speeds and avoid nonlinear regimes without altering net spacecraft torque; preserved nominal torque tracking across randomized wheel dropouts
- Precomputed smooth gimbal motor-command surfaces via constrained optimization of an underconstrained mapping for O(1) commands with low motor travel for small pointing updates; calibrated hardware with iterative least squares, cutting pointing error 46% on average
- Built real-time gimbale-thruster control allocator in Rust, mapping maneuver and reaction-wheel momentum-unloading commands to feasible pointing directions and firing times; used momentum feedback to estimate and correct center-of-mass error

SFL MISSIONS INC.

Toronto, Canada

Aug 2021 – Apr 2024

Senior Research Associate

- Designed and tested GNC systems and conducted on-orbit operations for 45+ spacecraft in 10+ missions as one of five GNC engineers
- Owned GNC hardware lifecycle for 35+ spacecraft; built test systems cutting acceptance/calibration time 60%; 100% on-orbit success
- Commissioned GNC systems for 20+ spacecraft through conjunction assessment, collision avoidance, formation flying, and calibration
- Developed on-orbit calibration methods and automated GNC and data-processing tasks, cutting average commissioning time by 40%
- Built Python tool to devise deorbit strategies for future spacecraft, validated against orbital-decay data from 40+ satellites
- Optimized attitude trajectories and sensor placement with a Python framework, raising useful annual observations by 35% on 6 spacecraft

SPACE FLIGHT LABORATORY

Toronto, Canada

Sep 2018 – Jul 2021

Graduate Researcher

- Developed and deployed an attitude-trajectory algorithm in C on two spacecraft, raising star-tracker availability 30% during target tracking
- Built a reaction-wheel momentum set-point optimizer; cut average pointing error 10% and raised momentum margin 20% on 10 spacecraft
- Led deployable solar-panel qualification and acceptance, diagnosing and resolving failures; 100% on-orbit success for 15+ spacecraft

UNIVERSITY OF TORONTO AEROSPACE TEAM

Toronto, Canada

Jul 2017 – Aug 2021

Head of Propulsion, Liquid & Hybrid Rocket Programs

- Led a team of 20+ to develop a 1,400-lbf N₂O-paraffin hybrid engine powering a rocket to 21,000 ft and a national competition win
- Led U of T's first liquid rocket engine project, leading a 14-person team through detailed design of a 110-lbf N₂O-ethanol engine
- Developed a flight-proven two-phase N₂O injector using analytical models and a modified CFD solver, achieving 3.9% and 3.6% average mass-flow error against experiments, respectively; first-authored an AIAA paper used in a Stanford graduate rocket-propulsion course
- Built and benchmarked a Python simulator coupling propulsion and 3-DOF flight dynamics; numerical optimization cut vehicle mass 15%
- Modeled structural loads and automated a CFD workflow on a supercomputer; cut tank length by 12" to meet a 2× safety factor

AEROSPACE COMPUTATIONAL ENGINEERING LABORATORY

Toronto, Canada

Sep 2017 – Apr 2018

Undergraduate Researcher

- Designed and numerically optimized a regeneratively cooled aerospike nozzle with thermal and thrust models validated against CFD

SPACECRAFT DYNAMICS AND CONTROL LABORATORY

Toronto, Canada

Sep 2017 – Apr 2018

Undergraduate Researcher

- Built MATLAB spacecraft simulation of magnetorquer-thruster LQR control; halved detumbling time versus magnetic-only control

EDUCATION

UNIVERSITY OF TORONTO

MAsc Master of Applied Science; Aerospace Science & Engineering; GPA: 3.95/4.00; fully funded tuition & stipend

Aug 2022

BASc Bachelor of Applied Science; Mechanical Engineering; Mechatronics, Solid Mechanics & Design; 16-month co-op

May 2018

SKILLS & INTERESTS

Technical Python, Rust, C++, C, MATLAB, Bash, L^AT_EX; Linux, Git, high-performance computing

Service Pueblo Science: created curricula, taught 100+ Indigenous students; Visions of Science: taught 30+ underserved youth weekly

Personal Trivia, rock climbing, solo alpine backpacking, scuba diving, birding, violin, art; bilingual (English, Spanish); lived in 6 countries