

# Patrick Youssef

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## Select Impact

- **Rivian Gen2 Highway Assist:** Enabled org-wide simulation validation for Rivian's flagship autonomy feature, supporting both pre-launch readiness and ongoing development for its next-generation highway driving experience deployed to customers
- **SpaceX Crew Dragon: First Crewed Mission:** Supported mission validation for SpaceX's first human spaceflight, enabling full launch-to-landing simulation and improved constraint checks ahead of the historic Crew Demo-2 launch to the ISS

## Work Experience

### Rivian

Software Engineer II, Simulation Infrastructure, Autonomy

Palo Alto, CA

Jan. 2024 – Present

- Spearheaded Rivian's first unified autonomy metrics framework, enabling 70%+ of teams to evaluate performance at scale. Runs 200K+ simulations/month with <15 min turnaround, eliminating redundant computations and streamlining debugging.
- Built a PyTorch-based evaluation pipeline to validate native BEV model outputs against logs and simulation. Improved inference speed 3x over training, enabling 5+ release debugging cycles and providing reusable ML utilities to the perception team.
- Developed SanityCheck, a pre-simulation validation framework preventing crashes by detecting data deficiencies. Saves \$150K/yr in compute costs by terminating faulty jobs early and improving debugging efficiency for developers.
- Strengthened Rivian's simulation ecosystem by improving performance metrics, debugging tools, and automation. Built a closed-loop evaluation suite, streamlined data retrieval, and enhanced local testing interfaces, accelerating development.

### SpaceX

GNC Software Engineering Intern

Hawthorne, CA

Jun. 2019 – Aug. 2019

- Overhauled Crew Dragon's flight simulation pipeline to enable full launch-to-land simulations and reduce update time by 70%
- Automated updating 500+ legacy configurations to utilize the new pipeline while cleaning out deprecated simulations
- Executed functional and regression testing on critical verification simulations to ensure the 500+ changes had no adverse effects
- Implemented Python statistics scripts on the cluster to accumulate 100+ performance metrics checked against mission constraints

Vehicle Engineering Intern

Mar. 2019 – Jun. 2019

- Developed computer vision software using Python/C++/OpenCV to automate a previously manual critical vehicle component inspection to reduce errors by 50%, increase process speed by 5x, and expedite crewed vehicle pre-flight checkouts

## Projects

### Neural Radiance Fields (NeRF)

Present

- Implementing NeRF with modern architectural and training updates to evaluate improvements against synthetic ground truth

### PatrickYoussef.com

Jun. 2020 – Present

- Designed and built a modern content-driven site with Astro (prev: Gatsby) to share projects, technical blogs, and spurious insights
- Features custom layouts, MDX-powered posts, and fast, minimalist performance to encourage exploration and readability

### N-Body Orbit Simulation

Oct. 2022

- Simulated orbital body precession with an RK4 numerical integrator and novel combinatorics for 40% faster simulations
- Validated Hohmann transfers from LEO to GEO, ensuring numerical stability in long-term trajectory modeling

## Education

### University of California, San Diego (UCSD)

Master of Science, Computer Science

Mar. 2022

La Jolla, CA

- GPA 3.95/4.0; Machine Learning, Artificial Intelligence, and Robotics Focus
- **Courses:** Grad Algorithms, Deep Visual Learning, Advanced Computer Vision, Robotic State Estimation, Probabilistic Reasoning

### University of California, Irvine (UCI)

Bachelor of Science, Mechanical Engineering

Mar. 2020

Irvine, CA

## Skills

- **Programming:** Python, JavaScript, HTML, CSS, MATLAB, R, C/C++, Bash
- **Technologies:** NumPy, Matplotlib, OpenCV, PyTorch, Robot/PyTest, Scikit-Learn, Pandas, TensorFlow, Git, Linux
- **Systems & Infra:** AWS (Batch, EC2, S3), Docker, Linux, GPU-based inference workloads, containerized deployment
- **Concepts:** Machine Learning, Computer Vision, Numerical Methods, Linear Algebra, Optimization, Algorithms