

# Joey Carpinelli · Technical Résumé

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## Professional Experience

### NASA Johnson Space Center (JSC)

August 2017 — Present

*GN&C Engineer, Pathways Intern, USRA Intern*

- Full time as of July 2021; Orion's Launch Abort System GN&C development, analysis, verification
- Reduced, analyzed, and implemented flexible body (structure) model (MATLAB, C++)
- Uses monte-carlo simulations for parameter tuning; improved vehicle performance noticeably
- Uses linear analysis to analyze vehicle performance, verify stability margins; validates linear models
- Serves as backup regression data approver for simulated Orion Launch Abort System performance
- Led development for polarity tests; created novel 6DOF kinematics simulation (Julia, Python); represented Orion GN&C at multiple lab tests in three states: Texas, Colorado, Florida

### Space Systems Laboratory (SSL)

August 2016 — May 2021

*Graduate Assistant*

- Graduate Assistant under Dr. Dave Akin as of August 2019; led robot software development (C++)
- Developed novel Julia package to generate symbolic manipulator kinematics models; implemented and merged required changes to `ModelingToolkit.jl`; intermediate Jacobian performance substantially improved over `Orocos` iterative solvers; implemented fast inverse-kinematics algorithm
- Created C++ interfaces (templates) and implementations for control, including force/torque control
- Maintained operator GUI (Python); diver for Neutral Buoyancy Research Facility Maintenance

### Harris Corporation

May 2016 — August 2016

*Electrical Engineering Intern*

- Automated Excel task with VBA; 20 worker hours → 2 minute runtime
- Worked with one other intern to implement rain attenuation ITU Propagation Model; MATLAB functions written to implement model calculations, C# used to gather terrain data

### SRI International

May 2015 — December 2015

*Data Annotation Intern*

- Collected and annotated data to train deep-learning algorithms; improved process with scripting
- Designed LED Array and circuit layouts for gaze tracking project using Eagle CAD

## Education

### M.S. Aerospace Engineering

August 2019 — May 2021

University of Maryland, College Park

- Research assistant under Dr. Akin; space robotics (manipulator) software lead, primary operator
- Halo orbit & invariant-manifold research project with Professor Barbee; released as open source tools
- Emphasis in space systems, prioritized dynamics & controls in coursework

### B.S. Electrical Engineering

May 2019

University of Maryland, College Park

- Four control theory courses, four computer science courses; major emphasis in control theory
- Undergraduate Research Assistant under Dr. Akin at SSL; ROS/Orocos software lead in third year
- Implemented inertial and viscous friction compensation for SSL's MGA Exoskeleton (Galil, UART)

## Technical Skills

### Computer Programming

- Experienced Julia & Python developer; aerospace dynamics, simulation, and analysis applications
- Productive C/C++ developer; robot core software, kinematics, & control applications

### Modeling & Simulation

- Experienced with linear model reduction, linear analysis, and nonlinear analysis methods

### Circuit Design

- Digital & analog lab experience, including Verilog, SPICE, PSpice, Xilinx, oscilloscopes, Eagle CAD

## Open Source

### [AstrodynamicalModels.jl](#)

Model generation — with optional state transition matrix dynamics — through `ModelingToolkit.jl`.

### [GeneralAstrodynamics.jl](#)

General calculations, visualizations, iterative & analytical periodic orbit solvers, and orbit-manifold solvers. Presented at [JuliaCon!](#)

### [SPICEApplications.jl](#)

All SPICE toolkit applications, wrapped in Julia functions with high-level syntax.

### [SPICEKernels.jl](#)

All general kernels provided by NASA, exposed and cached through Julia functions.

### [HorizonsAPI.jl](#)

A word-for-word wrapper for the JPL Horizons REST API. Fetch solar system ephemeris for free! See also: [HorizonsEphemeris.jl](#).

### [PolynomialGTM.jl](#)

Implements publicly available polynomial models for NASA's Generic Transport Model using `ModelingToolkit.jl`.

### [CommonLicenses.jl](#)

Inline any [standard license](#) into your executable document! For example: `CommonLicenses.MIT()`.

### [module-hygiene](#)

Provides an `__export__` key, and an associated `cleanup` function to reduce namespace clutter. See also, [block-scopes](#).

### [rich-admonitions](#)

Extends the excellent terminal formatting package [rich](#) with Julia-style Markdown admonition blocks!

## Personal Media

🐙 @cadojo

📄 in/joeycarp

🏠 <https://loopy.software>