Aditya Raman

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EDUCATION

Rutgers University, New Brunswick — New Brunswick, NJ
Mathematics and Electrical Engineering; GPA: 3.6 — *2023–2027*

EXPERIENCE

Controls Engineering Intern — New Brunswick, NJ
Swarm Intelligence Lab — *Dec 2025 – Present*
- **Analytical Equilibrium Derivation**: Derived equilibrium points of a highly nonlinear swarm interaction model and linearized the dynamics via Jacobian-based Taylor expansion around three nominal operating states, enabling local stability analysis.
- **Data-Driven Dynamics**: Modeled leader–follower behavior with six coupled nonlinear error-dynamics equations fitted to experimental trajectory data, capturing relative position and velocity between agents.
- **Non-linear Stability Analysis**: Analyzed how varying interaction and control gains across multi-parameter sweeps shifted eigenvalues of the linearized error system, identifying regions that yield stable equilibrium behavior.

Undergraduate Researcher — Newark, NJ
Rutgers University – Newark — *Sep 2024 – May 2025*
- **Mechanical Assembly**: Assembled and configured high-vacuum chamber systems for atomic physics experiments, applying electromagnetism, circuit design, and quantum mechanics principles.
- **Circuit Design**: Designed and implemented analog circuits, including a multiplexer-based square-wave generator, to drive and control experimental hardware for gravimeter measurements.
- **Laser Feedback Control**: Built an op-amp-based feedback circuit to stabilize and tune laser frequency, improving control over atom-trapping conditions in the vacuum chamber setup.
- **Data Collection and Analysis**: Acquired and analyzed time-series measurements from cold-atom gravimeter runs, extracting gravity-induced signal changes from noisy experimental data.

Rutgers University – Learning Centers — New Brunswick, NJ
Mentor Learning Coordinator — *Dec 2023 – Present*
- **Engineering Course Design**: Joined faculty to design the Linear Systems and Signals course in the ECE department using historical trends and data from prior iterations of the course.
- **Mentor Instructor**: Managed a group of seven new learning assistants responsible for over 240 students at Rutgers University and supported their integration into the program.

PROJECTS AND ORGANIZATIONS

Hindmarsh–Rose Neuron Model
Control System Design Project — *Fall 2025*
- **Nonlinear neuron modeling**: Implemented a three-state Hindmarsh–Rose neuron model in MATLAB/Simulink to reproduce biologically realistic spiking and bursting dynamics from nonlinear differential equations.
- **Equilibrium and linearization**: Solved for equilibrium points and derived a linear state-space representation around the operating point, applying Routh–Hurwitz and eigenvalue analysis to assess local stability.
- **Control design**: Designed and tuned open-loop and closed-loop controllers using root locus, Nyquist, and Bode methods and verified performance on the nonlinear Simulink model.

Rutgers Formula Racing
Vehicle Dynamics and Manufacturing — *2023 – 2024*
- **Suspension design**: Designed and analyzed suspension geometry in SolidWorks to improve mechanical grip and load distribution for a Formula SAE racecar.
- **Manufacturing**: Supported fabrication of a tubular space frame through manual machining, welding, and custom construction of structural members.
- **Aerodynamic optimization**: Implemented aerodynamic fairings that reduced the measured drag coefficient by 12% during track testing.

SKILLS AND FRAMEWORKS

- **Electrical Engineering**: Circuit design, feedback control, signal processing, LTspice
- **Programming and Simulation**: MATLAB, Simulink, Python, Git, SQL, JavaScript, TypeScript
- **Microsoft Office**: Excel, Word, Project, PowerPoint, Outlook