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*
  - **Modeling Agent Behavior**: Modeled the interaction between 2 autonomous agents (a pursuer and an evader) using a system of 5 coupled equations, identifying the stability conditions.
  - **Control Law Design**: Designed 2 separate feedback control laws governing each agent's behavior — one for pursuit and one for evasion — and derived the 3 key equilibrium equations for steady state behavior.
  - **Parameter Analysis**: Ran systematic tests by sweeping across 8 model parameters, determining which combinations produced smooth, stable behavior versus unpredictable or diverging outcomes.
- **Undergraduate Researcher** — Newark, NJ
  Rutgers University – Newark — *Sep 2024 – May 2025*
  - **Lab Equipment Assembly**: Built and configured specialized vacuum chamber systems used to isolate and study individual atoms, applying precise assembly techniques across multiple experimental setups.
  - **Circuit Design**: Designed and built 4 custom electronic circuits to power and control the lab's measurement instruments, including a signal generator that provided precise timing control for experiments.
  - **Laser Stabilization**: Built an electronic feedback system that automatically corrected laser frequency drift by over 90%, keeping the laser locked to the exact frequency needed for atom-trapping experiments.
  - **Data Collection and Analysis**: Collected and processed data from hundreds of experimental runs, extracting reliable gravity-induced signals from noisy measurements to support ongoing research.
- **Rutgers University – Learning Centers** — New Brunswick, NJ
  Mentor Learning Coordinator — *Dec 2023 – Present*
  - **Course Development**: Collaborated with faculty over 7 semesters to redesign a core engineering course, using past student performance data to improve structure and content — contributing to an 8% increase in student pass rates.
  - **Team Leadership**: Mentored 17 first-semester learning assistants across multiple cohorts, supporting staff who collectively helped over 240 students with coursework and academic success.

Projects and Organizations

- **Hindmarsh–Rose Neuron Model**
  Control System Design Project — *Fall 2025*
  - **Brain Cell Simulation**: Built a computer simulation of how a single neuron (brain cell) fires electrical signals, reproducing realistic spiking and bursting patterns seen in biological systems.
  - **System Analysis**: Identified the conditions under which the simulated neuron reaches a steady state and mathematically analyzed whether that state is stable or prone to unpredictable behavior.
  - **Control Design**: Designed and tested automatic control systems to regulate the neuron model's behavior, verifying that the controllers worked correctly on the full simulation.
- **FIR Filter Design and Implementation**
  Digital Signal Processing Project — *2023 – 2024*
  - **Filter Design**: Built digital filters in MATLAB that selectively allow certain frequencies of a signal to pass through while blocking others — similar to how an audio equalizer boosts or cuts specific sound frequencies.
  - **Noise Reduction**: Applied the filters to noisy audio and sensor data, successfully isolating the useful signal from unwanted interference.
  - **Performance Evaluation**: Tested and fine-tuned each filter to confirm it met specified performance targets, analyzing how well it separated desired signals from noise.

Skills and Frameworks

- **Electrical Engineering**: Circuit design, feedback control, signal processing, LTspice
- **Programming and Simulation**: MATLAB, Simulink, Python, Git, SQL, JavaScript, TypeScript