

Micah Banschick

Curriculum Vitae

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EDUCATION

B.Sc. in Physics and Mathematics (University Scholar with Honors) 2022 - 2026
University of Connecticut
Thesis: Stochastic Methods For Identifying Binary Supermassive Black Holes
GPA: 3.63

RESEARCH EXPERIENCE

Stochastic Methods For Identifying Binary Supermassive Black Holes 2025 - Present
Advisory Committee: Jonathan Trump, Lea Ferreira dos Santos, Cara Battersby
University of Connecticut

- Calculated binary supermassive black hole luminosity fluctuations using Monte Carlo Markov Chains and Python packages such as numpy, matplotlib, astropy, and emcee.
- Modeled 950 light curves of supermassive black holes and their properties against each other to enhance key property extraction by feeding the model over 20 gigabytes of black hole data.
- Programmed an algorithm supported by verified scientific publications to calculate the spectral emission distributions of binary supermassive black holes.

Modeling and Simulation of Electrospray Plumes - Advisor: Benjamin Prince 2025
Air Force Research Laboratory

- Simulate charged-particle trajectories in capillary electrospray plumes using LAMMPS.
- Perform design-space exploration that informs next-generation emitter-array geometry for higher thrust-to-power efficiency.
- Process experimental beam-probe data in IgorPro and visualized plume evolution with VMD to cross-validate simulation predictions.

Merging Binary Supermassive Black Holes - Advisor: Jonathan Trump 2024 - 2025
University of Connecticut

- Calculated the spectral emission distributions of supermassive black holes by integrating radially through their mini-disks.
- Modeled black hole luminosity fluctuations using Python packages such as matplotlib and astropy.

Optical Signatures of Ion-neutral Collisions - Advisor: Benjamin Prince 2024
Air Force Research Laboratory

- Experimentally gathered optical emissions of $N_2^+ + N_2$ collisions for $N_2^+(B-X)$ and $N_2^+(A-X)$ molecular transitions across $16 - 600 \frac{eV}{q}$ kinetic energies using a 13.86 MHz radio frequency ion source.
- Generated vibrational & rotational basis functions with Diatomic and simulated spectra in IgorPro, extracting state-resolved cross-sections.
- Leveraged Monte-Carlo cascade simulations and statistical analysis to validate measurements, enabling data-driven refinement of beam-imaging diagnostics for the follow-on experiment.
- Produced NIH validated N_2^+ spectra further supporting upper-atmosphere radiative-transport models.

PUBLICATIONS & PREPRINTS

Manuscripts in Preparation

Banschick, M., *Stochastic Methods For Identifying Binary Supermassive Black Holes* (in prep., target IEEE Transactions on Plasma Science, Apr 2026). 2025

Prince, B., **Banschick, M.**, *Capillary Electrospray Plume Dynamics at the nL/s Flow Rates: Experiments and Simulations* (in prep., target JANNAP on Exhaust Plume and Signatures, Jan 2026). 2025

Hause, M., Prince, B., **Banschick, M.**, *Luminescence Measurements of Charge Transfer Collisions of $N_2^+ + N_2$* (in prep., planned submission Oct 2025). 2024

SELECTED PRESENTATIONS

Seminar Lectures

Ion–Neutral Collision Imaging in Low-Pressure Ion Beams. 2025
Dept. of Physics, University of Connecticut

Poster Sessions

Modeling and Simulation of Capillary Electrospray Thruster Plumes 2025
Air Force Research Laboratory

Luminescence Measurements of Charge Transfer Collisions of $N_2^+ + N_2$ 2024
Air Force Research Laboratory

AWARDS AND HONORS

Secret Level Security Clearance (DoD, active), USRA 2025 - Present

University Scholar, University of Connecticut 2025 - Present

Honors Scholar in Physics, University of Connecticut 2023 - Present

Annual Physics & Mathematics Awards, University of Connecticut 2023

LEADERSHIP & SERVICE

Quantitative Researcher Apr 2025 – Present
Husky Quantitative Group (Student-run Hedge Fund)

- Implement Policy Gradient machine learning algorithms into HQG trading model.
- Backtest experimental strategies in QuantConnect using PyTorch and stable_baselines3.PPO.
- Present strategy memo regularly to UConn Dean of Business and external investors to secure funding.

Co-lead 2023 - 2025
Science Technology & Astronomy Recruits (STARs)

- Mentored ~ 40 STEM undergrads/semester (majors, research, grad apps) & coordinate campus programming.
- Designed & delivered physics demos to ~ 60 HS students/yr and managed $\sim \$2K$ materials & safety kits.
- Organized and delivered interactive lessons on optics, electrostatics, projectile motion, and gravity.

PROFESSIONAL SKILLS

Simulation & Analysis: Monte-Carlo & MCMC, Plasma Plume Modeling, Spectroscopic Fitting, Statistical Inference.

Programming & Software: Python (NumPy, SciPy, Astropy, Matplotlib, emcee), MATLAB, Mathematica, IgorPro, LAMMPS, Java, Git.

REFERENCES

Jonathan Trump, *Associate Professor*
Dept. of Physics, University of Connecticut
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Lea Ferreira dos Santos, *Associate Department Head for Administration and Professor*
Dept. of Physics, University of Connecticut
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Benjamin Prince, *Senior Research Chemist*
Space Vehicles Directorate, Air Force Research Laboratory
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