Emily M. Boudreaux (they/she)

Dartmouth College, Hanover NH, 03784
Department of Physics and Astronomy
HB 6127
emily@boudreauxmail.com

RESEARCH INTERESTS

Computational astrophysics, stellar evolution, low mass stars.

JOBS

- **Dartmouth College**, May 2024 - present
  Post Doctoral Research Associate working with Aaron Dotter on 4D-STAR
- **Dartmouth College**, May 2024 - present
  Lecturer

EDUCATION

Dartmouth College — Hanover, NH
Master of Science — Physics & Astronomy — May 2022
Advisor: Dr. Brian C. Chaboyer
Secondary Advisor: Dr. Elisabeth R. Newton
Doctor of Philosophy —- Physics & Astronomy — April 2024
Thesis: Models of Low Mass Stars as Physical Laboratories
Advisor: Dr. Brian C. Chaboyer
Commitee: Dr. Aaron Dotter, Dr. Elisabeth R. Newton, Dr. Jamie Tayar

High Point University — High Point, NC
Bachelor of Science, **summa cum laude** — Computational Physics — May 2019
Advisor: Brad N. Barlow

PUBLICATIONS

First Author

- **Boudreaux, E.M.**, Garcia Soto, Aylin., Chaboyer, B.C., 2024. Correlations between Ca II H&K Emission and the Gaia M dwarf Gap, *The Astrophysical Journal*. 965(1), p.56
- **Boudreaux, E.M.**, Chaboyer, B.C., Ash, Amanda., Edaes Hoh, Renata., Feiden, Gregory., 2024. Chemically Self-Consitent Modeling of the Globular Cluster NGC 2808 and its Effects on the Inferred Helium abundance of Multiple Stellar Populations, *The Astrophysical Journal*. 980(1), p.180
- **Boudreaux, E.M.**, Chaboyer, B.C., 2023. Updated High-Temperature Opacties for the Dartmouth Stellar Evolution Program and their Effect on the Jao Gap Location, *The Astrophysical Journal*. 944(2), p.129
- **Boudreaux, E.M.**, Newton, E.R., Mondrik, N., Charbonneau, D., Irwin, J., 2021. The Ca II H&K Rotation-Activity Relation in 53 mid-to-late type M-Dwarfs, *The Astrophysical Journal*. 926(1), p.80
- **Boudreaux, T. M.**, 2017, "The applications of deep neural networks to sdBV classification", *Open Astronomy*, **26**, 258.

- **Boudreaux, E. M.**, Barlow, B. N., Fleming, S. W., Soto, A. V., Million, C., Reichart, D. E., Haislip, J. B., Linder, T. R., Moore, J. P., 2017. "A search for rapidly pulsating hot subdwarf stars in the GALEX survey", *Astrophysical Journal*, **845**, 171.

Contributing Author

- Ying, M., Chaboyer, B., **Boudreaux, E.M.**, Slaughter, C., Boylan-Kolchin, M., Wesiz, D., The Absolute Age of M92. *The Astronomical Journal*, 166(1), p.18.
- Guidry, J.A., Vanderbosch, Z.P., Hermes, J.J., Barlow, B.N., Lopez, I.D., **Boudreaux, E.M.**, Corcoran, K.A., Bell, K.J., Montgomery, M.H., Heintz, T.M. and Castanheira, B.G., 2021. I Spy Transits and Pulsations: Empirical Variability in White Dwarfs Using Gaia and the Zwicky Transient Facility. *The Astrophysical Journal*, 912(2), p.125.
- Vos, J., Vučkovič, M., Chen, X., Han, Z., **Boudreaux, E. M.**, Barlow, B. N., Østensen, R., Nèmeth, P., 2019, "The orbital period — mass ratio relation of wide sdB+MS binaries and its application to the stability of RLOF.", *Monthly Notices of The Royal Astronomical Society*, **482**, 4592

COMPUTING SKILLS

- *Programming Languages:*
  1. *Expert:* Python, C, C++(11/17/20/23), Fortran (77/90)
  2. *Comfortable:* Arduino, PHP, JavaScript, Mathematica
  3. *Familiar:* Go, Rust
- *Numerical Tools:* Finite Element Modeling (MFEM, deal.II)
- *Web Backend Technologies:* Flask, FastAPI, MongoDB, MySQL, MariaDB, Postgres
- *Misc:* Period04, Docker, GitHub, ZFS, LaTeX, Bash, Zsh

INTERNSHIPS

- **Harvard Smithsonian Astrophysical Observatory**, 2018
  Harvard SAO REU Student
- **Space Telescope Science Institute**, 2016
  SASP Summer Intern

AWARDS & HONORS

- **Dartmouth College Department of Physics & Astronomy** 2024
  Selamawit Tsehaye Teaching Award
- **Dartmouth College Department of Physics & Astronomy** 2019
  Department Chair Fellowship
- **The National Science Foundation**, 2019
  Graduate Record Fellowship Program Honorable Mention
- **High Point University**, 2019
  University Award for Highest Achievement
- **High Point University Honors Scholar Program**, 2019
  All University Honors
- **The Barry Goldwater Scholarship and Excellence in Education Foundation**, 2018
  Goldwater Scholar in Mathematics, Science, and Engineering

- **High Point University Department of Physics**, 2018
  Endowed Scholarship
- **National Collegiate Honors Council**, 2018
  Portz Scholarship
- **Sigma Xi, The Scientific Research Honors Society**, 2018
  Elected Associate Member
- **Sigma Pi Sigma, National Physics Honor Society**, 2018
  Elected Member
- **The Barry Goldwater Scholarship and Excellence in Education Foundation**, 2017
  Honorable Mention for excellence in Mathematics, Science, and Engineering
- **High Point University**, 2015–2019
  Presidential Scholarship

SELECTED ORAL PRESENTATIONS

- **Sixth Challenges and Innovations in Computational Astrophysics**, 2025 (upcoming), ISER Mohali, India
  "New Dimensions in Stellar Structure and Evolution." [Invited]
- **Twelfth Annual Meeting on Hot Subdwarfs and Related Objects**, 2025, Little Switzerland NC, USA
  "New Dimensions in Stellar Structure and Evolution."
- **National Collegiate Honors Council Annual Meeting**, 2018, Boston, MA
  "The Applications of Deep Neural Networks to sdBV Classification" [Invited]
- **North Carolina Astronomers Meeting**, 2017, Greensboro, NC
  "The Applications of Deep Neural Networks to sdBV Classification"
- **Eighth Annual Meeting on Hot Subdwarfs and Related Objects**, 2017, Krakòw, Poland
  "The Applications of Deep Neural Networks to sdBV Classification"
- **High Point University Research and Creative Works Symposium**, 2017, High Point, NC
  "A Virtual Survey of all known Hot Subdwarfs – searching for p-mode pulsations with GALEX"
- **Meeting of Astronomers in South Carolina**, 2017, Greenville, SC
  "The Applications of Deep Neural Networks to Time Domain Astrophysics"

SELECTED POSTER PRESENTATIONS

- **21st Meeting on Cool Stars**, 2022, Toulouse France
  Updated High-Temperature Opacties for DSEP and Their Effect on the Jao Gap Location
- **233rd Meeting of the American Astronomical Society**, 2019, Seattle Washington
  "A Journey to Mars: HPUniverse Day and Its Impact on Young Minds and a Community."
- **233rd Meeting of the American Astronomical Society**, 2019, Seattle Washington
  "Effects of the Primordial Binary Fraction on the Evolution of Globular Clusters."
- **231st Meeting of the American Astronomical Society**, 2018, Washington D.C.
  "Using Deep Learning to Analyze the Voices of Stars."
- **227th Meeting of the American Astronomical Society**, 2016, Kissimmee, FL
  "New Long Period Hot Subdwarfs from the Hobby-Eberly Telescope"

TEACHING EXPERIENCE Instructor of Record

- **Dartmouth College**, Winter 2026 (upcoming)
  Stellar Structure (*Astr 115*) ($\sim$ 5 students)
- **Dartmouth College**, Fall 2025
  Exploring the Universe (*Astr 2 & 3*) (61 students)
- **Dartmouth College**, Fall 2024
  Astrophysics (*Astr(1)74*) (5 students)

TEACHING EXPERIENCE Teaching Staff

- **High Point University**, 2016,2017
  Multivariable Calculus (*MTH 2410*, SI)
- **Dartmouth College**, 2022
  Advanced Stellar Astrophysics (*Astr 115*, TA)
- **Dartmouth College**, 2021,2022
  Public Obsserving (TA)
- **Dartmouth College**, 2020
  Introductory Mechanics (*Phys 13*, TA)
- **Dartmouth College**, 2020, 2023
  Introductory Solar System Astronomy (*Astr 1*, TA, 7 Lectures)
- **Dartmouth College**, 2023
  Stars and the Milky Way (*Astr 15*, TA)
- **Dartmouth College**, 2024
  The Development of Astronomical Thought (*Astr 4*, TA)

REFEREE SERVICE

- **The Astrophysical Journal, IOP**, 2025
- **Nature Physics, Nature Portfolio**, 2024

MENTORSHIP & STUDENTS

- **Renata Edaes Hoh**, **Dartmouth College, WISP**, 2022
  Identifying zero point offsets between absolute and differential photometry the globular cluster NGC 2808.
- **Mayumi Liz de Andrade Miyazato**, **Dartmouth College, WISP**, 2023
  Identifying zero point offsets between absolute and differential photometry the globular clusters NGC 6752 & 47 Tuc.

SELECTED SOFTWARE

All of my software can be found on my GitHub page.

- GridFire — High preformance dynamic nuclear network.
- OPAT — C++ and Python interface for OPAT file format.
- libmesac — C interface for much of the MESA microphysics and numerical libraries
- CoolDwarf — Three dimensional brown dwarf structure cooling model.
- fidanka — Robust CMD fiducial line extractor and isochrone fitter.
- mplEasyAnimate — Simple and easy animation library for use with matplotlib.
- pubPolishPy — Automatically rebuilt LaTeX project to target different journals.
- splitAxes — An easy way to build complex split axes graphs in matplotlib.
- PolytropicStellarModel — A blazingly fast, GPU accelerated, polytrope solver.

TEACHING TOOLS

I have developed a number of open source teaching utilities which can be found in my lectures page and my widgets page. These are intended to help students learn basic concepts in an interactive manner

- Embedding Diagram — Explore how light moves over geodesics in a curved space-time
- LIGO Simulator — Explore how strain leads to the famous "chirp" heard by LIGO
- Light Clock — Explore how holding the speed of light constant for all observes implies the rate time moves must be non constant

VOLUNTEER WORK

- **Dartmouth College**, 2024
  Dartmouth Astronomy Night
- **Dartmouth College**, 2023–2024
  Dartmouth Physics and Astronomy Graduate Curriculum Committee
- **Dartmouth College**, 2020,2021,2022,2023
  Public Observing
- **The Hopkins Center for the Arts**, 2022
  Pre-Movie Public Science Talk
- **Montshire Museum of Science**, 2020,2022,2023
  Astronomy Day – Comet Making, Ask an Astronomer, Star Clock
- **High Point University**, 2015,2016,2017,2018,2019
  HPUniverse Day – Finding Exoplanets

RESEARCH PROJECTS

- Development of a next generation 3+1D Stellar Structure and Evolution Program, 2024–
- The effects of OPLIB opacities and mutliple populations on the location of the Red Giant Branch Bump, 2024–2025
- The Jao Gap width and location as a population age indicator, 2022–2024
- The effect of Opacties on the location of the Jap Gap, 2021–2023
- Modifying the Dartmouth Stellar Evolution Program to fully self consistantly handel increased He abundance, 2020–2024
- The Ca II H&K Rotation-Activity Relation in 50 early-to-late type M-dwarfs, 2019–2020.
- Effects of the Primordial Binary Fraction on Globular Cluster Evolution, 2018
- Applications of Deep Learning to Classification of PTF Data, 2018
- Applications of Machine Learning to the Classification of Pulsating Stars, 2017–2018
- A Search for Rapidly Pulsating Hot Subdwarfs in the GALEX Survey, 2016–2017
- Orbital Solution Analysis of Long Period sdB+F/G/K Binaries, 2015–2016