

Marina M. Dunn

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Profile

Passionate, enthusiastic, and driven recent M.S. graduate specializing in data science, with focus on machine learning applications for space research. Experience working in industry, government and academic environments.

Education

M.S. Engineering: Data Science - University of California, Riverside

JUNE 2023

Advisor: Dr. Bahram Mobasher; Research Mentors: Dr. Aleksandra Ćiprijanović & Dr. Brian Nord

Thesis: "Galaxy Morphology Classification Using Bayesian Neural Networks for the Legacy Survey of Space and Time (LSST)"

Coursework: Data Science, Statistical Computing, Data Mining, Machine Learning, Engineering Principles, Image Processing

B.S. Astronomy - University of Arizona

MAY 2018

Coursework: Classical & Quantum Physics, Theoretical & Observational Astrophysics, Orbital Dynamics, Computer Programming, Mathematics

Skills

Data Science, Machine Learning, Deep Learning, Observational & Computational Astrophysics, Planetary Science

Python (TensorFlow, Keras, scikit-learn, PyTorch, Numpy, Pandas, Matplotlib, Plotly, PySpark), R Programming, MATLAB, Git Version Control, HTML, LaTeX

Data Visualization, Data Analysis, Quantitative Research, Telescope Operations, Image Processing, Image Classification, Proposal Writing, Technical Presentations, Agile Software Development, Web Design, STEM Outreach, Science Communication, Digital Art, Technical Troubleshooting & Repairs

Research & Work Experience

Deep Skies Lab; University of California, Riverside

Graduate Researcher | SEP 2021 - PRESENT

- Investigated application of Bayesian Neural Networks and transfer learning methods to classify galaxy morphologies in simulated imaging dataset representing different observing years with the upcoming Legacy Survey of Space & Time (LSST) to explore the impact of observational realism, including noise, on performance of classification models.

NASA Goddard Space Flight Center

CRESST II Research Assistant | JAN 2023 - PRESENT

- Utilized deep learning techniques, including regional convolutional neural networks and transfer learning, to detect ice blocks within the complex "chaos terrain" regions of Jupiter's moon, Europa.

Graduate Intern | AUG 2021 - MAY 2022

- Researched strategies for efficient migration & storage of NASA Earth science data and models in commercial cloud environments.
- Designed and implemented a data pipeline for the NASA SHIFT AVIRIS-NG campaign.

NASA Langley Research Center

Data Science Graduate Intern | AUG - DEC 2022

- Developed user-friendly, cloud-based machine learning models, visualization tools, and online resources as part of "The Machine Learning Showroom" initiative for NASA teams to evaluate implementing machine learning approaches in their projects.

Lawrence Livermore National Laboratory

Computing Scholar – Data Science Summer Institute | MAY - AUG 2022

- Created visualization tool for optimizing the scalable Gaussian process method "MuyGPs" to predict missing observations of orbital debris.
- Investigated machine learning methodologies using chemical molecular descriptors and 3D atomic representations for rapid screening of drug-like compounds targeting COVID-19.

Apple Inc.

Data Science Engineer – Strategic Data Solutions Team | JAN 2021 - JUNE 2021 (6-month Program)

- Developed a Python-based data pipeline utilizing web APIs to identify & track "high risk/priority" customers, effectively mitigating unwarranted personal information access.

Data Engineer – Data Analytics Server Engineering Team | JAN 2020 - JULY 2020 (7-month Program)

- Designed & deployed code utilizing Apache Spark, Python & SQL to provide iOS device analytics, enhancing business-critical reporting capabilities.

Technical Specialist, Technical Expert | OCT 2018 - JULY 2019, JULY 2019 - AUG 2021

- Resolved complex technical issues through software troubleshooting and hardware repairs, while delivering exceptional customer service and maintaining adaptability in a dynamic environment.

University of Arizona

Instructional Specialist – Astronomy Camp | JUNE 2015, 2018, 2019

- Managed operations and care, facilitated telescope observing sessions, and developed and delivered educational STEM content for students during week-long astronomy camps on remote mountaintop observatories.

Chief Telescope Operator – Steward Observatory | AUG 2014 - MAY 2018

- Led operations and public outreach efforts for multiple on-campus telescopes, overseeing student operators and organizing STEM outreach events.

Undergraduate Research Assistant - Steward Observatory Radio Astronomy Lab | JUNE 2016 - SEP 2017

- Wrote proposals, built and tested antenna prototypes for the high-resolution, space-based, inflatable Terahertz Space Telescope. Presented preliminary results at the 2017 AAS Meeting, and for the Office of Naval Research, securing full project funding.
- Managed substantial budgets, secured institutional letters of intent, and organized key meetings and site visits for the Europa Ice & Ocean Structure Seismometer (SIOS) and NASA GUSTO missions.
- Analyzed sub-millimeter astronomy data using Python, generated visual maps of gas flows within giant molecular clouds, confirmed active star formation.

Undergraduate Researcher – University of Arizona Astronomy Club | JAN 2015 - MAY 2018

- Observed 101 dense molecular clouds using the 12-Meter Arizona Radio Observatory Telescope, employing radiative transfer models to identify clouds actively accumulating material for future star formation. Published findings in 2018.

Undergraduate Researcher | AUG 2014 - DEC 2016

- Conducted observations of transiting exoplanets using the Kuiper 61" Telescope & analyzed data to determine atmospheric compositions.
- Co-presented research at the 2016 American Astronomical Society Meeting, showcasing contributions to atmospheric characterization techniques using reference stars.

Publications

1. Calahan, J. K., Shirley, Y. L., Svoboda, B. E., ... Robinson, D. R. (2018). Searching for Inflow toward Massive Starless Clump Candidates Identified in the Bolocam Galactic Plane Survey. *The Astrophysical Journal*, 862(1), 63. <https://doi.org/gkvm47>
2. Nguyen, D. M. T., Cortes, J. C., Dunn, M. M., & Shiklomanov, A. N. (2023). Impact of Chunk Size on Read Performance of Zarr Data in Cloud-based Object Stores [Preprint]. *ESS Open Archive*. <https://doi.org/10.1002/essoar.10511054.2>
3. Dunn, M. M. (2023). *Galaxy Morphology Classification Using Bayesian Neural Networks for the Legacy Survey of Space and Time (LSST)*. [Master's thesis, University of California, Riverside].
4. Dunn M. M. et al. (2023). *Detection and Segmentation of Ice Blocks in Europa's Chaos Regions Using Mask R-CNN*. [Unpublished manuscript]. NASA Goddard Spaceflight Center.

Posters & Presentations

5. Ryleigh Fitzpatrick, M., Pearson, K., Griffith, C. A., Dunn, M., Montiel, N. J., Zellem, R. T., Calahan, J., Chance, Q., Henrici, A., Sanchez, D., & AzGOE. (2016). *A Study of the Effects of Underlying Assumptions in the Reduction of Multi-Object Photometry of Transiting Exoplanets*. 227, 138.07. <https://ui.adsabs.harvard.edu/abs/2016AAS...22713807R>
6. Dunn, M. M., Lesser, D., O'Dougherty, S., Swift, B., Pat, T., Cortez, G., Smith, S., Goldsmith, P., & Walker, C. K. (2017). *TeraHertz Space Telescope (TST)*. 229, 238.30. <https://ui.adsabs.harvard.edu/abs/2017AAS...22923830D>
7. Dunn, M., Chazaro Cortes, J., Nguyen, D. M. (2021, December 8). *Optimizing Data Formats for Earth Information System Fire Portal*. [Poster presentation]. NASA Goddard Space Flight Center.
8. Dunn, M., Chazaro Cortes, J., Nguyen, D. M. (2022, May 9). *Cloud-Optimized Tools for the Surface Biology & Geology High-Frequency Time Series Campaign*. [Poster presentation]. NASA Goddard Space Flight Center.
9. Dunn, M. (2022, August 4). *Visualizing Model Optimization for Orbital Debris Characterization*. [PowerPoint slides]. Data Science Summer Institute, Lawrence Livermore National Laboratory.
10. Dunn, M. (2022, August 9). *DSSI Challenge Problem: Machine Learning Methods to Screen Compounds Targeting COVID-19*. [PowerPoint slides]. Data Science Summer Institute, Lawrence Livermore National Laboratory.
11. Dunn, M., Na, D., Trent, D. (2022, November 15-17). *The Machine Learning Showroom*. [Conference session]. 2022 NASA Data Science Summit, NASA Langley Research Center, Hampton, VA, USA.
12. Dunn, M., Čiprijanović, A., Nord, B., & Mobasher, B. (2023). Galaxy Morphology Classification Using Bayesian Neural Networks for LSST. 55, 105.13. <https://ui.adsabs.harvard.edu/abs/2023AAS...24110513D>
13. Dunn, M. (2023, February 23). *A Long Time Ago In a Galaxy Far, Far Away: Using Machine Learning to Classify Galaxy Morphologies*. [Presentation]. 2023 University of California, Riverside Grad Slam Semi-Finals Competition, Riverside, CA, USA. <https://gsrc.ucr.edu/grad-slam-2023>
14. Dunn, M. (2023, March 9). *A Long Time Ago In a Galaxy Far, Far Away: Using Machine Learning to Classify Galaxies*. [Presentation]. 2023 University of California, Riverside Grad Slam Finals Competition, Riverside, CA, USA. <https://gsrc.ucr.edu/grad-slam-2023>
15. Dunn, M. M., Duncan, E., Mills, A. C., Santerre, J., Larsen, A., Trent, D. M., Neidel, I., Yahn, Z., Nixon, C. A. (2023, May 2-3). *Detection and Segmentation of Ice Blocks in Europa's Chaos Regions Using Deep Learning*. [Conference session]. 2023 Outer Planets Assessment Group Meeting, John Hopkins University, Laurel, MD, USA.

Past & Present Professional Memberships

Academic Data Science Alliance, American Astronomical Society, Association for Computing Machinery (ACM), ACM SIGHPC, Deep Skies Lab, oSTEM, UCR Women in Computing, Society of Women Engineers, Graduate Women in Science, Girls in Tech Nashville, Rubin Observatory LSST Science Collaborations (Informatics & Statistics, Galaxies, Solar System)

Honors, Awards & Distinctions

2023 UCR Bourns College of Engineering Commencement Graduate Student Marshal, 2023 UCR Graduate Division Grad Slam Finalist - University of California, Riverside

2023 Wanda Munn Scholarship (offered), 2023 WE Local Collegiate Competition Finalist, WE22 Conference Grant (2022)- Society of Women Engineers

Funds for Astronomical Meetings: Outreach to Underrepresented Scientists (FAMOUS) Travel Grant (2023) - American Astronomical Society

Grace Hopper Celebration Student Scholar (2022) - [AnitaB.org](https://anitaB.org)

Uncertainty Quantification for Machine Learning Integrated Physics Modeling Travel Award (2022) - National Science Foundation/Sandia Laboratories

Honors College Alumni Legacy Grant (2016) - The University of Arizona Honors College
Arizona Excellence Scholarship (2014), Angelos C. Langadas Astronomy Department Scholarship (2017) - The University of Arizona

Volunteer & Leadership Experience

Vanderbilt University Dyer Observatory

JUNE 2009 - PRESENT

- Led public astronomy telescope viewings, lectures, and tours, educating diverse audiences on STEM concepts and operating telescopes.

University of Arizona Astronomy Club

AUG 2014 - MAY 2018

Outreach Coordinator | 2016 - 2017; President | 2017 - 2018

- Curated engaging weekly content for undergraduate students, organized club meetings, fundraisers, and research opportunities.
- Collaborated with local schools to provide 300+ free telescope viewings & STEM activities at events, strengthening community impact.
- Established the free Astronomy Tutoring of Majors & Minors (ATOMM) tutoring program to support students in upper-division astrophysics classes.

TIMESTEP Student Leader – University of Arizona

AUG 2015 - MAY 2018

- Led panels & discussion groups for Tucson Initiative for Minoritized Student Engagement in Science and TEchnology Program (TIMESTEP), focused on topics such as successfully navigating academic degrees, STEM careers in industry & government, and retaining underrepresented individuals in STEM.
- Coordinated hands-on workshops for topics such as battling persistent stereotypes in STEM, developing professional skills to achieve career goals, how to be a better advocate and challenges faced by marginalized groups in STEM.

Invited Talks & Panels

“Navigating the First Two Years of Physics/Astronomy Programs.” Panel discussion with Khalid Omer and Kevin Perez, presented for University of Arizona’s Tucson Initiative for Minoritized Student Engagement in Science and TEchnology Program (TIMESTEP), Tucson, AZ, September 6, 2017.

“Gap Year Planning & Industry Careers.” Panel presentation with Tyler Baines and Junellie Gonzalez-Quiles, presented virtually for University of Arizona’s Tucson Initiative for Minoritized Student Engagement in Science and TEchnology Program (TIMESTEP), February 5, 2020.

“Gap Year Planning.” Panel presentation with Kaylah McGowan, Jose Perez, and Alex Stoken, presented virtually for University of Arizona’s Tucson Initiative for Minoritized Student Engagement in Science and TEchnology Program (TIMESTEP), February 16, 2022.

“Data Reconstruction: AI/ML’s Place in NASA’s Future.” Panel presentation with Grace Goff, Adriana Holst, and Jessica Robinson, presented virtually for NASA, November 29, 2022.

Press & Contributions

Peters-Lidard, C., Shiklomanov, A., Kumar, S., & Felikson, D. (2021, November 12). *Analysis-ready Fire, Freshwater, and Sea Level Change Products*. NASA@SC21. <https://www.nas.nasa.gov/SC21/research/project41.html>

Lewis, B. (2021, December 3). *Bringing Together Art & the Cosmos*. Astrobites.

Million STEM. (2020, May 18). *Marina Madeline Dunn*. Million STEM.

Dunn, M., Fulmer, L., & Gagliano, A. (2018, May 6). *How to Land a Post-Baccalaureate Research Experience*.