Marina M. Dunn

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Profile

Enthusiastic, motivated, determined Data Science M.S. Student performing interdisciplinary research on Machine Learning applications for large-scale Astrophysics surveys. Experience in industry, government, and academia; passionate about STEM outreach and advocacy.

Education

M.Sc. Engineering: Data Science **JUNE 2023 (EXPECTED)**

University of California, Riverside

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

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

2023 UCR Grad Slam Finalist *- University of California, Riverside*

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

Grace Hopper Celebration Student Scholar (2022) *- AnitaB.org*

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

Vera C. Rubin Observatory Data Preview 0.2 Delegate

Additional Coursework in Data Science (Non-Degree Seeking) **SUMMER 2020**

University of California, Berkeley

B.Sc. Astronomy **MAY 2018**

University of Arizona Steward Observatory (Tucson, AZ)

Coursework: Classical & Quantum Physics, Theoretical & Observational Astrophysics, Orbital Dynamics, Computational Programming (including Galactic Data Modeling & Analysis), Mathematics

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*

Skills

Data Science, Machine Learning, Deep Learning, Data Visualization, Data Analysis, Statistics, Observational & Theoretical Astronomy, Computational Astrophysics, Telescope Operations, Image Processing, Planetary Science

Python, SQL, HTML, **R, Git/Github, LaTeX, TensorFlow, Scikit-learn, PyTorch, Apache Spark, Jupyter, Numpy, Pandas, Matplotlib, Plotly**

Quantitative Research, Developing Scientific Proposals and Publications, Developing Technical Reports and Presentations, STEM Outreach and Leadership, Science Communication, Public Speaking, Mentoring, Computer Hardware Repairs and Troubleshooting, Event Planning, Fundraising

Problem Solving, Critical Thinking, Decision Making, Detail-Oriented, Excellent Written and Verbal Communication, Virtual & In-Person Collaboration, Customer Service, Rapport-Building, Active Listening, Empathy, Conflict Resolution

Extracurriculars: Web Design & Development, Digital Art, Independent Learning

Posters, Presentations & Publications

1. Ryleigh Fitzpatrick, M., Pearson, K., Griffith, C. A., Dunn, M., Montiel, N. J., Zellem, R. T., … AzGOE. (2016, January). *A Study of the Effects of Underlying Assumptions in the Reduction of Multi-Object Photometry of Transiting Exoplanets*. [Poster presentation]. *American Astronomical Society Meeting Abstracts #227*, 227, 138.07.
2. 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)*. [Poster presentation]. *American Astronomical Society Meeting Abstracts #229*, *229*, 238.30.
3. Calahan, J. K., Shirley, Y. L., Svoboda, B. E., Ivanov, E. A., Schmid, J. R., Pulley, A., Lautenbach, J., Zawadzki, N., Bullivant, C., Cook, C. W., Gray, L., Henrici, A., Pascale, M., Bosse, C., Chance, Q., Choi, S., Dunn, M., Jaime-Frias, R., Kearsley, I., … 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. doi.org/10.3847/1538-4357/aabfea
4. Dunn, M., Chazaro Cortes, J., Nguyen, D. M. (2021, December 8). *Optimizing Data Formats for Earth Information System Fire Portal*. [PowerPoint slides]. NASA Goddard Space Flight Center.
5. 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.
6. Nguyen, D. M. T., Chazaro Cortes, J., Dunn, M. M., & Shiklomanov, A. N. (2022). *Optimal Chunking Strategies for Cloud-based Storage of Geospatial Data Using Zarr* [Submitted manuscript].
7. Dunn, M. (2022, August 4). *Visualizing Model Optimization for Orbital Debris Characterization*. [PowerPoint slides]. Data Science Summer Institute, Lawrence Livermore National Laboratory.
8. 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.
9. Dunn, M. , Na, D., Trent, D. (2022, November 14). *The Machine Learning Showroom*. [PowerPoint slides]. 2022 NASA Data Science Summit.
10. Dunn, M., Ciprijanovic, A., Mobasher, B., Nord, B. (2023, January 9). *Galaxy Morphology Classification Using Bayesian Neural Networks for LSST*. [Poster presentation]. *American Astronomical Society Meeting Abstracts #241, 241,* 105.13.
11. Dunn, M. (2023, February 23). *A Long Time Ago In a Galaxy Far, Far Away: Using Machine Learning to Classify Galaxy Morphologies*. [PowerPoint slides]. 2023 University of California, Riverside Grad Slam Semi-Finals Competition. https://gsrc.ucr.edu/grad-slam-2023

12. Dunn, M. (2023, March 9). *A Long Time Ago In a Galaxy Far, Far Away: Using Machine Learning to Classify Galaxies.* [PowerPoint slides]. 2023 University of California, Riverside Grad Slam Finals Competition. https://gsrc.ucr.edu/grad-slam-2023
13. Dunn, M. M., Duncan, E., Mills, A. C., Santerre, J. , Larsen, A. , Trent, D. M., Neidel, I., Yahn, Z., Nixon, C. A. (2023, May). *Detection and Segmentation of Ice Blocks in Europa's Chaos Regions Using Deep Learning.* [Poster presentation, PowerPoint slides]. Outer Planets Assessment Group May 2023.
14. Dunn, M., Duncan, E., Trent, D., Santerre, J., Mills, A., Larsen, A., Neidel, I., Yahn, Z., Walker, C., & Nixon, C. A. (2023). *Detection and Segmentation of Ice Blocks in Europa's Chaos Regions Using Mask R-CNN.* [Unpublished manuscript]. NASA Goddard Spaceflight Center.
15. Dunn, M. (2023, June). *Classifying Galaxy Morphologies Using Bayesian Neural Networks for LSST.* [Unpublished master's thesis]. University of California, Riverside.

Research Experience

M.Sc. Thesis — University of California, Riverside **SEP 2021 - PRESENT**

- Collaboratively working with Fermilab and Deep Skies Lab to research using Bayesian Neural Networks to accurately classify morphologies of galaxies with simulated mock datasets of different observing years and observational noise levels in preparation for the Legacy Survey of Space & Time. **[10, 11, 12, 15]**

CRESST II Research Assistant — NASA Goddard Space Flight Center/CRESST II **JAN 2023 - PRESENT**

- Researching application of Machine Learning techniques such as Convolutional Neural Networks to detect ice floes in the "chaos regions" of fractured ice on bodies like Europa. **[13, 14]**

Data Science Graduate Intern — NASA Langley Research Center **AUG - DEC 2022**

- As part of the "Machine Learning Showroom" project, developed simplified, cloud-based, "read-to-try" Machine Learning models, visualization tools, and online content for NASA teams to evaluate potential of using Machine Learning approaches for their work. **[9]**

Computing Scholar — Data Science Summer Institute, Lawrence Livermore National Laboratory **MAY - AUG 2022**

- Developed tool for visualizing model optimization for the scalable Gaussian Process method MuyGPs, used to predictively fill in gaps of observations of orbital debris. **[7]**
- Researched various Machine Learning approaches using molecular descriptors and 3D atomic representations to rapidly screen drug-like compounds targeting SARS-CoV-2 in an effort to identify which may best treat the virus. **[8]**

Graduate Intern — NASA Goddard Space Flight Center **AUG 2021 - MAY 2022**

- Researched how to optimally migrate NASA Earth Science data & models to cloud-optimized, analysis-ready formats. **[4, 6]**
- Developed improved interactive visualization/analysis dashboards for NASA fire data, including for near-real-time fire emissions forecasting, and vegetation data, such as the Surface Biology and Geology hyper-spectral imaging SHIFT campaign. **[5]**

Undergraduate Research Assistant — University of Arizona **JUNE 2016 - SEP 2017**

- Wrote proposals for a high resolution, spherical, space-based, inflatable observatory Terahertz Space Telescope. Presented proposal at the 2017 American Astronomical Society conference in Grapevine, TX. **[1]**
- Built and tested radio telescope antenna prototypes in a welding shop, presented preliminary results for the Office of Naval Research (ONR), resulting in full project funding.
- Wrote significant proposal components, procured institutional letters of intent and instrument estimates, managed large budgets, supported weekly science & engineering meetings for two NASA missions: the Europa Ice and Ocean Structure Seismometer (SIIOS), and the balloon-borne observatory GUSTO. Additionally organized 2017 NASA site visit for GUSTO, marking project transition into the next mission phase, and $40 million in funding.
- Analyzed sub-millimeter astronomy data of molecular transitions, created visual maps of gas flows within a giant molecular clouds using Python, and confirmed previous hypotheses about suspected ongoing star formation.

Undergraduate Researcher — University of Arizona Astronomy Club **JAN 2015 - MAY 2018**

- Observed 101 dense, dark molecular clouds with the 12-Meter Arizona Radio Observatory Telescope on Kitt Peak, AZ, & determined which were actively collecting enough material to produce future stars using radiative transfer models. Published research in 2018. **[9]**

Undergraduate Researcher — University of Arizona **AUG 2014 - DEC 2016**

- Observed transiting exoplanets and operated the Kuiper 61" Telescope on Mt. Bigelow, AZ, analyzed observational data in multiple wavelengths to determine the composition of their atmospheres.
- Determined which data reduction techniques better reveal atmospheric characteristics, such as using brighter nearby reference stars. Co-presented research at the 2016 American Astronomical Society conference in Kissimmee, FL. **[8]**

Additional Work Experience

Data Science Engineer — Apple Inc. **JAN 2021 - JUNE 2021 (6-month Program)**

- As part of Apple's Strategic Data Solutions team, developed data pipeline using Python that utilizes web APIs to create & maintain records of "high risk/ priority" customers to mitigate unwarranted personal information searches by internal employees. Sends weekly team report with critical statistics (i.e. recent-additions, global page visits, commonality, etc.).

Data Engineer — Apple Inc. **JAN 2020 - JULY 2020 (7-month Program)**

- As part of Apple's Data Analytics Server Engineering team, developed & deployed code that utilizes Apache Spark, Python, and SQL to create interactive historical table of active iOS devices transmitting diagnostics/usage analytics data with statistics (i.e. current OS version). Informs other Apple teams about device populations used for business-critical reports, and allows for less-expensive lookups.

Technical Expert (Previously Technical Specialist) — Apple Inc. **OCT 2018 - AUG 2021**

- Resolved customer technical issues at the Apple Store Genius Bar, including software troubleshooting & hardware repairs, & re-built customer relationships by de-escalating & approaching situations with empathy & practical, ethical problem-solving.
- Provided exceptional customer experience, demonstrated ability to be flexible and knowledgeable in a high-pressure, fast-paced environment as products & services evolve.

- Supported additional departments, including in-house technology diagnostics & troubleshooting, visual merchandising, leading creative sessions (i.e. coding, visual art), & inventory operations.

Chief Telescope Operator — University of Arizona Steward Observatory **AUG 2014 - MAY 2018**

- Oversaw weekly operations of multiple on-campus telescopes, led nightly public astronomy talks, and managed a team of student telescope operators. Organized local private & educational STEM outreach events.
- Assisted professors with teaching tasks, such as grading, and class/lab preparation for general education astronomy courses.

Instructional Specialist — University of Arizona Steward Observatory **JUNE 2015, 2018, 2019**

- Developed educational STEM content (including computational astronomy projects) and oversaw operations for students at the annual Astronomy Camp. Educated students in basic principles of astronomy, physics, engineering, environmental science, and computing using inquiry-based learning techniques.
- Facilitated all-night astronomy observing sessions with professional telescopes, educated students about telescopes, electronic instrumentation, & astronomy image processing software.
- Administered medical care, worked extended/irregular hours, and managed large groups of students for 8 consecutive days/nights at remote observatories such as Kitt Peak, Mt. Graham, & Mt. Lemmon.

Volunteer & Leadership Experience

Astronomer — Vanderbilt University Dyer Observatory **JUNE 2009 - PRESENT**

- At age 13, began volunteering as an astronomer and space camp counselor at Vanderbilt Dyer Observatory, operating professional telescopes, leading monthly telescope evening lectures and tours, teaching school groups about astronomy/physics concepts, and performing science outreach experiments.

Outreach Coordinator (2016 - 2017), President (2017 - 2018) — University of Arizona Astronomy Club **AUG 2014 - MAY 2018**

- Presented engaging content weekly for undergraduate students passionate about Astrophysics.
- Organized club meetings, fundraisers, and professional research opportunities.
- Partnered with local Tucson schools to provide more than 300 events with telescope viewings and STEM activities at no cost.
- Established the free Astronomy Tutoring of Majors & Minors (ATOMM) tutoring service for upper-division astronomy and physics 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.

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, Rubin Observatory LSST Science Collaborations (Informatics & Statistics, Galaxies), Graduate Women in Science

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*.