

# NATHAN D. MILES

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◇ [nmiles2718.github.io](https://nmiles2718.github.io)

## RESEARCH INTERESTS

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space weather and its effects on the geomagnetic environment; big data and machine learning; compact objects and accretion phenomena; star formation and evolution

## CAREER OBJECTIVES

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To become a NASA astronaut serving as a mission specialist in the Lunar Gateway program by providing expertise in space weather and radiation from both solar particles and galactic cosmic rays.

To serve as an advocate for the advancement of science and science education in the United States of America by stressing the importance of international collaboration in solving global problems shared by all of humanity.

## EDUCATION

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### PhD Student

*September 2020 -*

Advisor: Professor Christopher T. Russell  
Department of Earth, Planetary, and Space Sciences  
University of Los Angeles, California

### B.S. Astronomy, Summa Cum Laude

*August 2010 - 2015*

Department of Astronomy  
University of Florida

### B.S. Physics, Cum Laude

*August 2010 - 2015*

Department of Physics  
University of Florida

### B.S. Mathematics, Cum Laude

*August 2010 - 2015*

Department of Mathematics  
University of Florida

## PROFESSIONAL EXPERIENCE

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**Red Canyon Engineering & Software, Cape Canaveral, Florida** June 2015 - September 2015  
*KLXS-II Intern*

As a Kennedy LX Support Contract II intern, I developed a touch screen interface and weather app that interfaced with the GlassWall project using the game engine, Unity. The GUI interface was written in C# while the weather was programmatically queried from the [Dark Sky API](#).

**Red Canyon Engineering & Software, Cape Canaveral, Florida** October 2015 - June 2016  
*Software Engineer*

As a software engineer I supported various investigate projects led by the Project Management Office at Kennedy Space Center. In addition to the projects I supported, I was also the principle investigator of the Lightning Prediction and Warning System (LPAWS) funded through the 2016 Kennedy Space Center Kickstart Competition.

**Space Telescope Science Institute, Baltimore, Maryland**

June 2016 - May 2018

*Research and Instrument Analyst I*

As a Research and Instrument Analyst I on the Advanced Camera for Surveys (ACS) Instrument Team I was tasked with the following duties and roles:

- Create and deliver superdark and superbias reference files each month.
- Principle Investigator of the ACS Postflash Calibration program.
- Interface with Exposure Time Calculator Software Team as the Instruments Divisions Coordination rep for ACS.
- Update and enhance the ACS Website to provide ACS users with a more intuitive user experience.
- Provide user support through the ACS Help Desk.
- Analyze regression suites to ensure updates made to the ACS calibration software are correctly implemented and satisfy requirements.
- Provide science support to Dr. Ori Fox following an assignment by the Technical Staff Research Committee.

**Space Telescope Science Institute, Baltimore, Maryland**

May 2018 - July 2020

*Research and Instrument Analyst II*

As a Research and Instrument Analyst II on the Advanced Camera for Surveys (ACS) Instrument Team I was tasked with following duties and roles:

- Provide user support through the ACS Help Desk and triaging of general HST Help tickets.
- Mentor junior staff through the Instrument Division's Mentoring program.
- Update the Technical Staff Training Guide with supplemental information concerning alternatives for parallelizing python code.
- Interface with Science Calibration Software Branch (SCSB) to help resolve outstanding issues, implement new logic, and fix bugs in ACS calibration pipelines, as well as, review and approve all updates made to the ACSTOOLS python package.
- Oversee and help manage the migration of the entire ACS website from a Zope based CMS to Jahia based CMS while modernizing the website along the way
- Provide science support to Dr. Susana Deustua and Dr. Gonzalo Tancredi following an assignment by the Technical Staff Research Committee.

**RESEARCH EXPERIENCE**

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**Space Telescope Science Institute, Baltimore, Maryland**

June 2017 - March 2018

*HST FUV/NUV Photometry of the Putative Binary Companion to the SN 1993J Progenitor*

Advisor: Dr. Ori D. Fox

As part of the Technical Staff at the Space Telescope Science institute I was awarded research time to perform data reduction and analysis of WFC3/UVIS and ACS/SBC observations from HST GO Proposal 13648. We found strong evidence consistent with previous analyses of the existence of a surviving B-type companion and the results were presented at the 232nd meeting of the American Astronomical Society. However, with a lack of contemporaneous optical photometry there is insufficient data to constrain circumstellar interactions and so the results remain unpublished pending further analysis.

**Skills Acquired**

- Source finding and deblending (**SExtractor**).
- Iterative PSF building via minimization of aperture photometry and PSF photometry residuals for bright isolated sources (**PyRAF**, **DAOPHOT**).
- PSF photometry of crowded sources and pipeline processing

## **Space Telescope Science Institute, Baltimore, Maryland**

April 2018 - 2020

*Geophysics with Hubble Space Telescope*

Advisors: Dr. Susana Deustua and Dr. Gonzalo Tancredi

As part of the Technical Staff at the Space Telescope Science institute I was awarded research time to perform data reduction and analysis for HST AR Proposal 14587. I wrote the entire data analysis package from scratch ( > 6000 lines of code) to download, process, and analyze over 75,000 dark calibration frames taken with 5 different CCD imagers. Using statistics generated by the pipeline we were able to independently confirm thickness models for ACS/WFC, ACS/HRC, WFC3/UVIS. We were also able to demonstrate the well-known anti-correlation between solar activity and observed cosmic ray rate.

### **Skills Acquired**

- Cloud processing with AWS and the HST public dataset.
- End-to-end pipeline processing including all necessary documentation using ReadTheDocs.
- Machine learning (binary classification using KNearestNeighbors algorithm)
- Big data analysis (4.5 TB worth of images analyzed, over 1.2 billion cosmic rays studied)
- Parallel processing with **dask**

## **Space Telescope Science Institute, Baltimore, Maryland**

May 2019 - March 2020

*Natural Language Processing for Classification of HST Proposals*

Advisor: Dr. Lou Strolger

As part of the technical staff at the Space Telescope Science Institute I was awarded research time to help build a modernize version of the Proposal Auto-Categorizer and Manager (PACMan) tool. PACMan is utilized by the Science Policies Group to automatically sort submitted HST proposals into one of six science categories. I built the entire pipeline from scratch utilizing industry standards and it is capable of classifying HST proposals into the correct top two science categories with an accuracy of 96%.

### **Skills Acquired**

- Text preprocessing and cleaning with **spaCy** NLP
- Multi-class classification using Näive-Bayes classifier implemented in **scikit-learn**

## **TECHNICAL SKILLS**

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### **Software Languages**

BASH, C++, python (preferred), HTML

### **Modeling and Data Analysis**

astropy, DAOPHOT, HDF5, numpy, pandas, photutils, pymc3, scipy, scikit-learn, scikit-image

### **Data Visualization**

matplotlib, plotly

### **Web Frameworks**

flask, jinja

## Parallelization

dask, multiprocessing

## Version Control

git

## Amazon Web Services (AWS)

EC2, S3, IAM, Lambda, API Gateway, SAM

## PUBLICATIONS

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### Journal Articles

1. **N. D. Miles**, S. E. Deustua, G. Tancredi, G. Schnyder, S. Nesmachnow, G. Cromwell, *Using Cosmic Rays detected by HST as Geophysical Markers I: Detection and Characterization of Cosmic Rays*, Accepted for Publication in ApJ, April 2021

### Technical Reports

1. M. C. McDonald, T. D. Desjardins, and **N. D. Miles**, *Anneal Efficacy in the Advanced Camera for Surveys Wide Field Channel*. ACS ISR 2020-05. Space Telescope Science Institute, April 2020
2. **N. D. Miles** and N.A. Grogin, *Temporal Stability of the ACS/WFC OD-800W LED*. ACS ISR 2019-08. Space Telescope Science Institute, September 2019
3. **N. D. Miles** and M. Chiaberge, *photCTE: The Photometric CTE Pipeline for the ACS/WFC* ACS TIR 2019-01. Space Telescope Science Institute, July 2019
4. **N. D. Miles**, P. L. Lim, A. Bellini, and N.A. Grogin, *Updates to the CALACS Cosmic Ray Rejection Routine: ACSREJ*. ACS ISR 2018-05. Space Telescope Science Institute, September 2018.
5. T. D. Desjardins, **N. D. Miles**, J. E. Ryon, and D. C. Borncamp, *ACS/WFC Superbias, Superdark, and Sink Pixel File Generation*. ACS TIR 2018-01. Space Telescope Science Institute, August 2018.
6. S. L. Hoffmann, **N. D. Miles**, J. E. Ryon, N. Hathi, and N. A. Grogin, *A Minor Contamination Event in May 2017 Affecting the ACS/WFC CCDs*. ACS ISR 2018-03. Space Telescope Science Institute, May 2018.
7. **N. D. Miles**, *Updates to Post-Flash Calibration for the Advanced Camera for Surveys Wide Field Channel*. ACS ISR 2018-02. Space Telescope Science Institute, March 2018.

### Conference Abstracts

1. **N. D. Miles**, S. Deustua, and G. Tancredi (2019) *HSTCosmicrays: A Python Package for Analyzing Cosmic Rays in HST Calibration Data*, presented at 2019 ADASS Meeting, Gronigen, Netherlands, 6-10 Oct.
2. S. Deustua, **N. D. Miles**, and G. Tancredi, (2018), *Geophysics with the Hubble Space Telescope*, Abstract GP13A-41, presented at 2018 AGU Fall Meeting, Washington, D.C., 10-14 Dec.
3. **N. D. Miles**, O. D. Fox, K. A. Bostroem, W. Zheng, M. Graham, S. D. Van Dyk, A.V. Filippenko, T. Matheson, V. Dwarkadas, C. Fransson, N. Smith, and T. Brink, (2018), *HST FUV/NUV Photometry of the Putative Binary Companion to the SN 1993J Progenitor*. American Astronomical Society Meeting Abstracts, 232, #320.09
4. **N. D. Miles** and N. A. Grogin, (2018), *Calibration Improvements for the Hubble Space Telescope Advanced Camera for Surveys Wide Field Channel: Post-Flash and Commanding Overheads*. American Astronomical Society Meeting Abstracts, 231, #355.33