

SARA DOAN

Software Engineer and NSF Graduate Research Fellow in Astrophysics

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PROFESSIONAL EXPERIENCE

Professional software engineering roles (2011 – 2021). Research experience (2021 – Present) listed separately below.

Senior Reverse Engineer

Novetta

📅 Nov 2019 – Jul 2021

- Developed utilities for auto analyzing software programs using the Ghidra reverse engineering tool.
- Developed a pipeline to analyze program execution similarities of software using the BERT technique for natural language processing.

Principal Software Engineer

Parsons Corporation

📅 Feb 2018 – Nov 2019

- Contributed to a highly technical software development team focused on mobile security in a fluid and quickly evolving environment.
- Utilized ability to self-motivate and think critically to deep dive into difficult technical problems, researching and developing cutting-edge engineering solutions.
- Participated in collaborative, technically-focused, problem solving workshops.

Senior Software Engineer and Team Lead

The MITRE Corporation

📅 Aug 2011 – Feb 2018

- TS/SCI security clearance held (2011 - 2021)
- Built and deployed innovative software capabilities and features in an operationally intensive environment.
- Utilized working knowledge of a large and interconnected code base, technical expertise, and strong software design principles to improve quality and security of delivered product.
- Acted as team liaison in collaboration and integration efforts of multiple software products, across multiple organizations and government units.
- Demonstrated willingness and enthusiasm to transition to a new team and embraced an unfamiliar role, eventually becoming team lead.
- Demonstrated ability to work both independently and as part of a geographically distant development team.
- Responsible for solving urgent customer issues and providing on-site support and troubleshooting to the IV&V testing team and end users.
- Served as a trusted technical source for project lead and non-technical customers for determining risks and benefits of decisions.
- Served as a mentor to junior developers, aiding in software design decisions.

BIO

I am an experienced, adaptable, and self-motivated software engineer and graduate researcher. I utilized and developed my technical, communication, and critical thinking skills in a 10 year career in the cyber security industry. In transitioning into astrophysics research, I exhibited my initiative and versatility in using my expertise across domains. I am now a NSF Graduate Research Fellow studying active galactic nuclei and galaxy evolution.

PROGRAMMING LANGUAGES

Python C Java
JavaScript/TypeScript HTML/CSS
Objective-C IDL SQL Markdown
Latex

TECHNICAL SKILLS

pandas NumPy, SciPy, & AstroPy
Data Cleaning, Analysis, & Visualization
Matplotlib Plotly pdb & lldb Bash
Flask HPC with Slurm Git REST
Flask Pydantic API Documentation
json, toml, & fits data Spectral Analysis
iOS/Android Development
Reverse Engineering Web Scraping

SOFT SKILLS

Verbal Communication
Written Communication
Scientific Writing Adaptability
Critical Thinking Independence
Collaboration Across Time & Space

AWARDS

NSF Graduate Research Fellowship

📅 Apr 2025

JWST Cycle 4 Observing Time

📅 Mar 2025

RESEARCH EXPERIENCE

NSF Graduate Research Fellow and Graduate Research Assistant

Black Hole-Galaxy Connection Group, George Mason University

📅 Aug 2023 – Present

📍 Fairfax, VA

- NSF Graduate Research Fellowship awardee.
- Performs optical and infrared spectral analysis of active galactic nuclei and dwarf galaxies in order to study the co-evolution of black holes and galaxies. Analysis is completed using Bayesian statistics, maximum likelihood estimation, and Markov Chain Monte Carlo (MCMC) fitting techniques.
- Utilizes a number of common Python libraries, such as pandas, NumPy, and Matplotlib on a daily basis in order to generate, examine, and maintain large astronomical data samples.
- Implements extensive use of the high performance computing cluster at GMU, in order to execute analysis software on large samples of single-spectrum targets and 3D integrated spectral data cubes with thousands of spaxels.
- Refactored the large spectral fitting code base, BADASS, to be modularized and adaptable for use with various observational instruments and spectral fitting techniques. Currently maintaining an active fork:
🔗 github.com/galactic-fireball/BADASS, integrating new features, committing bug fixes, and managing pull requests.
- Developed a code base for inspection, reduction, and preprocessing of the initial spectroscopic data release for JWST instruments. Allows efficient testing of various configuration settings and implementing third party reduction algorithms. GitHub: 🔗 github.com/galactic-fireball/daedalus.
- Developed a web application for viewing, identifying, and labeling spectral features quickly and efficiently. The application is built using pure HTML, CSS, and JavaScript as the front end and Flask with Jinja as the backend.
🔗 github.com/galactic-fireball/lyra
- Served as a Co-PI for a JWST/NIRSpec proposal (submitted), a Contributor for 3 JWST/NIRSpec and JWST/MIRI (1 awarded, 2 submitted), 1 HST (submitted), and 1 XMM-Newton (submitted) proposals. Contribution activities include literature review, initial target analysis, creation of data visualization figures using Matplotlib, and scientific writing.
- Presented a poster at the 245th Meeting of the AAS | National Harbor, MD | Jan 2025: *Local Analogs of Primordial Galaxies: In Search of Intermediate Mass Black Holes with JWST NIRSpec*.

Undergraduate Research Student

Black Hole-Galaxy Connection Group, George Mason University

📅 Jul 2021 – Aug 2023

📍 Fairfax, VA

- Analyzed a sample of over 19,000 quasars with a spectral fitting routine for the purpose of using high energy emission lines as a diagnostic of black hole properties. Resulted in first author paper.
- Participated in an observing run at W.M. Keck Observatory, providing real time data reduction routines and support .| Kamuela, HI | Sep 2021
- Gave an oral presentation at the 240th Meeting of the AAS. | Pasadena, CA | Jun 2022: *The Diagnostic Potential of Coronal Lines in the Study of Active Galactic Nuclei*

Undergraduate Research Student

Solar Physics and Space Weather Group, George Mason University

📅 Jul 2021 – Apr 2022

📍 Fairfax, VA

- Created full 360 degree solar synchronic maps using instrument calibration and brightening profiles with SDO, STEREO-A, and STEREO-B data.
- Studied the full life evolution of solar active regions by measuring their emergence, peak, and decay times.

CREU Project Student

Allegheny College

📅 Sep 2009 – Sep 2010

📍 Meadville, PA

- Worked on a CREU project involving 3D printing technology.
- Designed and implemented software to translate 2D shapes into 3D objects for printing, with the goal of improving understanding of course concepts for blind students.
- Presented a poster at the Grace Hopper Celebration | Atlanta, GA | Sep 2010

REU Student

University of Maine

May 2009 – Aug 2009

Orono, ME

- Worked with a professor in the Computer Science department on the University of Maine Ice Sheet Model (UMISM).
- Gained experience improving the efficiency of a large code base through multithreading.

PUBLICATIONS

First Author Journal Articles

- **S. Doan**, S. Satyapal, W. Matzko, N. P. Abel, T. Böker, T. Bohn, G. Canalizo, J. M. Cann, J. Fischer, S. LaMassa, S. C. Madden, et al., “Local Analogs of Primordial Galaxies: In Search of Intermediate-mass Black Holes with JWST NIRSpec,” *The Astrophysical Journal*, vol. 987, no. 1, p. 99, Jul. 2025. DOI: 10.3847/1538-4357/adcd59.
- **S. Doan**, S. Satyapal, M. Reefer, R. O. Sexton, W. Matzko, J. D. McKaig, N. J. Secrest, J. M. Cann, A. Laor, and G. Canalizo, “The CLASS Quasar Catalog: Coronal Line Activity in Type 1 SDSS Quasars,” *The Astrophysical Journal Supplement Series*, vol. 280, no. 2, p. 57, Oct. 2025. DOI: 10.3847/1538-4365/ade304.

Contributed Journal Articles and Preprints

- A. Aravindan, T. Bohn, G. Canalizo, S. Satyapal, V. U, W. Liu, W. Matzko, **S. Doan**, M. Malkan, L. Armus, T. Nagao, et al., “Probing AGN Feedback in Dwarf Galaxies with Spatially Resolved NIR Coronal Lines from JWST,” *arXiv e-prints*, arXiv:2512.05041, Dec. 2025, preprint (submitted). DOI: 10.48550/arXiv.2512.05041.
- W. Matzko, S. Satyapal, M. Reefer, J. McKaig, R. O. Sexton, and **S. Doan**, “An Increase in the Prevalence of Ionized Outflows in Galaxies with Coronal Line Emission: Feedback in Action?” *The Astrophysical Journal*, vol. 984, no. 2, p. 170, May 2025. DOI: 10.3847/1538-4357/ad92f.
- C. Vazquez, S. Satyapal, G. Canalizo, N. J. Secrest, R. W. Pfeifle, T. Bohn, K. Nyland, A. Aravindan, L. Blecha, J. M. Cann, **S. Doan**, et al., “A High Resolution Search for Dual AGNs in Mergers: Pushing the Frontier with Keck AO,” *arXiv e-prints*, arXiv:2507.05250, Jul. 2025, preprint (submitted). DOI: 10.48550/arXiv.2507.05250.
- N. Latouf, E. Schwartzman, J. McKaig, **S. Doan**, and J. Weingartner, “Effective & Ethical Mentorship in Physics and Astronomy through Grassroots Organizations,” *Bulletin of the AAS*, vol. 56, no. 1, May 2024. DOI: 10.3847/25c2cfef.31201d9b.
- J. D. McKaig, S. Satyapal, A. Laor, N. P. Abel, **S. Doan**, C. Ricci, and J. M. Cann, “Why Are Optical Coronal Lines Faint in Active Galactic Nuclei?” vol. 976, no. 1, p. 130, Nov. 2024. DOI: 10.3847/1538-4357/ad7a79.
- J. M. Cann, A. O. Martinez, A. Barnes, **S. Doan**, F. Ilesanmi, M. Lazzarini, T. Monsue, C. Pinedo, N. Cabrera Salazar, and A. Steele, “Early Career Perspectives For the NASA SMD Bridge Program,” *arXiv e-prints*, arXiv:2310.15287, Oct. 2023, preprint. DOI: 10.48550/arXiv.2310.15287.
- M. Reefer, R. O. Sexton, **S. Doan**, S. Satyapal, N. J. Secrest, and J. M. Cann, “CLASS Survey Description: Coronal-line Needles in the SDSS Haystack,” *The Astrophysical Journal Supplement Series*, vol. 265, no. 1, p. 21, Mar. 2023. DOI: 10.3847/1538-4365/acb0d2.
- M. Reefer, S. Satyapal, R. O. Sexton, **S. Doan**, N. J. Secrest, and J. M. Cann, “CLASS: Coronal Line Activity Spectroscopic Survey,” *The Astrophysical Journal*, vol. 936, no. 2, p. 140, Sep. 2022. DOI: 10.3847/1538-4357/ac8981.

Awarded Observation Proposals

- S. Satyapal, N. P. Abel, O. Bait, L. Blecha, T. Boeker, T. Bohn, G. Canalizo, J. M. Cann, **S. Doan**, J. Fischer, F. Galliano, et al., *Local Analogs of JWST’s high-z AGN: Uncovering a deeply embedded IMBH in a compact metal poor dwarf*, JWST Proposal. Cycle 4, ID. #8139, Mar. 2025. url: <https://ui.adsabs.harvard.edu/abs/2025jwst.prop.8139S>.

Presented Conference Proceedings

- **S. Doan**, S. Satyapal, W. Matzko, N. Abel, T. Boeker, T. Bohn, G. Canalizo, J. Cann, J. Fischer, S. LaMassa, S. Madden, et al., “Local Analogs of Primordial Galaxies: In Search of Intermediate Mass Black Holes with JWST NIRSpec,” in *American Astronomical Society Meeting Abstracts #245*, ser. American Astronomical Society Meeting Abstracts, vol. 245, Jan. 2025, p. 253.12. url: <https://ui.adsabs.harvard.edu/abs/2025AAS...24525312D>.
- **S. Doan**, S. Satyapal, M. Reefer, and R. Sexton, “The Diagnostic Potential of Coronal lines in the Study of Active Galactic Nuclei,” in *American Astronomical Society Meeting #240*, ser. American Astronomical Society Meeting Abstracts, vol. 240, Jun. 2022, p. 213.07. url: <https://ui.adsabs.harvard.edu/abs/2022AAS...24021307D>.

Contributed Conference Proceedings

- N. Abel, S. Satyapal, **S. Doan**, S. Madden, J. Fischer, D. Schaerer, and W. Matzko, "Analysis of JWST Molecular Hydrogen Emission in the Metal Poor Dwarf Galaxy J1201+0211," in *246th Meeting of the American Astronomical Society*, ser. American Astronomical Society Meeting Abstracts, vol. 246, Jun. 2025, p. 414.04. url: <https://ui.adsabs.harvard.edu/abs/2025AAS...24641404A>.
- W. Matzko, S. Satyapal, **S. Doan**, A. Aravindan, G. Canalizo, M. McDonald, N. Abel, T. Boeker, T. Bohn, J. Cann, J. Fischer, et al., "Local Analogs of Primordial High-z Galaxies: Characterizing Nearby Low-Metallicity Dwarfs with JWST/NIRSpec," in *American Astronomical Society Meeting Abstracts #245*, ser. American Astronomical Society Meeting Abstracts, vol. 245, Jan. 2025, p. 345.06D. url: <https://ui.adsabs.harvard.edu/abs/2025AAS...24534506M>.
- J. McKaig, S. Satyapal, A. Laor, N. Abel, **S. Doan**, C. Ricci, and J. Cann, "On the strength of optical coronal lines in active galactic nuclei," in *American Astronomical Society Meeting Abstracts #245*, ser. American Astronomical Society Meeting Abstracts, vol. 245, Jan. 2025, p. 457.06D. url: <https://ui.adsabs.harvard.edu/abs/2025AAS...24545706M>.
- N. Latouf, E. Schwartzman, J. McKaig, **S. Doan**, and R. Elliott, "Spectrum: Empowering Equitable Excellence," in *American Astronomical Society Meeting Abstracts #243*, ser. American Astronomical Society Meeting Abstracts, vol. 243, Feb. 2024, p. 172.02. url: <https://ui.adsabs.harvard.edu/abs/2024AAS...24317202L>.
- N. Latouf, E. Schwartzman, J. McKaig, **S. Doan**, and J. Weingartner, "Effective & Ethical Mentorship in Physics and Astronomy through Grassroots Organizations," in *Bulletin of the American Astronomical Society*, vol. 56, May 2024, p. 2024i013. doi: 10.3847/25c2cfeb.31201d9b.
- J. McKaig, S. Satyapal, N. Abel, **S. Doan**, and C. Ricci, "The Case of the Missing Optical Coronal Lines," in *American Astronomical Society Meeting Abstracts #241*, ser. American Astronomical Society Meeting Abstracts, vol. 241, Jan. 2023, p. 360.37. url: <https://ui.adsabs.harvard.edu/abs/2023AAS...24136037M>.
- S. Satyapal, M. Reefe, **S. Doan**, R. Sexton, N. Secrest, J. Cann, and W. Matzko, "Uncovering Active Galactic Nuclei using Coronal Lines," in *American Astronomical Society Meeting Abstracts #241*, ser. American Astronomical Society Meeting Abstracts, vol. 241, Jan. 2023, p. 242.03. url: <https://ui.adsabs.harvard.edu/abs/2023AAS...24124203S>.
- R. Sexton, M. Reefe, **S. Doan**, W. Matzko, and S. Satyapal, "The Newest Version of Bayesian AGN Decomposition Analysis for SDSS Spectra (BADASS)," in *American Astronomical Society Meeting Abstracts #241*, ser. American Astronomical Society Meeting Abstracts, vol. 241, Jan. 2023, p. 105.25. url: <https://ui.adsabs.harvard.edu/abs/2023AAS...24110525S>.
- J. McKaig, S. Satyapal, C. Ricci, **S. Doan**, and N. Able, "X-ray Simulations of Polar Gas in Accreting Supermassive Black Holes," in *American Astronomical Society Meeting #240*, ser. American Astronomical Society Meeting Abstracts, vol. 240, Jun. 2022, p. 101.33. url: <https://ui.adsabs.harvard.edu/abs/2022AAS...24010133M>.
- M. Reefe, S. Satyapal, **S. Doan**, R. Sexton, N. Secrest, and J. Cann, "A Large Scale Survey of Galaxies with Coronal Line Emission Selected from the Sloan Digital Sky Survey," in *American Astronomical Society Meeting #240*, ser. American Astronomical Society Meeting Abstracts, vol. 240, Jun. 2022, p. 101.13. url: <https://ui.adsabs.harvard.edu/abs/2022AAS...24010113R>.

EDUCATION

PhD in Physics with a focus in Astronomy (In progress)

George Mason University

 Aug 2023 – Present

 Fairfax, VA

Expected Graduation: May 2028

Cumulative GPA: 3.67

Undergraduate-level coursework completed prior to graduate admission (Jan 2020 – May 2023)

Bachelor of Science in Computer Science, *cum laude*

Allegheny College

 Aug 2007 – May 2011

 Meadville, PA

Senior Thesis: *An Implementation of xTEA for FPGAs*

Cumulative GPA: 3.53

NCAA Scholar Athlete; Softball team co-captain

Teaching Assistant in the Computer Science department

EXTRACURRICULAR

Leadership Council

Spectrum, George Mason University

 Aug 2023 – Present

 Fairfax, VA

- Spectrum is a student-run organization dedicated to creating a more equitable and inclusive environment for students in the Physics and Astronomy Department at George Mason University.
 - Developed a monthly Professional Development Series in order to provide undergraduate and graduate students with presentations on meaningful and relevant career, research, and personal growth topics.
 - Initiating a mentorship program designed to foster community in physics and astronomy.
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Assistant Instructor

Potomac Kempo

📅 2015 – Present

📍 Alexandria, VA

- Volunteer instructor of personal lessons and group classes for children and adults.
- 10 years experience and a Nidan (2nd Degree Black Belt) in Shaolin Kempo.
- 6 years experience in Pekiti-Tirsia Kali.