Ilija **Medan**

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Education

Georgia State University *Atlanta, GA, USA*

Doctor of Philosophy in Astronomy *Aug. 2018 - Aug. 2023*

- Advisor: Dr. Sébastien Lépine
- Research Focus: Astroinformatics, Astrostatistics, Milky Way Structure and Evolution

Georgia State University *Atlanta, GA, USA*

Masters in Physics *Aug. 2018 - Dec. 2020*

- Advisor: Dr. Sébastien Lépine

Santa Clara University *Santa Clara, CA, USA*

Bachelor of Science in Mechanical Engineering with a Minor in Physics *Sep. 2012 - Dec. 2016*

Skills

Proficient Python, LaTeX, SQL, ADQL, bash scripting, DS9

Familiar MATLAB, R, HTML, Julia, IRAF, C++

Research Experience

Vanderbilt University

VIDA Postdoctoral Fellow *Aug. 2023 - PRESENT*

- Developed method to identify likely, close separaton binares (< 2") In Gaia DR3 without astrometric solution. Sample has high pruity and greatly builds on number of known, visual binaries with separations < 100 AU in Gaia. See Medan,& Lépine 2023, AJ, 166, 218 and Medan, Lépine, Hartman & Stassun 2024, AJ, 167, 252.
- Developed method to standardize SDSS-V BOSS M dwarf spectra. Method helps account for spectrophotmetric issues in the optical spectra.
- Developing the selection function for the SDSS-V Solar Neighborhood Census to facilitate future statistical studies with the sample.
- Advisor: Dr. Keivan Stassun

Sloan Digital Sky Survey

FPS Design Implementation Lead *Sep. 2020 - PRESENT*

- Develop and maintain a Python package, `sdss-mugatu`, that compiles SDSS-V FPS designs (configurations of targets to be observed using a focal plane system of re-configurable robots) to and from the targeting database, and validates these designs based on desired observing conditions.
- Coordinate with other software leads to ensure FPS design software is compatible with existing SDSS-V software products.
- Supervisor: Dr. Kevin Covey

Georgia State University

Atlanta, GA, USA

Graduate Research Assistant *Aug. 2018 - Aug. 2023*

- Develop Bayesian cross-matching method to match Gaia DR2 sources to various photometric catalogs. The resulting cross-match for high proper-motion sources produces higher match rates than the internal Gaia match. See Medan, Lépine & Hartman 2021, AJ, 161, 234.
- Calibrate a photometric metallicity relationship for K and early M dwarfs of $3500 < T_{eff} < 5280$ K using a Gaussian Process Regressor, which has better precision and accuracy than previous studies. See Medan, Lépine & Hartman 2021, AJ, 161, 234.
- Combine photometric metallicities of low-mass stars with kinematics from Gaia DR3 to develop method to derive probable chemo-dynamical age distributions of group of stars. Use method to study variations in chemistry and age for kinematic structures in Solar Neighborhood. See Medan & Lépine 2023, MNRAS, 521, 208.
- Advisor: Dr. Sébastien Lépine

SOFIA Science Center *Moffet Field, CA, USA*

Research Assistant *Jul. 2017 - Aug. 2018*

- Use polarized flux images from HAWC+ on SOFIA of IRC +10216 to derive the temperature profile in the circumstellar envelope via the radiative transfer modeling code DUSTY, that was optimized using differential evolution, to study of grain alignment mechanisms for carbon grains. See Andersson, Lopez-Rodriguez, Medan, et al. 2022 ApJ, 931, 80
- Expand data analysis of Local Bubble project from the Summer of 2016 by adding all of the nearby field stars to the model of the local radiation field to show that the degree of polarization is largely insensitive to the radiation field from red field stars. See Medan & Andersson 2019, ApJ, 873, 87
- Organize an observing run at the Wyoming Infrared Observatory (WIRO) to conduct a multi-band polarimetry study of the stellar contents around the Per OB3 association.
- Provide guidance to an undergraduate summer research student who processed and analyzed data from the observations at WIRO.
- Advisor: Dr. B-G Andersson

Universities Space Research Association *Mountain View, CA, USA*

Student Intern *Jan. 2017 - Jun. 2017*

- Write Python scripts to detect sources, calculate calibrated magnitudes and measure stellar proper motions from Hubble Space Telescope (HST) images of Kepler's Supernova Remnant from two epochs to search for the surviving companion of the supernova progenitor.
- Catalog the bright knots in the remnant, and calculate calibrated fluxes and surface brightnesses to track changes in morphology and intensity over the epoch.
- Advisor: Dr. Ravi Sankrit

SOFIA Science Center *Moffet Field, CA, USA*

Summer Research Student *Jun. 2016 - Sep. 2016*

- Support a large polarization survey by data mining archival photometric and spectroscopic data to study the effects of radiatively driven grain alignment in the Local Bubble.
- The above data was used to demonstrate that the degree of polarization in the wall of the Local Bubble was correlated with the radiation field that is dominated by the light from the OB associations within 200 pc of the Sun, which supports radiatively driven grain alignment.
- Advisor: Dr. B-G Andersson

Observing Experience

2025 **15.5 hours queue observing – Zorro speckle imager (PI),** Gemini South (GS-2025B-Q-217)
6.9 hours queue observing – 'Alopeke speckle imager (PI), Gemini North (GN-2025B-Q-310)
27.7 hours queue observing – GHOST spectrograph (Co-I), Gemini South (GS-2025B-Q-142, GS-2025B-Q-237, GS-2025B-Q-325)
31.6 hours queue observing – GHOST spectrograph (Co-I), Gemini South (GS-2025A-Q-242, GS-2025A-Q-326)
11.3 hours queue observing – IGRINS-2 spectrograph (Co-I), Gemini North (GN-2025A-Q-246, GN-2025A-Q-325)

2022 **7.0 hours queue observing – Zorro speckle imager (PI),** Gemini South (GS-2022B-Q-313)
3.5 hours queue observing – 'Alopeke speckle imager (PI), Gemini North (GN-2022A-Q-313)
4.9 hours queue observing – Zorro speckle imager (PI), Gemini South (GS-2022A-Q-316)

2018 **3 nights classical observing – Kast Dual Channel Spectrograph,** Lick Observatory

2017 **10 nights classical observing – OptiPol polarimeter,** Wyoming Infrared Observatory

Awards

2022–23 **Recipient,** Georgia State University Provost's Dissertation Fellowship *Atlanta, GA, USA*

2019 **Scholarship,** La Serena School of Data Science: Applied Tools for Data-driven Sciences *La Serena, Chile*

2018–22 **Recipient,** Georgia State University Second Century Initiative (2CI) Fellowship *Atlanta, GA, USA*

2016 **Recipient,** Geoff and Josie Fox Summer Research Fellowship *Santa Clara, CA, USA*

Volunteer Work

SDSS-V Solar Neighborhood Census *Nashville, TN, USA*

Working Group Co-Chair *July 2024 - PRESENT*

- Duties include organizing and running periodic science calls, organizing effort on targeting verification and survey strategy, soliciting feedback and organizing investigation of science data, and encouraging the creation and announcement of projects.

Astronomy on Tap *Nashville, TN, USA*

Volunteer *July 2024 - PRESENT*

- Have given two talks at Astronomy on Tap events for the local chapter.

AstroPAL *Atlanta, GA, USA*

Faculty Liaison *September 2021 - June 2023*

- Act as liaison between graduate students and faculty as part of AstroPAL, a peer mentoring group which seeks to mentor 1st and 2nd year graduate students.

Imagining The Future *Atlanta, GA, USA*

Volunteer Speaker *March 2020*

- Spoke to a total of ∼125 elementary school students throughout one day about distances to objects in the Solar System and how astronomers measure distances via trigonometric parallax. This program was organized by the Atlanta Science Festival.

Georgia Outreach Team for Space (GOT Space) *Atlanta, GA, USA*

Volunteer Speaker *January 2019 - January 2020*

- Speak with high school classes about various topics in astronomy. Participate in outreach events 2-3 times per semester.

Publications and Presentations

First Author Publications

The Importance of Standardizing Spectra in the Era of Large Spectroscopic Surveys: A Case Study of M Dwarfs in SDSS-V

Medan, Way, et al. 2025, in review

- Lead in the creation, analysis and interpretation of method to standardized SDSS-V BOSS spectra of M dwarfs.

Procedures for Constraining Robotic Fiber Positioning for Highly Multiplexed Spectroscopic Surveys: The Case of FPS for SDSS-V

Medan, Dwelly, Covey, et al. 2025, in review

- Work summarizing framework for design requirements in SDSS-V. Summaries, in large part, the validation code written for `mugatu`.

Detecting New Visual Binaries in Gaia DR3 with Gaia and Two Micron All Sky Survey (2MASS) Photometry II. Speckle Observations of 16 Low-Separation Systems

Medan, Lépine, Hartman & Stassun 2024, AJ, 167, 252

- Created sample for speckle observations and analyzed resulting data products to determine if systems were true binaries or not.

Detecting New Visual Binaries in Gaia DR3 with Gaia and Two Micron All Sky Survey (2MASS) Photometry. I. New Candidate Binaries within 200 pc of the Sun

Medan & Lépine 2023 AJ, 166, 218

- Created methodology to detect close separation binaries in Gaia DR3 without the use of astrometry. With the method, created a catalog of binaries within 200 pc.

Chemodynamical Ages of Small-Scale Kinematic Structures of the Galactic Disc in the Solar Neighborhood from ∼250,000 K and M Dwarfs

Medan & Lépine 2023 MNRAS, stad435

- Created the data sample of low-mass stars with photometric metallicities, developed the chemodyanmical age methodology, and conducted subsequent data analysis and interpretation of the chemo-dynamic-age sub-structure.

Bayesian Cross-Matching of High Proper Motion Stars in *Gaia* DR2 and Photometric Metallicities for ∼1.7 million K and M Dwarfs

Medan, Lépine & Hartman 2021, AJ, 161, 234

- Developed method for Bayesian cross-matching and wrote code to create cross-match catalog of higher proper motion sources in Gaia DR2.
- Used cross-match catalog to calibrate photometric metallicity relationship using a Gaussian Process regressor.

Magnetic Field Strengths and Variations in Grain Alignment in the Local Bubble Wall

Medan & Andersson 2019, ApJ, 873, 87

- Compiled data from various archival sources to comprise final dataset for analysis and analyze variations in subsequent polarization data.
- Construct models of nearby radiation field to compare to variations in polarization data.

Co-Author Publications

Mapping the Distant and Metal-Poor Milky Way with SDSS-V

Chandra, et al. 2025, in review

- Assisted with the planning and execution of the SDSS-V cluster observations used for validation.

Resolving the Unresolved: Using NESSI to Search for Unresolved Companions in Low-mass Disk Wide Binaries

Hartman, van Belle, Lépine, Everett and **Medan** 2025, AJ, 170, 91

- Provided photometric metallicity data for wide binaries and contributed to the statistical analysis presented.

The Nineteenth Data Release of the Sloan Digital Sky Survey

SDSS Collaboration, et al. 2025, in review

- Granted authorship for work as FPS Design Implementation lead with SDSS-V.

Sloan Digital Sky Survey-V: Pioneering Panoptic Spectroscopy

Kollmeier, et al. 2025, in review

- Granted authorship for work as FPS Design Implementation lead with SDSS-V.

robostrategy: Field and Target Assignment Optimization in the Sloan Digital Sky Survey V

Blanton, Carlberg, Dwelly, **Medan**, et al. 2025, in review

- Contributed to sections of the paper on design validation and offsetting.

Roboscheduler: coordinating 50,000 observations over the five years of SDSS-V

Donor, Blanton, Covey, Dwelly, **Medan** & Sánchez-Gallego 2024, SPIE, 13101, 46

- Contributed to the database schema needed for the scheduler.

The Eighteenth Data Release of the Sloan Digital Sky Surveys: Targeting and First Spectra from SDSS-V

Almeida, et al. 2023, ApJS, 267, 44

- Granted authorship for work as FPS Design Implementation lead with SDSS-V.

From Data to Software to Science with the Rubin Observatory LSST

Breivik, et al. 2022, arXiv:2208.02781

- Was lead contributor and editor for section on determining properties of low-mass stars with LSST data.
- Contributed to discussions on time series tools, feature extraction and data visualization.

Grain Alignment in the Circumstellar Shell of IRC+10°216

Andersson, Lopez-Rodriguez, **Medan**, et al. 2022 ApJ, 931, 80

- Wrote differential evolution code for temperature modeling of circumstellar shell using HAWC+ polarization data and DUSTY radiative transfer code.

Vetting the Lobster Diagram: Searching for Unseen Companions in Wide Binaries using NASA Space Exoplanet Missions

Hartman, Lépine & **Medan** 2022 ApJ, 934, 72

- Provided photometric metallicity data for components of wide binary systems.

A Catalog of 531 White Dwarf Candidates in the Local Galactic Halo from *Gaia* Data Release 2

Kim, Lépine & **Medan** 2020, ApJ, 889, 83

- Provided cross-match between Gaia DR2 white dwarfs identified and their counterparts in Pan-STARRS.

Presentations

SDSS-V Collaboration Meeting 2025

June 2025 – Heidelberg, Germany

- Invited talk on the overview of the science goals and progress made for the SDSS-V Solar Neighborhood Census.

Vanderbilt Astro Seminary

September 2024 – Nashville, TN, USA

- Oral presentation on the planning, execution and early results from SDSS-V.

The 22nd Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun

June 2024 – San Diego, CA, USA

- Poster presentation on detection of visual binaries with Gaia and 2MASS.
- Medan, Lépine, Hartman & Stassun 2024, Zenodo. DOI: 10.5281/zenodo.12977131

SDSS-V Collaboration Meeting 2024

June 2024 – Las Cruces, NM, USA

- Oral presentation on method to normalize M dwarf optical spectra using alpha shapes.

241st AAS Meeting

January 2023 – Seattle, WA, USA

- Oral presentation on "The Chemodynamic-Age Structure of the Local (d < 300 pc) Population of Low-Mass Stars".
- Medan, Lépine, Hartman & Hunt 2023, Abstract 421.03D, 241, AAS

The 20th (and a half) Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun

March 2021 – Virtual

- Poster presentation of improved photometric metallicity relationship for K/M dwarfs from APOGEE spectra.
- Medan, Lépine & Hartman 2021, Zenodo. DOI: 10.5281

237th AAS Meeting

January 2021 – Virtual

- Oral presentation of improved photometric metallicity relationship for K/M dwarfs from APOGEE spectra.
- Medan & Lépine 2020, Abstract 513.03, 237, AAS

SDSS-V Collaboration Meeting 2020

June 2020 – Virtual

- Poster presentation of improved photometric metallicity relationship for K/M dwarfs from APOGEE spectra.

235th AAS Meeting

January 2020 – Honolulu, HI, USA

- Poster presentation of Bayesian cross-matching of high proper motion stars in *Gaia*.
- Medan & Lépine 2020, Abstract 273.05, 235, AAS

Georgia State University Dunwoody Campus Astronomy Conference

October 2019 – Dunwoody GA, USA

- Conference presentation to undergraduate astronomy students on graduate research concerning cross-matching astronomical surveys.