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*

- Joined Dr. Keivan Stassun's reserach group to continue work regarding binary systems in Gaia DR3 and SDSS-V, and chemodynamics of low-mass stars in the Solar Neighborhood.
- 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 chemodymical 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.
- 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

2022	**7.0 hours of queue observing with the Zorro speckle imager,** Gemini South (GS-2022B-Q-313)	*Cerro Pachon, Chile*
2022	**3.5 hours of queue observing with the 'Alopeke speckle imager,** Gemini North (GN-2022A-Q-313)	*Mauna Kea, Hawaii, USA*
2022	**4.9 hours of queue observing with the Zorro speckle imager,** Gemini South (GS-2022A-Q-316)	*Cerro Pachon, Chile*
2018	**3 nights of classical observing with the Kast Dual Channel Spectrograph on the Shane 3m telescope,** Lick Observatory	*Mount Hamilton, CA, USA*
2017	**10 nights of classical observing with the OptiPol polarimeter,** Wyoming Infrared Observatory	*Laramie, WY, USA*

Awards

2022-2023	**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*
2018-2022	**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

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

Publications

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, arXiv:2404.02976

- 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-dyanmic-age sub-structure.

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.

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.

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.

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.

Presentations

241st AAS Meeting — *Seattle, WA, USE*

Oral Presentation (Dissertation) — *Jan. 2023*

- 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 — *Virtual*

Poster Presentation — *Mar. 2021*

- 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 — *Virtual*

Oral Presentation — *Jan. 2021*

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

SDSS-V Team Meeting — *Virtual*

Poster Presentation — *Jun. 2020*

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

235th AAS Meeting — *Honolulu, HI, USA*

Poster Presentation — *Jan. 2020*

- 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 — *Dunwoody GA, USA*

Georgia State University Dunwoody Campus Astronomy Conference — *October 2019*

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