Max Kurzner

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Galaxy Morphology | Machine Learning Methods |
Stellar Population Synthesis | Data Analysis and Reduction

Education

University of Victoria, Victoria, BC, CA — September 2021 - [August 2025]
PhD in Astrophysics
Tufts University, Medford, MA, USA — May 2021
Master of Science in Astrophysics (*GPA: 3.88/4.00*)
Colgate University, Hamilton, NY, USA — May 2017
Bachelor of Arts in Astronomy & Physics (*GPA: 3.31/4.00)*

Research Interests

Extragalactic Astrophysics, Galaxy Formation and Evolution, Galaxy Structure, Machine Learning Applications

Research Experience

University of Victoria, Victoria, BC — September 2021 - Present

Graduate Research: *Determining CAS parameters and morphologies of NGVS Galaxies*

- Utilizing the statmorph Python package to fit CAS and other morphological factors to the entire catalog of NGVS galaxies
- Identifying trends in galaxy properties and morphologies in relation to location in the Virgo cluster and properties of the local environment
- Extending this analysis by extending a visual classification scheme to the entire the NGVS sample as well as comparing these results to those obtained by employing a machine learning workflow trained on galaxy structural properties and Convolutional Neural Network trained on Sloan Digital Sky Survey galaxies determine the morphologies of galaxies

Graduate Research: *The properties and distribution of Nuclear Star Clusters in the Virgo Cluster*

- Extending the understanding of nuclear star cluster properties in cluster environments by combining model fits, visual classifications and catalog measurements for the entire NGVS in Python
- Bridging the connection between galaxy morphology and nuclear star cluster properties to provide novel insights into nuclear star cluster formation channels for galaxies at all mass regimes
- Utilizing legacy and complimentary data products from HST and CFHT to probe the connections between globular clusters and nuclear star clusters

Tufts University, Medford, MA — May 2020 - May 2021

Graduate Research: *Mass-to-Light ratios and Bottom-Heavy IMFs in Elliptical Galaxies*

- Probed effects of varying Initial Mass Function (IMF), star formation history and metallicity on the stellar mass-to-light (M*/L) ratio of synthetic stellar populations using Fast Stellar Population Synthesis (FSPS) code in Python
- Explored the possibility of bottom-heavy IMFs in the cores of massive elliptical galaxies to explain mismatches in dynamical mass estimates of elliptical galaxies

Colgate University, Hamilton, NY — June 2016 - December 2016

Senior Research: *Starspot Parameter and Numerical Uncertainty determination for AA Tau*

- Investigated starspot coverage of T Tauri stars to classify and characterize their evolution
- Built off previous work on constraining starspot properties of T Tauri stars
- Numerically constrained starspot coverage and temperature with a Markov Chain Monte Carlo (MCMC) implemented in Python

Summer Research: *Photometric Mapping of Ice and Silicate Dust Composition in Dense Molecular Clouds*

- Developed a methodology to constrain spectral types of stars behind dense molecular clouds to probe the properties of dense molecular clouds with CO absorption lines in the near-infrared.
- Acquired data using the TripleSpec cross-dispersed near-infrared spectrograph on the Astrophysical Research Consortium 3.5 m telescope at Apache Point Observatory
- Reduced data with SpeX tool package in the Interactive Data Language (IDL)
- Worked collaboratively to implement an MCMC to constrain K band extinction of target stars

Presentations

Contributed Talk at **The physical processes shaping the stellar and gaseous histories of galaxies (GASPISA2024), Pisa, Italy** "*Probing the Structure and Environment of Cluster Galaxies with Deep Optical Morphology in the Virgo Cluster"* Summer 2024

Contributed Talk at the **241st Meeting of the American Astronomical Society, Seattle, WA.** "*High Resolution Optical Galaxy Morphology with the Next Generation Virgo Survey"* Winter 2023

Contributed Talk at the **240th Meeting of the American Astronomical Society, Pasadena, CA.** "*The Impact of the Initial Mass Function on the Evolution of M/L"* Summer 2022

27thAnnual Keck Northeast Astronomy Consortium Undergraduate Symposium on Research in Astronomy, Wesleyan University, Middletown, CT "*Spectral Classification of Extincted Stars by CO Absorption Strength"* Fall 2016

26thAnnual Keck Northeast Astronomy Consortium Undergraduate Symposium on Research in Astronomy, Williams College, **Williamstown, MA** *"Constraining the Sidereal Period and Spin Direction of (2144) Marietta"* Fall 201

Publications

1. **Kurzner, M.M.,** Côté, P., et al. (In Prep, Expected 2024) The Next Generation Virgo Cluster Survey (NGVS). XL: The Morphological Properties of Virgo Cluster Galaxies
2. **Kurzner, M.M.,** Spengler, C, Côté, P., et al. (In Prep, Expected Late 2024) The Next Generation Virgo Cluster Survey (NGVS). XXIX. Analysis of the Complete Nuclear Star Cluster Sample
3. Cantiello, M., et al. (including **Kurzner, M.M),** (2024) The Next Generation Virgo Cluster Survey (NGVS). III. A Catalog of Surface Brightness Fluctuation (SBF) Distances and the Three-Dimensional Distribution of Galaxies in the Virgo Cluster, The Astrophysical Journal, Volume 966, Issue 1, id.145, 23 pp.
4. Slivan, Stephen, M., Hosek Jr., **Kurzner, M.M.** et al. (2023) Spin vectors in the Koronis family: IV. Completing the sample of its largest members after 35 years of study, Icarus Volume 394, article id. 115397.
5. **Kurzner, M.M.** (2016) Spectral Classification of Extincted Stars by CO Absorption Strength. Proceedings of the 27th Annual Keck Northeast Astronomy Consortium Undergraduate Symposium on Research in Astronomy
6. **Kurzner, M.M.** (2015) Constraining the Sidereal Period and Spin Direction of (2144) Marietta. Proceedings of the 26th Annual Keck Northeast Astronomy Consortium Undergraduate Symposium on Research in Astronomy

Outreach

Region IV Scientific Review Committee Spring 2021

Reviewed the safety of high school science fair project submissions for the 2021 Region IV High School Science & Engineering Fair

Presentation Pioneer Charter School of Science 2 Fall 2021

Presented work on the state of research in extragalactic astronomy for high school physics students during the Pioneer Charter School annual science speakers series

Friends of the DAO Star Party Public Talk Speaker Summer 2023

Presented public general audience talk on galaxy evolution entitled How Galaxies Shape Up (link to talk on YouTube)

Honors & Awards

University of Victoria Graduate Award Fall 2021-

Finalist: Tufts Graduate School of Arts and Sciences Outstanding Academic Scholarship Award Spring 2021

Justus '43 and Jayne Schlichting Grant for summer research at Colgate University Summer 2016

Colgate University Dean's Award for Academic Excellence Fall 2015 - Spring 2017

Patriot League Academic Honor Roll Fall 2015 - Spring 2017

Teaching Experience

University of Victoria, Victoria, BC Fall 2021 –

Laboratory Teaching Assistant, Department of Physics and Astronomy, AST101: Exploring the Night Sky and AST150: Concepts in Modern Astronomy

- Independently conduct and teach labs through organizing lab lectures and activities
- Manage student performance and learning outcomes through grading lab exercises and providing feedback to support student success in AST101
- Proctored exams and held office hours remotely during the COVID-19 Pandemic and aided in shifting all lectures and class materials to an easily accessible online format for all students

Tufts University, Medford, MA Spring 2020 – Spring 2021

Teaching Assistant, Department of Physics and Astronomy, AST09: Concepts of the Cosmos, AST32: Galactic and Extragalactic Astronomy

- Distributed in class learning materials and answered student questions during class discussions and activities
- Provided additional help and assistance on homework and exams at office hours
- Proctored exams and held office hours remotely during the COVID-19 Pandemic and aided in shifting all lectures and class materials to an easily accessible online format for all students

Colgate University, Hamilton, NY Spring 2015 - Spring 2017

Learning Assistant, Department of Physics and Astronomy, AST 101: Solar System Astronomy, AST 102: Stars, Galaxies and the Universe

- Aided students enrolled in ASTR 101 and 102 with weekly tutoring sessions to supplement in class learning and assist in exam preparations
- Led out of class observing sessions to put night sky into context
- Engaged with students during in class demonstrations and exercises

Tutor, Varsity Tutors, Cambridge, MA September 2020 - June 2021

- Tutored high school and college in physics and mathematics in online virtual help sessions
- Tailored student learning experiences based on their needs and weekly assignments

Professional Experience

Clinical Analyst, *Remedy Partners,* Norwalk, CT October 2018 - August 2019

A healthcare software company that collaborates with healthcare organizations to launch bundled payment programs

- Compiled and assisted in the creation of learning materials to support software for physicians engaged in redesigning the healthcare system

Analyst, *Third Bridge Group, New* York, NY May 2018 - September 2018

A financial research firm specializing in connecting institutional investors with subject matter experts in industries relevant to investment and growth opportunities

- Conducted primary research to facilitate one-on one consultations between clients and industry experts to support clients on corporate strategy cases dealing with reorganization, product launch, industry benchmarking and market entry

Actuarial Analyst*, Tokio Millennium Re AG,* Stamford, CT July 2017- November 2017

A reinsurance company focusing on property and casualty and workers compensation lines of business insurance risks

- Provided analytical support to Actuarial team by updating pricing/reserving models used to forecast the development of loss trends across industries

Computer and Language Skills

Computer*:* High proficiency with Python, Bash and Unix, working proficiency with MATLAB, IDL and IRAF

Languages: High proficiency in oral and written Spanish, elementary proficiency in oral and written Welsh, Russian, Hebrew and Arabic