Robert Crager ⏶

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Summary

A returning student with a background in Cybersecurity interested in pursuing observational Astronomy that focuses on galaxy evolution, spectroscopic detection of active galactic nuclei, classification of high redshift galaxies, and searching for the origin of supermassive black holes.

Education

B.S.   **University of Massachusetts**, Physics   Feb 2023 - Present
                                                                                            Amherst, MA
- GPA: 3.73
- Relevant Coursework: Stellar Astrophysics, Computational Physics, Electricity & Magnetism, Quantum Mechanics, Ordinary Differential Equations, Thermodynamics & Waves

B.A.T.   **Collin College**, Cybersecurity   Sep 2018 - Dec 2022
                                                                                            McKinney, TX
- GPA: 3.53 - Cum Laude

Research Experience

Measuring Galaxy Morphology with JWST, Department of Astronomy, UMass - Amherst   Feb 2024 - Present
                                                                                            (Indep. Study)
                                                                                            Jun 2024 - Aug 2024
                                                                                            (Internship)
- **Advisor:** Dr. Alex Pope
- **Scientific Question:** Do galaxies with an active galactic nucleus have structural properties that suggest a particular evolutionary history?
- **Tasks:** Compare visual and quantitative galaxy properties with active galactic nucleus fraction
    - Obtain images of 44 galaxies with JWST NIRCam from the JADES survey and Grizli using AstroPy
    - Add proper Poisson noise and use the Bootstrapping method to obtain accurate uncertainties
    - Calculate quantitative morphological measurements with Statmorph
- **Results:** Galaxies with an active galactic nucleus:
    - Aren't typically in a late-stage merger system
    - Don't have any definitive trend in asymmetry, concentration, Gini, or M20
- Research to be showcased in a paper (Crager et al. in prep)

Posters and Presentations

Structural Properties of $z \sim 2$ Dusty Star-Forming Galaxies and AGN Revealed by Deep NIRCAM Imaging ⏶   Jan 2025
Poster at the 245th American Astronomical Society (AAS) Meeting   National Harbor, MD

Measuring the Morphology of Galaxies with JWST   August 2024
Five College Astronomy Department Research Symposium   Amherst, MA
Department of Astronomy, University of Massachusetts Amherst

Safeguarding the Modern Internet: Machine-Learning-Enabled Web Application Firewalls ⏶   April 2022
Mississippi Academy of Sciences   Biloxi, MS

Awards and Achievements

Mass Space Grant Fellowship, Funded by the Massachusetts Space Grant Consortium   2024
Mass Space Grant provides funding to exemplary students whose research directly supports NASA's scientific goals

FCAD Summer Internship, Funded by the Massachusetts Space Grant Consortium   2024
The FCAD Internship is awarded to motivated Five-College students who showcase exceptional research capability

Lee Cole Emerson Scholarship in Cosmology, Astronomy, and Physics   2023-2024
The Lee Cole Emerson Scholarship supports promising students in the Natural Sciences who showcase academic excellence

HackDFW - 1st Place, Digit7 Sponsor Challenge   2022

   Awarded to contestants who showcase how computer vision and AI can create a personalized customer journey
   Our team created a LiDar scanning app that could allow customers to try on clothes before buying them

Relevant Computational Projects

Astrophysics Simulation Program ⬈, UMass - Amherst (Computational Physics - PHYS 281)   2023
- **Project Goal:** Simulate the creation and evolution of a galaxy in an NFW dark matter halo
- Developed a simulation using Python and Numpy to generate a static distribution of particles based on an inputted density profile
- Evolved the simulation in time using leapfrog integration and Newtonian Laws to simulate a galaxy merger event over the course of 10 gigayears

MESA Stellar Simulation, UMass - Amherst (Stellar Astrophysics - ASTR 335H)   2023
- **Project Goal:** Configure MESA ⬈ to simulate the evolution of a high-metallicity star and understand how metallicity might affect stellar evolution
- Concluded that metallicity directly affects stellar temperatures, but not length of lifetime

Vaste ⬈, Personal Project   2021
- **Project Goal:** Create an environment to allow users to copy and paste between any computer or phone
- Developed a Python web server to paste content into
- Created an interface for users to input text, images, or other clipboard-pasted content

Miami Multiplayer ⬈, Personal Project   2020
- **Project Goal:** Learn about networking and online gaming by remaking Hotline Miami into a multiplayer (paintball) shooter game
- Built the networking from scratch using packet codes for player-to-server communication
- Learned about game development and best practices for player inter-connectivity
- Created a level editor for users to create their own levels to play with friends

Procegen ⬈, Personal Project   2018
- **Project Goal:** Learn about procedural generation and graphics by making an app to generate images
- Developed an Android phone app to generate triangular images based on user-selected color palettes

Volunteering/Outreach

Zooniverse Citizen Science, Zooniverse.org   Dec 2022 - Present
- Gravity Spy - Identify gravitational waves from LIGO detectors (1200+ classifications)
- Dark Energy Explorers - Discover galaxy candidates using spectral lines from telescope data

Science Outreach Club, UMass - Amherst   Feb. 2023 - May 2023
- Performed science demonstrations for elementary and middle schools to get   Amherst, MA
  students excited about astronomy, physics, etc.

Youtube Educator ⬈, Youtube.com   2021 - 2022
- Created educational videos showcasing different cybersecurity attack avenues for 20+ subscribers

Webb Elementary Outreach, Webb Elementary School   2016 - 2018
- Assisted students in programming LEGO robots to navigate an obstacle course   McKinney, TX
- Tutored the children every other week on high-level programming techniques
- Part of an outreach effort by the local high school Computer Science Department

Relevant Work Experience

Security Operations Center Analyst, Health Care Services Corp.   Jan. 2022 - Dec. 2022
Dallas, TX
- Refined Python and Bash skills to automate log analysis processes for a team of 6 analysts
- Acted as the shift point of contact for escalation of severe events
- Regularly researched new cybersecurity attack avenues to implement preventative measures

Systems Administrator, Dust Free LP.   May 2021 - Jan. 2022
Royse City, TX
- Educated a team of 10 employees on cybersecurity best practices
- Incorporated standardized security procedures and computer backup mechanisms
- Provisioned new employee computers with necessary software

Cyber Security Intern, Lafayette Group, Inc.   May 2020 - May 2021
Vienna, VA
- Developed educational material to showcase compliance requirements for government agencies
- Researched cybersecurity policy to support the Cybersecurity and Infrastructure Security Agency (CISA)

Skills

Languages: Python, Bash, Java, HTML, CSS, JavaScript, Latex

Libraries: AstroPy, Statmorph, Numpy, Pandas, Git, PhotUtils

Software: VS Code, SAOImage DS9, Github, MS Office Suite