

# Robert Crager

📍 Amherst, MA    ✉ robert.crager@outlook.com    ☎ (262) 203-1646    in physics-rob    🌐 rcrager

## 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 super-massive 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)
- **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 NIRCам 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
    - Are more symmetric but not more concentrated than star-forming galaxies
  - Research to be showcased in a paper and presented at AAS 245<sup>th</sup> meeting
- Jun 2024 - Aug 2024  
(Internship)

## Posters and Presentations

- Structural Properties of  $z \sim 2$  Dusty Star-Forming Galaxies and AGN Revealed by Deep NIRCам Imaging** Expected Jan 2025  
Poster at the 245<sup>th</sup> 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

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

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### **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

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### **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  
Amherst, MA

- Performed science demonstrations for elementary and middle schools to get 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  
McKinney, TX

- Assisted students in programming LEGO robots to navigate an obstacle course
- 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

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<b>Security Operations Center Analyst</b> , Health Care Services Corp.	Jan. 2022 - Dec. 2022 Dallas, TX
<ul style="list-style-type: none"><li>• Refined Python and Bash skills to automate log analysis processes for a team of 6 analysts</li><li>• Acted as the shift point of contact for escalation of severe events</li><li>• Regularly researched new cybersecurity attack avenues to implement preventative measures</li></ul>	
<b>Systems Administrator</b> , Dust Free LP.	May 2021 - Jan. 2022 Royse City, TX
<ul style="list-style-type: none"><li>• Educated a team of 10 employees on cybersecurity best practices</li><li>• Incorporated standardized security procedures and computer backup mechanisms</li><li>• Provisioned new employee computers with necessary software</li></ul>	
<b>Cyber Security Intern</b> , Lafayette Group, Inc.	May 2020 - May 2021 Vienna, VA
<ul style="list-style-type: none"><li>• Developed educational material to showcase compliance requirements for government agencies</li><li>• Researched cybersecurity policy to support the Cybersecurity and Infrastructure Security Agency (CISA)</li></ul>	

Skills

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

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

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