

PHYSICS
ARTS AND SCIENCES

FOR APPLICATION YEAR: 2026

PROJECT TITLE: Resolving Distant Galaxies with Gravitational Lensing

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Project Description

NASA's flagship astronomical observatories provide us with powerful tools to study the distant universe. In this project a student will work with data from the Hubble Space Telescope (HST) and the James Webb Space Telescope (JWST) to study the spatially resolved properties of distant galaxies that are gravitationally lensed (and highly magnified) by massive foreground galaxy clusters. The galaxy clusters act as "Nature's Telescopes", delivering a zoomed-in view of the distant universe behind them. By pointing our most powerful telescopes at these gravitational lensing systems we can make much deeper and higher resolution (i.e., sharper) observations of the distant universe.

In this project the UPRISE student will get hands-on experience working with data from HST and JWST, beginning with data reduction (turning raw data into high-level data products). They will also help to develop new analysis tools to make science measurements from the data, with a stretch goal of making a new measurement to contribute to future conference proceedings and publications. The day-to-day work on this project will involve a lot of computational work using Python, which will include both running scripts/pipelines and developing new Python software to explore new ways to implement existing pipeline packages. Prior experience with programming, especially in Python, and using command line (unix/linux) operating systems is not strictly required but would be hugely beneficial (and will definitely be heavily used). Completion of astronomy/astrophysics coursework is also a major plus. In addition to astrophysics content, the project will also involve a significant amount of statistical analysis and error propagation.