GLUPYTER: ENABLING MULTI-DIMENSIONAL LINKED DATA VISUALIZATION WITH GLUE IN THE BROWSER (NSF 1908419)

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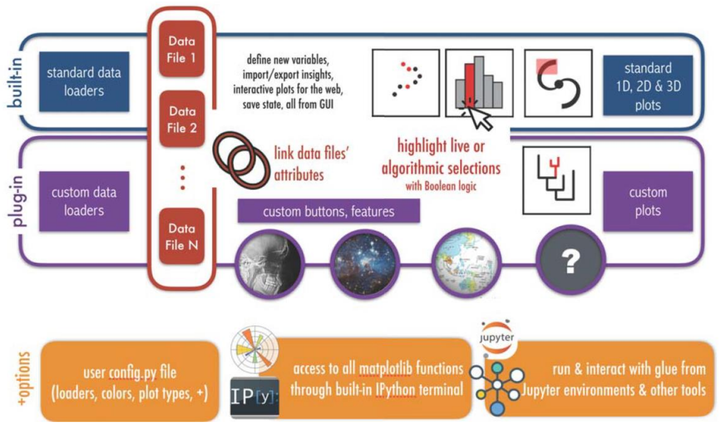
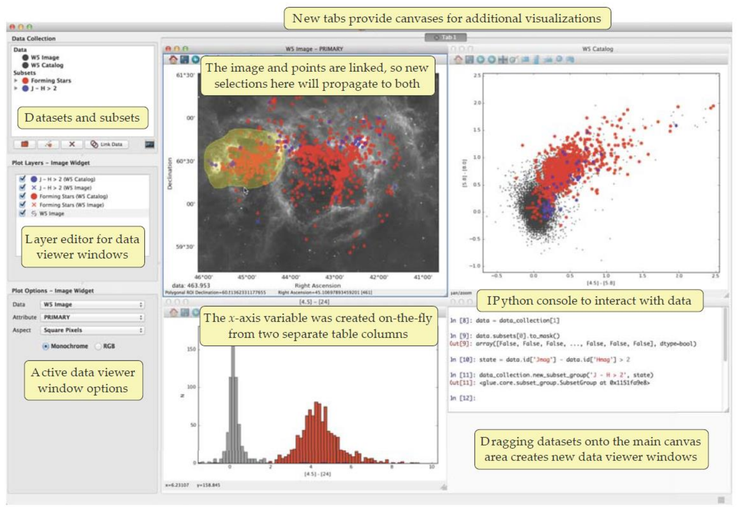
WHAT IS GLUE?

glue is an open-source python package that allows researchers to explore relationships within and across datasets.



The "glue" name comes from three critical features.

1. Data sets can be "glued" together without being merged—**shared attributes are linked**.
2. Open plots are "glued" together in that selections of data subsets in one plot propagate live to all others.
3. Tools can be "glued" to each other using plug-in functionality, and/or, JupyterLab



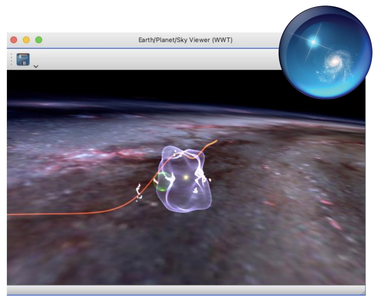
HOW TO GLUE?

Historically, the most common way to use glue is via a desktop application built using Qt. This application's GUI (shown above) allows users to manipulate data visually and programmatically, view and rearrange viewers, and make selections which propagate across all open displays.

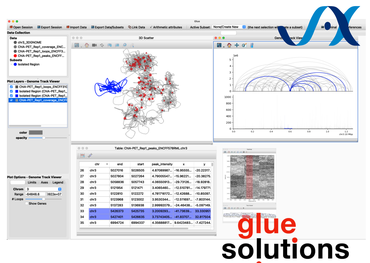
MODULARITY, EXTENSIBILITY

glue is extremely extensible, allowing users from various disciplines to create domain-specific viewers and plugins to aid analysis

AAS WorldWide Telescope's **pyWWT** package allows users to explore astronomical data within both Qt glue and glupyter.



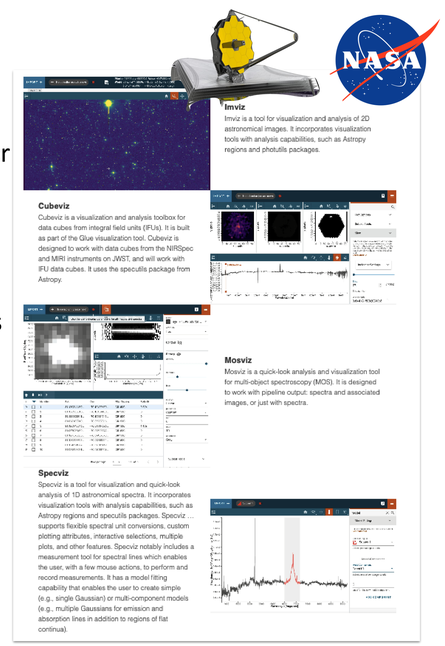
The open-source **glue genes** package developed by glue's commercial spinoff, glue solutions, inc., in partnership with the Jackson Laboratory facilitates exploratory data visualization in genomics.



glue solutions inc.

gluegenes

Jdaviz, created in partnership with the glue team by NASA for analyzing Webb Telescope data, is built using glue, and implemented in Jupyter environments (elements include Imviz, Cubeviz, Mosviz, and Specviz, shown at right)



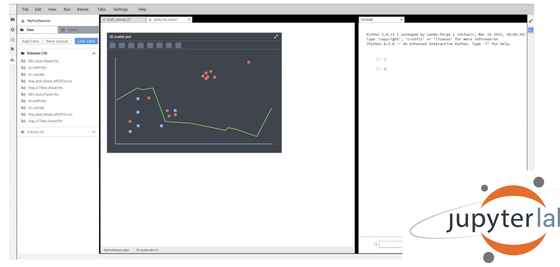
Jdaviz

"GLUPYTER": GLUE FOR THE BROWSER

Data analysis is increasingly performed in an online setting, so glue is adapting. g**lue-jupyter**, or **glupyter**, brings glue functionality into the Jupyter ecosystem.

Development of glupyter infrastructure, ongoing thanks to this NSF grant and other support, has facilitated the creation of the astronomy, biology and educational plug-ins featured here.

Coming next is a completely JupyterLab-based version of glue offering near feature-parity with the Qt version of glue.



jupyterlab™

This "full-functionality" version of glupyter, should be ready in 2023, and its UI development has recently been completed thanks to additional funding from the Moore Foundation.

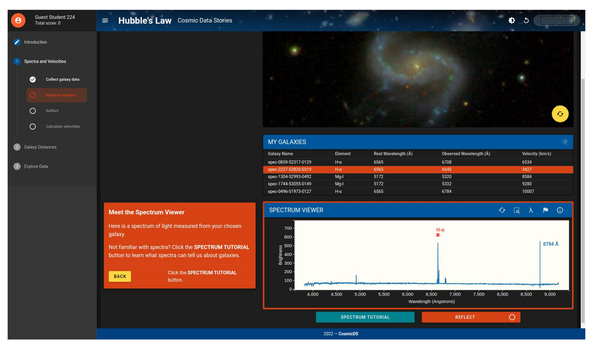
GORDON AND BETTY MOORE FOUNDATION

GLUPYTER IN STEM EDUCATION

The most extensive use of gluptyer in STEM education is in the "Cosmic Data Stories" project, also run out of Harvard, funded by NASA's Science Activation Program.

CosmicDS leverages NSF-sponsored glupyter tools to teach students about data science via interactive "data stories."

The screenshot below comes from a story that allows STEM learners to re-create Edwin Hubble's discovery of an expanding universe.



CosmicDS