

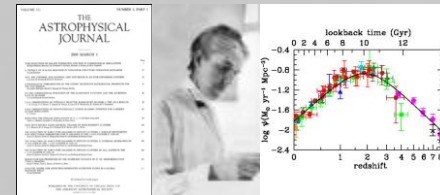
# JWST Python Data-Analysis Tools

Pey Lian Lim  
(on behalf of Harry Ferguson)

Python in Astronomy 2018

# Motivation

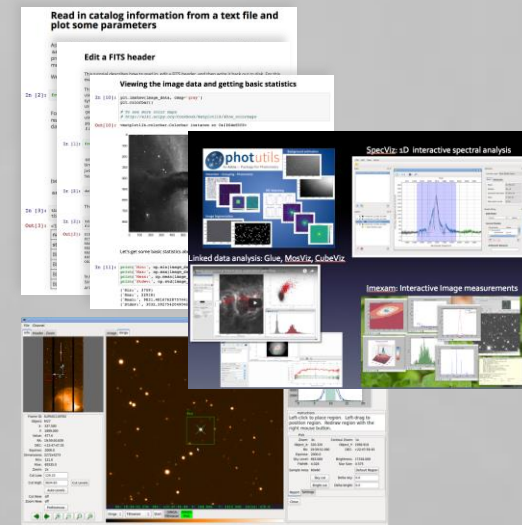
- Enable science
  - Rigorous analysis, fast
- Provide common tools
  - Cross-mission/observatory/discipline
  - Convert, combine, measure, model, visualize
- Provide quality tools
  - Built on robust scientific libraries
  - Powerful and user-friendly
  - Well documented



Knowledge



Analysis Tools



100101 01110110 01100101 01110010 01100000 011000  
101100 00100000 01101101 01101111 01101101 011001  
101000 01100101 01101110 00100000 01101100 011011



# Tiers and key dependencies

## STScI-led Data Analysis Tools

### Viz Tools:

Glue   DS9   Ginga

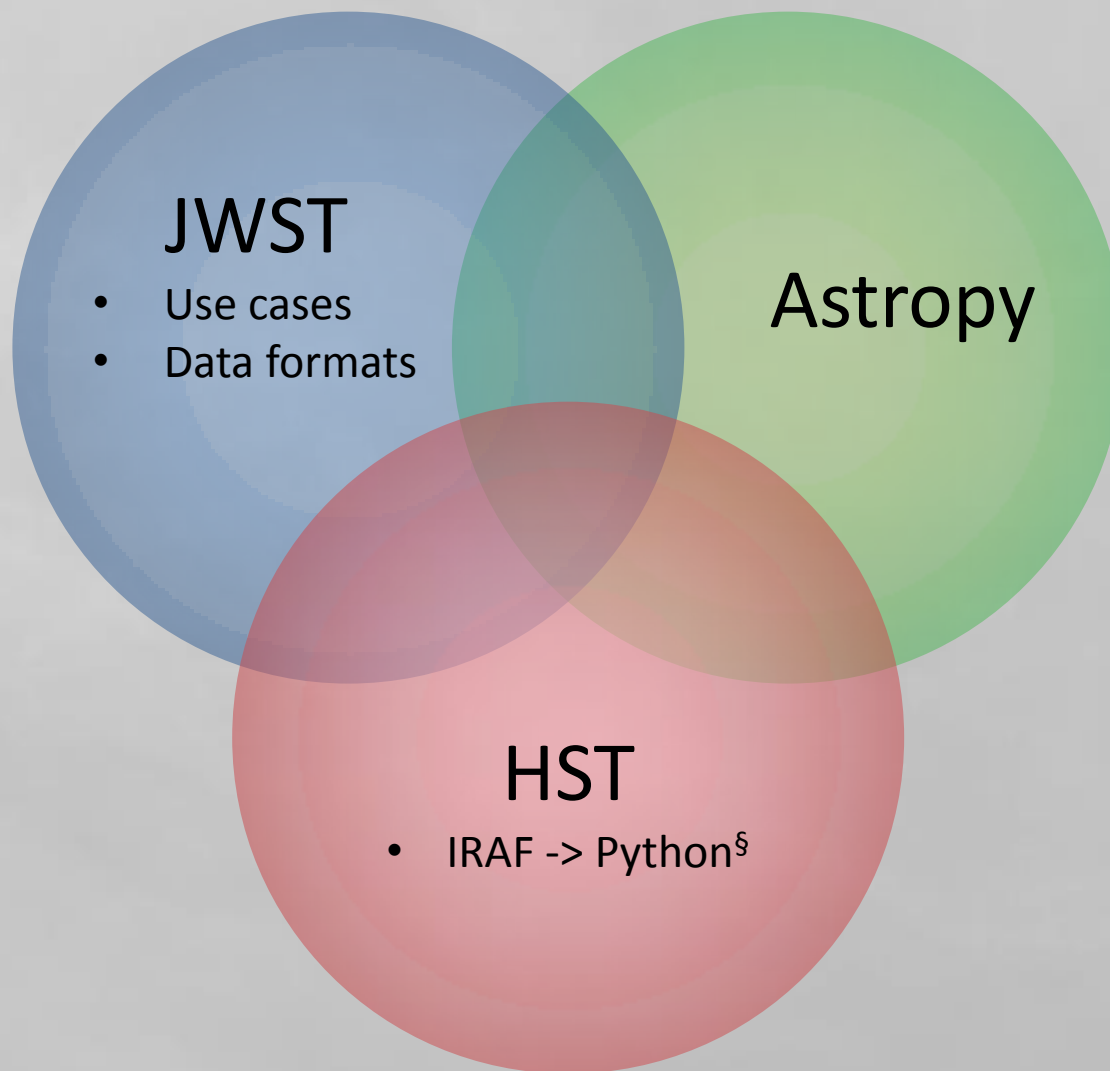
### Libraries:

Astropy   Numpy   Scipy   Matplotlib   PyQtGraph

### Languages:

Python   C

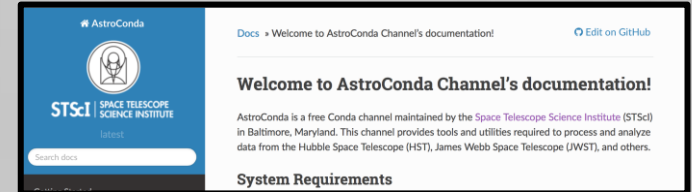
# Development @STScI



<sup>§</sup> [stak-notebooks.readthedocs.io](http://stak-notebooks.readthedocs.io)

# AstroConda

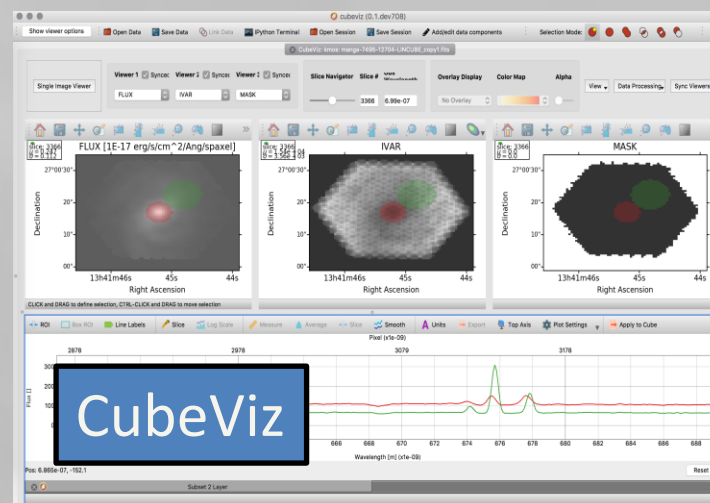
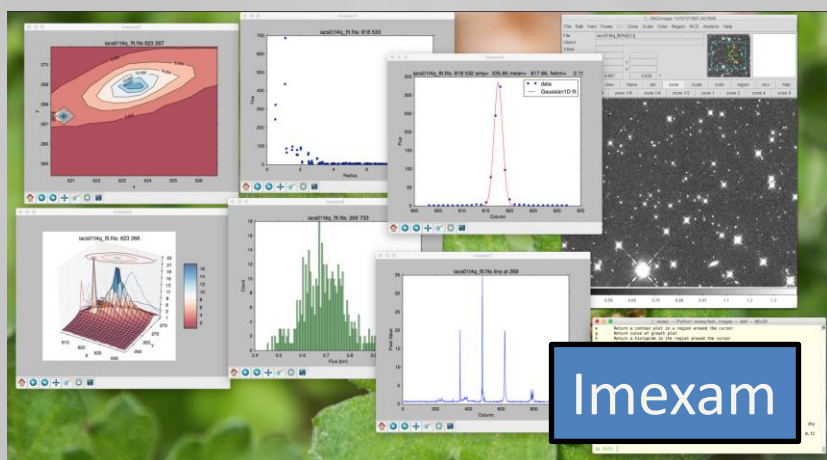
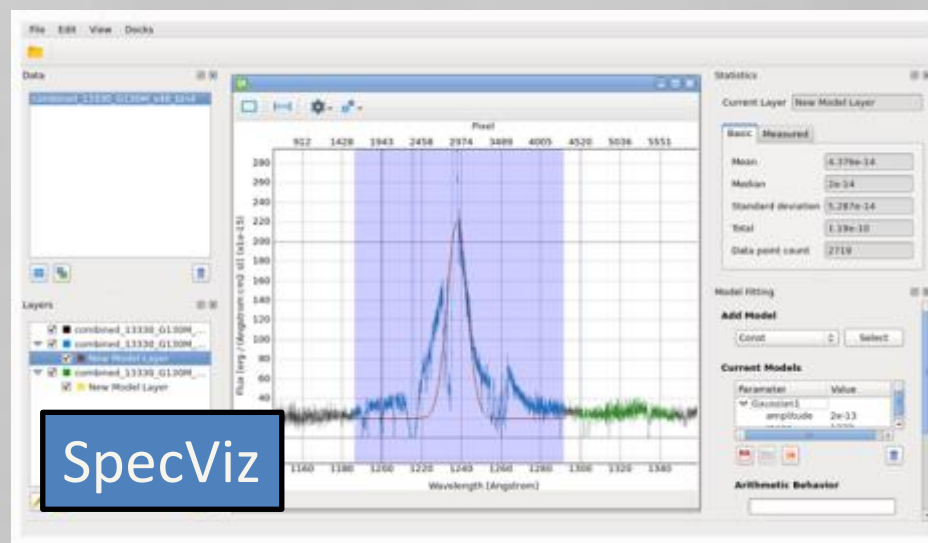
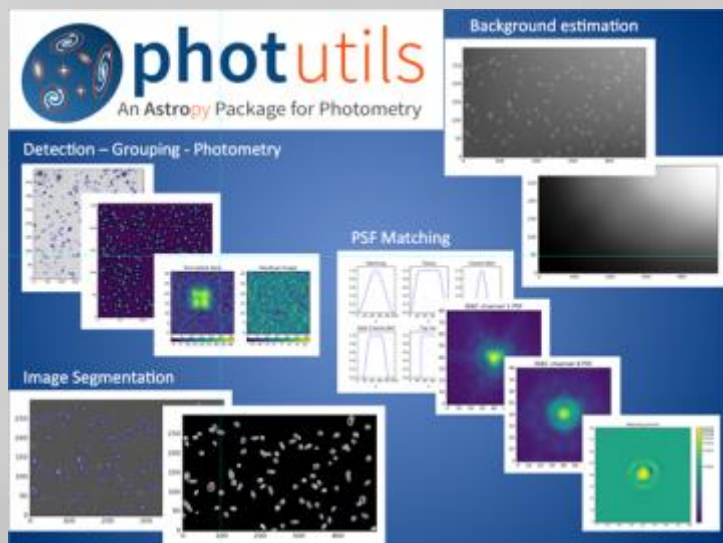
*astroconda.readthedocs.io*



- Conda channel for one-stop shopping
- Distribute public STScI software
- `conda create -n astroconda stsci`
- Includes:
  - Data Analysis Tools
  - HST pipelines
  - non-Python: IRAF, DS9, CFITSIO
- Future: JWST pipeline

# Showcase

## Data Exploration & Interactive Analysis



# JWST Goals





















- Enable un-resampled data analysis
  - Photometry, profile fitting,  $n$ -D spectral modeling
- Build Python infrastructure to enable rapid development by the community
  - Data formats, in-memory data structures (e.g., ASDF)
  - Support complex WCS (GWCS)
- Build “viz” tools for images and spectra
  - Interactive, responsive, versatile
- Build PSF and LSF tools

# Challenges

- No JWST data
- Handling existing data formats in the wild
- Transition users from, say, IRAF
  - API changes
  - Workflow changes
- Some Python libs still in development
  - Spectroscopy
- Resources



# Now & 2020

Package	Purpose	Maturity Now	Maturity 2020
<a href="#">Astropy</a>	A community python library for astronomy		
<a href="#">glue</a>	Linked-dataset exploration; visualization toolkit		
<a href="#">Ginga/stginga</a>	Image viewer toolkit		
<a href="#">Photutils</a>	Source detection & photometry		
<a href="#">psfutils</a> , <a href="#">astroimtools</a> , <a href="#">imexam</a>	Tools for images & point-spread functions (PSFs)		
<a href="#">specviz</a>	Interactive 1D spectra analysis		
<a href="#">mosviz</a>	Quick-look analysis for multi-object spectroscopy.		
<a href="#">cubeviz</a>	Interactive analysis tool for 3-d spectroscopy		
<a href="#">asdf</a>	Advanced Scientific Data Format (replaces FITS)		
<a href="#">gwcs</a>	Geometric distortion mapping & transformations		



Prototype



Evolving &  
unstable



Relatively  
stable



Ready to be baked  
into your workflow

jwst-docs.stsci.edu  
Landing page for JWST documentation

## James Webb Space Telescope User Documentation

HOME INSTRUMENTS ▾ PLANNING ▾ CALL FOR PROPOSALS ▾ DATA ▾ QUICK LINKS ▾ SITE MAP Search 🔍

JWST Data Calibration and Analysis Documentation

### JWST Post-Pipeline Data Analysis

This article provides an overview of JWST post-pipeline data analysis tools and contains pointers to software installation and training materials.

#### Introduction

JWST post-pipeline data analysis tools are distributed as part of [AstroConda](#) to assist observers in viewing and analyzing their JWST data. The tools are generally written in Python and work with [Astropy](#). Development is ongoing. All software is open source and community contributions are welcome in the form of suggestions, bug reports, or actual code. Further details on how to contribute can be found at the [Data Analysis Tools Development Forum](#).

The suite of post-pipeline data analysis tools is intended to help astronomers with the often iterative and interactive workflow involved in converting these pipeline data products into meaningful scientific results. This involves tasks such as:

- inspecting data and data quality information;
- masking or flagging data and using those annotations to guide later steps in the analysis;
- using the results of interactive analysis to guide a custom run of the pipeline (e.g., tweaking spectral extraction parameters or background estimates);
- combining data sets in various ways, with careful attention to astrometry, PSF matching, and



JWST  
Post-  
Pipeline  
Data

#### Last updated

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#### On this page

- [Introduction](#)
- [Software installation](#)

# Get Involved

- Public packages all on GitHub
  - Feature requests, bug reports
- Contribute: Code, algorithms, tutorials
- JWST DADF Sprints
  - [jwst\\_dadf-subscribe-request@maillist.stsci.edu](mailto:jwst_dadf-subscribe-request@maillist.stsci.edu)
- Use and provide feedback
  - Specviz, CubeViz, Photutils, Glue, Ginga/stginga

# Demo Time

CubeViz! On Windows!