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SciTrace Use-Case:
Reusability of a Custom Data Reduction Pipeline

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Outline

- Custom data reduction pipeline for the Cosmic Origins Spectrograph
- SciTrace packages for the data reduction pipeline
- Live presentation
- Take-home points

Cosmic Origins Spectrograph

- The Cosmic Origin Spectrograph is a UV spectrograph on board of Hubble Space Telescope (HST/COS)

- Since its installment in 2009, HST/COS had a few issues:
  - gain sag: sensitivity loss on the illuminated areas of the detector
  - inaccurate background (dark current) estimation

- The gain sag further enforces the inaccurate background estimation:
  - the standard pipeline (CALCOS) uses the detector areas outside of the spectral trace for the background estimation which are not affected by the gain sag

- CALCOS co-adds spectra only on the dataset level : single observational setup and pointing

FaintCOS - custom data reduction pipeline for HST/COS

FaintCOS solves two major problems:

- **Accurate background estimation**
    - FaintCOS uses the darkframes taken for the monitoring purposes
    - the selected darkframes are taken in the similar conditions as the science exposures

- **Co-addition** of spectra taken with different observational setups
    - the datasets, bin size and wavelength range are selected by user

FaintCOS without SciTrace

AIP

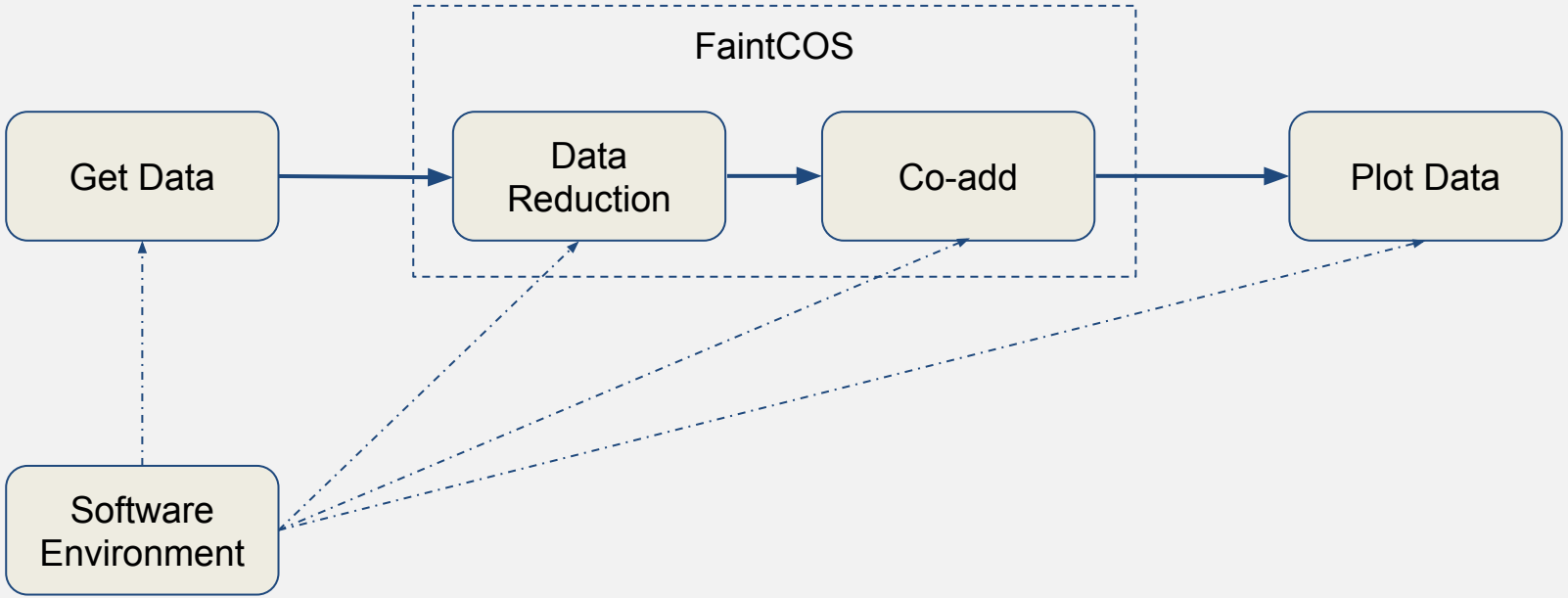
Installation process

- Install the required software and libraries (python, gcc)
- Clone FaintCOS from GitHub and install it
- Define environmental variables

Data reduction process

- Download raw data (downloading darkframes is not straightforward)
- Adopt the data reduction settings
- Run scripts manually

FaintCOS with SciTrace



SciTraceWeb Live presentation

Take-home points

- SciTrace allows reusability
  - packages are ready to use without software installation
  - clear structure of the packages is almost self documenting
- In many cases, SciTrace allows reproducibility
  - If you would like to reproduce results of a package then just run it again with the same parameters!
- SciTrace allows a better understanding of the technical setup used for a scientific analysis