Pipeline Runtime Analysis

- Total runtime: 26.91s
- Main stages:
  - LoadData: 11.40s (42.3%)
    - Energy threshold: 11.38s
    - Delay binning: 0.02s
  - MakeHistogram: 11.27s (41.9%)
    - Histogram calculation: 11.27s
  - Signal Analysis: 2.72s (10.1%)
    - EMD + P-values + Masks: 1.20s
    - PumpProbe: 1.52s

Key Bottlenecks

- Energy threshold computation in LoadData
- Histogram calculation with large frame count (37,301)

Data loading differences

- Two distinct analysis workflows for different datasets
- Key differences in:
  - HDF5 path structures
  - Event classification methods
  - Detector mask handling
  - Filter parameters
  - Data processing approaches

HDF5 Path Structure - Delay Encoding

Dataset A: xppx1003221

- Uses `enc/lasDelay` combined with timetool position
- Additional timing corrections applied

Dataset B: xppl1030522

- Uses `enc/lasDelay2` directly
- Different delay calculation methodology

Impact: Different delay calculations affect time binning and resolution

Event Classification

Dataset A:

```
# HDF5 attributes:
/evr/code_90                # uint8 array
/evr/code_91                # uint8 array
/evr/code_40                # uint8 array

# Processing:
laser_on = evr.code_90 == 1
laser_off = evr.code_91 == 1
```

Event Classification (cont.)

Dataset B:

```
# HDF5 attributes:
/lightStatus/laser          # bool array
/lightStatus/xray           # bool array
/lightStatus/valid          # bool array

# Processing:
laser_on = lightStatus/laser == True
xray_on = lightStatus/xray == True
```

Detector Mask Handling

Dataset A:

```
# HDF5 attributes:
/UserDataCfg/jungfrau1M/ROI_0__ROI_0_ROI
/UserDataCfg/jungfrau1M/mask

# Processing:
idx_tile = ROI_0__ROI_0_ROI[0,0]
mask = jungfrau1M.mask[idx_tile][roi_slice_y,
    roi_slice_x]
```

Detector Mask Handling (cont.)

Dataset B:

```
# HDF5 attributes:
/UserDataCfg/jungfrau1M/ROI_0__ROI_0_mask

# Processing:
roi0_mask = ROI_0__ROI_0_mask[0]
```

Impact: Different approaches to background subtraction and signal isolation

Filter Parameters

IPM Position Filters:

- **Dataset A:**
  - X: [-0.2, 0.2]
  - Y: [-0.5, 0.5]
- **Dataset B:**
  - X: [-0.45, 0.45]
  - Y: [-1.6, 0.0]

TimeTool Integration

Dataset A

- Optional usage
- Configurable threshold
- Laser-on events only

Dataset B

- Always enabled
- Fixed threshold
- All events