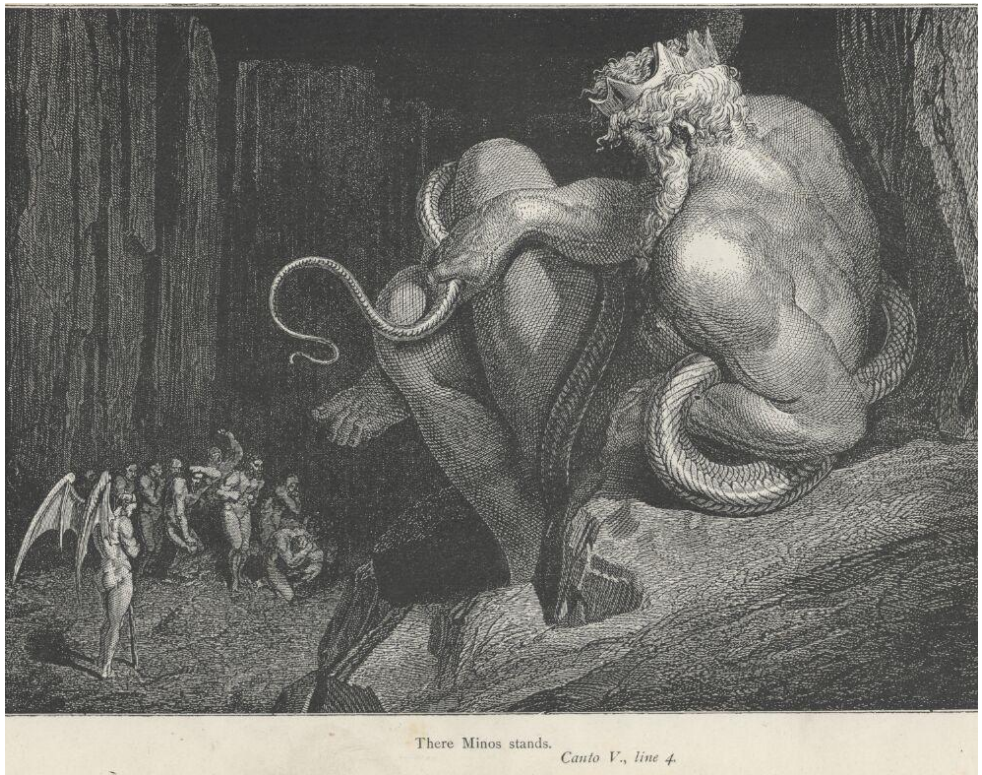
Straxferno

Circle 2: low-level processing



There Minos stands. *Canto V., line 4.*

Today

Intro

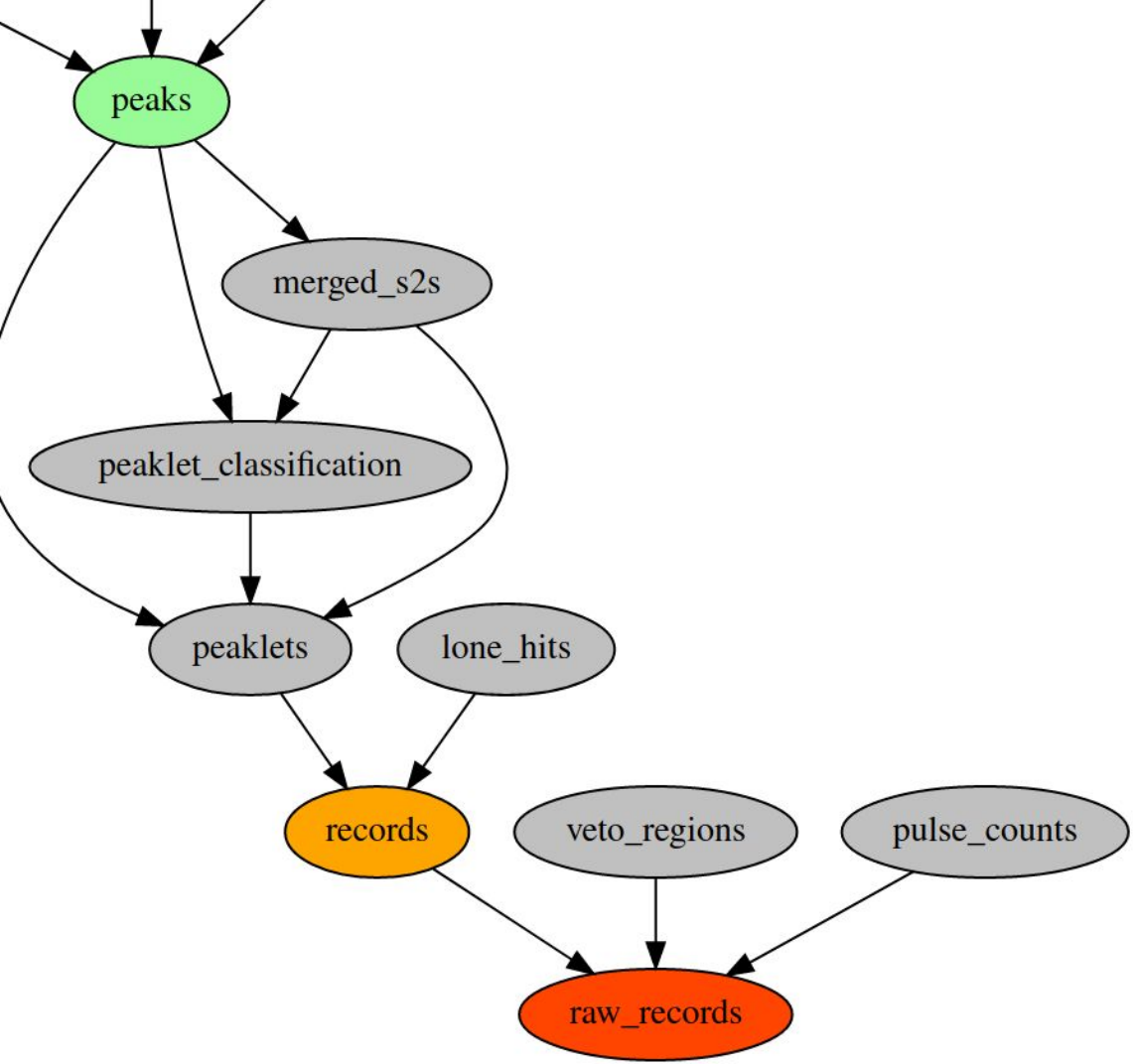
- Outline of low-level plugins

Questions / discussion

- Homework results examples
- `straxen/plugins/pulse_processing.py`
- `straxen/plugins/peaklet_processing.py`

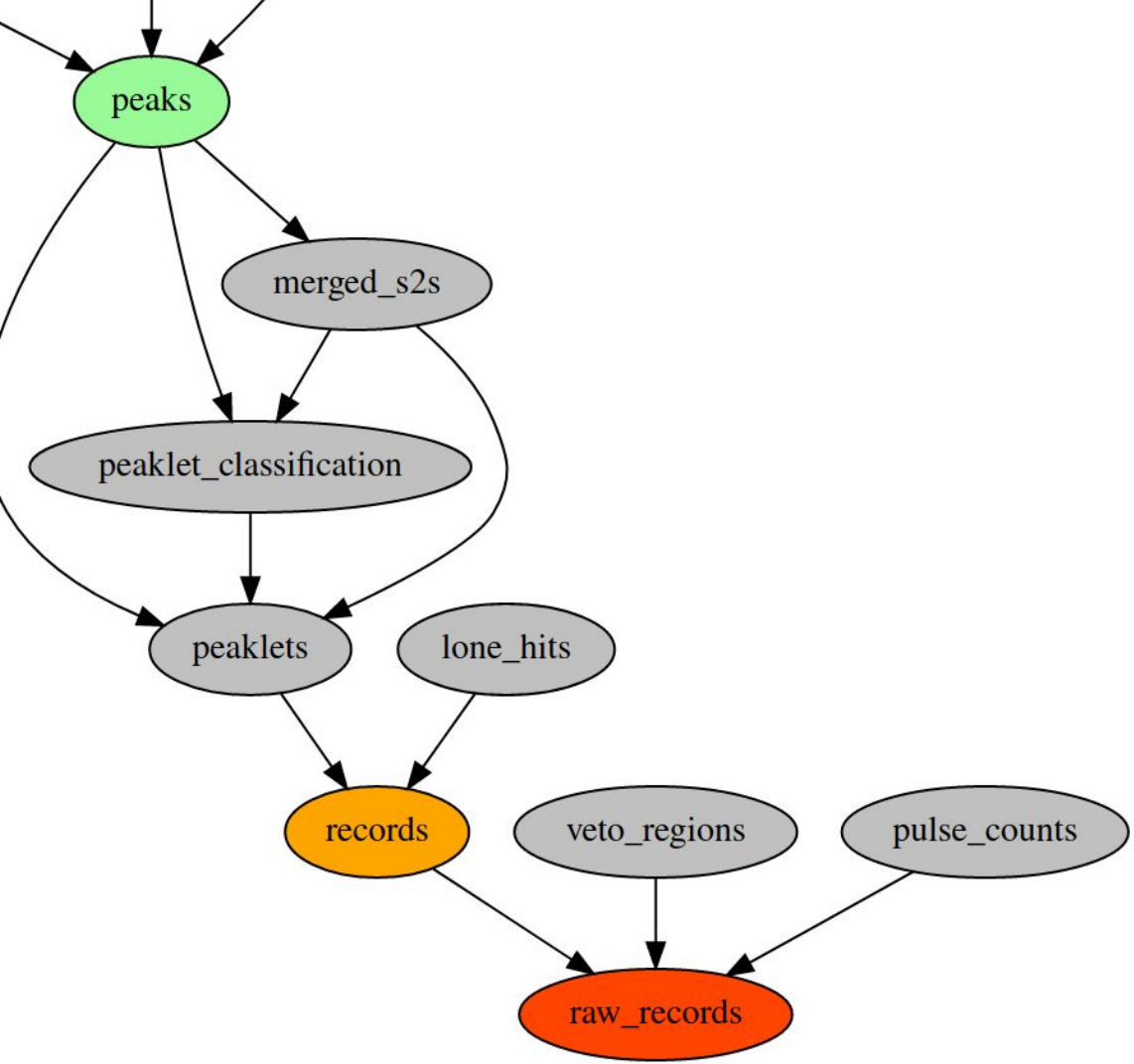
Preview of next week

Channel	Independent output of DAQ. For TPC, channel numbers = PMT numbers. Channel map.
Self-trigger	Condition for DAQ to acquire a pulse; raw signal crosses ADC threshold.
Pulse	Variable-length piece of data emitted by DAQ in one channel
Record	Fixed-length piece of data in one channel, fragment of a pulse
Hit	Range of time during which a record exceeds the hitfinder threshold
Peak	Range of time *across all channels in a detector* which strax considers as an S1 or S2 candidate. Non-overlapping.
Peaklet	Candidate peak, may get merged. Non-overlapping.
ADC count	Unit of signal amplitude (i.e. ultimately voltage difference) used by digitizer.
PE (photoelectron)	Unit of **area** (amplitude x time) In XENON, we operationally define 1 PE as the mean area caused by an long-wavelength photon that caused any signal in the PMT (underamplified or not)



	datatype	depth	n_files	filesize_mb
events	event_info_double	-1	0	0.0
	event_info	0	1	4.7
	energy_estimates	1	1	0.5
	corrected_areas	2	1	0.6
	event_positions	3	1	0.9
	event_basics	4	1	3.7
	events	5	1	0.4
peks	peak_positions	5	1	70.5
	peak_proximity	5	2	122.7
	peak_basics	6	3	183.7
	peaks	7	0	0.0
	merged_s2s	8	3	63.3
	peaklet_classification	9	1	38.9
	peaklets	10	72	1052.4
	lone_hits	10	28	1112.2
	veto_regions	11	721	0.4
	records	11	721	12094.0
	pulse_counts	11	721	3.1
	raw_records	12	721	33055.3

Discussed last week



Peaks
Combine MergedS2s and Peaklets

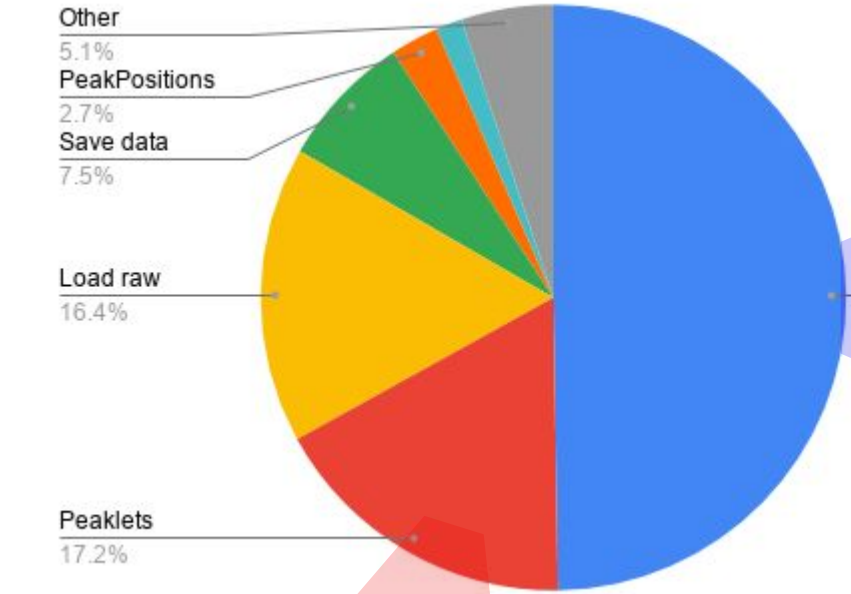
MergedS2s
Merge nearby peaklets starting with S2 (fragments)

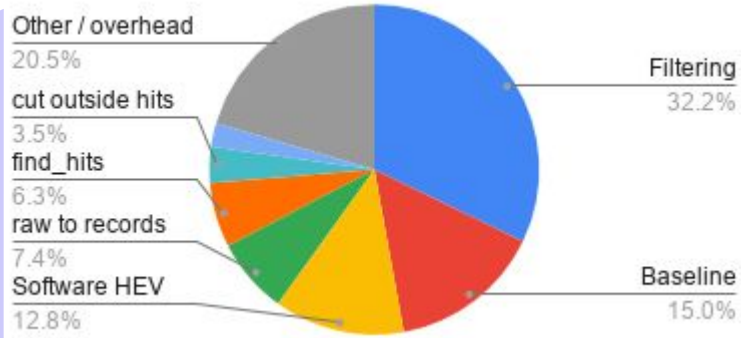
PeakletClassification
Unknown, S1 or S2 (fragment)

Peaklets
Find hits (again)
Gap-size and natural breaks clustering

PulseProcessing
Baseline, find hits, cut outside them
Pulse filtering, software HE veto

DAQReader
Determine safe chunk splits
Splits TPC/MV/NV data





XENON1T 170204_1410

`raw_records`: 83 GB raw, 25 GB on disk

Single core batch job, `xenon1t` queue

Strax v0.11.0, straxen v0.9.0

RAM usage ~2.5 GB

Wall time: 1650 sec

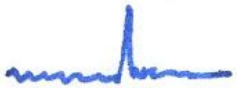
-> **50.3 MB_raw / core / sec** (pax: ~0.2)

Avoiding variable-length objects

XENON1T / pax: **pulses**

Time Data	Channel	
130214564	24	
130214575	12	
130214580	192	
130214590	87	

XENONnT / strax: **"records" / "fragments"**

Time	Channel	index	Data
130214564	24	0	
130214575	12	0	
130214580	192	0	
130214590	87	0	
130214590	87	1	
130214590	87	2	

Baselining/hitfinding take this splitting into account. Sum waveform is indifferent.