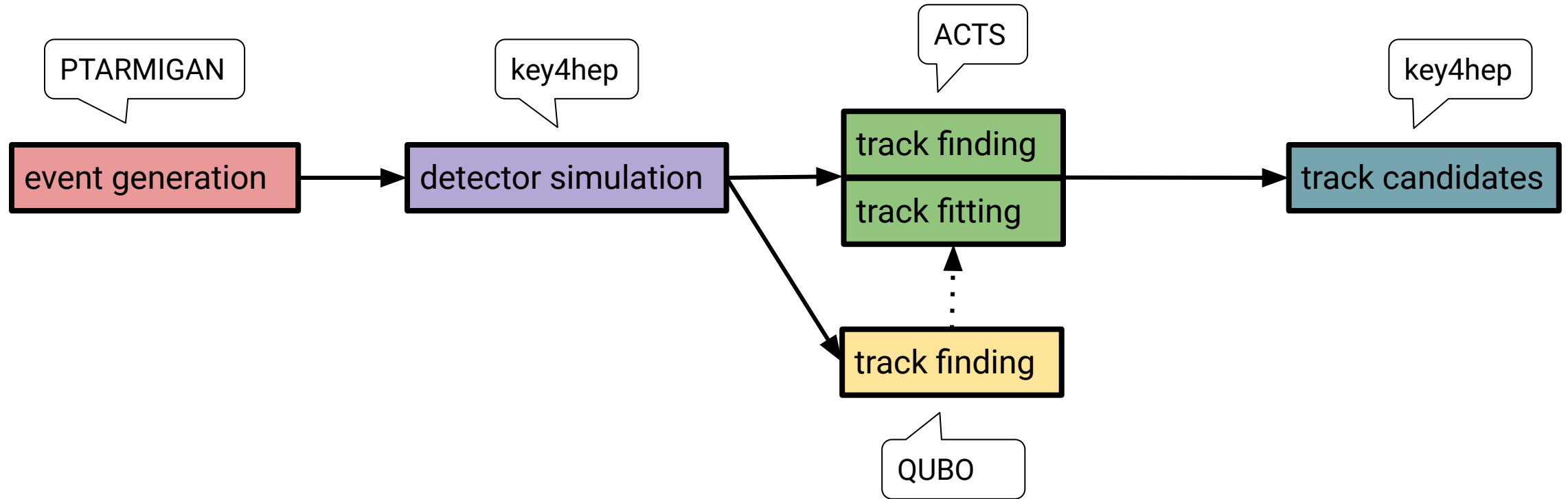


Pattern recognition framework for track reconstruction in LUXE

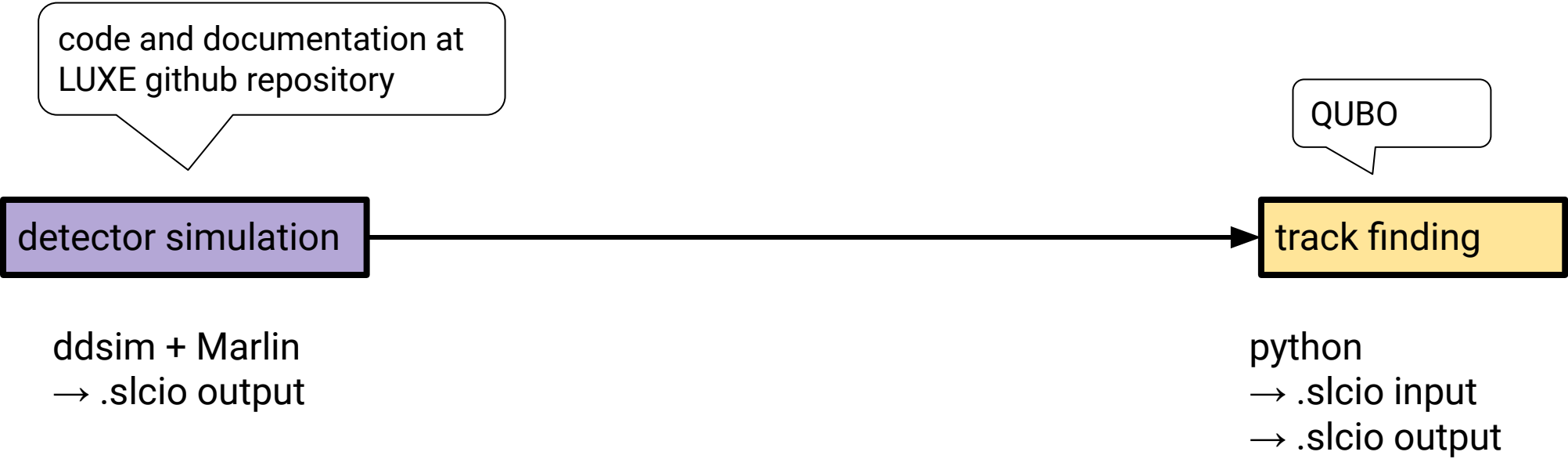
LUXE-DESY meeting 07/12/23

David Spataro

Pipeline



File formats



COLLECTION NAME	COLLECTION TYPE	NUMBER OF ELEMENTS
MCParticle	MCParticle	2637
SiHits	SimTrackerHit	8767
SiTrackerHitRelations	LCRelation	8678
SiTrackerHits	TrackerHitPlane	8678

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TrackCandidates	Track	2087

Steering file

```
1 ---
2 tracking data:
3   detector geometry: '/afs/desy.de/user/s/spatarod/QUBO-V2/geometry/LUXE_key4hep.csv'
4   tracking data format: 'key4hep slcio'
5   sample composition: 'signal only'
6
7 doublet:
8   dx/x0: 0.5278
9   dx/x0 eps: 0.015
10  dy/x0: 0.0
11  dy/x0 eps: 0.015
12
13 triplet:
14   max scattering: 0.0015
15
16 binning:
17   num bins x: 128
18   num bins y: 8
19
20 qubo parameters:
21   b_ij conflict: 2
22   b_ij match: 'default'
23   a_i: 'default'
24
25 scale range parameters:
26   z_scores: True
27   quality: [-0.1, 0.1]
28   interaction: [-1.0, -0.9]
29
30 ansatz:
31   layout: null
32   circuit depth: null
33   rotation blocks: null
34   entanglement blocks: null
35   entanglement: null
36   skip final rotation layer: null
37   skip unentangled qubits: null
38
```

```
38
39 solver:
40   algorithm: 'Numpy Eigensolver'
41   backend: null
42   optimiser: null
43   maxiter: null
44   maxfev: null
45   seed: null
46   shots: null
47   optimisation level: null
48
49 qubo:
50   optimisation strategy: 'connection list'
51   hamiltonian rescaling: null
52   initial binary vector: 'zeros'
53   search depth: 1
54   num qubits: 7
55   error mitigation algorithm: null
56   compare to eigensolver: null
57
58 bit flip optimisation:
59   iterations: null
60   reverse: null
61
62 track:
63   minimum track length: 4
64
```

Usage

1. source key4hep environment:

`/cvmfs/sw.hsf.org/spackages7/key4hep-stack/2023-04-08/x86_64-centos7-gcc11.2.0-opt/urwcv/setup.sh`

2. `python qubo_pattern_recognition.py -- steering_file <steering file> -- tracking_data <file.slcio>`

might need to install
additional packages with pip