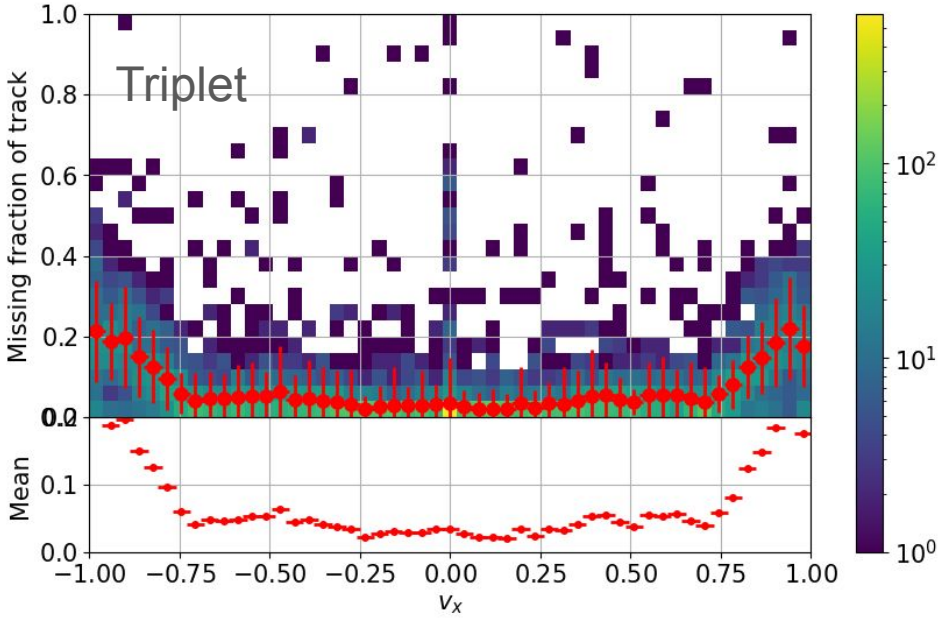
Weekly Bear

02/28/2025

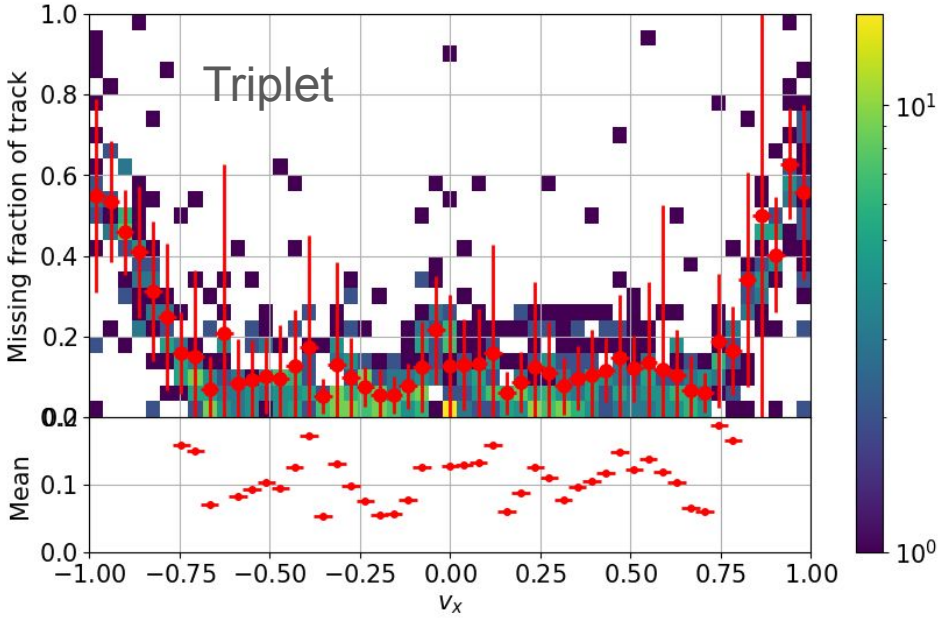
Where did we leave off?

Space point making has degraded

Training v00: 1D drift / simulation



Training v01: 2D drift / simulation



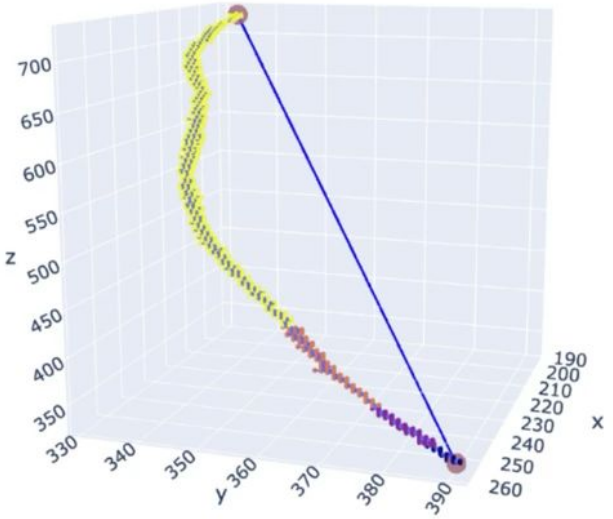
Calculating Track Completeness

1. Cluster voxels with Chebyshev metric (ϵ=1.1)
2. Order clusters along track
3. Calculate inter-cluster distance $d_{i,i+1}$ between consecutive clusters
4. Find G = sum of gaps in track

$$G = \sum_{i=0}^{n-1} (d_{i,i+1} - \delta)\ ,\ \delta = 1/\max_i |\vec{v}|$$

Track direction

5. Lower G (gap length) / L (track length) means better track completeness



Ghost labeling parameters -
Hit Ne (Ne) - Threshold number of electron hits
Tick window threshold (TW) - Time between true and reco 2d hits to accept hit Ne (500 ns = 1 tick) in ticks
Voxel distance threshold (VDS) = 1/5 time window due to drift vel. (same in ICARUS and SBND)
Post averaging threshold (PA) - radius for averaging voxels

Metrics -
True tagged voxel - True voxel that's matched to a reco voxel = 3
Reco tagged voxel - Reco voxel that's matched to a true voxel = 3
Purity - reco tagged voxel count / reco voxels (noghost)
Efficiency - true tagged voxel count / true voxel count

Goal - Select parameters that maximize purity/efficiency

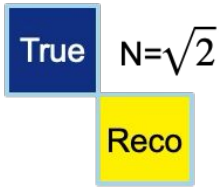
- Investigate matching reco (parse_sparse3d) to true voxels (cluster3d_sed) through voxel coordinates
- Matching threshold (N)- max distance between reco voxel and true voxel to be considered matched
- Used N^2 = 3, voxel shares a corner to be considered matched

N=1

shares a face

N=2

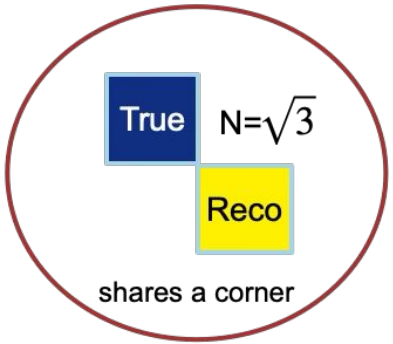
one voxel separation



N=$\sqrt{2}$

shares an edge

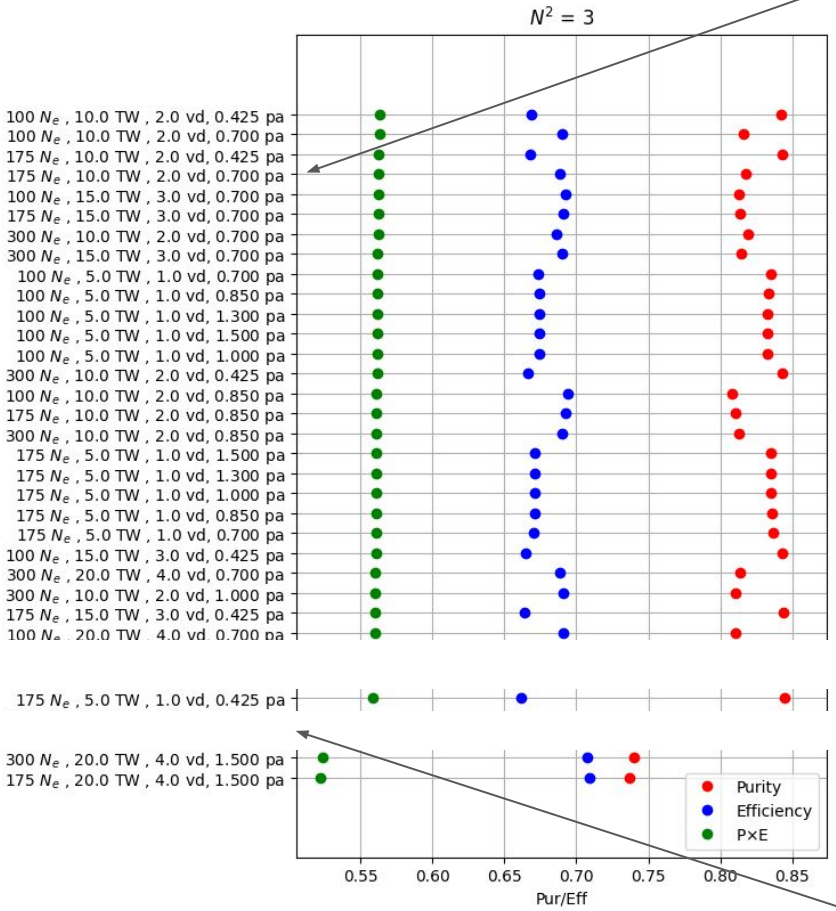
$$N = |\vec{x}_{\text{true}} - \vec{x}_{\text{reco}}|$$

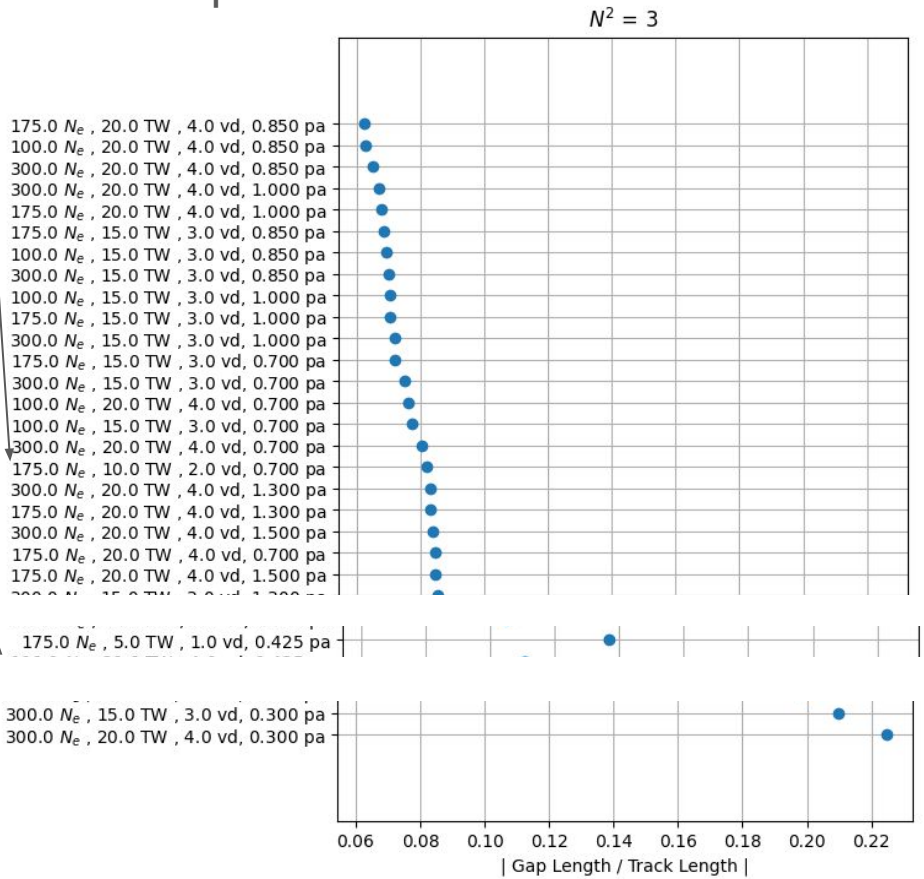


N=$\sqrt{3}$

shares a corner

Selected params

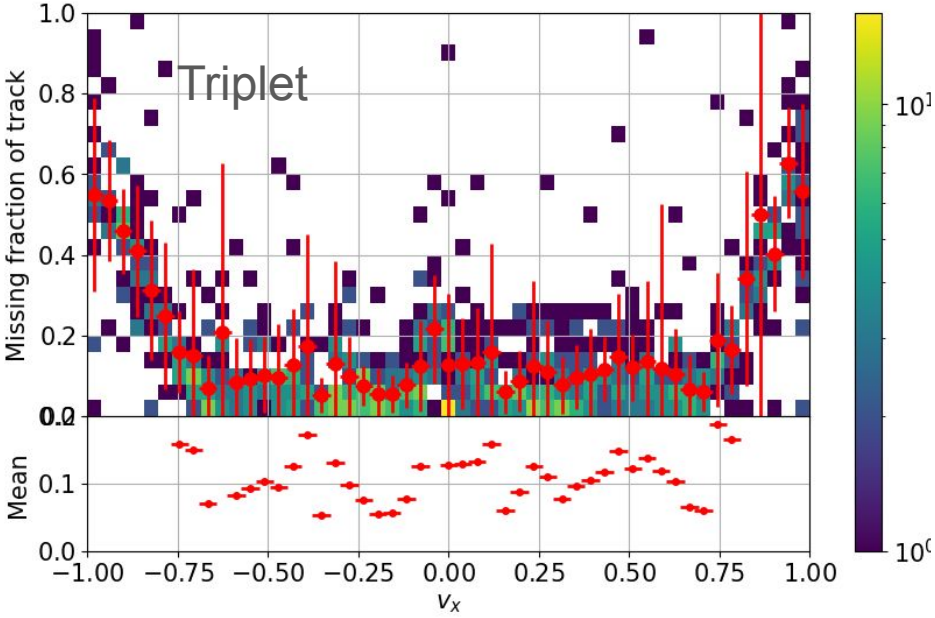




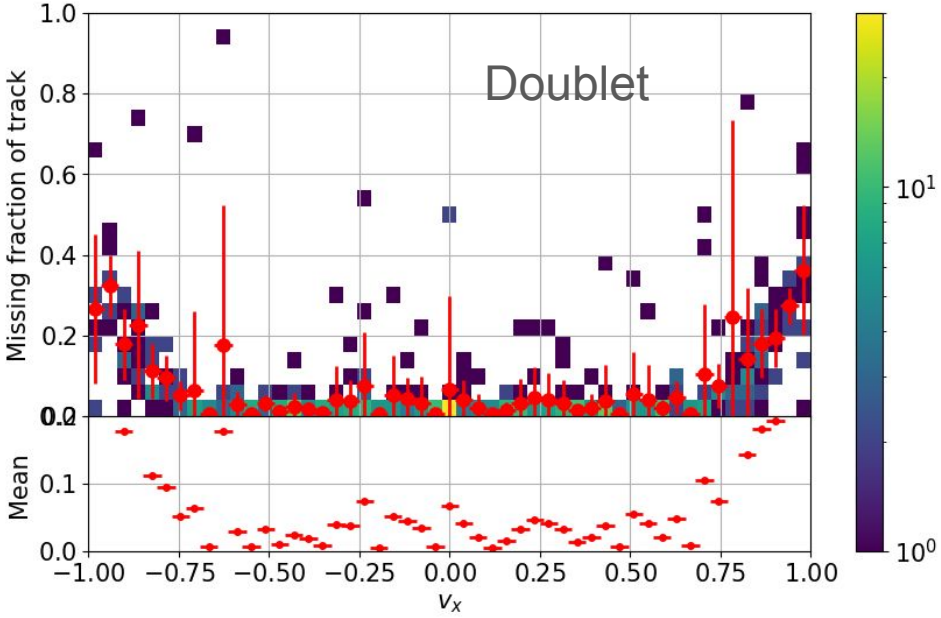
Old params

Where are we now

v01: 2D drift / simulation

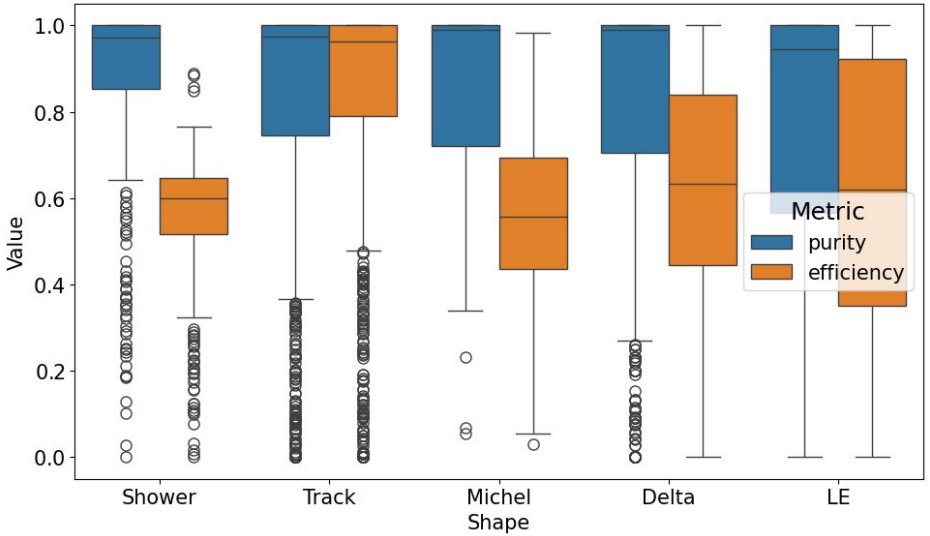


v02: 2D drift / simulation

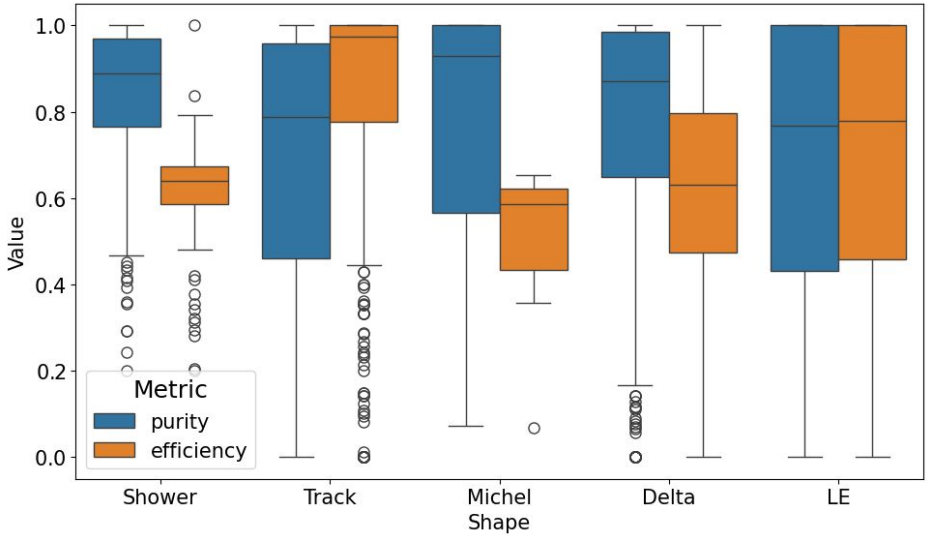


Where are we now

v01: 2D drift / simulation



v02: 2D drift / simulation

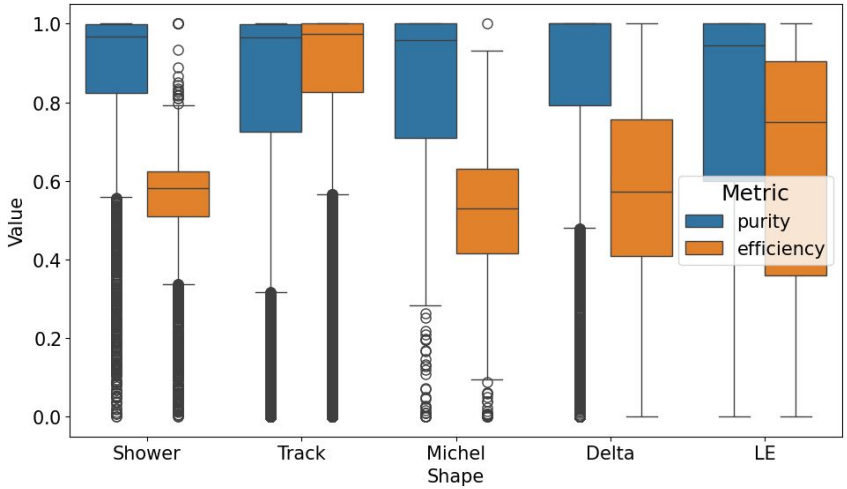


Computing impact

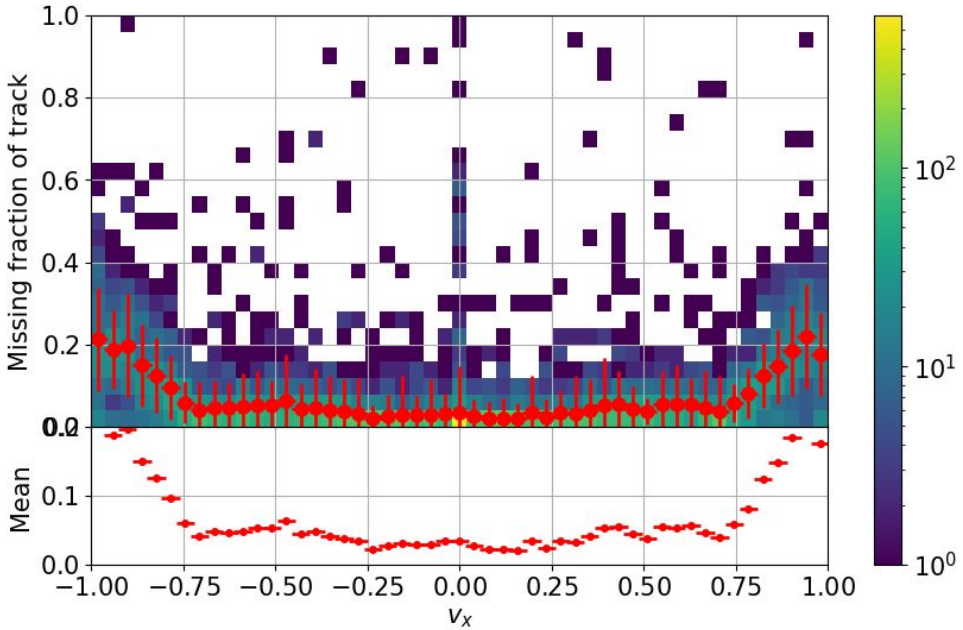
- Larcv file size increases by 4-5x from triplet + bad channel service -> doublet
  - 2.4 GB -> 12 GB for 1k MPVMPR events
- RAM - doublets
  - Peak virtual memory usage (VmPeak) : 5729.37 MB
  - Peak resident set size usage (VmHWM): 4295.55 MB
- RAM - triplets
  - Peak virtual memory usage (VmPeak) : 3292.9 MB
  - Peak resident set size usage (VmHWM): 1934.36 MB

Where are we now

v00: 1D drift / simulation

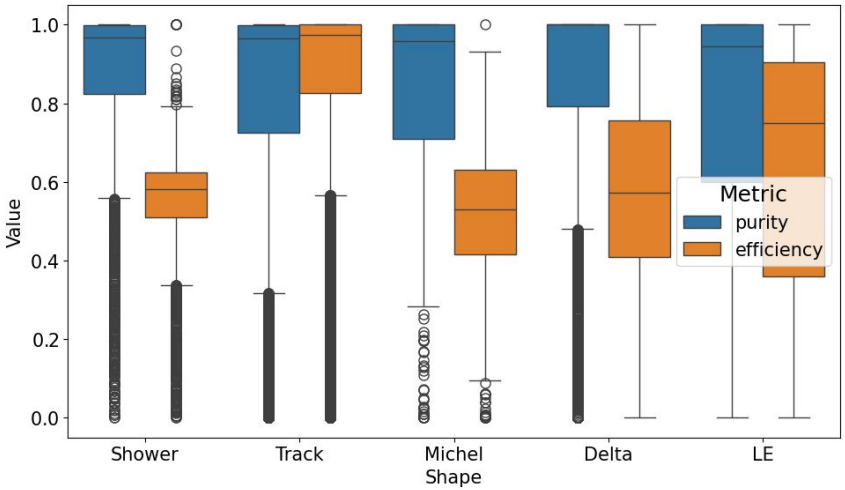


v00: 1D drift / simulation

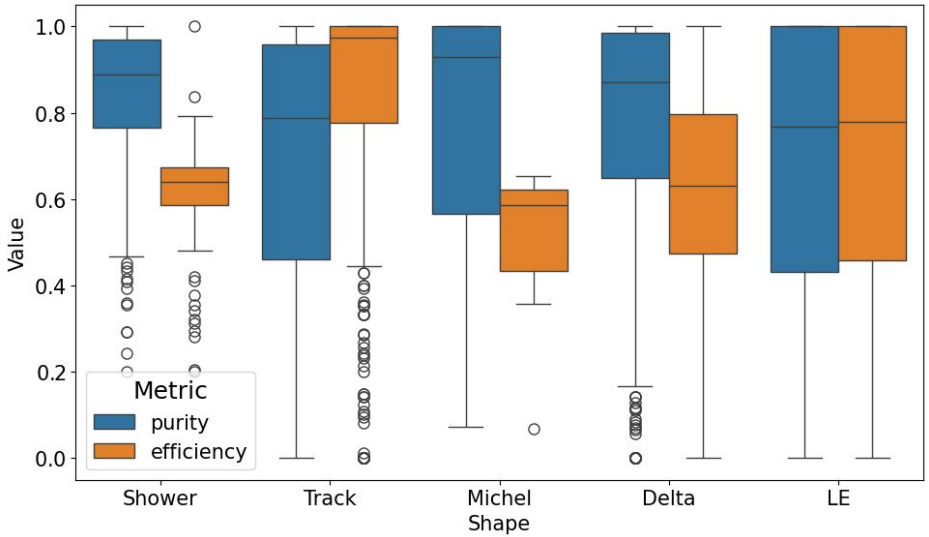


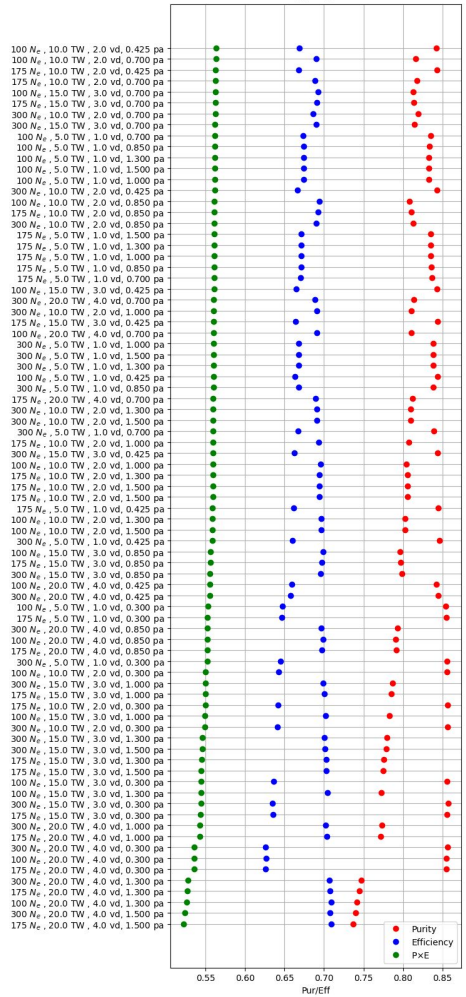
Where are we now

v00: 1D drift / simulation



v02: 2D drift / simulation




N^2 = 3
100 N_e , 10.0 TW , 2.0 vd, 0.425 pa
100 N_e , 10.0 TW , 2.0 vd, 0.700 pa
175 N_e , 10.0 TW , 2.0 vd, 0.425 pa
175 N_e , 10.0 TW , 2.0 vd, 0.700 pa
100 N_e , 15.0 TW , 3.0 vd, 0.700 pa
175 N_e , 15.0 TW , 3.0 vd, 0.700 pa
300 N_e , 10.0 TW , 2.0 vd, 0.700 pa
300 N_e , 15.0 TW , 3.0 vd, 0.700 pa
100 N_e , 5.0 TW , 1.0 vd, 0.700 pa
100 N_e , 5.0 TW , 1.0 vd, 0.850 pa
100 N_e , 5.0 TW , 1.0 vd, 1.300 pa
100 N_e , 5.0 TW , 1.0 vd, 1.500 pa
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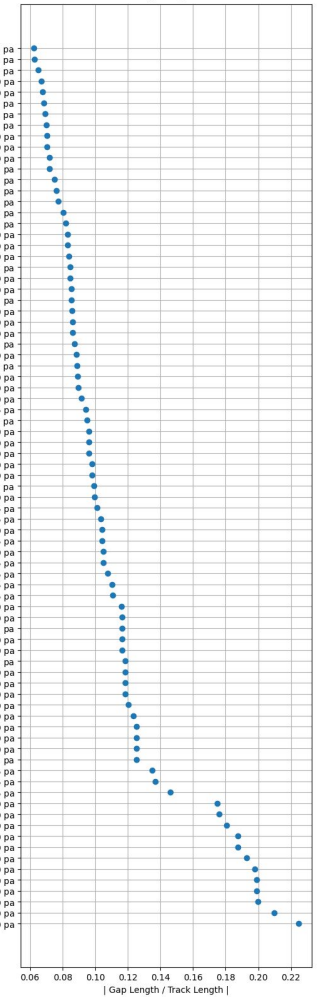
100 N_e , 20.0 TW , 4.0 vd, 1.300 pa
300 N_e , 20.0 TW , 4.0 vd, 1.500 pa
175 N_e , 20.0 TW , 4.0 vd, 1.500 pa
Purity
Efficiency
PxE
0.55
0.60
0.65
0.70
0.75
0.80
0.85
Pur/Eff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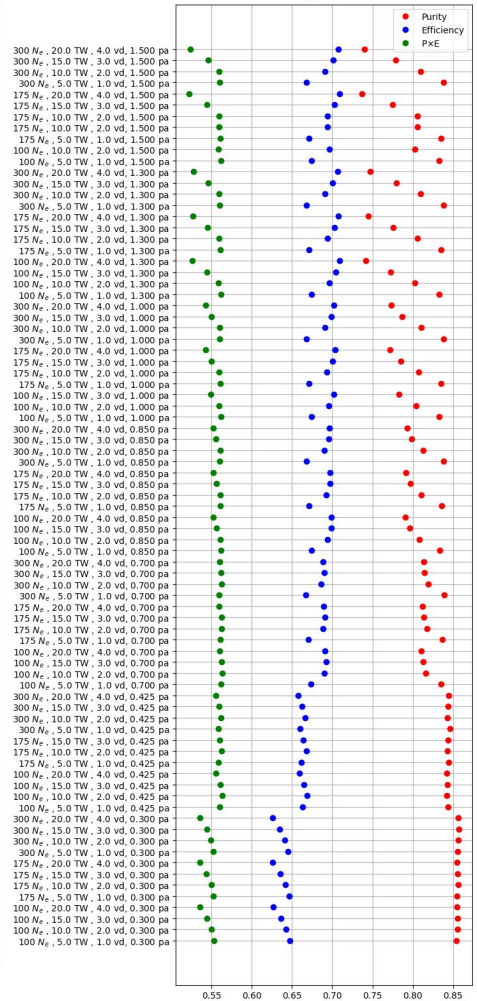
300.0 N_e , 15.0 TW , 3.0 vd, 0.300 pa
300.0 N_e , 20.0 TW , 4.0 vd, 0.300 pa
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
| Gap Length / Track Length |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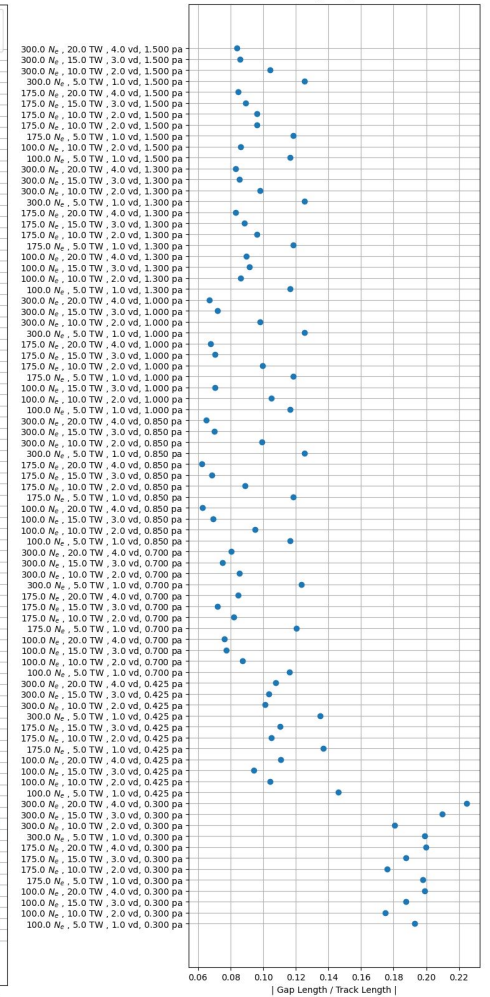
100 N_e , 20.0 TW , 4.0 vd, 0.850 pa
100 N_e , 15.0 TW , 3.0 vd, 0.850 pa
100 N_e , 10.0 TW , 2.0 vd, 0.850 pa
100 N_e , 5.0 TW , 1.0 vd, 0.850 pa
300 N_e , 20.0 TW , 4.0 vd, 0.700 pa
300 N_e , 15.0 TW , 3.0 vd, 0.700 pa
300 N_e , 10.0 TW , 2.0 vd, 0.700 pa
300 N_e , 5.0 TW , 1.0 vd, 0.700 pa
175 N_e , 20.0 TW , 4.0 vd, 0.700 pa
175 N_e , 15.0 TW , 3.0 vd, 0.700 pa
175 N_e , 10.0 TW , 2.0 vd, 0.700 pa
175 N_e , 5.0 TW , 1.0 vd, 0.700 pa
100 N_e , 20.0 TW , 4.0 vd, 0.700 pa
100 N_e , 15.0 TW , 3.0 vd, 0.700 pa
100 N_e , 10.0 TW , 2.0 vd, 0.700 pa
100 N_e , 5.0 TW , 1.0 vd, 0.700 pa
300 N_e , 20.0 TW , 4.0 vd, 0.425 pa
300 N_e , 15.0 TW , 3.0 vd, 0.425 pa
300 N_e , 10.0 TW , 2.0 vd, 0.425 pa
300 N_e , 5.0 TW , 1.0 vd, 0.425 pa
175 N_e , 20.0 TW , 4.0 vd, 0.425 pa
175 N_e , 15.0 TW , 3.0 vd, 0.425 pa
175 N_e , 10.0 TW , 2.0 vd, 0.425 pa
175 N_e , 5.0 TW , 1.0 vd, 0.425 pa
100 N_e , 20.0 TW , 4.0 vd, 0.425 pa
100 N_e , 15.0 TW , 3.0 vd, 0.425 pa
100 N_e , 10.0 TW , 2.0 vd, 0.425 pa
100 N_e , 5.0 TW , 1.0 vd, 0.425 pa
300 N_e , 20.0 TW , 4.0 vd, 0.300 pa
300 N_e , 15.0 TW , 3.0 vd, 0.300 pa
300 N_e , 10.0 TW , 2.0 vd, 0.300 pa
300 N_e , 5.0 TW , 1.0 vd, 0.300 pa
175 N_e , 20.0 TW , 4.0 vd, 0.300 pa
175 N_e , 15.0 TW , 3.0 vd, 0.300 pa
175 N_e , 10.0 TW , 2.0 vd, 0.300 pa
175 N_e , 5.0 TW , 1.0 vd, 0.300 pa
100 N_e , 20.0 TW , 4.0 vd, 0.300 pa
100 N_e , 15.0 TW , 3.0 vd, 0.300 pa
100 N_e , 10.0 TW , 2.0 vd, 0.300 pa
100 N_e , 5.0 TW , 1.0 vd, 0.300 pa
Purity
Efficiency
PxE
0.55
0.60
0.65
0.70
0.75
0.80
0.85
Pur/Eff


N^2 = 3
300.0 N_e , 20.0 TW , 4.0 vd, 1.500 pa
300.0 N_e , 15.0 TW , 3.0 vd, 1.500 pa
300.0 N_e , 10.0 TW , 2.0 vd, 1.500 pa
300.0 N_e , 5.0 TW , 1.0 vd, 1.500 pa
175.0 N_e , 20.0 TW , 4.0 vd, 1.500 pa
175.0 N_e , 15.0 TW , 3.0 vd, 1.500 pa
175.0 N_e , 10.0 TW , 2.0 vd, 1.500 pa
175.0 N_e , 5.0 TW , 1.0 vd, 1.500 pa
100.0 N_e , 10.0 TW , 2.0 vd, 1.500 pa
100.0 N_e , 5.0 TW , 1.0 vd, 1.500 pa
300.0 N_e , 20.0 TW , 4.0 vd, 1.300 pa
300.0 N_e , 15.0 TW , 3.0 vd, 1.300 pa
300.0 N_e , 10.0 TW , 2.0 vd, 1.300 pa
300.0 N_e , 5.0 TW , 1.0 vd, 1.300 pa
175.0 N_e , 20.0 TW , 4.0 vd, 1.300 pa
175.0 N_e , 15.0 TW , 3.0 vd, 1.300 pa
175.0 N_e , 10.0 TW , 2.0 vd, 1.300 pa
175.0 N_e , 5.0 TW , 1.0 vd, 1.300 pa
100.0 N_e , 20.0 TW , 4.0 vd, 1.300 pa
100.0 N_e , 15.0 TW , 3.0 vd, 1.300 pa
100.0 N_e , 10.0 TW , 2.0 vd, 1.300 pa
100.0 N_e , 5.0 TW , 1.0 vd, 1.300 pa
300.0 N_e , 20.0 TW , 4.0 vd, 1.000 pa
300.0 N_e , 15.0 TW , 3.0 vd, 1.000 pa
300.0 N_e , 10.0 TW , 2.0 vd, 1.000 pa
300.0 N_e , 5.0 TW , 1.0 vd, 1.000 pa
175.0 N_e , 20.0 TW , 4.0 vd, 1.000 pa
175.0 N_e , 15.0 TW , 3.0 vd, 1.000 pa
175.0 N_e , 10.0 TW , 2.0 vd, 1.000 pa
175.0 N_e , 5.0 TW , 1.0 vd, 1.000 pa
100.0 N_e , 15.0 TW , 3.0 vd, 1.000 pa
100.0 N_e , 10.0 TW , 2.0 vd, 1.000 pa
100.0 N_e , 5.0 TW , 1.0 vd, 1.000 pa
300.0 N_e , 20.0 TW , 4.0 vd, 0.850 pa
300.0 N_e , 15.0 TW , 3.0 vd, 0.850 pa
300.0 N_e , 10.0 TW , 2.0 vd, 0.850 pa
300.0 N_e , 5.0 TW , 1.0 vd, 0.850 pa
175.0 N_e , 20.0 TW , 4.0 vd, 0.850 pa
175.0 N_e , 15.0 TW , 3.0 vd, 0.850 pa
175.0 N_e , 10.0 TW , 2.0 vd, 0.850 pa
175.0 N_e , 5.0 TW , 1.0 vd, 0.850 pa
100.0 N_e , 20.0 TW , 4.0 vd, 0.850 pa
100.0 N_e , 15.0 TW , 3.0 vd, 0.850 pa
100.0 N_e , 10.0 TW , 2.0 vd, 0.850 pa
100.0 N_e , 5.0 TW , 1.0 vd, 0.850 pa
300.0 N_e , 20.0 TW , 4.0 vd, 0.700 pa
300.0 N_e , 15.0 TW , 3.0 vd, 0.700 pa
300.0 N_e , 10.0 TW , 2.0 vd, 0.700 pa
300.0 N_e , 5.0 TW , 1.0 vd, 0.700 pa
175.0 N_e , 20.0 TW , 4.0 vd, 0.700 pa
175.0 N_e , 15.0 TW , 3.0 vd, 0.700 pa
175.0 N_e , 10.0 TW , 2.0 vd, 0.700 pa
175.0 N_e , 5.0 TW , 1.0 vd, 0.700 pa
100.0 N_e , 20.0 TW , 4.0 vd, 0.700 pa
100.0 N_e , 15.0 TW , 3.0 vd, 0.700 pa
100.0 N_e , 10.0 TW , 2.0 vd, 0.700 pa
100.0 N_e , 5.0 TW , 1.0 vd, 0.700 pa
300.0 N_e , 20.0 TW , 4.0 vd, 0.425 pa
300.0 N_e , 15.0 TW , 3.0 vd, 0.425 pa
300.0 N_e , 10.0 TW , 2.0 vd, 0.425 pa
300.0 N_e , 5.0 TW , 1.0 vd, 0.425 pa
175.0 N_e , 20.0 TW , 4.0 vd, 0.425 pa
175.0 N_e , 15.0 TW , 3.0 vd, 0.425 pa
175.0 N_e , 10.0 TW , 2.0 vd, 0.425 pa
175.0 N_e , 5.0 TW , 1.0 vd, 0.425 pa
100.0 N_e , 20.0 TW , 4.0 vd, 0.425 pa
100.0 N_e , 15.0 TW , 3.0 vd, 0.425 pa
100.0 N_e , 10.0 TW , 2.0 vd, 0.425 pa
100.0 N_e , 5.0 TW , 1.0 vd, 0.425 pa
300.0 N_e , 20.0 TW , 4.0 vd, 0.300 pa
300.0 N_e , 15.0 TW , 3.0 vd, 0.300 pa
300.0 N_e , 10.0 TW , 2.0 vd, 0.300 pa
300.0 N_e , 5.0 TW , 1.0 vd, 0.300 pa
175.0 N_e , 20.0 TW , 4.0 vd, 0.300 pa
175.0 N_e , 15.0 TW , 3.0 vd, 0.300 pa
175.0 N_e , 10.0 TW , 2.0 vd, 0.300 pa
175.0 N_e , 5.0 TW , 1.0 vd, 0.300 pa
100.0 N_e , 20.0 TW , 4.0 vd, 0.300 pa
100.0 N_e , 15.0 TW , 3.0 vd, 0.300 pa
100.0 N_e , 10.0 TW , 2.0 vd, 0.300 pa
100.0 N_e , 5.0 TW , 1.0 vd, 0.300 pa
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
| Gap Length / Track Length |

Next

Making v02 training sample now

Revisit flash matching