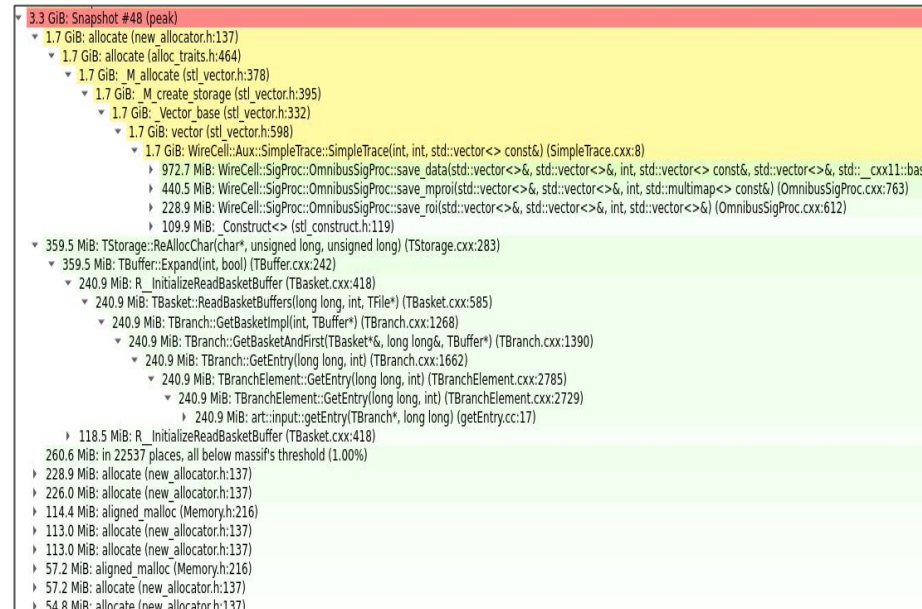
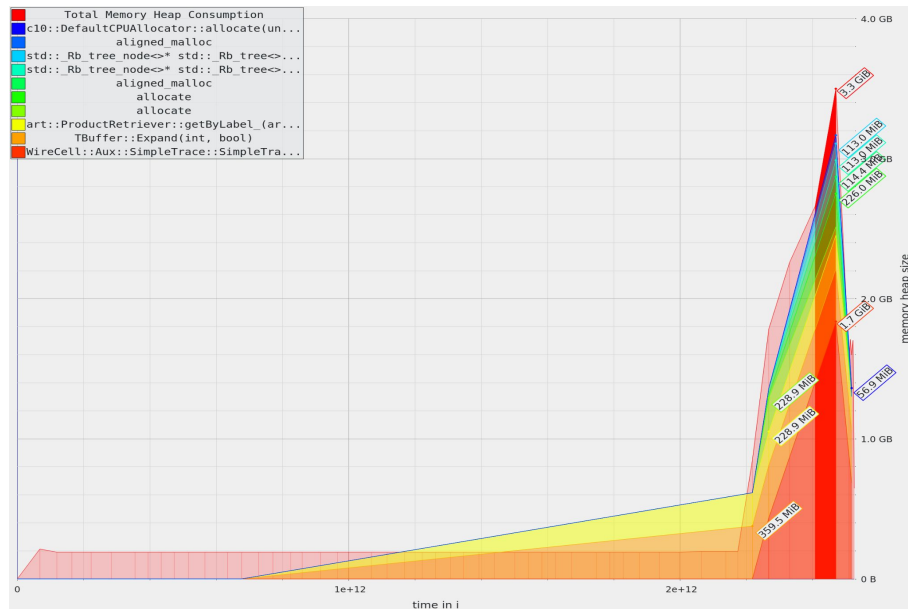




# Status report on **DNNROI sigproc**

Hokyeong Nam  
Chung-Ang University

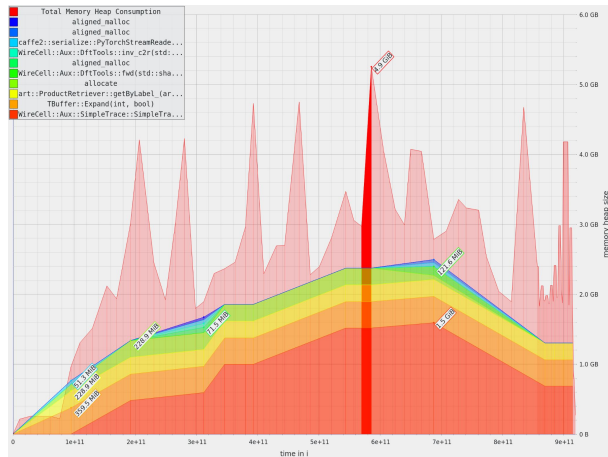
# Memory Profiling - Valgrind



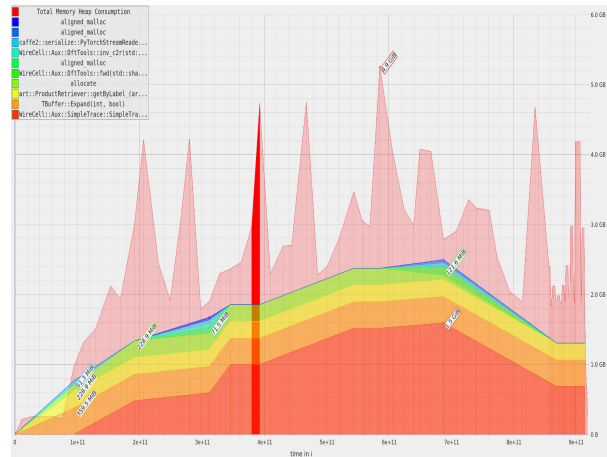
- PD-HD data, DNN SP with MobileNetV2
- The peak memory recorded is 3.3 GiB
- Almost half of the memory (~1.7 GiB) is due to:
  - WireCell::SigProc::OmnibusSigProc::save\_data (972 MiB out of 1.7 GiB)
  - WireCell::SigProc::OmnibusSigProc::save\_mproi (440 MiB out of 1.7 GiB)

do\_not\_mp\_protect\_traditional is set to true

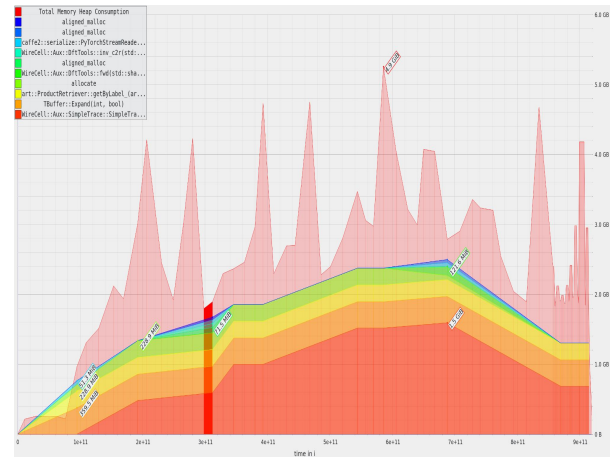
# Memory Profiling - Valgrind



❑ 1st peak



❑ 2nd peak




❑ low torch activity


- PD-HD data, DNN SP with UNet
- The peak memory recorded is 4.9 GiB
- Not like a MobileNet result, the total cost graph has several peaks
- Almost half of the memory (~2.5 GiB) is allocated to libtorch\_cpu.so around the peak
- Another major contributions are from:
  - WireCell::SigProc::OmnibusSigProc::save\_data (853 MiB out of 1.4 GiB)
  - WireCell::SigProc::OmnibusSigProc::save\_mproi (343 MiB out of 1.4 GiB)

# Memory Profiling - Valgrind

[illegible][illegible]

- 1.8 GB: Snapshot #18
  - 565.9 MB: allocate (new allocator:h137)
    - 565.9 MB: allocate (alloc\_traits:h464)
      - 565.9 MB: `_M_allocate (std::vector:h378)`
        - 565.9 MB: `_M_create_storage (std::vector:h395)`
          - 565.9 MB: `Vector base (std::vector:h332)`
            - 565.9 MB: `vector (std::vector:h390)`
              - 565.9 MB: `WireCell::Aux::SimpleTrace::SimpleTrace(int, int, std::vector<> const&)(SimpleTrace.cxx:8)`
                - 357.6 MB: `WireCell::SigProc::OmnibusSigProc::save_data(std::vector<> &, std::vector<> &, int, std::vector<> const&, std::vector<> &, std::vector<> &, std::vector<> &)(OmnibusSigProc.cxx:111)`
                  - 93.0 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1669)`
                  - 71.5 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1678)`
                  - 57.2 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1822)`
                  - 57.2 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1800)`
                  - 57.2 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1814)`
                  - 21.5 MB: `WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> &)(OmnibusSigProc.cxx:1693)`
                  - 114.4 MB: `WireCell::SigProc::OmnibusSigProc::save_mpol(std::vector<> &, std::vector<> &, int, std::multimap<> const&)(OmnibusSigProc.cxx:763)`
                  - 57.2 MB: `WireCell::SigProc::OmnibusSigProc::save_nol(std::vector<> &, std::vector<> &, int, std::vector<> &)(OmnibusSigProc.cxx:612)`
                    - 36.6 MB: `Construct<> (std::construct:h119)`
        - 359.5 MB: `TStorage::ReAllocChar(char*, unsigned long, unsigned long)(TStorage.cxx:283)`
        - 228.9 MB: allocate (new\_allocator:h137)
        - 228.9 MB: allocate (new\_allocator:h137)
        - 207.8 MB: in 22540 places, all below massfs's threshold (1.00%)
        - 71.5 MB: aligned malloc (Memory:h216)
        - 53.6 MB: aligned malloc (Memory:h216)
        - 51.3 MB: `c10::alloc_cpu(unsigned long) [in /cvmfs/soft.opensciencegrid.org/products/libtorch/v2.1.1b/Linux64bit+3.10-2.17-e26/llvm/libc10.so]`
        - 35.8 MB: aligned malloc (Memory:h216)

 1st peak

 2nd peak

- low torch activity

# Writing LArSoft Module

```
113 // Geometry & services
114 auto const* geom = lar::providerFrom<geo::Geometry>();
115 auto const* wireReadout = &art::ServiceHandle<geo::WireReadout>()->Get();
116 auto const& dprop = art::ServiceHandle<detinfo::DetectorPropertiesService>()->DataFor(e);
117
118 // Convert to geo::Point_t for TPC lookup
119 geo::Point_t mcpos(fX, fY, fZ);
120
121 // Determine TPC containing position
122 geo::TPCID tpcid = geom->FindTPCATPosition(mcpos);
123 if (!tpcid) {
124     mf::LogWarning("ShowerAna") << "MC position outside any TPC: ("
125         << fX << ", " << fY << ", " << fZ << ")";
126     return;
127 }
128
129 fTPCID = tpcid.TPC;
130
131 // Map X to tick and position to wire channel for planes 0, 1, 2
132 for (unsigned int plane = 0; plane < 3; ++plane) {
133     geo::PlaneID pid(tpcid, plane);
134     float tick = dprop.ConvertXTToTicks(fX, pid.Plane, pid.TPC, pid.Cryostat);
135     int channel = std::lround(wireReadout->Plane(pid).WireCoordinate(mcpos));
136
137     if (plane == 0) { fTick0 = tick; fChannel0 = channel; }
138     if (plane == 1) { fTick1 = tick; fChannel1 = channel; }
139     if (plane == 2) { fTick2 = tick; fChannel2 = channel; }
140 }
141
142
143
144 // Fill tree
145 fTree->Fill();
```

- Succeed to get x, y, z positions of primary electron generated from particle gun
- Currently under updates to include momentum, direction, TPC id, PDG id

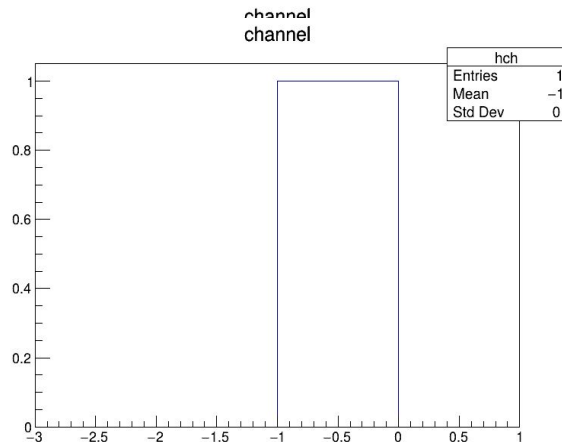
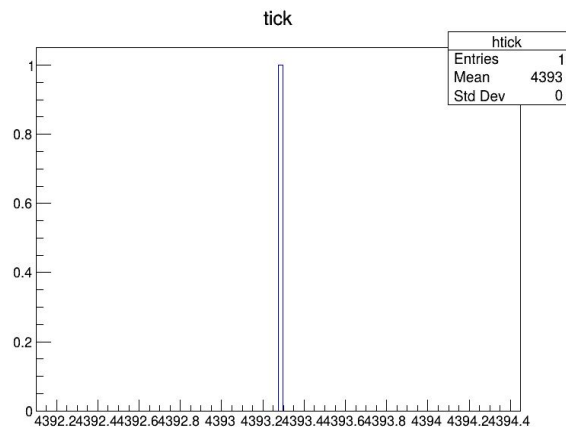
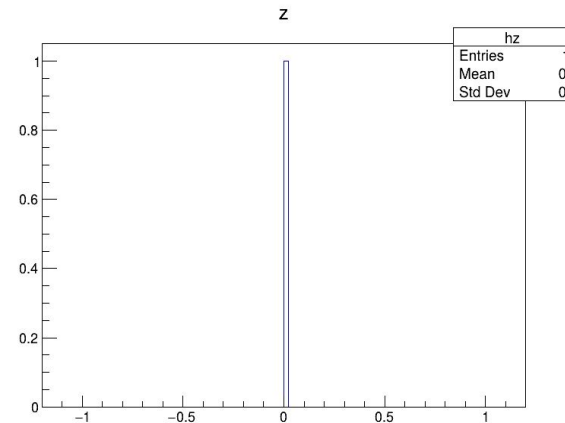
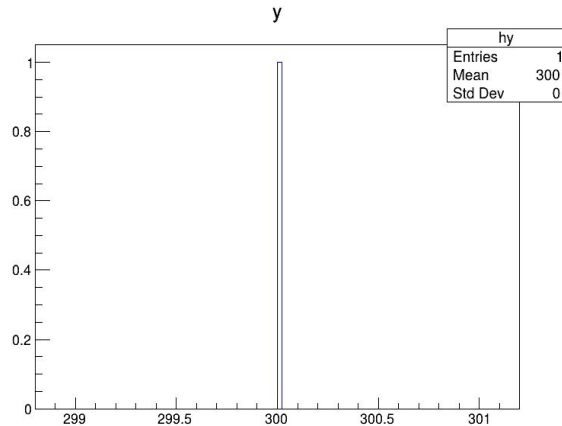
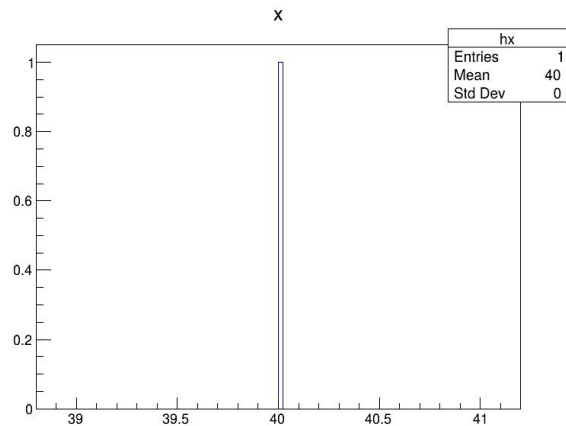
Can access under my local larsoft development environment

```
Apptainer> lar --print-available-modules | grep ShowerAna
```

```
402. ShowerAna analyzer /exp/dune/app/users/hnam/2024tutorial/srcs/protoduneana/protoduneana/TutorialExamples/ShowerAna_module.cc
```



# Truth Info. from MCParticle



```
# This block defines starting parameters
physics.producers.generator.PosDist: 0
physics.producers.generator.X0: [40.]
physics.producers.generator.Y0: [300.]
physics.producers.generator.Z0: [0.0]
```

# Back Up