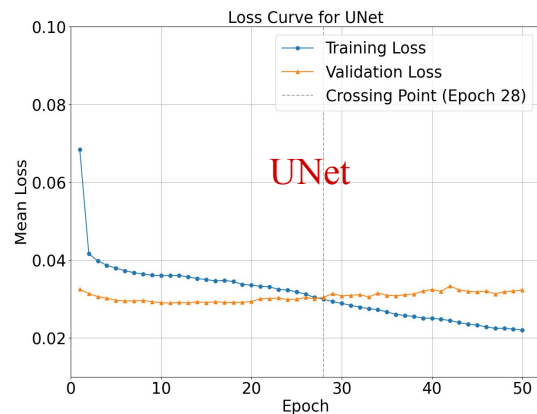
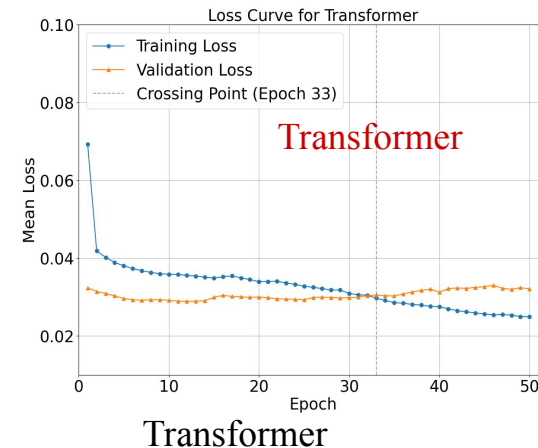
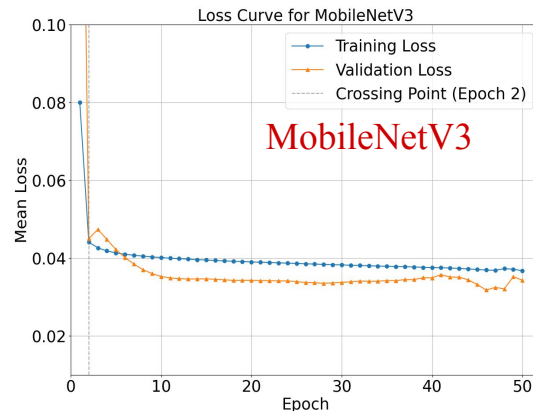
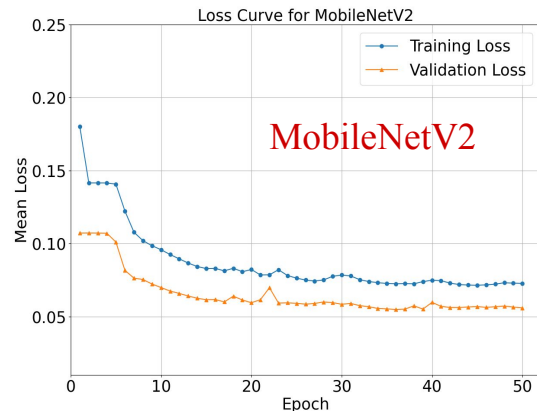




Status report on **DNNROI sigproc**

Hokyeong Nam
Chung-Ang University

Model Comparison - Train vs Val loss

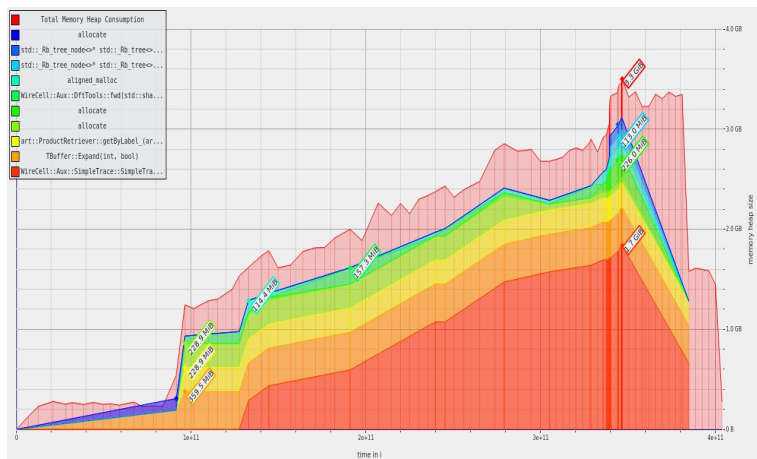


- # of events for training: 590 events (reco), 590 events (truth)
- Rebin factor: 10
- Training loss at the selected checkpoints:
 - MobileNetV2: 0.072
 - MobileNetV3: 0.044
 - Transformer: 0.029
 - UNet: 0.029

Model Comparison - Memory and Time Consumption

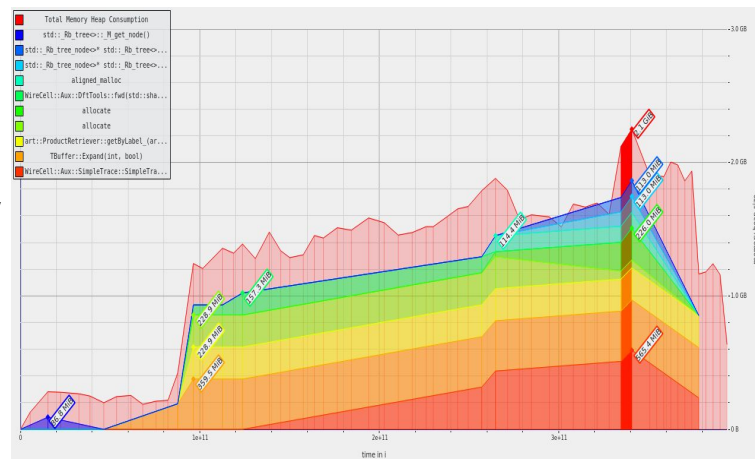
Model	UNet	Transformer	MobileNetV2	MobileNetV3
Peak Memory (MB)	5693	5816	2843	3156
Time (s)	101	87	42	42

- Tested with 1 event: np04hd_raw_run027673_0000_dataflow0_datawriter_0_20240704T050545.hdf5
- save_data function (for tight_lf, loose_lf, cleanup_roi) is deactivated in the cfg file



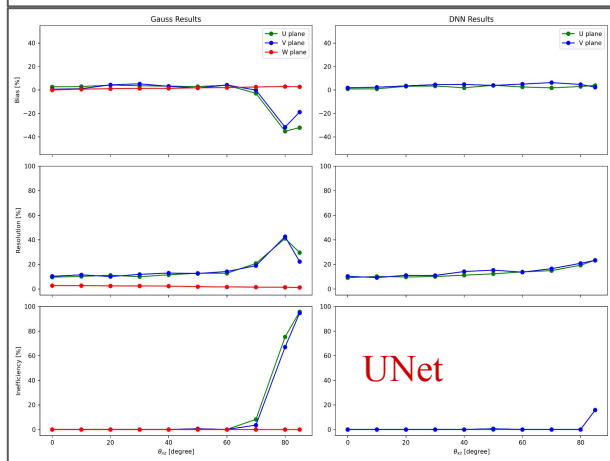
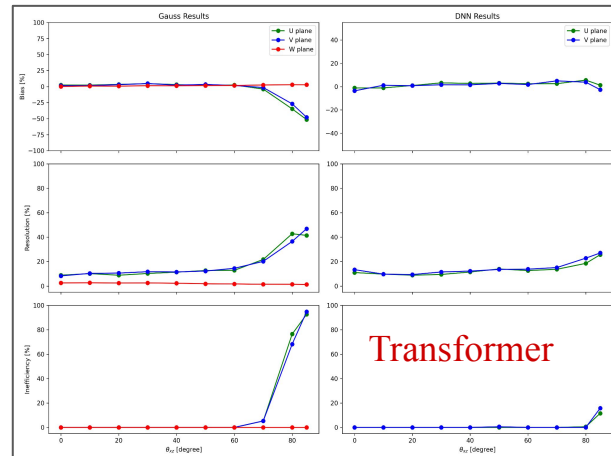
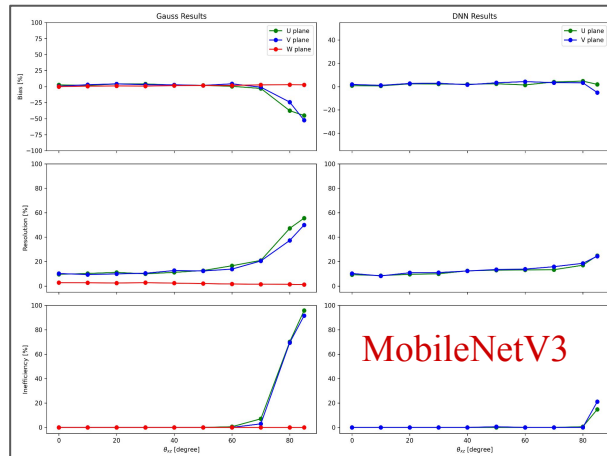
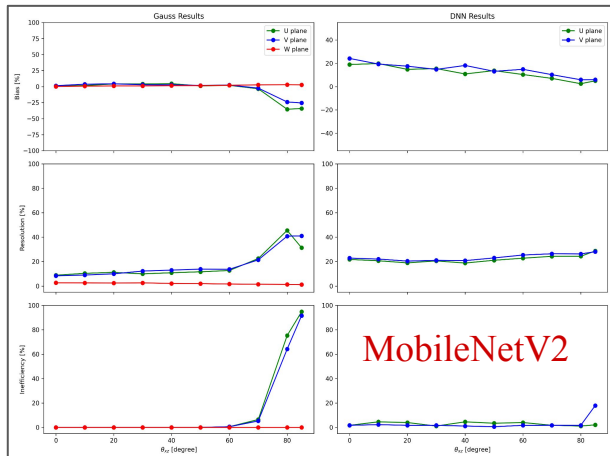
☒ save data on

MobileNetV2



☐ save data off

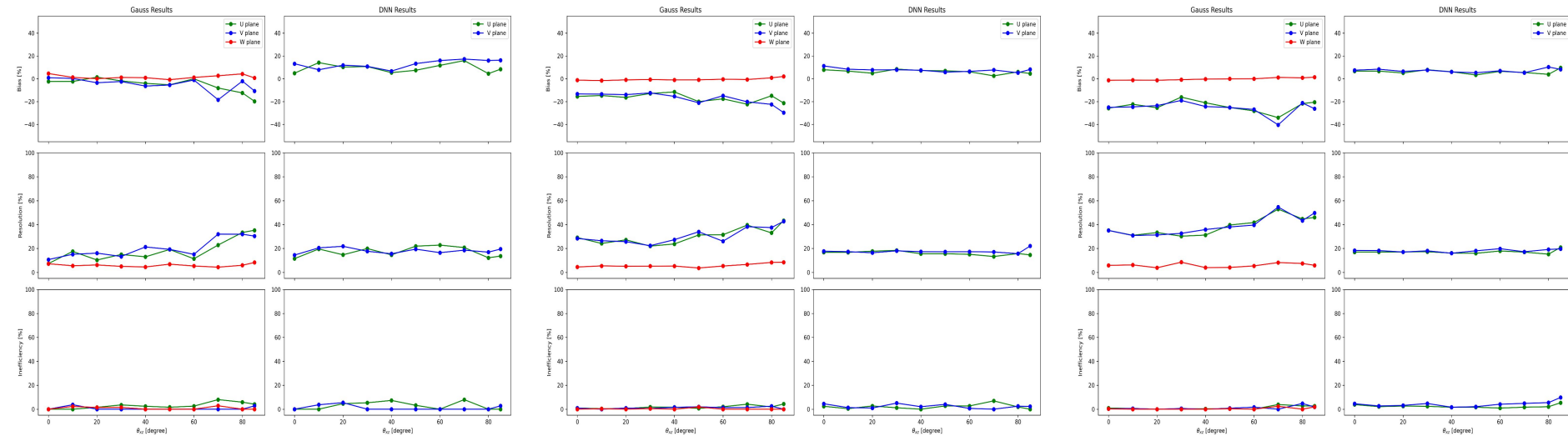
Model Comparison - Track evaluation



- Normal APA
- MobileNetV2 has bias about 20% at low angles
- MobileNetV3 and Transformer has similar performance

Back Up

DNN SP evaluation - single shower event



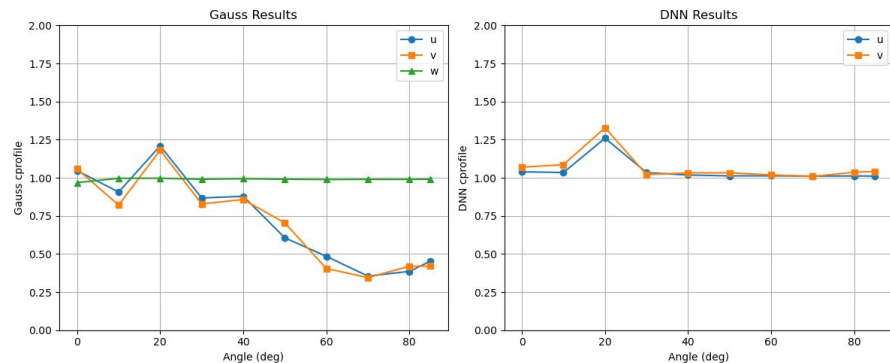
❑ P0: 100 MeV, SigmaP: 0.05

❑ P0: 1 GeV, SigmaP: 0.05

❑ P0: 5 GeV, SigmaP: 0.05

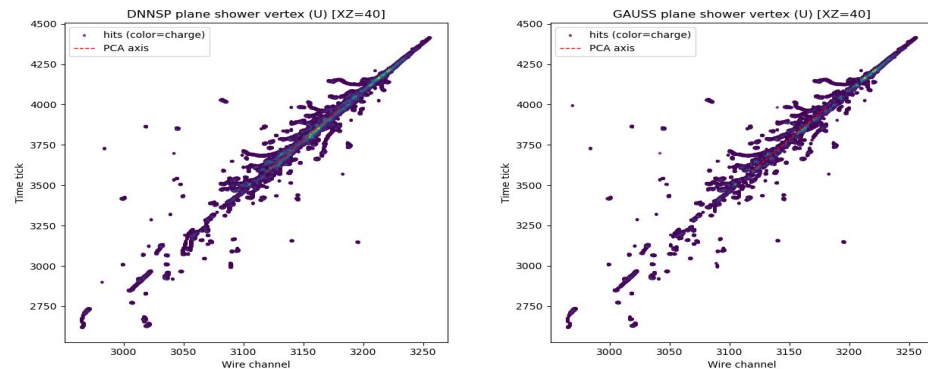
- As the energy increases, the bias and resolution in Gauss is getting worse
- DNN SP maintains more consistent performance across all energy levels

DNN SP evaluation - single shower event



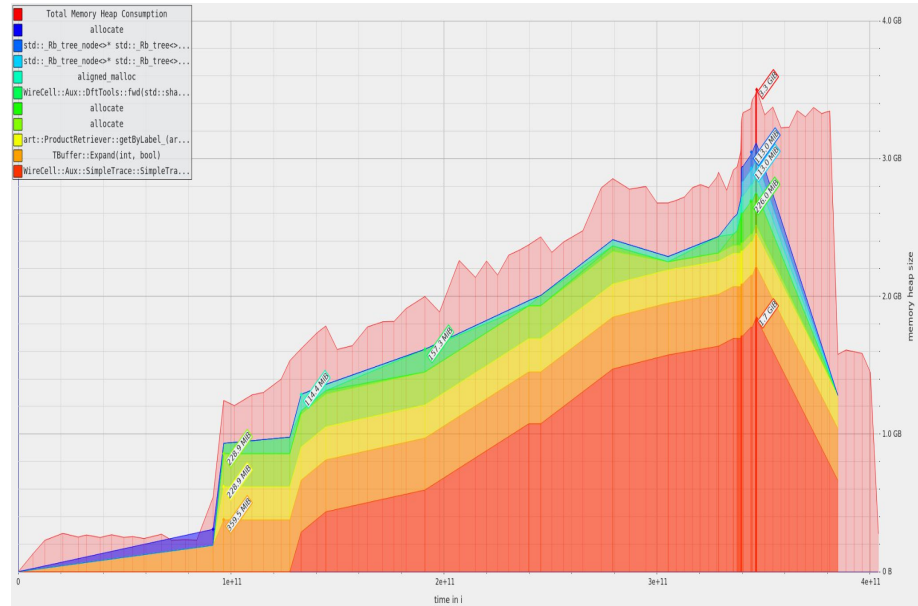
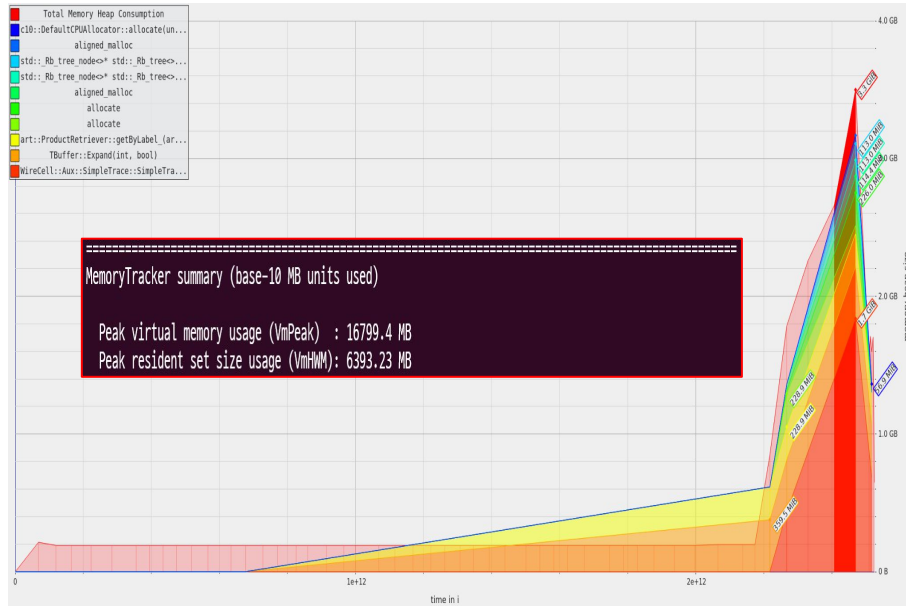
□ P0: 5 GeV, SigmaP: 0.05

- New metrics for Shower evaluation:
 - Angle diff
 - Charge profile within 1 radiation length (14 cm ~ 47 wire channels)
- Charge Profile: Decon / Truth
- DNN showed better performance when we look at near the vertex



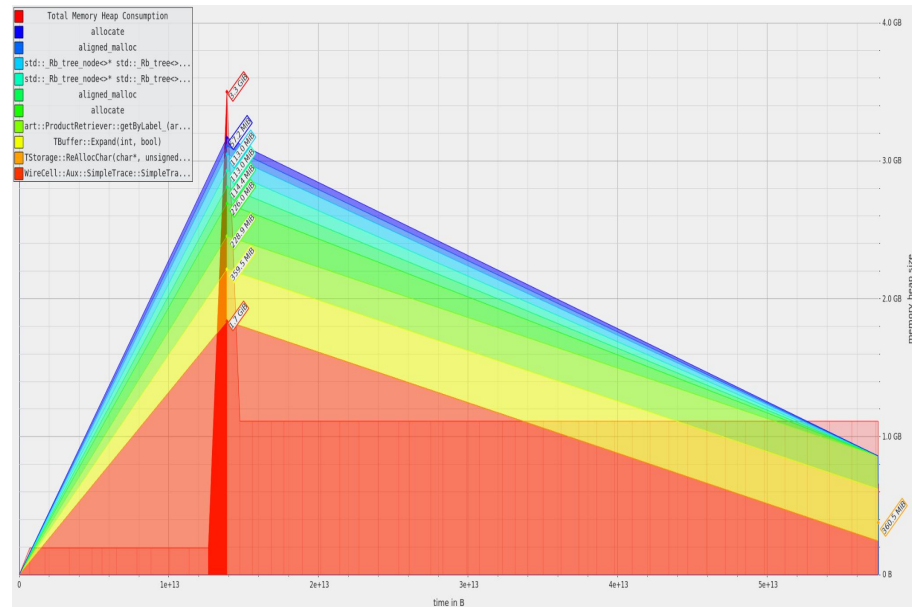
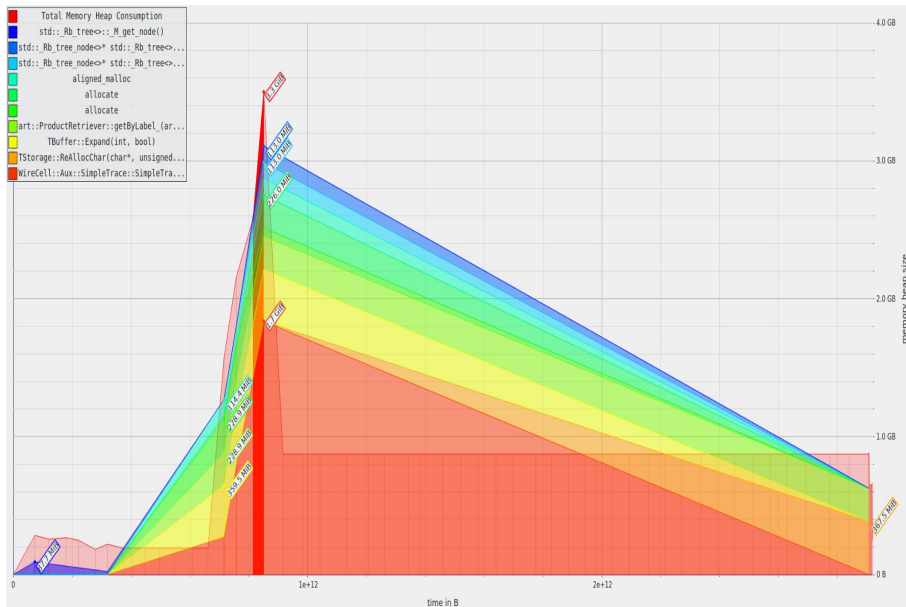
	Angle diff	
	Gauss (deg.)	DNN (deg.)
U plane	0.74	0.82
V plane	0.52	0.51
W plane	1.22	

Memory Profiling - Valgrind



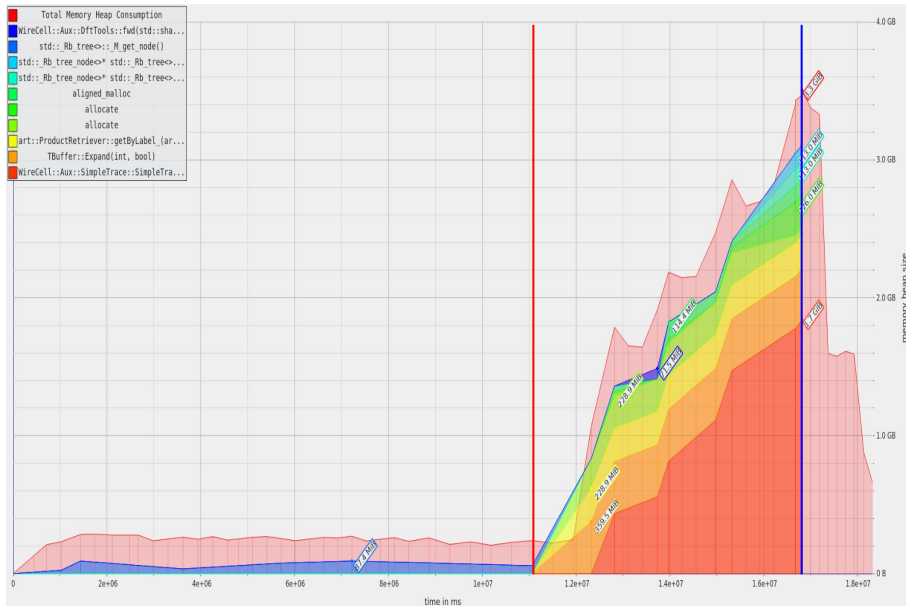
- Profiled twice over DNN SP (MobileNetV2) with a PD-HD data file (one event)
- Time unit: i - instructions (default)
- The left is what I shared in the last meeting, the right one is newly generated
- The peak appears near the end of the instructions
- The peak memory from Valgrind (~ 3.3 GiB) is different from LArSoft's MemoryTracker (~6.4 GB)

Memory Profiling - Valgrind



- Profiled twice over DNN SP (MobileNetV2) with a PD-HD data file (one event)
- Time unit: B - Bytes
- For the same data processing, total amount of heap memory allocated is different
- The peak appears abruptly, and there is low memory usage after the peak

Memory Profiling - Valgrind



```
=====
MemoryTracker summary (base-10 MB units used)

Peak virtual memory usage (VmPeak) :
XMSG-s ArtException: RootOutput:out1@EndJob 15-Jul-2025 15:33:06 PDT ModuleEndJob
---- SQLExecutionError BEGIN
      unique_value expected of non-unique query.
---- SQLExecutionError END
XMSG
Art has completed and will exit with status 1.
Command exited with non-zero status 1
Command being timed: "valgrind --tool=massif --time-unit=ms --massif-out-file=massif_output_mobilenetv2_timems2.out --stacks=yes -
-log-file=valgrind_timems2.log lar -nl -c my_standard_reco_stage2_calibration_protodunehd_keepup_dnnroi.fcl -s .././../data/stage1/run
027673/np04hd_raw_run027673_0000_dataflow0_datawriter_0_20240704T050545_reco_stage1.root"
User time (seconds): 6884.62
System time (seconds): 11417.65
Percent of CPU this job got: 99%
Elapsed (wall clock) time (h:mm:ss or m:ss): 5:06:16
Average shared text size (kbytes): 0
Average unshared data size (kbytes): 0
Average stack size (kbytes): 0
Average total size (kbytes): 0
Maximum resident set size (kbytes): 6398684
Average resident set size (kbytes): 0
Major (requiring I/O) page faults: 73
Minor (reclaiming a frame) page faults: 1606802
Voluntary context switches: 307636
Involuntary context switches: 122524
Swaps: 0
File system inputs: 0
File system outputs: 241944
Socket messages sent: 0
Socket messages received: 0
Signals delivered: 0
Page size (bytes): 4096
Exit status: 1
Done.
Massif output file: massif_output_mobilenetv2_timems2.out
Valgrind log file: valgrind_timems2.log
```

- Profiled twice over DNN SP (MobileNetV2) with a PD-HD data file (one event)
- **Time unit: ms - milliseconds**
- Profiling stopped due to error: unique_value expected of non-unique query
- Run time is almost 5 hours but the memory usage is low for 3 hours (red line)
- The peak snapshot is taken within very short time (blue line)

Angle between reco and true direction

$$\hat{\mathbf{v}}_{\text{true}} = \frac{(\Delta \mathbf{w}_{\text{true}} + \Delta \mathbf{t}_{\text{true}} \hat{\mathbf{v}}_{\text{true}})}{\sqrt{(\Delta \mathbf{w}_{\text{true}})^2 + (\Delta \mathbf{t}_{\text{true}})^2}}$$

- From MCParticle

$$\hat{\mathbf{v}}_{\text{reco}} = \frac{(\Delta \mathbf{w}_{\text{reco}} + \Delta \mathbf{t}_{\text{reco}} \hat{\mathbf{v}}_{\text{reco}})}{\sqrt{(\Delta \mathbf{w}_{\text{reco}})^2 + (\Delta \mathbf{t}_{\text{reco}})^2}}$$

PCA axis

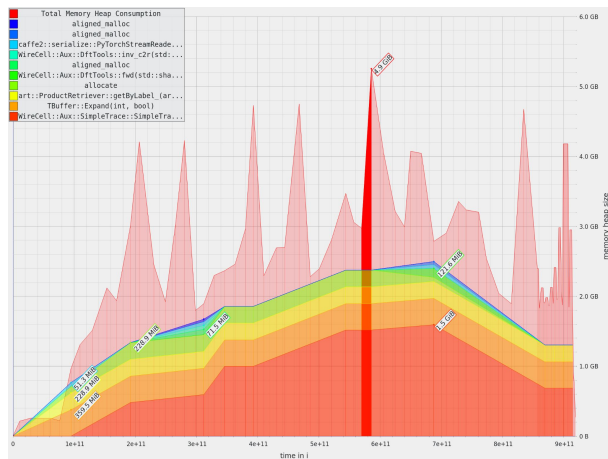
$$\hat{\mathbf{v}}_{\text{PCA}} = \frac{(\Delta \mathbf{w}_{\text{PCA}} + \Delta \mathbf{t}_{\text{PCA}} \hat{\mathbf{v}}_{\text{PCA}})}{\sqrt{(\Delta \mathbf{w}_{\text{PCA}})^2 + (\Delta \mathbf{t}_{\text{PCA}})^2}}$$

PCA axis

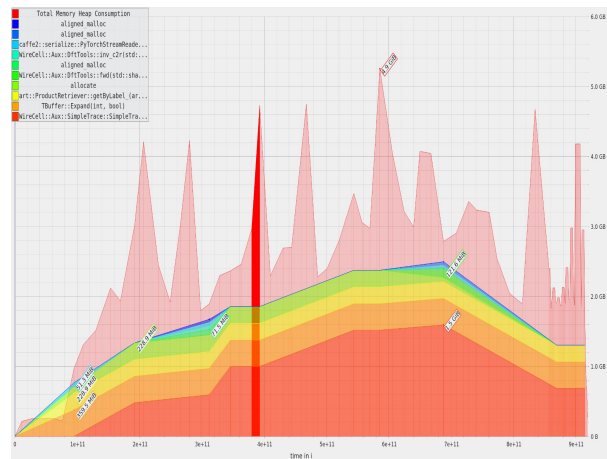
$$\cos \theta = \hat{\mathbf{v}}_{\text{true}} \cdot \hat{\mathbf{v}}_{\text{reco}} = \frac{(\Delta \mathbf{w}_{\text{true}} + \Delta \mathbf{t}_{\text{true}} \hat{\mathbf{v}}_{\text{true}}) \cdot (\Delta \mathbf{w}_{\text{reco}} + \Delta \mathbf{t}_{\text{reco}} \hat{\mathbf{v}}_{\text{reco}})}{\sqrt{(\Delta \mathbf{w}_{\text{true}})^2 + (\Delta \mathbf{t}_{\text{true}})^2} \sqrt{(\Delta \mathbf{w}_{\text{reco}})^2 + (\Delta \mathbf{t}_{\text{reco}})^2}}$$

$$\theta = \arccos(\cos \theta)$$

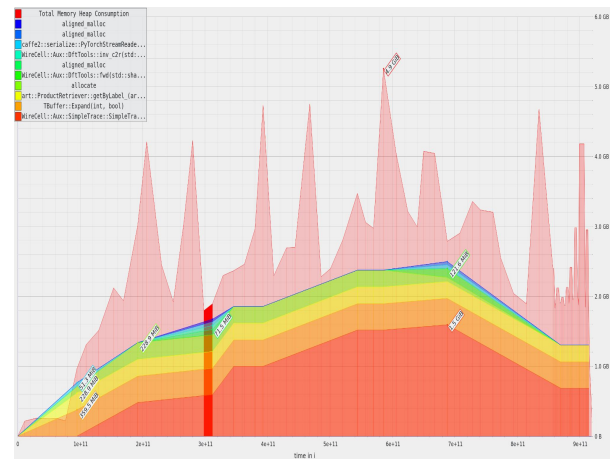
Memory Profiling - Valgrind



❑ 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

```

* 25 GB: c10::alloc_cpu(unsigned long) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 25 GB: c10::DefaultCPULocator::allocate(unsigned long) const (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 23 GB: c10::StorageImpl::StorageImpl(unsigned char*, unsigned int, c10::Symint::consts, c10::Allocator*, bool) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 23 GB: at::TensorBase::at::detail::empty_cud10::c10::ArrayRef<>, c10::Allocator*, c10::DispatchKeySet, c10::ScalarType, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 23 GB: at::detail::empty_cud10::c10::ArrayRef<>, c10::Allocator*, c10::DispatchKeySet, c10::ScalarType, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 23 GB: at::detail::empty_cud10::c10::ArrayRef<>, c10::ScalarType, bool, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 23 GB: at::detail::empty_cud10::c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::native::empty_c10::c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: c10::impl::wrap_kernel_function_unboxed::call(c10::OperatorKernel*, c10::DispatchKeySet, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::ops::memory_format::redispatch(c10::DispatchKeySet, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: c10::impl::wrap_kernel_function_unboxed::call(c10::OperatorKernel*, c10::DispatchKeySet, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::ops::memory_format::call(c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::native::anonymous namespace::compute_columns2d::Tensor::consts, c10::ArrayRef<>, c10::ArrayRef<>, c10::ArrayRef<>, c10::ArrayRef<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::native::slow_conv2d_forward_cpu::Tensor::consts, at::Tensor::consts, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: at::native::slow_conv2d_forward_cpu::Tensor::consts, at::Tensor::consts, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 21 GB: c10::impl::wrap_kernel_function_unboxed::call(c10::OperatorKernel*, c10::DispatchKeySet, c10::ArrayRef<>, c10::optional<>, c10::optional<>, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 245.4 MB: at::detail::empty_cud10::c10::ArrayRef<>, c10::TensorOptions, c10::optional<>) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 117.2 MB: at::native::resize_bytes_cud10::StorageImpl*, unsigned long) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 117.2 MB: c10::TensorImpl::at::native::resize_impl::c10::TensorImpl*, c10::OptionalArrayRef<>, bool) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
* 51.3 MB: caffe::SerializeProtoStreamReader::getRecord(const std::cxx11::basic_string<> const&) (in /cvmfs/farfrost.opensciencegrid.org/products/fiftorch/v2.1.1bLunur40it+3.10.2.17+26b1fb(c10.so)
14 GB: allocate (new_allocator<137>)
14 GB: allocate (libc::traits<464>)
14 GB: M::allocate (std::vector<378>)
14 GB: M::create_storage (std::vector<395>)
14 GB: Vector base (std::vector<332>)
14 GB: vector (std::vector<598>)
14 GB: WireCell::Aux::SimpleTrace::SimpleTrace(int, std::vector<> const&) (SimpleTrace.cpp:8)
* 858.3 MB: WireCell::SigProc::OmnibusSigProc::save_data(std::vector<> const&, std::vector<> const&, int, std::vector<> const&, std::vector<> const&, std::cxx11::
* 1717 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1822)
* 1717 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1699)
* 1717 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1804)
* 1717 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1810)
* 1073 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1678)
* 64.4 MB: WireCell::SigProc::OmnibusSigProc::operator()(std::shared_ptr<> const&, std::shared_ptr<> const&) (OmnibusSigProc.cpp:1693)
* 343.3 MB: WireCell::SigProc::OmnibusSigProc::save_npz(std::vector<> const&, std::vector<> const&, int, std::map<> const&) (OmnibusSigProc.cpp:763)
* 1717 MB: WireCell::SigProc::OmnibusSigProc::save_npz(std::vector<> const&, std::vector<> const&, int, std::vector<> const&) (OmnibusSigProc.cpp:612)
* 73.2 MB: Construct<> (std::construct<119>)
* 359.5 MB: TStorage::ReAllocChar(char* unsigned long, unsigned long) (TStorage.cpp:283)
* 359.5 MB: TBuffer::ExpandAnd, bool) (TBuffer.cpp:242)
* 228.9 MB: allocate (new_allocator<137>)
* 228.9 MB: allocate (new_allocator<137>)
220.9 MB: in 22544 places, all below massif's threshold (1.00%)

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25 GB: cllAllocUnsafe(long) in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(ccll.s)
25 GB: cllDefaultCpuAllocationSize(long) const in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(ccll.s)
23 GB: CllStorageImpl.StorageImpl(CllStorageImpl byte size, CllSymint const, CllAllocat bool) in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
23 GB: at.TerzoSeed.atDetailEmptyGen<CllArrayRef>, CllAllocat, CllDispatchSet, CllScalarType, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
23 GB: at.DetailEmptyGen<CllArrayRef>, CllAllocat, CllDispatchSet, CllScalarType, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
23 GB: at.DetailEmptyGen<CllArrayRef>, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
21 GB: at.NativeEmptyGen<CllArrayRef>, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
21 GB: cllImpWgVeneVeneVeneUnboxed<callCllOperatorMem, CllDispatchSet, CllArrayRef, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
21 GB: at.SymEmptyMemoryInMemSpatk(CllDispatchSet, CllArrayRef, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions) in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
21 GB: cllImpWgVeneVeneVeneUnboxed<callCllOperatorMem, CllDispatchSet, CllArrayRef, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions> in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
21 GB: at.SymEmptyMemoryInMemSpatk(CllArrayRef, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions, CllOptions) in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
245.4 MB: at.DetailEmptyGen<CllArrayRef>, CllTerzoOptions const in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
1172 MB: at.DetailEmptyGen<CllStorageImpl>, unsigned long in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
513 MB: at.DetailEmptyGen<CllStorageImpl>, unsigned long in (com.fasterxml.jackson.org.products.fibonacci.V1_1aLunus4k4+10-17-26%)(btrch.gu)
521 MB: allocate heap allocation(137)
952.1 MB: allocate heap allocation(184)
952.1 MB: M allocate ist vector(278)
952.1 MB: M create storage(ist vector(295))
952.1 MB: vector base(ist vector(332))
952.1 MB: vector(ist vector(558))
952.1 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
572.2 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
114.4 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
114.4 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
114.4 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
114.4 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
71.5 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
42.9 MB: in place, below mass's threshold(1.00%)
228.9 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
114.4 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
36.6 MB: in place, below mass's threshold(1.00%)
395.5 MB: WVecAllocSimpleType: SimpleType(int, int, vector<const>, SimpleType<const>)
228.9 MB: allocate heap allocation(137)
228.9 MB: allocate heap allocation(137)
1174 MB: in place, below mass's threshold(1.00%)


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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::cxx11::basic_string_view<char, std::allocator<char>>>) (OmniBusSigProc.cxx:1669)
                  * 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_mpi(std::vector<&*>, std::vector<&*>, int, std::multimap<&*>, const&) (OmniBusSigProc.cxx:763)
                  * 57.2 MB: WireCell::SigProc::OmniBusSigProc::save_nu(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 massf'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/v2.1.1_1bLinux4d4b+3.10-2.17-e26/torchlib(torch10.so)]
      * 35.8 MB: aligned_malloc (Memory:h216)

```

 1st peak

 2nd peak

- low torch activity