Towards 2x2 First Analysis Publication in 2024

– Coalescing Effort and Strategy –

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2x2 First Analysis Meeting
November 17, 2023

Development of a common, generic neutrino selection

Dual paths developed in parallel:

(1) Through mainline reconstruction (e.g. MLReco and/or Pandora) ⇒ 2-3 people?

+ Stand-alone reconstruction quantitatively benchmarked & well documented

– Reliant on charge information alone (anticipated to change in the future)

+/– Reliant on iteration with reconstruction experts

Pandora:

+ Neutrino slicing and scoring baked into reconstruction

– Reconstruction files not available, not incorporated into CAFs

MLReco:

– Neutrino slicing and scoring to be user defined

(2) Through interaction-level charge-light matching in *ndlar_flow* ⇒ 2-3 people?

+ Synergy with existing plans/work within simulation/calibration sub-group

+ Reliant on hit-level charge and light data

– Primitive stand-alone reconstruction; significant development, benchmarking, and documentation effort needed

– Integration at / propagation to CAF-level to be worked out

Proposal: call for analysis teams to join efforts to tackle common, generic neutrino selection

Weekly or bi-weekly working group meeting (time TBD)

Deliverables:

- **Generic neutrino selection**
- **Quantitative benchmark with simulation: efficiency, purity, bias**
- **Data/MC comparison assessment**
- **Systematic uncertainties evaluation**
- **Technical note**

Most urgent question: what is the neutrino selection performance with the existing MLReco files?

Analysis Tools

Coalesce efforts on analysis tools infrastructure implementation, validation, and common systematics assessment

Proposal: working group meeting to address general or analysis specific analysis tools development

Non-binding suggestions of AT Tasks:

1. CAFAna suitability
2. Nusystematics integration
   a. Ask LBL and Jaesung how this was done for TDR-era which also did not use art for its analysis.
3. Geant4RW integration
   a. Work with Jake Calcultt
4. CAF Plotters
   a. Generic ntuple plotter.

Monthly ‘Analysis Tools’ meeting to begin December ‘23

Date/time TBD

Analysis Review Strategy

Our aim is to have public analysis results in 2024.

We should draw from the ProtoDUNE analysis review process experience to inform our documentation and analysis review strategy for thoroughly vetted, timely public results.

Proposal: generic ProtoDUNE-ND analysis super technote + analysis specific technotes

Generic ProtoDUNE-ND analysis super technote:

- Description of common hardware, analysis infrastructure
  - Some sections can be written now! E.g. installed hardware, beam simulation, etc.
- A primer for DUNE collaborators not familiar with ProtoDUNE-ND
- Potential documentation-seed for portions of FDR
- Living-document to be reviewed, added upon through various stages of operation
  - E.g. installed hardware chapter internally reviewed very early on, calibration chapter reviewed once methods settled

Analysis-specific technotes:

- Charged track multiplicity
- Mesonless muon antineutrino charged-current differential cross section
- Beam-induced neutron kinetic energy spectrum

DUNE analysis policies at DocDB 1115

All technical documents tied to the analysis (including code) are reviewed:
- Working Group (WG) review w/in ND Prototype Analysis (>1 week)
- Analysis Review Committee (ARC) review (> 2 weeks)
- Collaboration review (> 2 weeks)