DIRT thoughts on outcomes from the workshop

Getting our hands DIRT(2)-y

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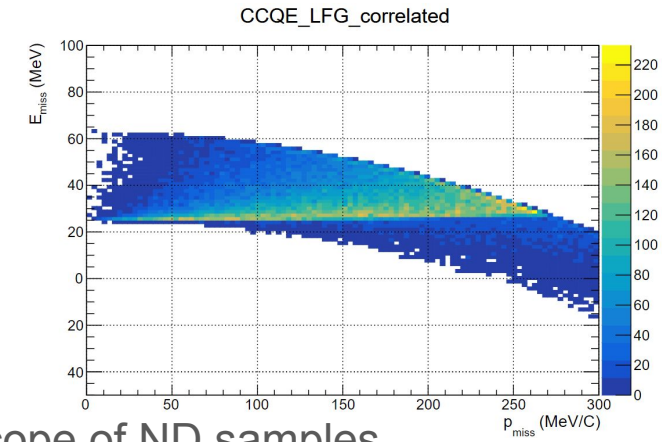
For the DIRT 2 taskforce

The DIRT 2 deliverables

- Expanded set of knobs implemented in NuSystematics
  - Plausible variations of the event distributions the ND samples will see
  - A conservative set of uncertainties that meaningfully extrapolate from ND to FD
- Document the motivation and magnitude (Theory? Experiment data?)
- Generator-level validation and diagnostic plot dumps for each knob
- Higher-level demonstration plots for each knob for broader audience
- Expertise in ND and LBL groups can access as they look at reco samples
- A group that will help battle through fitter behavior problems
- A citable tech note and/or publication of the suite of systematics
- Kind of fun: are touching physics models, may generate more publications

What we've achieved so far



- Baseline model almost defined
  - Talk to GENIE (next forum) and at Collab Mtg to socialize model
- Fruitful discussion with ND groups about achievable scope of ND samples
- Expanded list of systematics knobs, prioritizing them now
- Acquired a good team for NuSystematics implementations and a lot of homework
- Team starts with **Laura** Munteanu, **Stephen** Dolan, **Rik** Gran as points of contacts
- Commitments from **Jaesung** (Icarus), **Anne** (MINERvA/NOvA/DIS/SIS), **Richie** (MicroBooNE, NDLAr), **Tom** (T2K, MaCh3), **Radi** (Machine learning reweighting), **Yifan** (Multi-D weights), others under discussion. Room for more contributors who touch NuSystematics code or input on how to style knobs.

DIRT matches systematics to samples

The samples we know about:

ND LAr

CC Inclusive
Split by π & γ?
Binned in E_ν^{rec}+μ kinematics
Stretch goal: TKI binning?

Possible ν+e sample

ND GAr

CC Inclusive
Split by $\pi^{+/-}$ multiplicity
Binned in $\pi^{+/-}$ momentum
Constrain lost $\pi^{+/-}$ in E_ν^{rec}
Stretch goal: *p* multiplicity

SAND

CC Inclusive
Split by CH2 and C targets
Binned in Q^2_{rec}
Constrain form factors and flux
Stretch goals:
π multiplicity
E_ν^{rec} binning

DIRT follows a staged approach

- We think everyone wants a staged implementation approach
  - Have an early “iteration one” hand-off of dials, date TBD
  - At least one dial with each kind of technical feature
  - Start with simplistic ND fit inputs (i.e. 1D coarse binning) and expand gradually
  - Check for overfitting at each stage

- DIRT-II timelines
  - By the collaboration meeting we want to have a quasi-final baseline interaction model
  - Further than this, we need to tailor our work to the readiness of the ND groups
    - Need to stay in contact, and coordinate via LBL

What DIRT 2 needs from you

- As a ND or LBL or Fitter customer, we need a subset of people analysing your post-selection, post-resolution samples.
- Verify DIRT inputs effects with our guidance
- Identify things that are negligible or unreasonable for your sample
- Be prepared (effort, timeline) to iterate
- Collaborate between other groups and DIRT (DUNE LBL JOINT fit)
- Coming soon: a timeline for ND groups and us about the first iteration

Next steps for DIRT 2 and summary

- This has been a very productive workshop, we have a clear path forward to building an uncertainty model suitable for the next LBL analysis
- Thank you to everyone who attended our DIRT 2 discussions

Next steps:

- We'll implement dials in some priority order
- We'll validate and document dial action with some generator level plots
- We'll explore what "DIRT 2" really stands for
- Please come to DIRT 2 meetings and help
  - DIRT 2 meetings Mondays @ 8am CDT / 3 pm CET
  - Subscribe to the mailing list DUNE-PHYSICS-DIRT-TASKFORCE@fnal.gov