ND-Gar LBL Plan

Naseem Khan
8th August 2023

Imperial College London

What goes into the LBL analysis
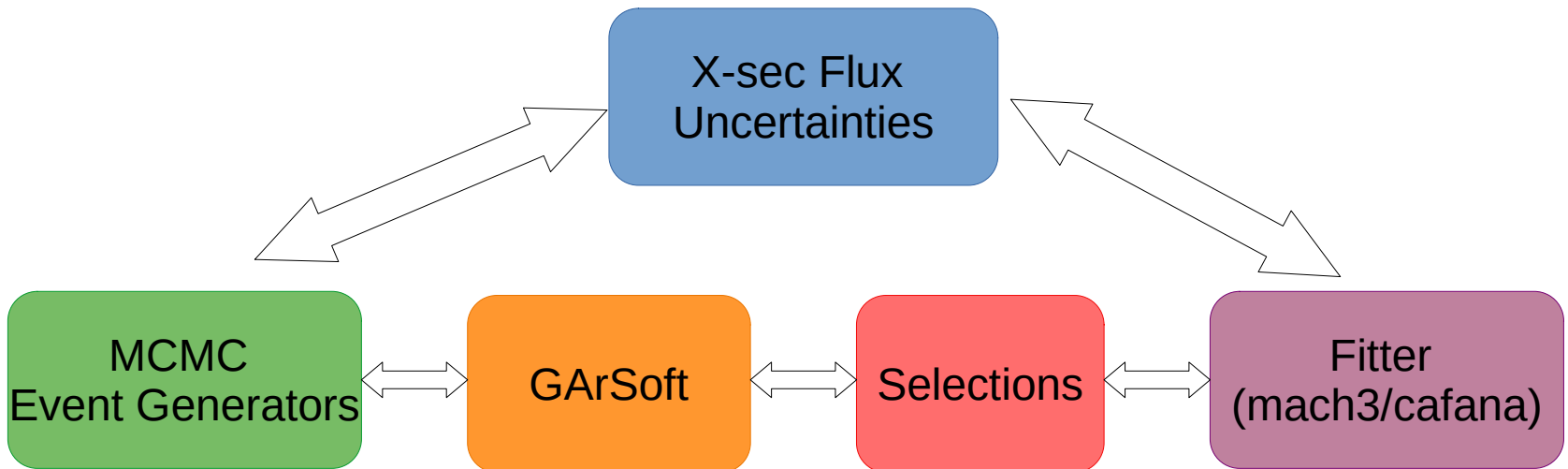
- We will eventually optimise each of these for the ND-GAr analysis but for the next few weeks we are aiming to get a full end to end example complete

Current Status

- MCMC Event Generator:
  - GENIE
- CAFs from GarSoft Reconstruction
  - Uses the Old Standard Record Format
- Charged pions can be selected PID = ±211
  - Large contamination of muons (See Francisco's slides from previous meetings and most recent slides sent on slack) if we only use the PID and no other selection cuts
- Francisco has made CAFs with a 100k FHC neutrino sample.
- Liban has implemented the FD and ND-LAr into mach3 already and simplified the process of adding new samples.
- Mach3 takes in CAF inputs, but these must be formatted correctly and can run full fits and likelihood scans.
- We will use these for the initial full pipeline in mach3.

Imperial College London

Future Work

- First aim to get the full pipeline running with the old CAFs. This will probably take the next few months.
- When we are confident we know how it all works and what information is needed in the fitter we can start improving the analysis, ideas so far:
  - Adding other event generators (NEUT/NuWro) as inputs into GArSoft
  - Updating the CAFs to be in the most recent Standard Record Format
  - Making more selection cuts to improve pion identification. Some of these cuts will be made before the events get written to the CAF, some cuts will be made before running the fit.
  - Look into improving modelling of cross section flux uncertainties
  - Improve the detector systematics for ND-LAr and ND-GAr within mach3.

Imperial College London