Covariance Matrix Fit Users' Guide

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Abstract

This technote details a new method for performing fits for oscillation parameters by using covariance matrices.

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1 Introduction

2 Structure

The CMF code lives within `nova/CovarianceMatrixFit`. Within this directory there are several directories:

```
core   : the core classes that CMF is built on: EventLists, VarVals,
   ↪ ShifterAndWeighter
data   : contains root files for calibration systematic uncertainties
dataProducts: data products and structs commonly used in CMF analysis
fhicl  : contains all fhicl files
macros   : useful .C files
modules  : art modules and plugins which are run with fhicl files
scripts  : scripts for, i.e. submitting to the grid
utilities : only the bin utility lives here, this may be removed in the
   ↪ future
```

3 Generating Covariance Matrices

This section contains information on how to generate covariance matrices for a given systematic uncertainty both locally.

3.1 Locally

In order to generate a covariance matrix locally, a single fhicl file can be run [1],

```
cmf_covariancematrixmakerjob.fcl
```

[2]

Inside this fhicl file, there are three options that a user should configure:

[1] I'd recommend copying this to your `SER/nova/ana/users/$U` area and running from there.

[2] Ensure you're using the CMF version of this file. Another version, `covariancematrixmakerjob.fcl` exists, but is related to the FNEX framework and is not what you should be running.

```
TREEFILE : Path to EventList file. For now these are located in /nova/ana/
    ↪ users/brebel/skimmed
SYSTPAR  : Systematic parameter to vary
NITER  : Number of iterations of the systematic to run (i.e. number of
    ↪ universes)
```

The options for which systematics you can choose can be found in `CMF_SystematicParameters.fcl`

Once these substitutions have been made, a covariance matrix can be generated with the following command

```
art -c cmf_covariancematrixmakerjob.fcl
```

3.2 On The Grid