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AHELP for CIAO 3.4

interval−uncertainty

Context: sherpa

Jump to: Description Examples CHANGES IN CIAO 3.2 Bugs See Also

Synopsis

Plots the fit statistic as a function of parameter value, using the UNCERTAINTY algorithm. The commands INT−UNC and INTUNC are abbreviated equivalents.

Syntax

```
sherpa> INTERVAL−UNCERTAINTY [<dataset range> | ALLSETS] <arg>

where <dataset range> = #, or more generally #:#,#:#,..., such that #
specifies a dataset number, and #:# represents an inclusive range of
datasets; one may specify multiple inclusive ranges by separating them
with commas. The default is to create plots using data from all
appropriate datasets.
```

Description

The command−line argument may be:

INTERVAL−PROJECTION Command Argument

Argument	Description
<sherpa_modelname>.{<paramname> | <#>}	A specified model component parameter (e.g., GAUSS.pos).
<modelname>.{<paramname> | <#>}	A specified model component parameter (e.g., g.pos).

The user may configure INTERVAL−UNCERTAINTY via the Sherpa state object structure intunc. The current values of the fields of this structure may be displayed using the command print(sherpa.intunc), or using the more verbose Sherpa/S−Lang module function list_intunc().

The structure fields are:

regproj Structure Fields

Field	Description
arange	If 1, the grid limits are to be determined automatically. If 0, the grid limits are specified (see min and max).

min	Specifies the grid minimum. This is always a linear quantity, regardless of the setting of log (see below). The setting is ignored if arange = 1.
max	Specifies the grid maximum. This is always a linear quantity, regardless of the setting of log (see below). The setting is ignored if arange = 1.
log	Specifies whether to use a linear (0) or logarithmic (1) spacing of grid points.
nloop	Specifies the number of grid points.
sigma	Specifies the number of sigma (i.e., the change in statistic) for the plot.

Field values may be set using directly, e.g.,

```
sherpa> sherpa.intunc.arange = 0
```

NOTE: strict checking of value inputs is not done, i.e., the user can errantly change arrays to scalars, etc. To restore the default settings of the structure at any time, use the Sherpa/S−Lang module function restore_intunc().

The plot is created by varying each selected parameter's value on an automatically determined grid, and computing the best−fit statistic at each grid point. INTERVAL−UNCERTAINTY differs from INTERVAL−PROJECTION in that all other thawed parameters are fixed to their best−fit values, instead of being allowed to float to new best−fit values. This makes a plot created by INTERVAL−UNCERTAINTY a less accurate rendering of the projected shape of statistical hypersurface, but it can be faster to create. For a fuller theoretical description of error estimation, see PROJECTION, UNCERTAINTY, and COVARIANCE.

The grid limits for the plot are determined automatically using the UNCERTAINTY algorithm. Each parameter's value is varied until the fit statistic is increased by delta_S, which is a function of sigma (e.g., delta_S = 1 if the statistic is chi−square and sigma = 1).

The grid−point values and best−fit statistics at each grid point may be retrieved using the Sherpa/S−Lang module function get_intunc. See the examples below.

Example 1

List the current and default values of the intunc structure, and restore the default values:

```
sherpa> sherpa.intunc.arange = 0
sherpa> sherpa.intunc.log = 1
sherpa> sherpa.intunc.sigma = 5
sherpa> list_intunc()
Parameter   Current         Default                       Description
-------------------------------------------------------------------
arange            0               1             Auto-range: 0(n)/1(y)
min               0               0                     Minimum value
max               0               0                     Maximum value
log               1               0            Log-spacing: 0(n)/1(y)
nloop           100             100             Number of grid points
sigma             5               1                   Number of sigma
sherpa> restore_intunc()
sherpa> list_intunc()
Parameter   Current         Default                       Description
-------------------------------------------------------------------
arange            1               1             Auto-range: 0(n)/1(y)
min               0               0                     Minimum value
max               0               0                     Maximum value
log               0               0            Log-spacing: 0(n)/1(y)
```

```
nloop           100             100              Number of grid points
sigma             1               1                    Number of sigma
```

Example 2

Plot chi−square within the 3−sigma confidence interval for a fit:

```
sherpa> READ DATA example1.dat
sherpa> PARAMPROMPT OFF
sherpa> SOURCE = POLYNOM1D[my]
sherpa> THAW my.c1 my.c2
sherpa> my.c0.min = −10
sherpa> FIT
...
sherpa> sherpa.intunc.sigma = 3
sherpa> INTERVAL−UNCERTAINTY my.c0
Interval−Uncertainty: computing grid size with uncertainty...done.
                      outer grid loop 20% done...
                      outer grid loop 40% done...
                      outer grid loop 60% done...
                      outer grid loop 80% done...
```

Example 3

Save the results of INTERVAL−UNCERTAINTY to an ASCII file:

```
[...run INTERVAL−UNCERTAINTY...]
sherpa> my_var = get_intunc()
sherpa> writeascii("my_output.dat",my_var.x0,my_var.y)
sherpa> quit
Goodbye.
unix> more my_output.dat
−4.17797        9.25601
−4.08741        8.89599
−3.99684        8.54331
...
```

CHANGES IN CIAO 3.2

Prior to CIAO 3.2 the INTERVAL−UNCERTAINTY command could not be used until the dataset had been fit. This was done to ensure that the parameter values were at their best−fit location, but caused problems when fitting multiple datasets or loading previously−saved analysis sessions. This restriction has now been removed. Please note that the results of INTERVAL−UNCERTAINTY may not be valid unless the parameters are at their best−fit values.

Bugs

See the Sherpa bug pages online for an up−to−date listing of known bugs.

See Also

sherpa

berrors, bsyserrors, compute_errors, compute_statistic, covariance, errors, ftest, get_paramest, get_paramestint, get_paramestlim, get_paramestreg, goodness, interval−projection, list_paramest, mlr, projection, region−projection, region−uncertainty, restore_paramest, run_paramest, run_paramestint,

run_paramestlim, run_paramestreg, set_errors, set_syserrors, staterrors, syserrors, uncertainty

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