

ctools - Change request #2237

Add stat parameter to all likelihood tools to specify the statistics

10/21/2017 02:02 PM - Knödlseeder Jürgen

Status:	Closed	Start date:	10/21/2017
Priority:	Normal	Due date:	
Assigned To:	Knödlseeder Jürgen	% Done:	100%
Category:		Estimated time:	0.00 hour
Target version:	1.5.0		
Description			
We should add a stat parameter to all likelihood tool to specify the statistics.			
Even better, we should rename stat to statistic since it's not too long and is clearer.			

History

#1 - 10/22/2017 01:00 AM - Knödlseeder Jürgen

- Assigned To set to Knödlseeder Jürgen

- % Done changed from 0 to 50

I renamed the stat parameter of ctlike into statistic. The parameter is now set to DEFAULT which means that the default optimization statistic that is in the observation container is used.

I added statistic parameters following the same logic to ctbutterfly, cterror, cttsmap, and ctlimit. I have not yet checked if the statistic parameter is actually correctly taken into account, but I added a unit test for the ctlikelihood::set_obs_statistic() method that handles the statistic setting.

I also changed csspec so that it derives now from cslikelihood. In that way it can benefit from the ctlikelihood::set_obs_statistic() method. The observation container is no longer stored in self._obs but in the ctlikelihood::m_obs data member.

I checked that running csspec with default or CSTAT and running the script with WSTAT actually leads to different results, and that the corresponding likelihood functions got called. For reference, here the difference in the fitted SED for some test data:

WSTAT

```
2017-10-21T21:15:22: Bin 1 .....: 1.373113e-10 +/- 3.812628e-12 [< 1.754375e-10] erg/cm2/s (TS = 1087.498)
2017-10-21T21:15:22: Bin 2 .....: 1.045101e-10 +/- 3.041434e-12 [< 1.349244e-10] erg/cm2/s (TS = 1057.596)
2017-10-21T21:15:22: Bin 3 .....: 1.077106e-10 +/- 3.147502e-12 [< 1.391855e-10] erg/cm2/s (TS = 1113.398)
2017-10-21T21:15:22: Bin 4 .....: 8.732562e-11 +/- 2.718267e-12 [< 1.145082e-10] erg/cm2/s (TS = 1038.574)
2017-10-21T21:15:22: Bin 5 .....: 6.957374e-11 +/- 2.422369e-12 [< 9.379738e-11] erg/cm2/s (TS = 870.357)
2017-10-21T21:15:22: Bin 6 .....: 5.656150e-11 +/- 2.233978e-12 [< 7.890123e-11] erg/cm2/s (TS = 692.162)
2017-10-21T21:15:22: Bin 7 .....: 4.858075e-11 +/- 2.090007e-12 [< 6.948078e-11] erg/cm2/s (TS = 597.593)
2017-10-21T21:15:22: Bin 8 .....: 4.659159e-11 +/- 2.116632e-12 [< 6.775789e-11] erg/cm2/s (TS = 534.525)
2017-10-21T21:15:22: Bin 9 .....: 3.321563e-11 +/- 1.877694e-12 [< 5.199255e-11] erg/cm2/s (TS = 350.602)
2017-10-21T21:15:22: Bin 10 .....: 3.395876e-11 +/- 2.121357e-12 [< 5.517231e-11] erg/cm2/s (TS = 346.723)
2017-10-21T21:15:22: Bin 11 .....: 1.773108e-11 +/- 1.619726e-12 [< 3.392832e-11] erg/cm2/s (TS = 128.381)
2017-10-21T21:15:22: Bin 12 .....: 1.850342e-11 +/- 1.864752e-12 [< 3.715092e-11] erg/cm2/s (TS = 106.198)
2017-10-21T21:15:22: Bin 13 .....: 2.100709e-11 +/- 3.408607e-12 [< 5.509315e-11] erg/cm2/s (TS = 117.038)
2017-10-21T21:15:22: Bin 14 .....: 1.815640e-11 +/- 3.209699e-12 [< 5.025339e-11] erg/cm2/s (TS = 69.478)
2017-10-21T21:15:22: Bin 15 .....: 1.258479e-11 +/- 3.364222e-12 [< 4.622700e-11] erg/cm2/s
2017-10-21T21:15:22: Bin 16 .....: 1.066218e-11 +/- 4.353846e-12 [< 5.420063e-11] erg/cm2/s
2017-10-21T21:15:22: Bin 17 .....: 9.033290e-12 +/- 3.011809e-12 [< 3.915137e-11] erg/cm2/s
2017-10-21T21:15:22: Bin 18 .....: 7.653251e-12 +/- 3.827531e-12 [< 4.592856e-11] erg/cm2/s
2017-10-21T21:15:22: Bin 19 .....: 6.484044e-12 +/- 0.000000e+00 [< 7.132448e-11] erg/cm2/s
2017-10-21T21:15:22: Bin 20 .....: 5.493460e-12 +/- 0.000000e+00 [< 6.042805e-11] erg/cm2/s
```

CSTAT

```
2017-10-21T20:45:41: Bin 1 .....: 1.373656e-10 +/- 6.030624e-12 [< 1.976718e-10] erg/cm2/s (TS = 1088.775)
2017-10-21T20:45:41: Bin 2 .....: 1.042587e-10 +/- 4.794084e-12 [< 1.521995e-10] erg/cm2/s (TS = 1062.849)
2017-10-21T20:45:41: Bin 3 .....: 1.078725e-10 +/- 4.977025e-12 [< 1.576427e-10] erg/cm2/s (TS = 1112.421)
2017-10-21T20:45:41: Bin 4 .....: 8.762697e-11 +/- 4.295399e-12 [< 1.305809e-10] erg/cm2/s (TS = 1035.871)
2017-10-21T20:45:41: Bin 5 .....: 6.986765e-11 +/- 3.827805e-12 [< 1.081457e-10] erg/cm2/s (TS = 868.705)
2017-10-21T20:45:41: Bin 6 .....: 5.670564e-11 +/- 3.522832e-12 [< 9.193392e-11] erg/cm2/s (TS = 690.559)
2017-10-21T20:45:41: Bin 7 .....: 4.872281e-11 +/- 3.295550e-12 [< 8.167827e-11] erg/cm2/s (TS = 595.845)
2017-10-21T20:45:41: Bin 8 .....: 4.678697e-11 +/- 3.335691e-12 [< 8.014386e-11] erg/cm2/s (TS = 536.790)
2017-10-21T20:45:41: Bin 9 .....: 3.296117e-11 +/- 2.933138e-12 [< 6.229252e-11] erg/cm2/s (TS = 350.816)
```

2017-10-21T20:45:41: Bin 10: 3.414304e-11 +/- 3.132408e-12 [< 6.546711e-11] erg/cm2/s (TS = 345.622)
2017-10-21T20:45:41: Bin 11: 1.757857e-11 +/- 2.494777e-12 [< 4.252633e-11] erg/cm2/s (TS = 129.887)
2017-10-21T20:45:41: Bin 12: 1.832112e-11 +/- 2.858257e-12 [< 4.690368e-11] erg/cm2/s (TS = 106.383)
2017-10-21T20:45:41: Bin 13: 2.100710e-11 +/- 3.300950e-11 [< 8.577811e-11] erg/cm2/s (TS = 123.839)
2017-10-21T20:45:41: Bin 14: 1.821459e-11 +/- 6.688968e-12 [< 7.087034e-11] erg/cm2/s (TS = 71.630)
2017-10-21T20:45:41: Bin 15: 1.425697e-11 +/- 1.835423e-11 [< 6.219684e-11] erg/cm2/s (TS = 49.067)
2017-10-21T20:45:41: Bin 16: 1.085186e-11 +/- 2.643605e-11 [< 1.362755e-10] erg/cm2/s (TS = 144.719)
2017-10-21T20:45:41: Bin 17: 1.745800e-11 +/- 1.241720e-10 [< 3.450824e-10] erg/cm2/s (TS = 280.243)
2017-10-21T20:45:41: Bin 18: 1.122167e-11 +/- 4.623641e-11 [< 2.467699e-10] erg/cm2/s (TS = 139.358)
2017-10-21T20:45:41: Bin 19: 6.484044e-12 +/- 0.000000e+00 [< 7.279449e-12] erg/cm2/s
2017-10-21T20:45:41: Bin 20: 5.493460e-12 +/- 0.000000e+00 [< 1.092135e-11] erg/cm2/s

I merged the code into devel.

I still need to modify all other cscripts that do maximum likelihood fitting (e.g. cslightcrv, csphasecrv).

#2 - 10/22/2017 10:06 PM - Knödseder Jürgen

The following tools and scripts now have a statistic parameter:

- ctbutterfly
- cterror
- ctlike
- cttsmap
- ctlimit
- cslightcrv
- csphasecrv
- cspull
- cssens
- csspec
- cstsdist
- cstsmasplit

Except of cstsmasplit, all the above mentioned cscripts now derive from cslikelihood, using the internal storage for the observation container and the cslikelihood.set_obs_statistic method to set the statistic for the observations.

Everything has been merged into devel.

#3 - 10/22/2017 10:10 PM - Knödseder Jürgen

- *Status changed from New to Closed*

- *% Done changed from 50 to 100*

#4 - 10/23/2017 11:05 AM - Knödseder Jürgen

Moved the `set_obs_statistic()` method from `cslikelihood` to `csobservation` since scripts using the method do in general not need an optimizer, and the method only operations on observations.