

ctools - Bug #2860

Understand discrepancy between unbinned and binned/stacked results for MSH

03/26/2019 07:46 AM - Knödlseider Jürgen

Status:	Closed	Start date:	03/26/2019
Priority:	Immediate	Due date:	
Assigned To:	Knödlseider Jürgen	% Done:	100%
Category:		Estimated time:	0.00 hour
Target version:	1.6.0		
Description			
The minor axis of the elliptical Gaussian fitted to MSH is smaller for unbinned than for binned/stacked analysis. This discrepancy seems to be very robust.			

History

#1 - 03/26/2019 02:50 PM - Knödlseider Jürgen

- Status changed from New to In Progress

- % Done changed from 0 to 10

It looks like if the integration precision in the GCTAResponseIrf::irf_elliptical method is not sufficient. The number of integration iterations is fixed in this method to 5, and increasing the number brings the fit results closer to the values that were simulated. Below a case where only source events were simulated. With iter=6 or 7 the unbinned results are comparable to the stacked analysis result.

Run	Nobs-Npred	RA	Dec	PA	Minor	Major	Prefactor	Index
Simulation		228.547	-59.174	61.961	0.04965	0.11648	6.93	2.45
Unbinned, iter=5	0.050	228.553	-59.177	63.001	0.049	0.120	7.185	2.435
Unbinned, iter=6	0.002	228.553	-59.177	62.658	0.056	0.121	7.186	2.434
Unbinned, iter=7	0.000	228.553	-59.177	62.653	0.055	0.121	7.186	2.435
Stacked, iter=5	0.032	228.552	-59.176	63.379	0.056	0.122	7.331	2.424

#2 - 03/26/2019 10:37 PM - Knödlseider Jürgen

And here now the analysis of the MSH data. For iter=6 or 7 the size of the 2D Gaussian is comparable to the binned and stacked analyses.

Run	Nobs-Npred	TS	RA	Dec	PA	Minor	Major	Prefactor	Index
Unbinned, iter=5	0.543	877.3	228.547	-59.173	62.352	0.050	0.117	6.943	2.433
Unbinned, iter=6	0.015	905.3	228.547	-59.173	59.001	0.071	0.118	7.479	2.437

iter=6									
Unbinned, iter=7	0.026	905.1	228.544	-59.173	58.286	0.076	0.119	7.600	2.438
Binned, iter=5	132.025	910.0	228.547	-59.173	59.810	0.082	0.123	8.044	2.414
Stacked, iter=5		872.8	228.545	-59.170	58.164	0.071	0.119	7.460	2.403

#3 - 03/27/2019 12:07 PM - Knödseder Jürgen

- Status changed from *In Progress* to *Closed*

- % Done changed from 10 to 100

And here the results for a simulation where the source model was amplified by a factor of 10 over the nominal flux value. Also here it was necessary to move to iter=6 to get morphological results consistent with the simulations and consistent with the stacked analysis results.

Run	Nobs-Npred	TS	RA	Dec	PA	Minor	Major	Prefactor	Index
Simulation			228.547	-59.174	61.961	0.04965	0.11648	69.3	2.45
Unbinned, iter=5	0.234	32417.3	228.548	-59.175	62.038	0.044	0.117	69.4	2.473
Unbinned, iter=6	0.017	32525.3	228.548	-59.175	62.070	0.051	0.118	69.9	2.474
Unbinned, iter=7	0.017	32513.1	228.548	-59.174	62.061	0.050	0.118	69.9	2.473
Stacked, iter=5	53.003	33884.7	228.548	-59.174	61.830	0.051	0.119	70.7	2.454

So the precision was changed to 6, and the code was merged into devel.