ctools - Action #1862

Improve ctbutterfly

10/04/2016 09:26 AM - Ziegler Alexander

Status:	Closed	Start date:	10/04/2016	
Priority:	Normal	Due date:		
Assigned To:	Ziegler Alexander	% Done:	100%	
Category:		Estimated time:	0.00 hour	
Target version:	1.3.0			
Description				
At the moment ctbutterfly only supports pure power law model. Aim is to make it available for arbitrary spectral model types.				

History

#1 - 04/04/2017 06:24 PM - Ziegler Alexander

- % Done changed from 0 to 60

As discussed at the coding sprint, I started to implement as alternative mode to use gaussian error propagation for calculating the butterfly. Now, there is a flag to switch to this alternative calculation scheme: ctbutterfly debug=yes gepmode=yes (gepmode = gaussian error propagation mode).

Default value is gepmode=no and will not be updated.

First comparison to the already implemented method (take envelope of the error ellipse for power law) yields only very small differences at a level of about 1 percent, simulating with the model \$CTOOLS/../ctools/models/crab.xml, using observation time of 1800 seconds. Needs a few more checks and documentation.

#2 - 04/04/2017 06:31 PM - Ziegler Alexander

- File comp.png added

- File diff.png added

Here are the plots from the first check (red and green: the different computation methods, bottom plot shows the relative difference of the butterfly boundaries)





#3 - 04/04/2017 06:32 PM - Knödlseder Jürgen

user#190 wrote:

As discussed at the coding sprint, I started to implement as alternative mode to use gaussian error propagation for calculating the butterfly. Now, there is a flag to switch to this alternative calculation scheme: ctbutterfly debug=yes gepmode=yes (gepmode = gaussian error propagation mode).

Default value is gepmode=no and will not be updated.

I was wondering whether we should not invert the logic, since the Gaussian error propagation is more general, though eventually less accurate. Default would be Gaussian error propagation, and only if a user specifies the "envelope" method the code would switch to the error ellipse envelope method.

To take provision for further evolution, we could have a method string parameter instead of the a bit cryptic gepmode parameter, which by default would be GAUSSIAN and alternatively could be ENVELOPE. This would allow for implementing different methods in the futur. The parameter description would then be

method, s, h, GAUSSIAN, GAUSSIAN|ENVELOPE,,"Butterfly computation method"

First comparison to the already implemented method (take envelope of the error ellipse for power law) yields only very small differences at a level of about 1 percent, simulating with the model \$CTOOLS/../ctools/models/crab.xml, using observation time of 1800 seconds. Needs a few more checks and documentation.

Great ! If the changes are so small it's a further argument for using that method as default.

#4 - 04/05/2017 02:47 PM - Ziegler Alexander

- File overview.pdf added
- % Done changed from 60 to 80

Update:

method, s, h, GAUSSIAN, GAUSSIAN|ENVELOPE,,"Butterfly computation method"
-> implemented, however internally it just steers the flag m_gepmode, which is evaluates to true if method string = Gaussian. Thus the default

mode is gaussian error propagation now.

- changed the computation of scaling factor for the ENVELOPE method. Now its calculated from a Chi2 distribution with 2dof. This should be the appropriate way to calculate it for the ellipse, and yield constant results with gep mode.
- new comparison plots for different confidence levels, shown below. Differences are small (after all the updates).

To do:

- update debug output
- update docu
- check get mode to work for other models than pure power laws

overview.pdf

#5 - 04/05/2017 02:48 PM - Ziegler Alexander

- File deleted (overview.pdf)

#6 - 04/05/2017 02:50 PM - Ziegler Alexander

- File Slide1.png added

Now the new plots should be visible (68, 95, 99 conf. level comparisons)...



#7 - 04/05/2017 03:43 PM - Ziegler Alexander

- File ecpl_logp.png added
- % Done changed from 80 to 90

Progress:

- updated log output, exception message for check_model method
- test log parabola and cutoff power law butterfly computation in gep mode, check plots see below (green=68% c.l., red=99% c.l.)



- Remaining (hours) set to 0.0

Merged into devel.

Files			
comp.png	35.8 KB	04/04/2017	Ziegler Alexander
diff.png	30.4 KB	04/04/2017	Ziegler Alexander
Slide1.png	148 KB	04/05/2017	Ziegler Alexander
ecpl_logp.png	93.2 KB	04/05/2017	Ziegler Alexander