ctools - Bug #2765

cscripts.obutils.residuals may have a floating-point math glitch

11/29/2018 01:56 AM - Kelley-Hoskins Nathan

Status:	Closed		**Start date:**	11/29/2018
Priority:	Low		**Due date:**	
Assigned To:	Knödlseder Jürgen		**% Done:**	100%
Category:			**Estimated time:**	0.00 hour
Target version:	1.7.0			

Description

I've been looking at the statistics of csresmap when using algorithm='SIGNIFICANCE' (calculated here), and I ran into something odd when recreating the calculation in my python script.

The situation is: you're calculating the significance of a bin that has 7 observed counts, and 6.9999999999999... modeled counts (7-<a really small number>).

```
$ python
>>> d = 7
>>> m = d - 1e-14
>>> print(sqrt(d*log(d/m) + m - d))
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
ValueError: math domain error
>>> d*log(d/m) + m - d
-8.881784197001252e-16
```

When calculating the significance (done here in csresmap), the value of

$$d*log(d/m) + m - d$$

becomes negative, and then the sqrt() throws an exception, ruining your wednesday night statistical experiments. I think its due to how python handles long floating point numbers, but I'm not sure.

Just to emphasize, I haven't actually seen this happen yet in csresmap since I don't have enough time to test it out. But I did see this when doing the same calculation with some MC statistical sims in a standalone python script, so I'm marking this as low priority, but it may be worth checking out.

History

#1 - 11/29/2018 01:59 AM - Kelley-Hoskins Nathan

*The next thing that's done with that negative number is square-rooted, which is where the sqrt() comes in.

#2 - 07/15/2020 10:00 PM - Knödlseder Jürgen

- Status changed from New to Pull request

- Assigned To set to Knödlseder Jürgen

- Target version set to 1.7.0

- % Done changed from 0 to 100

Thanks for pointing this out. This looks indeed like a numerical glitch. I force now negative residual values in obsutils.residual() to zero so that no square root error will occur.

#3 - 07/15/2020 10:15 PM - Knödlseder Jürgen

- Status changed from Pull request to Closed

Merged into devel.