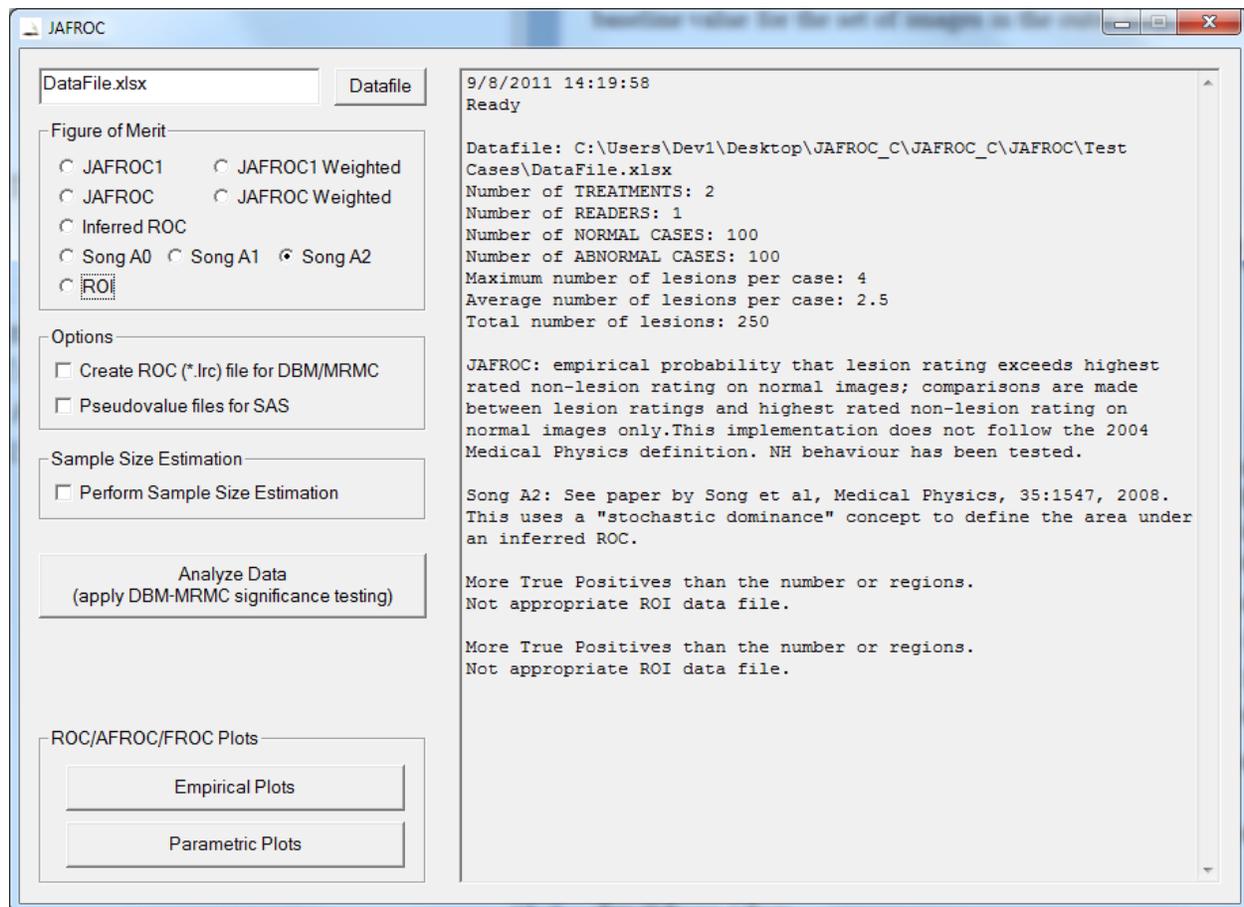9/8/2011

JAFROC 4.1

A new version of JAFROC has been uploaded to the web. This implements the following changes.

1. Additional figures of merit have been implemented. Brief descriptions of how these figures of merit are calculated are shown in the right panel of the GUI. These include standard JAFROC1 and JAFROC as before, weighted JAFROC1 and weighted JAFROC, which implement the exact formulas in my 2004 Medical Physics paper (Med Phys, 31, 2313, 2004). The standard JAFROC1 / JAFROC figures of merit are not an exact implementation, as some of you have reported. The weighted figures of merit are more rigorous in the sense that they give each case equal importance, unlike the non-weighted ones, which give equal importance to each lesion. For datasets with few lesions per case, it does seem to make much difference. But we might as well be more rigorous.

2. Also implemented are three ROC figures of merit proposed by Song et al, Med Phys, 35:1547, 2008, that are derivable from FROC data. The first, termed "Song A0", is uses the highest rating as the inferred ROC rating, and should yield identical results to the

Inferred ROC selection in the GUI. The second, termed "Song A1", uses the average rating as the inferred ROC rating and the third, termed Song A2, uses a "stochastic dominance" concept to define the area under an inferred ROC. Unlike me, Song et al are genuine statisticians. The Song et al paper describes a significance testing method that is applicable to single reader and two modalities (or one modality and two readers). To the best of my knowledge, it does not handle the more general case of multiple readers and multiple modalities. The significance testing, for which I take full responsibility, relies on computing pseudovalues and then applying the DBM-MRMC ANOVA analysis to obtain p-values, etc. The null hypothesis behavior of this remains to be tested, but I believe it will be proven correct.

3. The significance testing method uses a DLL module kindly provided us by Prof. Kevin Berbaum. The output should closely resemble that of DBM-MRMC code available from the University of Iowa website. Since the basic idea behind the analysis is FOM → pseudovalues → ANOVA, I did not see the point of reinventing the ANOVA module, and keeping up with progress by Prof. Steve Hillis and Prof. Berbaum, and thanks to their cooperation, I don't have to. Of course, the results are my responsibility alone.

4. The sample-size estimation procedure does not apply to ROI data; this may be handled in a later update.

5. The plotting routines have been improved. The software now provides both non-parametric plots (think trapezoidal plot) and parametric plots. For multiple readers the average reader plot is also provided. All plots can be saved to CSV files. For parametric plots, the search model fit parameters are provided.

6. Sample datasets, the original text format, the current Excel format, and a simulated ROI dataset, are provided.

7. Full credit for this undertaking goes to Dr. Hong-Jun Yoon (Yes! He has got his degree in Biomedical Engineering.) HJY is currently working on an R implementation, which will be open source to the extent possible. I am converting my coding to R; the main reason is the disappointing performance of the newer IDL software (versions 7 and 8). IDL seems to have given up on us scientific programmers. R is a widely supported platform and a lot of complex programming, e.g., the jackknife routines, are part of standard R.

8. By default the software installs in C:\Program Files\DevChakraborty. The datasets are to be found in C:\Users\Dev1\Documents\JAFROC Data.

9. Good luck, and let me know if you find any bugs.

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