This file,
D:\UserData\z004b0je\OneDrive - Siemens Healthineers\codes\Prostate_MR\Pilot_Study\raw_isup_data_isup_1_202212051318\MRMCResult.pdf,
shows the MRMC ROC analysis results for the data in:
D:\UserData\z004b0je\OneDrive - Siemens Healthineers\codes\Prostate_MR\Pilot_Study\raw_isup_data_isup_1.csv
using iMRMC Version 4.0.3, https://github.com/DIDSR/iMRMC/releases

The data analyzed are based on 7 readers scoring 87 signal-absent cases and 93 signal-present cases in modalities A (named "Aided" in input file) and B (named "Unaided" in input file). In the table below we show the non-parametric (U-statistic) AUC of each reader and the single-reader estimate of standard error. The last row shows the reader-averaged AUC and the MRMC estimate of standard error based on U-statistics [1,2,3]. In the last table, the number of signal-absent and signal-present cases shown correspond to the number of cases read in both modalities.* The study design was fully crossed. When the study design is not fully crossed, we use an extension that can treat arbitrary study designs [3,4].

Modality A				
Reader ID	# of signal-absent	# of signal-present	AUC	AUC_SE
AI	0	0	-1.00	NaN
Reader1	87	93	0.93	2.09E-2
Reader2	87	93	0.94	1.80E-2
Reader3	87	93	0.94	1.83E-2
Reader4	87	93	0.86	2.94E-2
Reader5	87	93	0.84	2.79E-2
Reader6	87	93	0.90	2.25E-2
Reader7	87	93	0.90	2.39E-2
Average	76	81	0.90	2.11E-2

Modality B				
Reader ID	# of signal-absent	# of signal-present	AUC	AUC_SE
AI	0	0	-1.00	NaN
Reader1	87	93	0.90	2.41E-2
Reader2	87	93	0.85	3.03E-2
Reader3	87	93	0.90	2.42E-2
Reader4	87	93	0.75	3.64E-2
Reader5	87	93	0.72	3.70E-2
Reader6	87	93	0.86	2.82E-2
Reader7	87	93	0.81	3.20E-2
Average	76	81	0.83	3.35E-2

Difference between modalities A and B				
Reader ID	# of signal-absent*	# of signal-present*	AUC	AUC_SE
AI	0	0	-1.00	
Reader1	87	93	0.03	1.37E-2
Reader2	87	93	0.09	2.86E-2
Reader3	87	93	0.04	1.71E-2
Reader4	87	93	0.11	3.93E-2
Reader5	87	93	0.12	3.64E-2
Reader6	87	93	0.04	2.70E-2
Reader7	87	93	0.09	2.55E-2
Average	76	81	0.07	1.63E-2

Consider the following hypothesis test:

H0: AUC(ModalityA) equals AUC(ModalityB),
H1: AUC(ModalityA) does not equal AUC(ModalityB),

For the hypothesis test above at 95% significance, we reject the null hypothesis that the AUCs of the two modalities are equal: p-value = 0.00, Confidence Interval = [0.04 , 0.11]. This result is based on the t-statistic = 4.42, each estimated by U-statistics as above. The degrees of freedom of this t-statistic are estimated by an equation motivated by the Satterthwaite approximation [3,5,6].

1. Gallas, B. D. (2006), 'One-Shot Estimate of MRMC Variance: AUC.' Acad Radiol, Vol. 13, (3), 353-362.
2. Gallas, B. D.; Bandos, A.; Samuelson, F. & Wagner, R. F. (2009), 'A Framework for Random-Effects ROC Analysis: Biases with the Bootstrap and Other Variance Estimators.' Commun Stat A-Theory, Vol. 38, (15), 2586-2603.
3. Gallas, B. D. (2013), 'iMRMC v2p8 Application for Analyzing and Sizing MRMC Reader Studies.', Division of Imaging and Applied Mathematics, CDRH, FDA, Silver Spring, MD, https://github.com/DIDSR/iMRMC/releases.
4. Gallas, B. D. & Brown, D. G. (2008), 'Reader Studies for Validation of CAD Systems.' Neural Networks Special Conference Issue, Vol. 21, (2-3), 387-397.
5. Satterthwaite, F. E. (1941), 'Synthesis of Variance.' Psychometrika, Vol. 6, 309-316.
6. Obuchowski, N.; Gallas, B. D. & Hillis, S. L. (2012), 'Multi-Reader ROC Studies with Split-Plot Designs: A Comparison of Statistical Methods.' Acad Radiol, Vol. 19, (12), 1508-1517.