A Unified Model for Joint Normalization and Differential Gene Expression Detection in RNA-Seq data: Supplementary Material

TABLE S1

The area under the curve (AUC) of edgeR-robust, DESeq2, limma-voom, ELMSeq and rSeqRobust on log-normally distributed data. The number of samples is $n = 7$. The variance of the normal distribution is $\sigma_i^2 = 0.01$. The table shows the percent of DE genes (DE %), percent of up-regulated genes among all the DE genes (Up %), as well as the mean AUCs for all four methods measured using 10 simulated replicates. The highest AUC value is shown in bold font. The standard errors of the mean AUCs are given in parentheses.

DE (%)	Up (%)	edgeR - robust	DESeq2	limma - voom	ELMSeq	rSeqRobust
1	50	0.9349	**0.9442**	0.9087	0.9243	0.9277
		(0.0222)	**(0.0134)**	(0.0265)	(0.0154)	(0.0156)
1	75	0.9349	0.9423	**0.9436**	0.9359	0.9315
		(0.0153)	(0.0125)	**(0.0144)**	(0.015)	(0.0147)
1	100	0.907	0.8781	**0.9235**	0.8498	0.8481
		(0.0391)	(0.0456)	**(0.0398)**	(0.0579)	(0.0596)
10	50	0.8743	**0.8772**	0.8687	0.8604	0.864
		(0.0177)	**(0.0171)**	(0.0211)	(0.0194)	(0.0192)
10	75	0.9043	0.8916	**0.9275**	0.8751	0.8729
		(0.0256)	(0.0276)	**(0.0226)**	(0.0329)	(0.0373)
10	100	0.9217	0.8959	0.9174	0.9194	**0.9217**
		(0.0185)	(0.0191)	(0.0233)	(0.0201)	**(0.0205)**
30	50	0.9154	0.9111	**0.9196**	0.8874	0.8937
		(0.0141)	(0.0177)	**(0.0153)**	(0.023)	(0.0224)
30	75	**0.9021**	0.8762	0.8942	0.8777	0.8862
		(0.0324)	(0.0395)	(0.0407)	(0.0458)	(0.0509)
30	100	0.8599	0.8431	0.8658	0.8391	**0.8964**
		(0.0201)	(0.0175)	(0.022)	(0.0265)	**(0.0149)**
50	50	0.9018	**0.9178**	0.9035	0.8978	0.8914
		(0.0187)	**(0.0132)**	(0.0162)	(0.0162)	(0.0252)
50	75	0.8704	0.8681	0.8724	0.8719	**0.9066**
		(0.02)	(0.021)	(0.0182)	(0.027)	**(0.0215)**
50	100	0.7227	0.759	0.7251	0.8133	**0.8809**
		(0.0331)	(0.0278)	(0.0291)	(0.036)	**(0.0268)**
70	50	0.8804	**0.905**	0.8641	0.9004	0.8885
		(0.0247)	**(0.0238)**	(0.0348)	(0.0258)	(0.0301)
70	75	0.8073	0.8202	0.8088	**0.8761**	0.8747
		(0.0275)	(0.0285)	(0.0241)	**(0.0277)**	(0.0227)
70	100	0.4748	0.5097	0.4891	0.4778	**0.9059**
		(0.0507)	(0.0415)	(0.0601)	(0.0614)	**(0.0165)**
90	50	0.8905	**0.9316**	0.8625	0.9094	0.8581
		(0.0299)	**(0.0113)**	(0.0322)	(0.0116)	(0.0433)
90	75	0.6897	0.6534	0.7015	0.6706	**0.7144**
		(0.0485)	(0.0438)	(0.045)	(0.0379)	**(0.0721)**
90	100	0.2229	**0.4989**	0.2818	0.3102	0.411
		(0.04)	**(0.0297)**	(0.0365)	(0.041)	(0.0916)

TABLE S2

THE AREA UNDER THE CURVE (AUC) OF EDGER-ROBUST, DESEQ2, LIMMA-VOOM, ELMSEQ AND RSEQROBUST ON LOG-NORMALLY DISTRIBUTED DATA. THE NUMBER OF SAMPLES IS $n = 200$. THE VARIANCE OF THE NORMAL DISTRIBUTION IS $\sigma_i^2 = 0.01$. THE TABLE SHOWS THE PERCENT OF DE GENES (DE %), PERCENT OF UP-REGULATED GENES AMONG ALL THE DE GENES (UP %), AS WELL AS THE MEAN AUCS FOR ALL FOUR METHODS MEASURED USING 10 SIMULATED REPLICATES. THE HIGHEST AUC VALUE IS SHOWN IN BOLD FONT. THE STANDARD ERRORS OF THE MEAN AUCS ARE GIVEN IN PARENTHESES.

DE (%)	Up (%)	edgeR - robust	DESeq2	limma - voom	ELMSeq	rSeqRobust
1	50	0.9727	0.9861	**0.9906**	0.9864	0.9863
		(0.0077)	(0.0066)	**(0.0051)**	(0.0061)	(0.0063)
1	75	0.9951	**0.9994**	0.9991	0.9986	0.9991
		(0.0032)	**(4e-04)**	(9e-04)	(9e-04)	(8e-04)
1	100	0.9774	0.9892	**0.9939**	0.9811	0.9845
		(0.0089)	(0.0068)	**(0.0026)**	(0.0093)	(0.0135)
10	50	0.9807	0.9889	**0.989**	0.983	0.9847
		(0.0038)	(0.0016)	**(0.0021)**	(0.0026)	(0.0025)
10	75	0.9803	0.9856	0.9889	0.987	**0.9895**
		(0.0037)	(0.0027)	(0.0019)	(0.0023)	**(0.0028)**
10	100	0.9601	0.9568	**0.979**	0.9784	0.9763
		(0.0072)	(0.007)	**(0.0038)**	(0.0052)	(0.0073)
30	50	0.9811	**0.9886**	0.9878	0.9854	0.9864
		(0.002)	**(8e-04)**	(0.002)	(9e-04)	(0.001)
30	75	0.9321	0.946	0.9576	0.9836	**0.9856**
		(0.005)	(0.0036)	(0.0031)	(0.0026)	**(0.0026)**
30	100	0.8313	0.7859	0.8892	0.9725	**0.9809**
		(0.0217)	(0.0072)	(0.0171)	(0.0036)	**(0.0028)**
50	50	0.9836	**0.9904**	0.9856	0.9889	0.9893
		(0.002)	**(0.0016)**	(0.0013)	(0.0013)	(0.0013)
50	75	0.8518	0.8061	0.8857	0.9787	**0.987**
		(0.0218)	(0.011)	(0.0167)	(0.0024)	**(0.002)**
50	100	0.5708	0.5533	0.5863	0.896	**0.9827**
		(0.0356)	(0.0086)	(0.0223)	(0.0078)	**(0.0029)**
70	50	0.9763	**0.9875**	0.97	0.986	0.9871
		(0.0034)	**(0.0013)**	(0.0085)	(0.0022)	(0.0019)
70	75	0.7051	0.5986	0.7466	0.885	**0.9826**
		(0.0226)	(0.0139)	(0.0311)	(0.0109)	**(0.003)**
70	100	0.3702	0.5275	0.3727	0.3825	**0.9864**
		(0.0052)	(0.0097)	(0.013)	(0.0018)	**(0.0028)**
90	50	0.9792	0.9851	0.9766	0.9878	**0.9894**
		(0.0034)	(0.0027)	(0.0035)	(0.0019)	**(0.0016)**
90	75	0.4242	0.5324	0.4887	0.4061	**0.9869**
		(0.0163)	(0.0135)	(0.0205)	(0.0049)	**(0.0018)**
90	100	0.3881	0.5456	0.3553	0.3833	**0.9841**
		(0.003)	(0.0119)	(0.0027)	(0.0026)	**(0.0018)**