1 Linear Weight

$$T = \frac{\sigma_B \mu_A + \sigma_A \mu_B}{\sigma_B + \sigma_A}$$

		True Negative				True Positive			
1st Order	Centralized	41.09	32.95	40.70	**38.25**	100.00	100.00	100.00	**100.00**
	Equalized	37.69	38.89	41.26	**39.28**	62.96	64.00	53.85	**60.27**
2nd Order	Centralized	55.68	46.59	47.96	**50.08**	100.00	100.00	100.00	**100.00**
	Equalized	46.95	44.36	50.96	**47.42**	100.00	100.00	100.00	**100.00**

		1st Order					2nd Order				
		TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized		34	172	89	0	**0.2833**	37	111	146	1	**0.3978**
		33	166	96	0	**0.2845**	39	141	115	0	**0.3562**
		23	178	94	0	**0.2054**	27	122	146	0	**0.3068**
		31	148	116	0	**0.2952**	34	116	145	0	**0.3696**
		26	173	96	0	**0.2311**	34	146	115	0	**0.3178**
Equalized		18	168	99	10	**0.1682**	25	134	136	0	**0.2717**
		17	170	99	9	**0.1596**	31	136	128	0	**0.3131**
		14	161	108	12	**0.1393**	30	140	125	0	**0.3000**
		25	157	98	15	**0.2252**	28	115	152	0	**0.3275**
		18	145	117	15	**0.1837**	23	136	136	0	**0.2527**

2 Square-Root Weight

$$T = \frac{\sqrt{\sigma_B} \mu_A + \sqrt{\sigma_A} \mu_B}{\sqrt{\sigma_B} + \sqrt{\sigma_A}}$$

		True Negative				True Positive			
1st Order	Centralized	97.22	98.15	97.45	**97.61**	100.00	100.00	100.00	**100.00**
	Equalized	68.50	70.59	68.87	**69.32**	19.51	30.43	39.47	**29.80**
2nd Order	Centralized	71.22	73.86	78.68	**74.59**	95.83	96.77	91.89	**94.83**
	Equalized	77.57	81.27	80.59	**79.81**	100.00	100.00	100.00	**100.00**

		1st Order					2nd Order				
		TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized		30	6	259	0	**0.9091**	20	48	227	0	**0.4545**
		35	8	252	0	**0.8974**	24	25	246	0	**0.6575**
		27	7	261	0	**0.8852**	30	48	217	0	**0.5556**
		36	6	253	0	**0.9231**	33	48	214	0	**0.5789**
		23	7	256	0	**0.8679**	32	48	215	0	**0.5714**
Equalized		7	73	194	21	**0.1296**	33	23	239	0	**0.7416**
		11	68	190	26	**0.1897**	27	45	223	0	**0.5455**
		10	90	171	24	**0.1493**	27	66	202	0	**0.4500**
		9	81	181	24	**0.1463**	31	30	234	0	**0.6739**
		5	83	193	14	**0.0935**	24	46	225	0	**0.5106**

3 Logarithmic Weight

$$T = \frac{(ln\sigma_B)\mu_A + (ln\sigma_A)\mu_B}{ln\sigma_B + ln\sigma_A}$$

		True Negative				True Positive			
1st Order	Centralized	99.23	99.25	99.63	**99.37**	55.88	53.57	70.37	**59.94**
	Equalized	95.80	95.04	95.11	**95.32**	9.09	3.03	3.45	**5.19**
2nd Order	Centralized	91.37	94.74	90.49	**92.20**	97.50	68.97	93.75	**86.74**
	Equalized	97.70	99.26	99.26	**98.74**	85.29	95.83	96.00	**92.37**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	13	2	264	16	**0.5909**	23	24	246	2	**0.6389**
	10	2	270	13	**0.5714**	24	16	250	5	**0.6957**
Centralized	29	2	242	22	**0.7073**	23	24	245	3	**0.6301**
	14	2	262	17	**0.5957**	23	32	234	1	**0.6292**
	14	1	263	17	**0.6087**	21	23	248	3	**0.6176**
	1	13	260	21	**0.0556**	35	9	250	1	**0.8750**
	1	13	260	21	**0.0556**	22	5	267	1	**0.8800**
Equalized	2	12	254	17	**0.0930**	27	2	261	5	**0.8852**
	5	13	246	31	**0.1852**	33	8	253	1	**0.8800**
	3	13	253	26	**0.1333**	26	6	261	2	**0.8667**

4 Square-Log Weight

$$T = \frac{(\sqrt{|ln\sigma_B|})\mu_A + (\sqrt{|ln\sigma_A|})\mu_B}{\sqrt{|ln\sigma_B|} + \sqrt{|ln\sigma_A|}}$$

		True Negative				True Positive			
1st Order	Centralized	99.24	99.26	99.25	**99.25**	53.13	52.17	56.67	**53.99**
	Equalized	93.89	94.81	95.45	**94.72**	3.03	8.00	6.45	**5.83**
2nd Order	Centralized	91.92	89.92	88.01	**89.95**	65.71	92.59	85.71	**81.34**
	Equalized	95.88	99.23	97.76	**97.62**	100.00	88.89	100.00	**96.30**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	21	1	260	13	**0.7500**	29	26	240	0	**0.6905**
	15	1	267	12	**0.6977**	28	41	221	5	**0.5490**
Centralized	9	2	263	21	**0.4390**	29	14	249	3	**0.7733**
	11	2	264	18	**0.5238**	28	28	236	3	**0.6437**
	8	2	274	11	**0.5517**	31	18	243	3	**0.7470**
	1	16	249	29	**0.0426**	21	11	263	0	**0.7925**
	5	10	249	31	**0.1961**	24	15	256	0	**0.7619**
Equalized	1	18	250	26	**0.0435**	35	8	252	0	**0.8974**
	2	13	243	37	**0.0741**	25	5	263	2	**0.8772**
	3	12	250	30	**0.1250**	32	4	253	6	**0.8649**

5 Log-Square Weight

$$T = \frac{(ln\sqrt{\sigma_B})\mu_A + (ln\sqrt{\sigma_A})\mu_B}{ln\sqrt{\sigma_B} + ln\sqrt{\sigma_A}}$$

		True Negative				True Positive			
1st Order	Centralized	99.25	99.25	99.62	**99.37**	51.85	40.74	43.33	**45.31**
	Equalized	95.45	93.51	94.93	**94.63**	6.45	6.06	5.26	**5.92**
2nd Order	Centralized	91.70	93.21	89.27	**91.39**	83.33	100.00	94.12	**92.48**
	Equalized	99.62	99.63	97.37	**98.87**	93.10	80.77	96.55	**90.14**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	11	2	263	19	**0.5116**	25	20	248	2	**0.6944**
	7	1	262	25	**0.3500**	25	18	250	2	**0.7143**
Centralized	11	2	272	10	**0.6471**	29	16	248	2	**0.7632**
	11	2	264	18	**0.5238**	23	20	244	8	**0.6216**
	15	2	248	30	**0.4839**	27	20	242	6	**0.6750**
	2	12	253	28	**0.0909**	25	4	264	2	**0.8929**
	0	17	249	29	**0.0000**	28	11	255	1	**0.8235**
Equalized	1	13	250	31	**0.0435**	23	4	263	5	**0.8364**
	2	14	254	25	**0.0930**	21	5	267	2	**0.8571**
	1	13	261	20	**0.0571**	25	1	266	3	**0.9259**

6 Linear Additional Weight

$$T = \frac{\sigma_B(1-\alpha)\mu_A + \sigma_A\alpha\mu_B}{\sigma_B(1-\alpha) + \sigma_A\alpha}$$

		True Negative				True Positive			
1st Order	Centralized	20.44	23.11	22.05	**21.87**	100.00	100.00	96.88	**98.96**
	Equalized	22.26	22.93	23.79	**22.99**	76.19	75.86	80.77	**77.61**
2nd Order	Centralized	17.10	17.60	16.54	**17.08**	100.00	100.00	100.00	**100.00**
	Equalized	17.18	17.23	17.36	**17.26**	100.00	100.00	100.00	**100.00**

		1st Order					2nd Order				
		TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized		34	202	59	0	**0.2519**	29	222	44	0	**0.2071**
		30	202	63	0	**0.2290**	33	217	45	0	**0.2332**
		24	216	55	0	**0.1818**	33	216	46	0	**0.2340**
		31	201	63	0	**0.2357**	33	216	46	0	**0.2340**
		36	202	57	0	**0.2628**	40	207	48	0	**0.2787**
Equalized		23	208	55	9	**0.1749**	25	228	42	0	**0.1799**
		20	206	59	10	**0.1563**	25	225	45	0	**0.1818**
		22	203	65	5	**0.1746**	17	234	44	0	**0.1269**
		15	217	55	8	**0.1176**	34	220	41	0	**0.2361**
		22	210	53	10	**0.1667**	23	228	44	0	**0.1679**

7 Square-Root Additional Weight

$$T = \frac{(\sigma_B\sqrt{1-\alpha})\mu_A + (\sigma_A\sqrt{\alpha})\mu_B}{\sigma_B\sqrt{1-\alpha} + \sigma_A\sqrt{\alpha}}$$

		True Negative				True Positive			
1st Order	Centralized	25.77	24.34	29.30	**26.47**	100.00	100.00	100.00	**100.00**
	Equalized	27.31	26.64	27.76	**27.24**	83.33	77.78	78.13	**79.75**
2nd Order	Centralized	20.91	18.96	19.10	**19.66**	100.00	100.00	100.00	**100.00**
	Equalized	17.74	17.16	17.91	**17.60**	100.00	100.00	100.00	**100.00**

		1st Order					2nd Order				
		TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized		33	193	63	0	**0.2548**	28	219	48	0	**0.2036**
		24	199	72	0	**0.1943**	36	207	52	0	**0.2581**
		38	183	74	0	**0.2934**	36	206	53	0	**0.2590**
		25	201	69	0	**0.1992**	35	205	55	0	**0.2545**
		28	199	68	0	**0.2196**	26	216	53	0	**0.1940**
Equalized		26	190	76	3	**0.2122**	22	224	49	0	**0.1642**
		17	201	70	7	**0.1405**	25	222	48	0	**0.1838**
		22	191	77	5	**0.1833**	26	220	49	0	**0.1912**
		16	200	73	6	**0.1345**	26	224	45	0	**0.1884**
		17	202	71	5	**0.1411**	29	219	47	0	**0.2094**

8 Logarithmic Additional Weight

$$T = \frac{[\sigma_B ln(1-\alpha)]\mu_A + [\sigma_A ln\alpha]\mu_B}{\sigma_B ln(1-\alpha) + \sigma_A ln\alpha}$$

		True Negative				True Positive			
1st Order	Centralized	99.62	99.62	99.61	**99.62**	23.53	25.00	19.44	**22.66**
	Equalized	96.85	96.18	97.73	**96.92**	4.88	3.03	12.90	**6.94**
2nd Order	Centralized	97.72	96.63	98.87	**97.74**	25.00	42.86	48.28	**38.71**
	Equalized	100.00	99.62	100.00	**100.00**	47.83	37.93	46.15	**43.97**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	6	2	267	18	**0.3750**	7	5	264	19	**0.3684**
	10	2	270	13	**0.5714**	7	4	263	21	**0.3590**
Centralized	8	1	262	24	**0.3902**	12	5	265	13	**0.5714**
	11	1	259	24	**0.4681**	7	4	263	21	**0.3590**
	12	1	262	20	**0.5333**	12	2	265	16	**0.5714**
	0	11	252	32	**0.0000**	12	0	262	21	**0.5333**
	0	11	253	31	**0.0000**	10	0	270	15	**0.5714**
Equalized	1	12	258	24	**0.0526**	18	0	254	23	**0.6101**
	2	9	261	23	**0.1111**	10	0	267	18	**0.5263**
	2	9	257	27	**0.1000**	13	0	260	22	**0.5417**

9 Square-Log Additional Weight

$$T = \frac{\mu_A \sigma_B \sqrt{-ln(1-\alpha)} + \mu_B \sigma_A \sqrt{-ln\alpha}}{\sigma_B \sqrt{-ln(1-\alpha)} + \sigma_A \sqrt{-ln\alpha}}$$

		True Negative				True Positive			
1st Order	Centralized	98.47	98.48	98.13	**98.36**	82.35	100.00	100.00	**94.12**
	Equalized	88.93	89.02	89.63	**89.19**	9.09	22.58	16.00	**15.89**
2nd Order	Centralized	96.28	95.09	95.44	**95.60**	73.08	66.67	84.38	**74.71**
	Equalized	99.26	98.49	96.67	**98.14**	91.30	100.00	96.00	**95.77**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	24	2	266	3	**0.9057**	19	12	252	12	**0.6129**
	28	3	264	0	**0.9492**	29	14	248	4	**0.7632**
Centralized	27	4	264	0	**0.9310**	23	14	253	5	**0.7077**
	26	3	265	1	**0.9286**	17	13	256	9	**0.6071**
	31	4	257	3	**0.8986**	18	14	257	6	**0.6429**
	8	25	242	20	**0.2623**	24	10	261	0	**0.8276**
	4	27	243	21	**0.1429**	30	6	258	1	**0.8955**
Equalized	3	32	239	21	**0.1017**	34	9	252	0	**0.8831**
	4	29	229	33	**0.1143**	20	1	262	12	**0.7547**
	1	33	235	26	**0.0328**	34	2	257	2	**0.9444**

10 Log-Square Additional Weight

$$T = \frac{\mu_A \sigma_B ln\sqrt{1-\alpha} + \mu_B \sigma_A ln\sqrt{\alpha}}{\sigma_B ln\sqrt{1-\alpha} + \sigma_A ln\sqrt{\alpha}}$$

		True Negative				True Positive			
1st Order	Centralized	99.24	99.63	99.63	**99.50**	18.18	21.43	18.52	**19.38**
	Equalized	95.91	96.01	95.20	**95.70**	0.00	0.00	0.00	**0.00**
2nd Order	Centralized	98.48	98.43	99.63	**98.85**	25.00	27.50	37.04	**29.85**
	Equalized	100.00	99.27	100.00	**99.76**	32.14	54.55	31.03	**39.24**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
	11	1	262	21	**0.5000**	8	5	259	23	**0.3636**
	5	1	266	23	**0.2941**	9	3	271	12	**0.5455**
Centralized	6	2	264	23	**0.3243**	10	2	267	16	**0.5263**
	6	1	270	18	**0.3871**	16	3	256	20	**0.5818**
	7	0	267	21	**0.4000**	9	6	261	19	**0.4186**
	0	11	262	22	**0.0000**	17	0	254	24	**0.5862**
	1	9	257	28	**0.0513**	6	0	269	20	**0.3750**
Equalized	1	10	258	26	**0.0526**	13	0	264	18	**0.5909**
	0	12	255	28	**0.0000**	15	0	255	25	**0.5455**
	1	10	238	46	**0.0345**	13	0	264	18	**0.5909**

11 Square-Log Combined Weight

$$T = \frac{\mu_A\sqrt{|ln[\sigma_B(1-\alpha)]|} + \mu_B\sqrt{|ln(\sigma_A\alpha)|}}{\sqrt{|ln[\sigma_B(1-\alpha)]|} + \sqrt{|ln(\sigma_A\alpha)|}}$$

		True Negative				True Positive			
1st Order	Centralized	99.26	99.22	99.62	**99.37**	50.00	59.46	39.39	**49.62**
	Equalized	94.70	94.70	95.20	**94.87**	12.90	0.00	4.17	**5.69**
2nd Order	Centralized	94.98	95.17	89.59	**93.25**	87.50	88.46	92.31	**89.42**
	Equalized	97.00	99.23	95.96	**97.40**	100.00	76.47	95.65	**90.71**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized	25	2	256	12	**0.7813**	22	17	250	6	**0.6567**
	15	2	260	18	**0.6000**	23	23	247	2	**0.6479**
	12	1	262	20	**0.5333**	24	15	250	6	**0.6957**
	13	2	267	13	**0.6341**	28	27	235	5	**0.6364**
	12	0	272	11	**0.6857**	21	29	242	3	**0.5676**
Equalized	2	12	256	25	**0.0976**	20	3	270	2	**0.8889**
	2	12	238	43	**0.0678**	43	7	244	1	**0.9149**
	3	11	244	37	**0.1111**	16	1	276	2	**0.9143**
	0	17	245	33	**0.0000**	29	7	259	0	**0.8923**
	3	11	259	22	**0.1538**	27	5	261	2	**0.8852**

12 Log-Square Combined Weight

$$T = \frac{\mu_A ln\sqrt{\sigma_B(1-\alpha)} + \mu_B ln\sqrt{\sigma_A\alpha}}{ln\sqrt{\sigma_B(1-\alpha)} + ln\sqrt{\sigma_A\alpha}}$$

		True Negative				True Positive			
1st Order	Centralized	99.26	99.62	99.64	**99.51**	36.00	45.71	38.89	**40.20**
	Equalized	95.57	95.17	95.51	**95.42**	4.17	0.00	3.57	**2.58**
2nd Order	Centralized	94.31	93.94	94.30	**94.18**	87.10	63.52	78.13	**76.25**
	Equalized	99.62	98.89	99.62	**99.38**	78.79	70.83	75.86	**75.16**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized	12	1	263	19	**0.5455**	24	14	247	10	**0.6667**
	6	1	274	14	**0.4444**	19	20	254	2	**0.6333**
	19	0	248	28	**0.5758**	16	17	256	6	**0.5818**
	19	1	259	16	**0.6909**	21	17	250	7	**0.6364**
	8	0	269	18	**0.4706**	15	14	261	5	**0.6122**
Equalized	3	11	258	23	**0.1500**	23	2	264	6	**0.8519**
	0	13	247	35	**0.0000**	24	0	261	10	**0.8276**
	0	12	257	26	**0.0000**	19	0	272	4	**0.9048**
	2	12	255	26	**0.0952**	15	1	266	13	**0.6818**
	2	11	255	27	**0.0952**	26	3	264	2	**0.9123**

13 Linear Balanced

$$T = \arg\min_{\mu_A \leq T \leq \mu_B} \alpha \cdot \int_{-\infty}^{T} P_B(x)dx + (1-\alpha) \cdot \int_{T}^{+\infty} P_A(x)dx$$

		True Negative				True Positive			
1st Order	Centralized	95.47	88.81	85.50	**89.93**	100.00	96.30	100.00	**98.77**
	Equalized	73.99	80.52	79.85	**78.12**	40.91	30.14	11.11	**27.39**
2nd Order	Centralized	77.70	78.88	76.87	**77.82**	96.15	84.09	96.30	**92.18**
	Equalized	72.35	78.83	77.17	**76.12**	100.00	100.00	100.00	**100.00**

	1st Order					2nd Order				
	TP	FP	TN	FN	F1 Score	TP	FP	TN	FN	F1 Score
Centralized	24	17	254	0	**0.7385**	25	57	210	3	**0.4545**
	30	11	254	0	**0.8451**	30	58	206	1	**0.5042**
	26	33	236	0	**0.6118**	28	59	203	5	**0.4667**
	27	28	240	0	**0.6585**	27	52	216	0	**0.5094**
	32	14	249	0	**0.8205**	32	60	203	0	**0.5161**
Equalized	6	63	199	27	**0.1176**	32	51	212	0	**0.5565**
	13	53	214	15	**0.2766**	35	48	212	0	**0.5932**
	5	66	194	30	**0.0943**	22	36	237	0	**0.5500**
	10	50	212	23	**0.2151**	23	51	221	0	**0.4742**
	3	62	208	22	**0.0667**	38	55	202	0	**0.5802**

Total

	1st Order		2nd Order		
No.	Centralized	Equalized	Centralized	Equalized	Sum
1	0.2410	0.1752	0.3496	0.2930	1.0588
2	0.8965	0.1417	0.5636	0.5843	2.1861
3	0.6148	0.1045	0.6423	0.8774	2.2390
4	0.5924	0.0963	0.6807	0.8388	2.2082
5	0.5033	0.0569	0.6937	0.8672	2.1211
6	0.2322	0.1580	0.2001	0.1785	0.7688
7	0.2323	0.1623	0.2338	0.1874	0.8158
8	0.4676	0.0527	0.4458	0.5566	1.5227
9	0.9226	0.1508	0.6668	0.8611	2.6013
10	0.3811	0.0277	0.4872	0.5195	1.4155
11	0.6469	0.0861	0.6409	0.8991	2.2730
12	0.5454	0.0681	0.6261	0.8357	2.0753
13	0.7349	0.1541	0.4902	0.5508	1.9300

Order:
9 > 11 > 3 > 4 > 2 > 5 > 12 > 13 > 8 > 10 > 1 > 7 > 6

Test with Gaussian Data

	F1	False Rate(%)
1	0.5810	17.12
2	0.5718	18.06
3	0.3860	31.50
4	0.5515	19.31
5	0.3811	30.31
6	0.3515	36.16
7	0.4510	26.54
8	0.5523	13.32
9	0.5791	14.71
10	0.5578	13.23
11	0.5600	17.98
12	0.2808	27.01
13	0.6072	12.69