

Supplementary Materials

The support information of the optimal set of β parameters of margin (α) 1.0 for MIN2Net in subject-dependent and subject-independent manners.

TABLE I

Classification performance (Accuracy \pm SD and F1-score \pm SD) in % of subject-dependent manner. Bold denotes the best numerical values.

β_1	β_2	β_3	BCIC IV 2a		SMR BCI		OpenBMI	
			Accuracy	F1-score	Accuracy	F1-score	Accuracy	F1-score
0.1	0.1	0.1	63.23 \pm 12.63	63.17 \pm 13.64	63.83 \pm 15.74	60.04 \pm 18.21	60.71 \pm 13.89	63.16 \pm 13.97
0.1	0.1	0.5	63.04 \pm 14.94	62.93 \pm 16.32	66.10 \pm 15.25	63.23 \pm 17.48	61.16 \pm 15.27	63.57 \pm 15.43
0.1	0.1	1.0	63.40 \pm 15.65	63.45 \pm 16.51	65.90 \pm 16.50	64.13 \pm 17.66	60.53 \pm 15.65	62.91 \pm 16.04
0.1	0.5	0.1	59.60 \pm 11.79	58.75 \pm 13.16	60.95 \pm 16.19	57.25 \pm 18.44	60.24 \pm 14.05	63.13 \pm 13.82
0.1	0.5	0.5	64.54 \pm 14.65	63.97 \pm 15.92	65.45 \pm 16.41	61.32 \pm 19.40	60.96 \pm 14.33	63.36 \pm 14.70
0.1	0.5	1.0	63.67 \pm 14.80	63.42 \pm 16.22	65.79 \pm 15.75	62.74 \pm 17.82	60.71 \pm 14.94	63.38 \pm 15.06
0.1	1.0	0.1	57.69 \pm 11.57	55.90 \pm 13.85	60.12 \pm 16.01	58.03 \pm 17.68	58.21 \pm 13.10	61.18 \pm 13.36
0.1	1.0	0.5	61.36 \pm 13.16	60.24 \pm 14.95	63.38 \pm 18.19	60.30 \pm 20.28	60.63 \pm 14.55	62.98 \pm 14.83
0.1	1.0	1.0	63.18 \pm 14.13	62.20 \pm 16.14	65.81 \pm 16.70	61.88 \pm 19.37	60.93 \pm 14.66	63.37 \pm 14.99
0.5	0.1	0.1	59.34 \pm 10.01	59.29 \pm 10.81	63.31 \pm 15.08	59.94 \pm 17.31	58.98 \pm 13.06	60.73 \pm 13.75
0.5	0.1	0.5	62.81 \pm 13.99	63.40 \pm 15.06	65.38 \pm 15.46	61.25 \pm 18.31	61.12 \pm 14.43	63.38 \pm 14.61
0.5	0.1	1.0	63.50 \pm 14.78	63.64 \pm 16.23	64.67 \pm 16.46	61.81 \pm 18.83	61.22 \pm 15.03	63.46 \pm 15.13
0.5	0.5	0.1	58.35 \pm 10.56	57.67 \pm 11.76	60.55 \pm 15.66	57.52 \pm 18.21	57.68 \pm 12.66	59.85 \pm 13.25
0.5	0.5	0.5	62.61 \pm 12.99	62.59 \pm 14.23	63.71 \pm 15.92	59.56 \pm 18.61	60.49 \pm 13.72	62.98 \pm 13.76
0.5	0.5	1.0	63.77 \pm 13.99	63.62 \pm 15.00	64.17 \pm 16.00	60.29 \pm 18.71	61.03 \pm 14.47	63.59 \pm 14.53
0.5	1.0	0.1	58.44 \pm 10.07	57.32 \pm 11.77	56.00 \pm 14.11	51.71 \pm 17.99	56.35 \pm 11.78	62.50 \pm 14.16
0.5	1.0	0.5	63.06 \pm 12.96	61.82 \pm 14.44	58.76 \pm 13.79	54.93 \pm 17.46	58.68 \pm 13.41	60.98 \pm 14.07
0.5	1.0	1.0	63.87 \pm 13.84	63.11 \pm 15.31	60.14 \pm 14.78	55.52 \pm 18.25	59.28 \pm 13.70	61.75 \pm 14.18
1.0	0.1	0.1	56.81 \pm 8.08	56.93 \pm 10.62	59.98 \pm 13.81	55.51 \pm 17.97	56.69 \pm 12.27	58.15 \pm 13.16
1.0	0.1	0.5	62.21 \pm 12.72	63.10 \pm 14.23	62.81 \pm 14.46	58.12 \pm 18.76	60.31 \pm 13.73	62.50 \pm 14.16
1.0	0.1	1.0	63.46 \pm 14.33	64.28 \pm 15.27	63.12 \pm 15.11	59.10 \pm 18.69	60.61 \pm 14.28	63.13 \pm 14.44
1.0	0.5	0.1	58.40 \pm 10.01	57.88 \pm 11.19	56.05 \pm 13.92	51.75 \pm 17.79	56.36 \pm 12.07	58.29 \pm 13.34
1.0	0.5	0.5	61.23 \pm 10.96	60.86 \pm 12.10	61.02 \pm 13.69	56.11 \pm 17.90	59.40 \pm 13.29	61.31 \pm 14.06
1.0	0.5	1.0	63.94 \pm 13.39	64.14 \pm 13.99	61.83 \pm 13.99	56.93 \pm 18.19	60.18 \pm 13.74	62.41 \pm 14.29
1.0	1.0	0.1	58.30 \pm 10.27	57.63 \pm 11.31	55.98 \pm 13.62	51.69 \pm 17.68	56.16 \pm 11.50	58.02 \pm 12.89
1.0	1.0	0.5	61.88 \pm 11.36	60.51 \pm 12.91	60.00 \pm 13.62	54.71 \pm 18.50	58.36 \pm 13.10	60.38 \pm 13.95
1.0	1.0	1.0	62.39 \pm 12.62	61.94 \pm 13.71	61.19 \pm 13.13	55.91 \pm 17.62	59.78 \pm 13.73	61.90 \pm 14.33

TABLE II

Classification performance (Accuracy \pm SD and F1-score \pm SD) in % of subject-independent manner. Bold denotes the best numerical values.

β_1	β_2	β_3	BCIC IV 2a		SMR BCI		OpenBMI	
			Accuracy	F1-score	Accuracy	F1-score	Accuracy	F1-score
0.1	0.1	0.1	58.81 \pm 8.76	43.39 \pm 23.51	58.07 \pm 11.86	56.10 \pm 24.06	71.59 \pm 13.94	71.95 \pm 14.75
0.1	0.1	0.5	59.17 \pm 8.34	50.28 \pm 18.35	57.64 \pm 12.80	58.07 \pm 23.21	71.45 \pm 14.24	71.97 \pm 14.40
0.1	0.1	1.0	57.62 \pm 8.16	46.87 \pm 20.60	58.71 \pm 12.18	60.82 \pm 20.14	71.40 \pm 14.35	71.94 \pm 14.51
0.1	0.5	0.1	55.09 \pm 7.35	38.30 \pm 24.19	57.76 \pm 11.80	57.09 \pm 24.45	69.79 \pm 14.49	69.36 \pm 15.74
0.1	0.5	0.5	58.02 \pm 9.05	45.10 \pm 22.86	60.00 \pm 13.04	60.58 \pm 22.04	70.02 \pm 14.53	69.40 \pm 16.45
0.1	0.5	1.0	57.78 \pm 8.31	44.05 \pm 22.07	58.71 \pm 12.52	60.72 \pm 20.57	71.13 \pm 13.97	71.51 \pm 14.13
0.1	1.0	0.1	52.89 \pm 7.87	54.16 \pm 18.23	59.79 \pm 13.72	61.10 \pm 23.64	69.54 \pm 14.28	68.83 \pm 15.80
0.1	1.0	0.5	53.49 \pm 7.05	40.93 \pm 26.35	58.07 \pm 11.36	58.40 \pm 21.67	69.86 \pm 14.22	69.32 \pm 15.74
0.1	1.0	1.0	53.87 \pm 7.38	36.79 \pm 23.55	59.50 \pm 13.03	60.57 \pm 22.31	69.95 \pm 14.58	69.35 \pm 16.39
0.5	0.1	0.1	57.89 \pm 8.42	37.33 \pm 25.69	59.38 \pm 12.87	56.70 \pm 26.25	62.43 \pm 14.61	61.88 \pm 15.24
0.5	0.1	0.5	59.10 \pm 8.64	43.27 \pm 23.35	59.10 \pm 13.50	58.32 \pm 24.60	71.85 \pm 14.18	71.35 \pm 15.98
0.5	0.1	1.0	60.03 \pm 9.24	49.09 \pm 23.28	58.52 \pm 12.91	58.82 \pm 22.89	71.83 \pm 13.95	71.25 \pm 15.35
0.5	0.5	0.1	57.65 \pm 8.08	37.54 \pm 25.74	57.90 \pm 11.16	56.79 \pm 23.30	70.89 \pm 14.13	71.46 \pm 14.09
0.5	0.5	0.5	58.21 \pm 8.87	42.65 \pm 23.81	58.86 \pm 12.58	56.13 \pm 25.06	71.30 \pm 14.04	72.15 \pm 13.76
0.5	0.5	1.0	59.14 \pm 8.79	47.03 \pm 21.61	58.81 \pm 14.01	58.18 \pm 23.42	72.03 \pm 14.04	72.62 \pm 14.14
0.5	1.0	0.1	57.69 \pm 7.54	39.64 \pm 23.36	58.21 \pm 11.86	57.68 \pm 22.22	70.47 \pm 13.59	71.07 \pm 13.80
0.5	1.0	0.5	58.02 \pm 7.53	41.43 \pm 23.78	58.88 \pm 11.74	57.75 \pm 23.18	70.45 \pm 13.87	70.77 \pm 14.28
0.5	1.0	1.0	58.40 \pm 8.52	45.02 \pm 21.63	59.60 \pm 12.63	58.46 \pm 22.85	70.83 \pm 13.63	70.99 \pm 13.97
1.0	0.1	0.1	55.91 \pm 6.70	34.63 \pm 24.83	57.26 \pm 10.06	54.40 \pm 23.60	54.52 \pm 11.08	54.17 \pm 11.57
1.0	0.1	0.5	58.18 \pm 8.70	40.77 \pm 25.77	58.00 \pm 11.06	56.38 \pm 24.07	71.12 \pm 14.55	71.42 \pm 15.02
1.0	0.1	1.0	59.20 \pm 8.20	45.32 \pm 23.50	58.50 \pm 11.28	57.52 \pm 23.90	72.20 \pm 14.19	72.40 \pm 14.70
1.0	0.5	0.1	58.27 \pm 8.64	38.16 \pm 26.01	58.05 \pm 11.31	57.61 \pm 21.90	70.50 \pm 13.92	71.27 \pm 14.26
1.0	0.5	0.5	58.84 \pm 8.61	42.66 \pm 23.50	60.12 \pm 12.22	58.41 \pm 23.23	70.66 \pm 13.80	70.98 \pm 14.41
1.0	0.5	1.0	59.10 \pm 9.39	43.13 \pm 25.48	59.40 \pm 11.67	58.41 \pm 23.11	71.19 \pm 13.67	71.50 \pm 14.07
1.0	1.0	0.1	58.26 \pm 8.64	38.33 \pm 25.80	57.74 \pm 10.48	57.56 \pm 21.05	70.26 \pm 13.59	71.05 \pm 13.60
1.0	1.0	0.5	57.95 \pm 7.76	38.65 \pm 24.68	59.14 \pm 11.34	58.22 \pm 22.10	70.56 \pm 13.33	70.86 \pm 13.60
1.0	1.0	1.0	58.55 \pm 8.99	43.96 \pm 22.80	60.69 \pm 13.04	58.25 \pm 25.13	70.86 \pm 13.66	71.14 \pm 14.03