Supplementary Materials

Of

Benefits of Deep Learning Classification of Continuous Noninvasive Brain-Computer Interface Control

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Statistical Tables

|	DF	RD	Mean RD	F	p-value	significance
Session	10	5.58	0.56	17.08	<0.00001	***
Model Type	3	19.47	6.49	198.66	<0.00001	***
Type:Task	30	0.78	0.026	0.79	0.78	

Table S1 | Parameters and statistics for modeling probability of correct class membership A significant main effect of model type was observed when modeling the probability of correct class membership. Independent variables include model type (4 Levels: CSP-All, CSP-Motor, CNN-All, CNN-Motor) and session (11 levels).

	Estimate	Std. Error	t-value	p-value	significance
(intercept)	18868926	38639	48.37	<0.00001	***
CNN-All	-546597	51449	-10.62	<0.00001	***
CSP-Motor	-114792	51449	-2.23	0.027	*
CNN-Motor	-407927	51449	-7.93	<0.00001	***

Table S2 | Parameters and statistics for modeling area under the curve A Wald test rejected the null hypothesis that all model types have the same rank. Overall Wald test: 145.44, P<0.00001.

	Estimate	Std. Error	t-value	p-value	significance
(intercept)	2.52	0.045	56.10	<0.00001	***
CNN-All	-0.37	0.054	-6.82	<0.00001	***
CSP-Motor	-0.023	0.054	-0.43	0.67	
CNN-Motor	-0.044	0.054	-0.81	0.42	

Table S3 | Parameters and statistics for modeling average trial length A Wald test rejected the null hypothesis that all model types have the same rank. Overall Wald test: 62.30, P<0.00001.
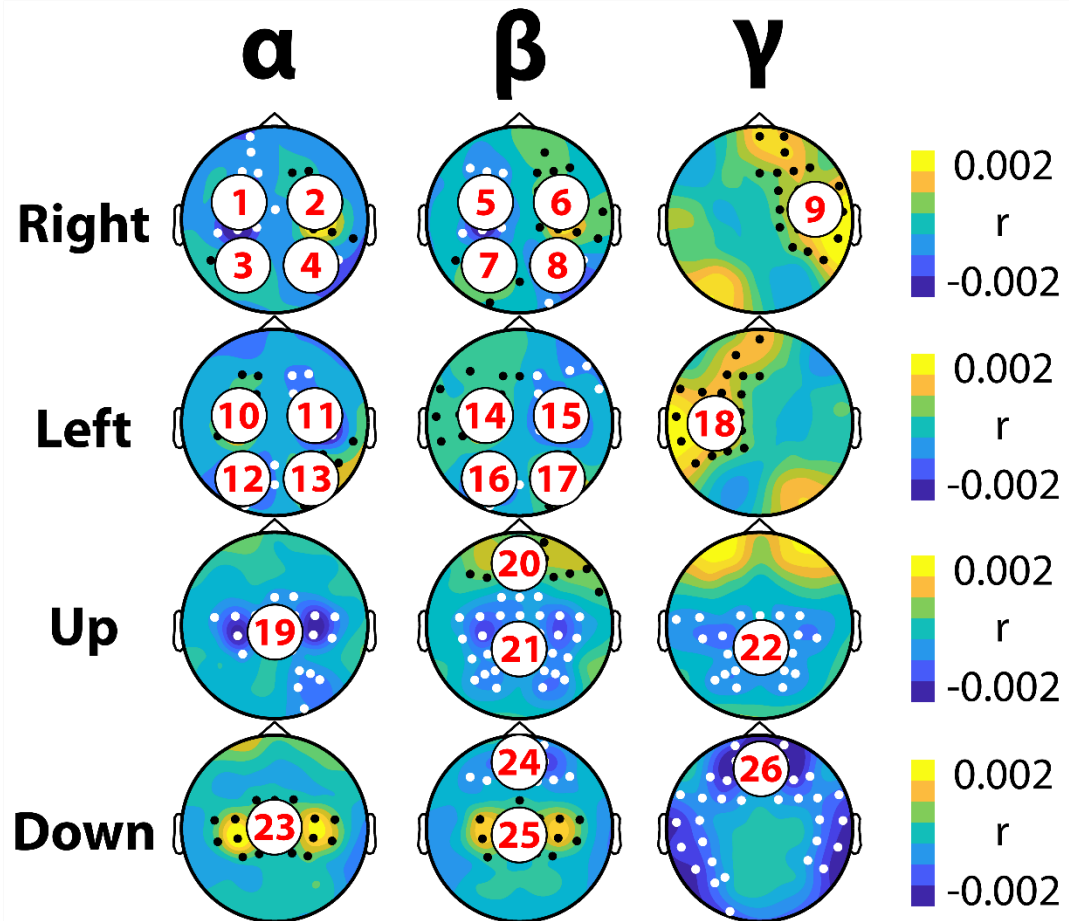
Figure S2 | Feature Importance Maps Display Multiple Biomarkers Used in Continuous BCI Control. Using the input-perturbation network-prediction correlation method, feature importance maps were created for each motor imagery strategy. Warm colors occur when increases in power over these areas increase the classification accuracy, while cool colors occur when decreases in power increase the classification accuracy (or vice-versa). Black dots represent significant clusters of positive correlation and white dots represent significant clusters of negative correlation. All clusters had a significance level lower than the Bonferroni threshold for multiple comparisons (P<0.0042). Cluster labels (red numbers) represent the rows in Table S4.

Cluster Number	Trial type	Power Band	Location	Sign	cluster stat maxsum(t_{60})	p-value	significance
1	Right	Alpha	L-Motor	-	-45.29	0.0002	***
2	Right	Alpha	R-Motor	+	37.56	0.0002	***
3	Right	Alpha	L-Occipital	+	32.30	0.0002	***
4	Right	Alpha	R-Occipital	-	-34.00	0.0002	***
5	Right	Beta	L-Motor	-	-42.07	0.0002	***
6	Right	Beta	R-Motor	+	61.90	0.0002	***
7	Right	Beta	L-Occipital	+	43.06	0.0002	***
8	Right	Beta	R-Occipital	-	-23.96	0.0004	***
9	Right	Gamma	R-Temporal/Frontal	+	92.96	0.0008	***
10	Left	Alpha	L-Motor	+	47.60	0.0002	***
11	Left	Alpha	R-Motor	-	-42.01	0.0002	***
12	Left	Alpha	L-Occipital	-	-28.44	0.0002	***
13	Left	Alpha	R-Occipital	+	29.83	0.0004	***
14	Left	Beta	L-Motor	+	52.90	0.0002	***
15	Left	Beta	R-Motor	-	-58.94	0.0002	***
16	Left	Beta	L-Occipital	-	-24.09	0.0006	***
17	Left	Beta	R-Occipital	+	39.10	0.0002	***
18	Left	Gamma	L-Temporal/Frontal	+	89.65	0.0006	***
19	Up	Alpha	Motor/R-Occipital	-	-68.03	0.0002	***
20	Up	Beta	Frontal	+	38.66	0.0002	***
21	Up	Beta	Motor/Occipital	-	-99.45	0.0002	***
22	Up	Gamma	Motor/Occipital	-	-69.31	0.003	**
23	Down	Alpha	Motor	+	77.99	0.0002	***
24	Down	Beta	Frontal	-	-37.95	0.0002	***
25	Down	Beta	Motor	+	71.28	0.0002	***
26	Down	Gamma	Frontal/Temporal	-	-164.99	0.0002	***

Table S4 | Feature Importance Maps Display Multiple Biomarkers Used in Continuous BCI Control. Unique band power measures were found to correlate significantly differently with classification accuracy depending on the motor imagery strategy employed. All clusters had a significance level lower than the Bonferroni threshold for multiple comparisons (P<0.0042).