Supplementary material

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1. Supplementary Tables

Table 1: Notation

Parameter	Shape	Notation	Shape notation
Number of MEG channels	*scalar*	n	
Number discretized time-points	*scalar*	t	
Number of latent sources	*scalar*	k	
Temporal filter length	*scalar*	l	
Number of classes	*scalar*	m	
Input shape	$204 \times 64/189$[1]	$\mathbf{X}$	$n \times t$
(De)-mixing matrix	204×32	$\mathbf{C}$	$n \times k$
Temporal convolution kernel	$7 \times 32(\times 32)$[2]	$\mathbf{A}$	$l \times k(\times k)$

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[1] Input time segment length in Experiments 1 and 2, respectively.
[2] Additional third dimension used in VAR-CNN.

Table 2: Comparisons in across-subject classification accuracy between LF-CNN, VAR-CNN and the benchmark models in a 5-class sensory stimulation task. Statistical significance estimated using a paired t-test. * - $p < 0.05$; ** - $p < 0.005$

	LF-CNN			VAR-CNN		
Model	validation (%)	test (%)	test+upd (%)	validation (%)	test (%)	test+upd (%)
Linear-SVM	1.68*	2.93	6.26**	2.55**	5.72**	7.30**
RBF-SVM	1.40*	0.36	9.31**	2.28**	3.15*	10.3**
ShallowFBCSP-CNN	9.67**	23.0**	n.a.	10.5**	25.8**	n.a.
EEGNET-8	6.24**	6.28*	4.07**	7.12**	9.06**	5.10**
VGG19	14.5**	13.1**	19.4**	15.4**	5.40**	13.8**

Table 3: Comparisons in across-subject classification accuracy between LF-CNN, VAR-CNN and the benchmark models in a 3-class motor imagery task. Statistical significance estimated using a paired t-test. * - $p < 0.05$; ** - $p < 0.005$

	LF-CNN			VAR-CNN		
Model	validation (%)	test (%)	test+upd (%)	validation (%)	test (%)	test+upd (%)
Linear-SVM	7.52**	6.03**	8.58**	9.83**	8.37**	10.89**
RBF-SVM	4.13**	0.20	6.31**	6.44**	2.54*	8.62**
ShallowFBCSP-CNN	20.57**	20.31**	n.a.	22.87**	22.66**	n.a.
EEGNET-8	3.73**	2.17	−0.94	6.03**	4.51**	1.38*
VGG19	13.33**	14.25**	23.29**	15.64**	16.59**	25.60**

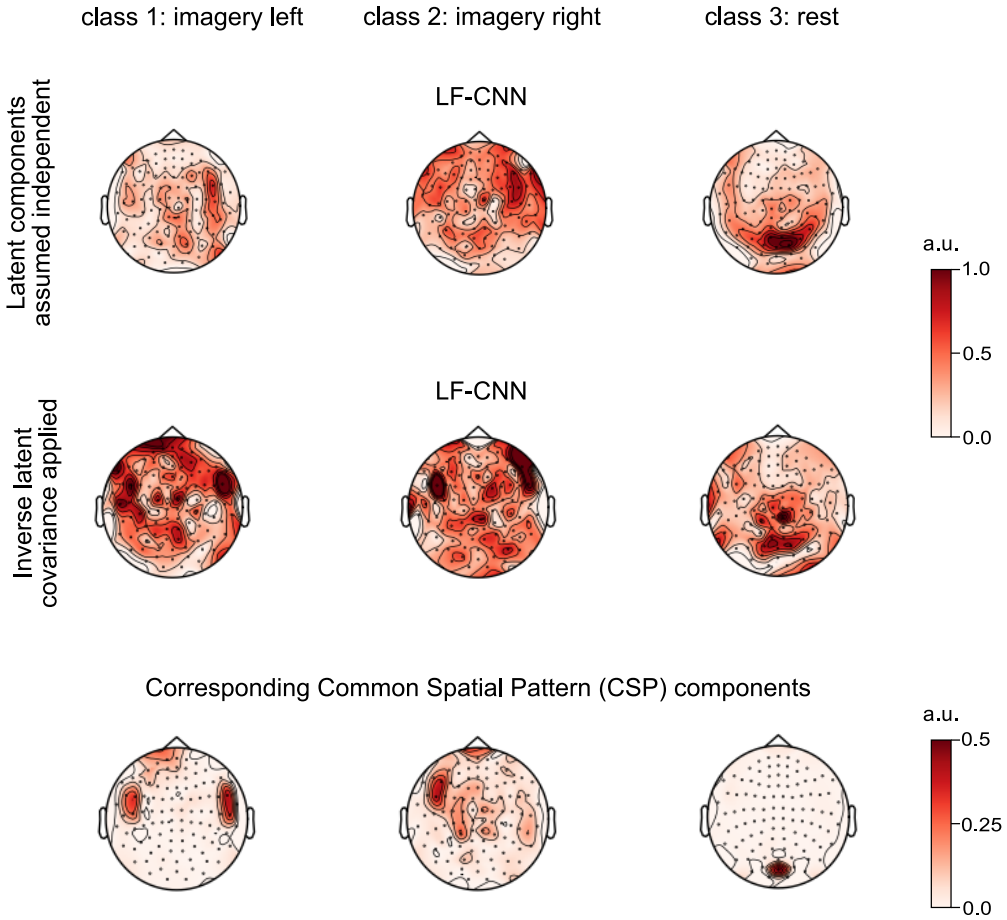

Figure 1: Spatial patterns extracted from LF-CNN model (top and middle row) and CSP (bottom row) trained on pooled data from all subjects in Experiment 2. **Top.** Spatial Patterns obtained by multiplying spatial extraction filters from the linear input layer with the covariance matrix of the data **Middle.** Spatial Patterns obtained by multiplying spatial extraction filters from the linear input layer with the (spatial) covariance matrix of the data and the inverse of the covariance matrix of the latent components. **Bottom.** Corresponding spatial patterns obtained using the Common Spatial Pattern (CSP) approach.