Cognitive Task	Stimuli	Description
Working Memory	2BK-0BK	remembering two pictures back versus the current one
	BODY-AVG	presented body parts versus other visual objects
	FACE-AVG	presented faces versus other visual objects
	PLACE-AVG	presented places versus other visual objects
	TOOL-AVG	presented tools versus other visual objects
Gambling	PUNISH	loss trials when asked to guess a range of a number.
	REWARD	reward trials when asked to guess a range of a number.
MOTOR	LF-AVG	Left foot movement versus other movements
	LH-AVG	Left hand movements versus other movements
	RF-AVG	Right foot movements versus other movements
	RH-AVG	Right hand movements versus other movements
	T-AVG	Tongue movements versus other movements
Language	MATH	complete addition and subtraction problems
	STORY	asked questions about topic of the story
Relational	MATCH	decide if objects match
	REL	find differences between objects
Emotion	FACES	decide which two faces match
	SHAPES	decide which two shapes match
Social	RANDOM	presented video clips where objects moved randomly
	TOM	presented video clips where objects interacted

Table A.1. Cognitive tasks and contrasts used for supervised classification for the neuroimaging data set

Cognitive Task	Stimuli	Description
Working Memory	2BK-0BK	remembering two pictures back versus the current one
Gambling	PUNISH	loss trials when asked to guess a range of a number.
	REWARD	reward trials when asked to guess a range of a number.
Relational	MATCH	decide if objects match
	REL	find differences between objects
Emotion	FACES	decide which two faces match
	SHAPES	decide which two shapes match
Social	TOM	presented video clips where objects interacted

Table A.2. Cognitive tasks and contrasts used for supervised classification for the neuroimaging data set

r : number of samples used for each Φ	b: number of projection matrices	Accuracy
10	100	79.88 ± 0.53
10	500	78.28 ± 0.54
50	100	79.24 ± 0.66
50	500	78.05 ± 1.04
50	1500	78.82 ± 0.79
100	100	78.84 ± 0.82
100	500	77.97 ± 0.823
100	1500	78.50 ± 0.68
200	100	78.30 ± 0.19
200	500	78.46 ± 0.30
200	1500	78.66 ± 0.60

Table A.3. Average and standard deviation of accuracy results of feature grouping for HCP dataset with sample size of 330 for different r and b values using logistic regression.

Cluster % ($100 * k/p$)	Test Accuracy (%)	
	no noise	high noise
0.01	41.91 ± 1.10	43.24 ± 0.92
0.1	74.50 ± 0.47	67.25 ± 0.54
1	84.12 ± 0.47	76.00 ± 0.68
10	87.37 ± 0.29	77.93 ± 0.38
20	87.37 ± 0.23	78.05 ± 0.22
40	87.57 ± 0.17	75.95 ± 0.49
80	87.10 ± 0.19	72.28 ± 0.49

Table A.4. Average and standard deviation of accuracy results of feature grouping for HCP dataset with sample size of 330 for different k values using logistic regression.