

Figure S1 GM atrophy in older individuals with WMLs. (A) GM atrophy in individuals with VaD *vs.* CH. (B) GM atrophy in individuals with VaD *vs.* VaMCI. A one-way ANCOVA test, adjusted for age, gender, and education levels, was used to test differences in the GM images for the 3 groups. A P value of <0.05 was considered significant. Family-discovery rate (FDR) corrected. GM, gray matter; WMLs, white matter lesions; VaD, vascular dementia; VaMCI, vascular mild cognitive impairment; ANCOVA, analysis of covariance; CH, good cognitive health.

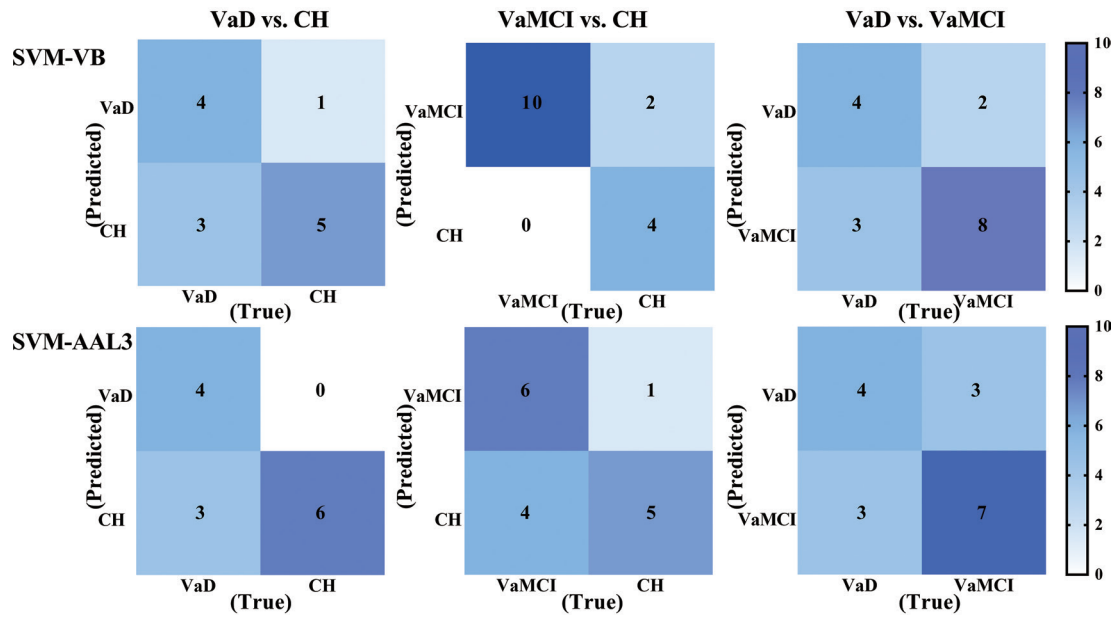


Figure S2 Confusion matrices of SVM predictions in the testing set. The first row shows SVM classifiers using VB data, and the second row is SVM classifiers using AAL3 data. The left column shows SVM models classifying VaD and CH, the middle column shows the classification of VaMCI *vs.* CH, and the right column shows VaD *vs.* VaMCI. SVM, support vector machine; VB, voxel-based; AAL3, automated anatomical labelling atlas 3; VaD, vascular dementia; CH, good cognitive health; VaMCI, vascular mild cognitive impairment.

Table S1 The 5 most relevant regions for the RVR models using on VB data

Method	Neuropsychological Tests	Regions	Importance (%)	ER
RVR_VB	MMSE	Cingulate_Post_R	1.58	2.05
		Thal_PuA_L	1.54	2.52
		N_Acc_R	1.49	3.36
		Thal_PuL_L	1.46	5.91
		Temporal_Pole_Mid_L	1.34	6.29
	MoCA	N_Acc_R	1.68	1.14
		SN_pr_L	1.47	2.75
		Rolandic_Oper_R	1.42	3.77
		Thal_MDI_R	1.33	5.41
		Thal_LGN_L	1.32	6.52
	Visuospatial/Executive	Thal_VPL_R	1.70	1.14
		Heschl_R	1.53	2.36
		Frontal_Inf_Oper_L	1.35	4.82
		Thal_PuL_R	1.33	7.09
		Thal_VL_R	1.33	5.80
	Attention	N_Acc_R	2.10	1.09
		SN_pr_L	1.69	2.41
		Thal_LP_R	1.60	3.14
		Thal_AV_R	1.53	4.48
		Thal_MDI_L	1.40	6.50
	Delayed recall	Thal_PuL_R	2.43	1.02
		Thal_MDI_R	1.96	2.36
		Thal_MDm_R	1.89	3.38
		Thal_PuA_R	1.85	3.70
		Thal_PuM_R	1.82	4.50
	Orientation	Thal_PuA_L	1.51	1.86
		N_Acc_R	1.47	2.68
		Thal_PuM_R	1.44	3.29
		Thal_LGN_R	1.43	3.50
		Thal_MGN_R	1.33	5.63

ER, expected ranking; RVR, relevance vector regression; VB, voxel-based; R, right; L, left; Cingulate_Post, posterior cingulate gyrus; Thal_PuA, pulvinar anterior; N_Acc, nucleus accumbens; Thal_PuL, pulvinar lateral; Temporal_Pole_Mid, temporal pole: middle temporal gyrus; SN_pr, substantia nigra (pars reticulata); Rolandic_Oper, rolandic operculum; Thal_MDI, mediodorsal lateral parvocellular; Thal_LGN, lateral geniculate; Thal_VPL, ventral posterolateral; Heschl, Heschl's gyrus; Frontal_Inf_Oper, inferior frontal gyrus (opercular part); Thal_VL, ventral lateral; Thal_LP, lateral posterior; Thal_AV, Thalamus & Anteroventral Nucleus; Thal_MDm, mediodorsal medial magnocellular; Thal_PuM, pulvinar medial; Thal_MGN, medial geniculate.

Table S2 the 5 most relevant regions for the RVR models using AAL3 data

Method	Neuropsychological Tests	Regions	Importance (%)	ER
RVR_AAL3	MMSE	Paracentral_Lobule_L	2.16	1.27
		Temporal_Pole_Mid_L	1.81	2.16
		Temporal_Pole_Mid_R	1.40	4.21
		Fusiform_L	1.39	4.32
		Caudate_L	1.36	5.36
	MoCA	Paracentral_Lobule_L	1.71	1.96
		N_Acc_R	1.57	2.04
		Caudate_L	1.36	3.75
		Fusiform_L	1.34	4.21
		Caudate_R	1.33	4.93
	Visuospatial/Executive	Temporal_Pole_Mid_L	1.78	1.95
		Paracentral_Lobule_L	1.73	2.57
		Amygdala_L	1.71	2.98
		Paracentral_Lobule_R	1.71	3.32
		Fusiform_L	1.46	5.09
	Attention	Paracentral_Lobule_L	1.74	2.09
		Thal_MDI_L	1.66	2.05
		Thal_MDm_L	1.54	4.34
		N_Acc_R	1.51	4.18
		Thal_PuL_R	1.45	5.04
	Delayed recall	Thal_PuL_R	1.95	1.30
		Thal_MDm_R	1.82	2.11
		Thal_MDI_R	1.74	3.05
		Postcentral_R	1.48	5.38
		Paracentral_Lobule_R	1.46	5.80
Orientation	Paracentral_Lobule_L	2.22	1.00	
	N_Acc_R	1.83	1.95	
	Caudate_R	1.46	3.09	
	Caudate_L	1.36	4.32	
	Temporal_Pole_Mid_R	1.29	5.41	

RVR, relevance vector regression; AAL3, automated anatomical labelling atlas 3; Paracentral_Lobule, paracentral lobule; Fusiform, fusiform gyrus; Caudate, caudate nucleus; Postcentral, postcentral gyrus.

Table S3 The 5 most relevant regions for the classifiers using VB data

Classification	SVM			GPC		
	Region	Importance (%)	ER	Region	Importance (%)	ER
VaD vs. CH	Thal_VL_R	1.89	1.27	Thal_MDI_L	2.25	1.03
	Thal_MDI_L	1.84	2.15	Putamen_L	2.10	2.58
	Thal_VPL_R	1.83	2.82	Thal_VL_R	2.08	2.45
	Putamen_L	1.65	4.67	Thal_VPL_R	1.99	4.00
	Thal_MDI_R	1.65	4.42	Putamen_R	1.95	4.82
VaMCI vs. CH	Thal_MDI_L	1.91	1.24	Thal_MDI_L	2.19	1.26
	Thal_VL_R	1.87	2.00	Putamen_R	2.15	1.71
	Thal_VL_L	1.78	3.19	Thal_VL_R	1.98	2.98
	Putamen_R	1.74	4.05	Thal_VPL_R	1.87	4.62
	Thal_VPL_R	1.69	5.45	Thal_VL_L	1.87	4.31
VaD vs. VaMCI	Cingulate_Post_R	1.61	1.22	Cingulate_Post_R	1.62	1.73
	Caudate_L	1.50	2.08	Caudate_L	1.62	1.57
	N_Acc_R	1.28	5.08	N_Acc_R	1.36	4.32
	Temporal_Inf_L	1.25	4.59	Putamen_R	1.34	4.95
	Caudate_R	1.23	6.24	N_Acc_L	1.33	5.35

VB, voxel-based; SVM, support vector machine; GPC, Gaussian process classification; Thal_IL, intralaminar; Putamen, lenticular nucleus & putamen; Temporal_Inf, inferior temporal gyrus; VaD, vascular dementia; VaMCI, vascular mild cognitive impairment; CH, good cognitive health.

Table S4 The 5 most relevant regions for the classifiers using AAL3 data

Classification	SVM			GPC		
	Region	Importance (%)	ER	Region	Importance (%)	ER
VaD vs. CH	Thal_MDI_L	1.97	1.03	Amygdala_R	1.65	2.03
	Putamen_L	1.77	2.27	Thal_MDI_L	1.64	2.58
	Thal_VPL_R	1.74	2.88	Putamen_L	1.63	3.06
	Thal_VL_R	1.69	3.97	Thal_VPL_R	1.60	3.58
	Putamen_R	1.58	5.85	Thal_VL_R	1.59	4.36
VaMCI vs. CH	Thal_MDI_L	1.88	1.12	LC_R	1.84	1.10
	Thal_VL_R	1.71	2.26	Amygdala_R	1.68	2.48
	ParaHippocampal_L	1.66	3.95	Putamen_R	1.62	3.21
	LC_R	1.65	3.90	Thal_MDI_L	1.61	3.67
	Amygdala_R	1.64	4.76	Raphe_D	1.50	5.45
VaD vs. VaMCI	N_Acc_R	1.57	2.24	N_Acc_R	1.55	2.30
	N_Acc_L	1.55	2.32	N_Acc_L	1.44	4.76
	Temporal_Inf_L	1.50	2.65	Cingulate_Post_R	1.43	4.76
	Paracentral_Lobule_L	1.44	4.22	Caudate_L	1.42	5.35
	Temporal_Pole_Mid_L	1.31	6.70	Paracentral_Lobule_L	1.41	4.92

AAL3, automated anatomical labelling atlas 3; SVM, support vector machine; GPC, Gaussian process classification; ParaHippocampal, parahippocampal gyrus; LC, locus coeruleus; Raphe_D, raphe nucleus (dorsal); VaD, vascular dementia; VaMCI, vascular mild cognitive impairment; CH, good cognitive health.