

ON-LINE FIG 1. Flowchart of the study population.



ON-LINE FIG 2. Covariate selection by the L1-regularization path algorithm. We used the area under the receiver operating characteristic curve to measure loss in the cross-validation. At the left end of the figure, all covariates are in the model. As the penalization increases (to the right of the figure), only some coefficients remain nonzero (these are labeled). The gray *vertical line* indicates the choice of imaging parameters with the largest area under the receiver operating curve. The labeled covariates (alphabetic letters) are selected for further analysis. The letter a indicates multifocal/multicentric distribution; b, nonlobar location; c, poor definition of the nonenhancing margin; and d, proportion of enhancing tumor >33%.

On-line Table 1 :	Patient	characteristics	in th	e discovery	and
validation sets ^a				•	

Variables	Discovery Set (<i>n</i> = 175)	Validation Set (<i>n</i> = 40)
Age (mean) (yr)	44.64 ± 12.89	46.86 ± 12.14
Sex		
Female	82 (46.9)	19 (47.5)
Male	93 (53.1)	21 (52.5)
WHO grade		
II	78 (44.6)	21 (52.5)
III	97 (55.4)	19 (47.5)
IDH1-mutation status		
Mutant	102 (58.3)	27 (67.5)
Wild type	73 (41.7)	13 (32.5)
Extent of resection		
Gross total resection	79 (45.1)	13 (32.5)
Subtotal/partial resection	73 (41.8)	18 (45)
Biopsy	23 (13.1)	9 (22.5)

^a Unless otherwise indicated, data are presented as number of patients (%).

On-line Table 3: Results of the interrater analysis for all imaging features

VASARI Imaging Features	к Value
Tumor location	1.000
Side of tumor epicenter	1.000
Eloquent area involvement	0.862
Enhancement quality	0.836
Proportion of enhancement	0.930
Proportion of nonenhancing tumor	0.930
Proportion of necrosis	0.958
Cysts	0.828
Multifocal or multicentric	0.849
T1/FLAIR ratio	0.721
Thickness of enhancing margin	0.854
Definition of the enhancing margin	0.818
Definition of nonenhancing margin	0.766
Proportion of edema	0.715
Hemorrhage	0.775
Diffusion	0.819
Pial invasion	0.857
Ependymal invasion	0.860
Cortical involvement	0.871
Deep white matter invasion	0.898
Nonenhancing tumor crosses midline	0.898
Enhancing tumor crosses midline	0.815
Satellites	0.801
Calvarial remodeling	1.000

On-line Table 2: Patient characteristics according to the IDH1-mutation status and 1p/19q-codeletion status in the discovery set^a

	<i>IDH1</i> Wild Type (<i>n</i> = 73)	<i>IDH1</i> Mutant and No 1p/19q Codeletion (<i>n</i> = 54)	<i>IDH1</i> Mutant and 1p/19q Codeleted (<i>n</i> = 48)
Age (mean) (yr)	46.73 ± 15.79	41.45 ± 9.30	45.04 ± 10.82
Sex			
Male	33 (45.2)	35 (64.8)	27 (56.3)
Female	40 (54.8)	19 (35.2)	21 (43.7)
Karnosfky Performance Status	79.86 ± 11.24	85.83 ± 9.64	87.04 ± 8.61
WHO grade			
II	16 (21.9)	39 (72.2)	23 (47.9)
III	57 (78.1)	15 (27.8)	25 (52.1)

^a Unless otherwise indicated, data are presented as number of patients (%).

	<i>IDH</i> Wild Type (<i>n</i> = 73)	<i>IDH</i> Mutant (<i>n</i> = 102)	P Value
Major axis (mean)	64.74 ± 23.98	53.93 ± 20.30	.002
Location			<.001
Frontal lobe	29 (39.7)	66 (64.7)	
Parietal lobe	11 (15.1)	18 (17.6)	
Temporal lobe	13 (17.8)	16 (15.7)	
Occipital lobe	O (1.4)	0 (0)	
Insula	1 (1.4)	1 (1.0)	
Others ^b	19 (21.0)	1 (1.0)	
Side of tumor epicenter (central)	12 (16.4)	O (O)	<.001
Eloquent area involvement	20 (27.4)	26 (25.5)	.777
Presence of enhancement	49 (67.1)	44 (43.1)	.002
Proportion of enhancement of >33%	22 (30.1)	5 (4.9)	<.001
Proportion of edema of $>33\%$	10 (13.7)	3 (2.9)	.007
Proportion of necrosis of $>33\%$	7 (9.6)	1 (1.0)	.007
Cyst	10 (13.9)	27 (26.5)	.046
Multifocal/multicentric distribution	24 (32.9)	1 (1.0)	<.001
Infiltrative tumor	38 (52.1)	22 (21.6)	<.001
Solid tumor enhancement ^c	31 (64.6)	11 (25.0)	<.001
Poorly defined enhancing margin ^c	12 (25.0)	26 (59.4)	.001
Poorly defined nonenhancing margin	35 (47.9)	15 (14.7)	<.001
Hemorrhage	14 (19.2)	17 (16.7)	.668
Mixed or restricted diffusion characteristics	38 (52.1)	31 (30.4)	.004
Pial invasion	19 (26.0)	12 (11.8)	.015
Ependymal extension	44 (60.3)	41 (40.2)	.009
Cortical involvement	59 (80.8)	101 (99)	<.001
Deep white matter invasion	32 (43.8)	26 (25.7)	.012
Nonenhancing tumor crossing midline	15 (20.5)	13 (12.7)	.165
Enhancing tumor crossing midline	4 (5.5)	3 (2.9)	.398
Satellite	19 (26.0)	16 (15.7)	.092
Calvarial remodeling	0 (0)	1 (1.0)	.396

^a Unless otherwise indicated, data are presented as number of patients (%). P values are calculated from the Student t test for continuous variables and the χ^2 or Fisher exact test for categoric variables.

^b Brain stem, corpus callosum, basal ganglia, thalamus, and cerebellum. ^c The percentage was calculated in the tumors showing contrast enhancement.

On-line Table 5: Association between the imaging features and IDHI-mutation status in grade II gliomas	On-line Table	5: Association betwee	n the imaging features	and IDH1-mutation statu	s in grade II g	liomasª
--	----------------------	-----------------------	------------------------	-------------------------	-----------------	---------

	<i>IDH</i> Wild Type (<i>n</i> = 16)	IDH Mutant (n = 62)	P Value
Major axis (mean)	54.01 ± 23.54	$47,384 \pm 17.94$.255
Location			.053
Frontal lobe	8 (50.0)	41 (66.1)	
Parietal lobe	O (15.1)	7 (11.3)	
Temporal lobe	6 (37.5)	13 (21.0)	
Occipital lobe	O (O)	0 (0)	
Insula	O (O)	0 (0)	
Others ^b	2 (12.5)	1 (1.6)	
Side of tumor epicenter (central)	2 (12.5)	0 (0)	.005
Eloquent area involvement	5 (31.3)	16 (25.8)	.662
Presence of enhancement	3 (18.8)	16 (25.8)	.558
Proportion of enhancement of >33%	O (O)	0 (0)	NA
Proportion of edema of $>33\%$	O (O)	1 (1.6)	.609
Proportion of necrosis of $>33\%$	O (O)	0 (0)	NA
Cyst	3 (18.8)	17 (27.4)	.479
Multifocal/multicentric distribution	4 (25.0)	0 (0)	<.001
Expansive tumor	5 (31.3)	7 (11.3)	.049
Solid tumor enhancement ^c	1 (33.3)	0 (0)	.018
Poorly defined enhancing margin ^c	1 (33.3)	8 (50.0)	.596
Poorly defined nonenhancing margin	5 (31.3)	4 (6.5)	.006
Hemorrhage	O (O)	2 (3.2)	.467
Mixed or restricted diffusion characteristics	2 (12.5)	9 (14.5)	.836
Pial invasion	1 (6.3)	0 (0)	.048
Ependymal extension	12 (75.0)	21 (33.9)	.003
Cortical involvement	14 (87.5)	61 (98.4)	.043
Deep white matter invasion	7 (43.8)	15 (4.6)	.131
Nonenhancing tumor crossing midline	3 (18.8)	4 (6.5)	.125
Enhancing tumor crossing midline	0 (0)	1 (1.6)	.609
Satellite	0 (0)	6 (9.7)	.195
Calvarial remodeling	0 (0)	0 (0)	NA

Note:-NA indicates not applicable.

^a Unless otherwise indicated, data are presented as number of patients (%). *P* values are calculated from the Student *t* test for continuous variables and the χ^2 or Fisher exact test for categoric variables.

^b Brain stem, corpus callosum, basal ganglia, thalamus, and cerebellum.

^c The percentage was calculated in the tumors showing contrast enhancement.

On-line Table 6:	Association between t	he imaging features	and IDH1-mutation s	status in grade II	l gliomas ^a
					0

•••	<i>IDH</i> Wild Type (<i>n</i> = 57)	IDH Mutant (n = 40)	P Value
Major axis (mean)	67.75 ± 23.43	63.34 ± 20.36	.340
Location			.006
Frontal lobe	21 (39.7)	25 (62.5)	
Parietal lobe	11 (19.3)	11 (27.5)	
Temporal lobe	7 (12.3)	3 (7.5)	
Occipital lobe	0 (0)	0 (0)	
Insula	1 (1.8)	1 (2.5)	
Others ^b	17 (29.8)	0 (0)	
Side of tumor epicenter (central)	10 (17.5)	0 (0)	.005
Eloquent area involvement	15 (26.3)	10 (25.0)	.884
Presence of enhancement	46 (80.7)	28 (70.0)	.222
Proportion of enhancement of >33%	22 (38.6)	5 (12.5)	.005
Proportion of edema of $>33\%$	10 (17.5)	2 (5.0)	.065
Proportion of necrosis of $>33\%$	7 (12.3)	1 (2.5)	.085
Cyst	7 (12.5)	10 (25.0)	.114
Multifocal/multicentric distribution	20 (35.1)	1 (2.5)	<.001
Expansive tumor	33 (57.9)	15 (37.5)	.048
Solid tumor enhancement ^c	30 (66.7)	11 (39.3)	.022
Poorly defined enhancing margin ^c	11 (24.4)	18 (64.3)	.001
Poorly defined nonenhancing margin	30 (52.6)	11 (27.5)	.014
Hemorrhage	14 (24.6)	15 (37.5)	.171
Mixed or restricted diffusion characteristics	36 (63.2)	2 (55.0)	.420
Pial invasion	18 (31.6)	12 (30.0)	.868
Ependymal extension	32 (56.1)	20 (50.0)	.551
Cortical involvement	45 (78.9)	40 (100.0)	.002
Deep white matter invasion	25 (43.9)	11 (27.5)	.101
Nonenhancing tumor crossing midline	12 (21.1)	9 (22.5)	.865
Enhancing tumor crossing midline	4 (7.0)	2 (5.0)	.685
Satellite	19 (33.3)	10 (25.0)	.378
Calvarial remodeling	0 (0)	1 (1.0)	.230

^a Unless otherwise indicated, data are presented as number of patients (%). P values are calculated from the Student t test for continuous variables and the χ^2 or Fisher exact test for categoric variables.

^b Brain stem, corpus callosum, basal ganglia, thalamus, and cerebellum. $^{\rm c}$ The percentage was calculated in the tumors showing contrast enhancement.

On-line Table 7: Imaging features in the IDM-mutant, no ID/ 19q-codeletion and IDM-mutant, ID/ 19q-codeleted gro
--

	IDH Mutant, No 1p/19q	IDH Mutant,	
	Codeletion (<i>n</i> = 54)	1p/19q-Codeleted (<i>n</i> = 48)	P Value
Major axis (mean)	52.64 ± 20.28	55.37 ± 20.46	.501
Location			.343
Frontal lobe	34 (63.0)	32 (66.7)	
Parietal lobe	8 (14.8)	10 (20.7)	
Temporal lobe	11 (20.3)	5 (7.5)	
Occipital lobe	O (O)	0 (0)	
Insula	0 (0)	1 (2.1)	
Others ^b	1 (1.9)	0 (0)	
Eloquent area involvement	17 (31.5)	9 (18.8)	.141
Presence of enhancement	19 (35.2)	25 (52.1)	.085
Proportion of enhancement of $>33\%$	1 (1.9)	4 (8.3)	.130
Proportion of edema of $>33\%$	2 (3.7)	1 (2.1)	.629
Proportion of necrosis of $>33\%$	O (O)	1 (2.1)	.286
Cyst	10 (18.5)	17 (35.4)	.054
Multifocal/multicentric distribution	0 (0)	1 (2.1)	.286
Infiltrative tumor	9 (16.7)	13 (27.1)	.202
Solid tumor enhancement ^c	6 (31.6)	5 (20.0)	.380
Poorly defined enhancing margin ^c	10 (52.6)	16 (64.0)	.447
Poorly defined nonenhancing margin	8 (14.8)	7 (14.6)	.974
Hemorrhage	8 (14.8)	9 (18.8)	.595
Mixed or restricted diffusion characteristics	11 (20.4)	19 (39.6)	.020
Pial invasion	3 (5.6)	9 (18.8)	.039
Ependymal extension	19 (35.2)	22 (45.8)	.274
Cortical involvement	53 (98.1)	48 (100)	.343
Deep white matter invasion	16 (29.6)	10 (21.3)	.338
Nonenhancing tumor crossing midline	6 (11.1)	7 (14.6)	.600
Enhancing tumor crossing midline	2 (3.7)	1 (2.1)	.629
Satellite	6 (11.1)	10 (20.8)	.178
Calvarial remodeling	1 (1.9)	O (O)	.343

^a Unless otherwise indicated, data are presented as number of patients (%). P values are calculated from the Student t test for continuous variables and the χ^2 or Fisher exact test for categoric variables.

 $^{\rm b}$ Brain stem, corpus callosum, basal ganglia, thalamus, and cerebellum. ^c The percentage was calculated in the tumors showing contrast enhancement.