Radiomics approach to quantify shape irregularity from crowd-based qualitative assessment of intracranial aneurysms

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Online Supplemental Material

Table A. Best performing univariate predictors for perceived irregularity, evaluated for two different average mesh cell areas A=0.01mm^2 and A=0.05mm^2. We included only metrics with Spearman correlation $\rho_{Sp} > 0.7$. The overall ordering of the features appears relatively stable for the two different mesh sizes examined. Only curvature metrics yielded systematically higher coefficients. All metrics have been computed on 3D geometries of the aneurysm dome. Their implementation follows the references cited in the main article. Abbreviations: Curvature L_2N – total curvature (L_2-norm), normalized by the surface area; curvature stdN – standard deviation of curvature, normalized by surface area; curvature vL_1 – area weighted variance of the curvature; curvature L_2NCH – same as curvature L_2N but further normalized by the total curvature (L_2N) of the convex hull; writhe mean, std, H, μ_2: mean, standard deviation, entropy or second statistical moment of the writhe values for a surface; GI – geometry indices; NSI – non-sphericity index; EI – ellipticity index; UI – undulation index; BF – bottleneck factor; aSz – aneurysm size; ZMI cumulant – metrics derived from Zernike moment invariants.

	Correlation ρ_{Sp}	
Predictor	**A=0.01 mm^2**	**A=0.05 mm^2**
GI: curvature (Gaussian, L_2N)	0.89	0.92
GI: curvature (Gaussian, stdN)	0.89	0.92
GI: curvature (mean, L_2N)	0.88	0.91
GI: curvature (mean, vL_1)	0.87	0.88
GI: curvature (mean, stdN)	0.85	0.89
writhe: inner squared (H)	0.84	0.83
writhe: inner squared (mean)	0.84	0.83
GI: curvature (Gaussian, L_2N)	0.84	0.84
GI: shape (NSI)	0.80	0.80
writhe: inner squared (std)	0.79	0.78
writhe: inner squared (μ_2)	0.77	0.77
GI: shape (EI)	0.76	0.76
ZMI: cumulant (n40)	0.74	0.73
ZMI: cumulant (n10)	0.74	0.74
ZMI: cumulant (n20)	0.74	0.73
GI: curvature (Gaussian, L_2NCH)	0.73	0.77
ZMI: cumulant (n05)	0.73	0.73
GI: shape (BF)	0.72	0.72
GI: size (aSz)	0.70	0.70
GI: shape (UI)	0.67	0.71
GI: curvature (mean, L_2NCH)	0.66	0.76

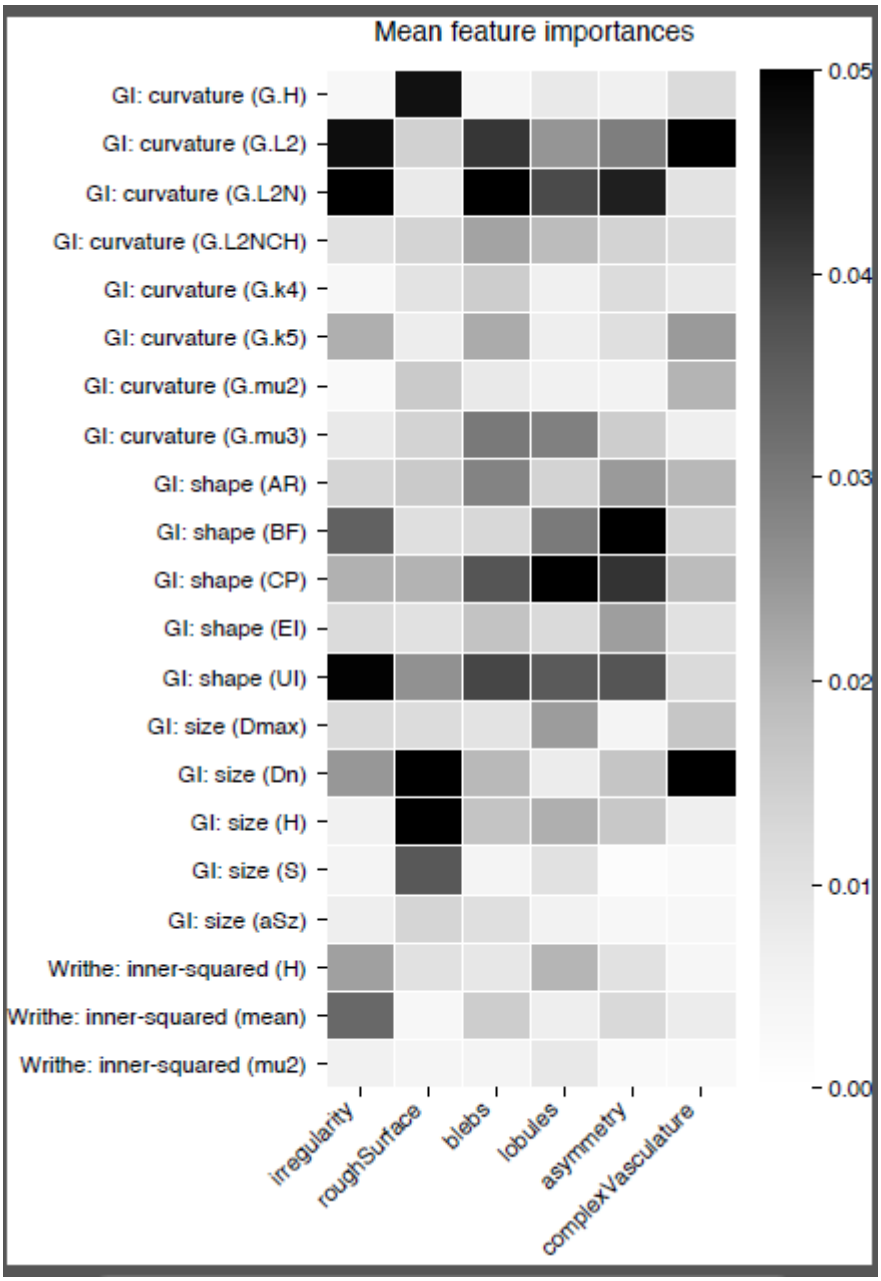

Figure A. Comparison of the mean feature importance (FI) for the prediction of perceived characteristics, averaged over the 1000 gradient boosting machines (GBMs) trained in the feature selection step. FI measures how valuable a feature was when training GBMs. Black and white colour indicate high and low FI, respectively. The listing is freed from highly redundant features and features that show low importance in all morphological characteristics. Abbreviations: see caption of Table A.