

Table S1 Grid-search for hyperparameters optimization of the utilized machine learning algorithms

Algorithm	Key hyperparameters searched	Optimized hyperparameters
LR	penalty: l1, l2 C: 0.001, 0.01, 0.1, 1, 10, 100, 1,000 solver: liblinear	penalty: l2 C: 1 solver: liblinear
SVM	C: 0.001, 0.01, 0.1, 1, 10, 100, 1,000 gamma: 1, 0.1, 0.01, auto, scale	C: 10 gamma: auto
DT	max_depth: int(x) for x in np.linspace(3, 100, 20) + None	max_depth: 3
MLP	hidden_layer_sizes: (50, 50, 50), (50, 100, 50), (100) activation: tanh, relu, solver: sgd, adam, alpha: 0.0001, 0.05, learning_rate: constant, adaptive	hidden_layer_sizes: (100) activation: tanh solver: adam, alpha: 0.0001 learning_rate: constant
RF	n_estimators: int(x) for x in np.linspace(200, 1000, 5) max_depth: int(x) for x in np.linspace(3, 100, 10) + None bootstrap: True, False	n_estimators: 400 max_depth: 13 bootstrap: True
BAG	base_estimator: SVC() LogisticRegression(tol=1e ⁻⁶ , max_iter=1,000), DecisionTreeClassifier()	base_estimator: LogisticRegression(tol=1e ⁻⁶ , max_iter=1000),

BAG, Bootstrap Aggregation; DT, Decision Tree; LR, Logistic Regression; MLP, Multi-layer Perceptron; RF, Random Forest; SVM, Support Vector Machine.

Table S2 Count of extracted and selected features per category

Category	Extracted features [919]	Selected lesion features [14]	Selected calcification features [44]	Selected fusion features [23]
First order	170	1	5	2
GLCM	230	1	4	2
GLDM	140	0	7	2
GLRLM	160	2	5	4
GLSZM	160	8	16	8
NGTDM	50	1	6	2
SHAPE2D	9	1	1	3

GLCM, Gray Level Co-occurrence Matrix; GLDM, Gray Level Dependence Matrix; GLRLM, Gray Level Run Length Matrix; GLSZM, Gray Level Size Zone Matrix; NGTDM, Neighbouring Gray Tone Difference Matrix; SHAPE2D, Shape Features (2D).

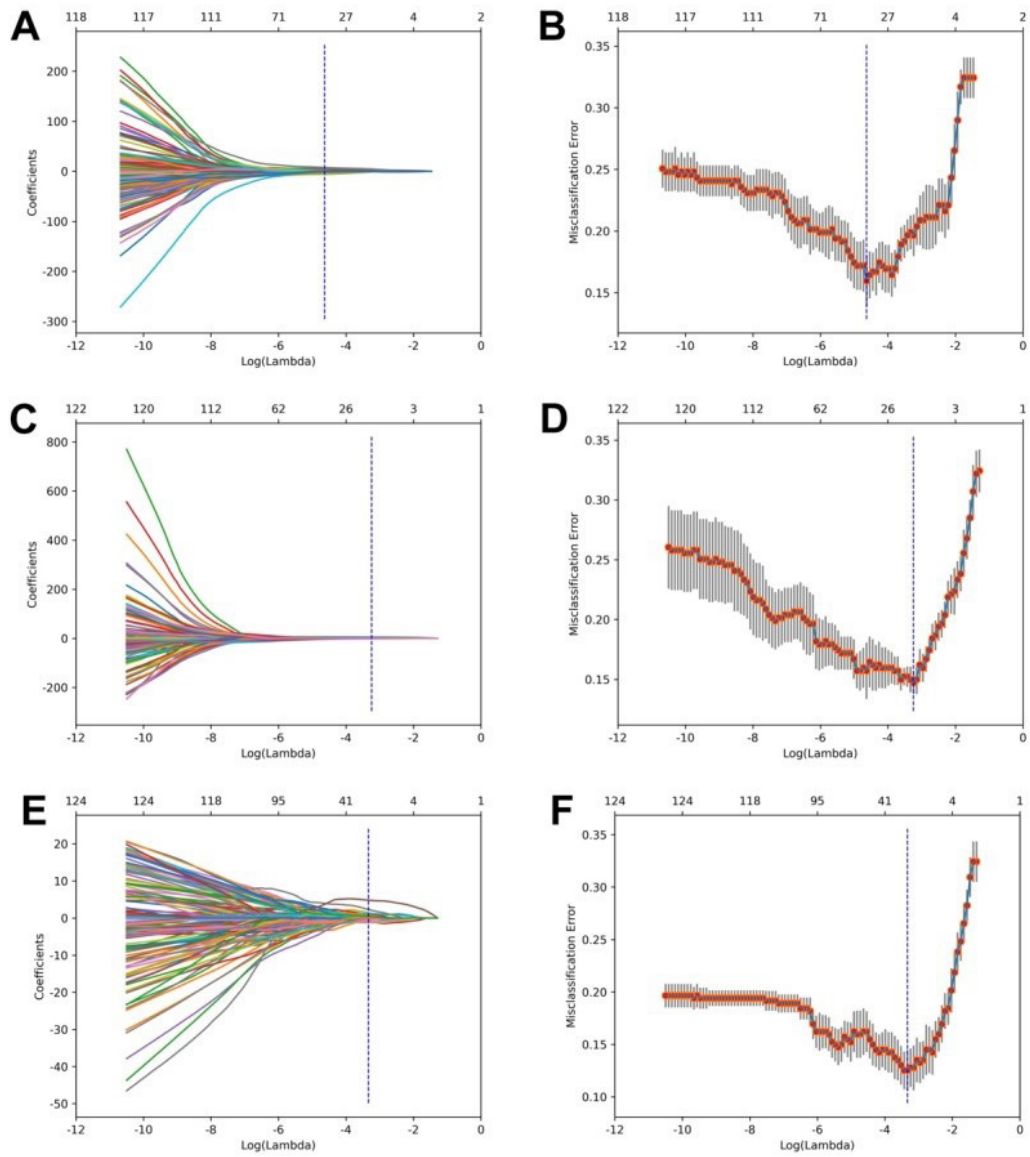


Figure S1 LASSO coefficient profiles and tuning parameter (λ) selection of calcification (A,B), lesion (C,D), and fusion ROIs (E,F). ROI, region of interest.