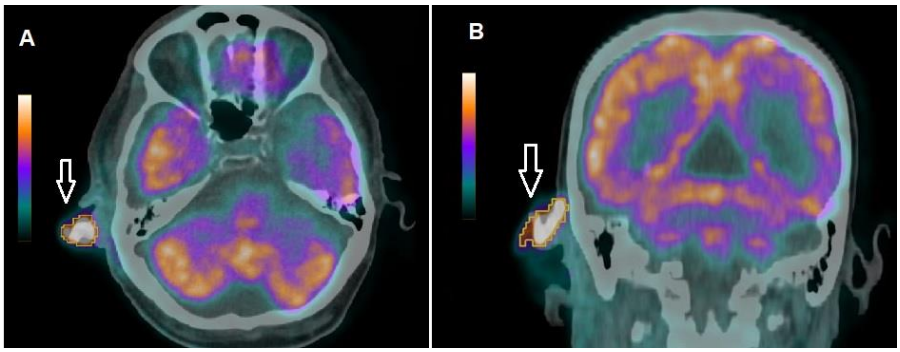


Figure S1: Axial (A) and coronal (B) fused PET/CT images showing the contouring (in yellow) of the primary cutaneous tumor (arrow) in the right ear, using an SUV-based threshold.

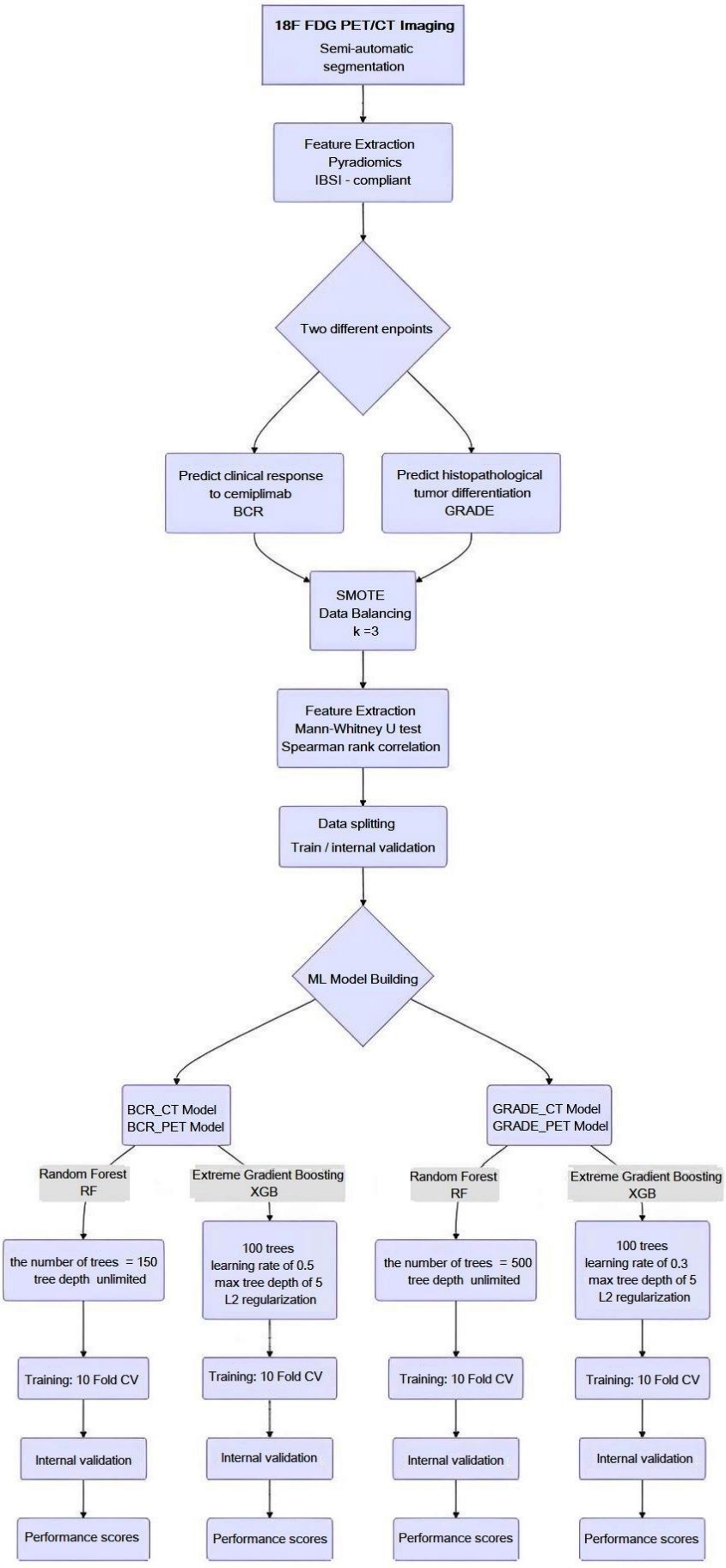


Figure S2: Overview of the radiomics and machine learning pipeline.

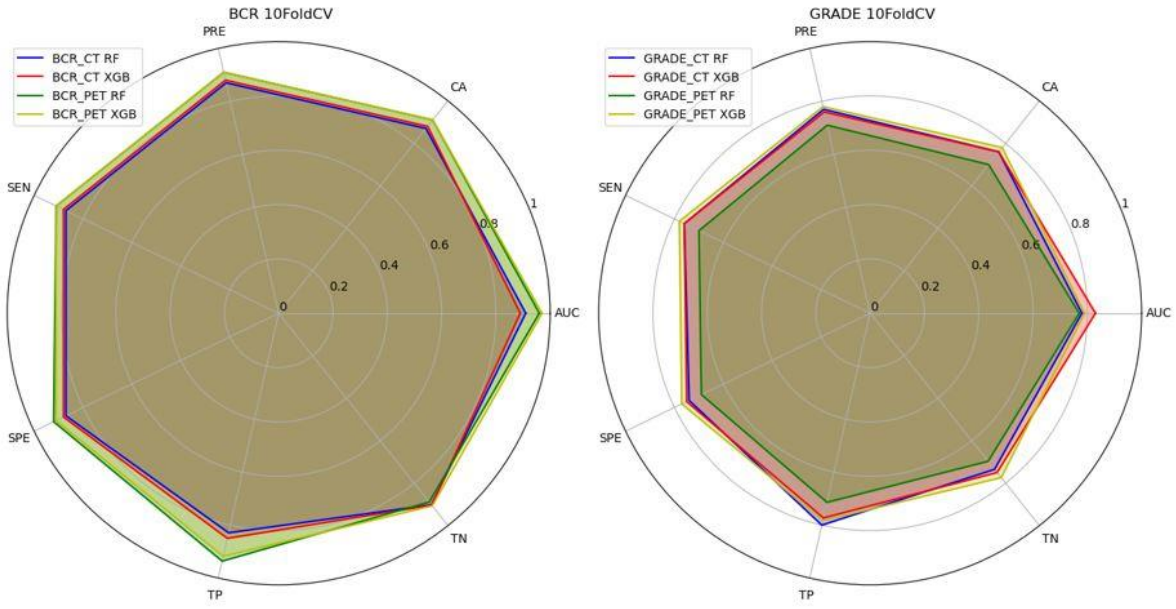


Figure S3: Radial plots showing the performance of the PET-based and CT-based radiomic models in the training cohort for the endpoint best clinical response (BCR) and tumor grade (GRADE) on the right and the left side, respectively.

Supplementary Text 1: The parameters used for Radiomics features extraction from CT and PET images using Pyradiomics.

For PET and CT images, the imageType was set to Original and Wavelet. The normalizeScale was set to 1, i.e. no normalization. The interpolator used was 'sitkBSpline'. The correctMask option was enabled to ensure accurate mask alignment. The binWidth for image discretization was set to 25.

Table S1-S5

TableS1: BCR_CT Model selected robust radiomic features

Filter	Class	Radiomic Feature	BCR 0	BCR 1	tot	pMW
wavelet-HHH	gldm	LargeDependenceLowGrayLevelEmphasis	3.35E+0±5.37E+0	1.46E+0±4.17E+0	2.41E+0±4.88E+0	0.036
wavelet-HHH	gldm	LowGrayLevelEmphasis	3.33E-1±2.28E-1	1.64E-1±1.76E-1	2.49E-1±2.2E-1	0.048
wavelet-HHH	glrlm	LowGrayLevelRunEmphasis	3.33E-1±2.28E-1	1.65E-1±1.75E-1	2.49E-1±2.19E-1	0.05
wavelet-HHH	glrlm	ShortRunLowGrayLevelEmphasis	3.2E-1±2.23E-1	1.59E-1±1.71E-1	2.4E-1±2.14E-1	0.047
wavelet-HHH	glszm	LargeAreaLowGrayLevelEmphasis	3.6E+3±1.08E+4	4.1E+4±2.78E+5	2.23E+4±1.96E+5	0.016
wavelet-HHH	glszm	LowGrayLevelZoneEmphasis	3.53E-1±2.2E-1	1.78E-1±1.81E-1	2.66E-1±2.19E-1	0.038
wavelet-HHH	ngtdm	Busyness	2.09E+1±2.66E+1	2.45E+1±1.03E+2	2.27E+1±7.45E+1	0.03

BCR= Best Clinical Response; GLCM=Gray-Level Co-occurrence Matrix; GLDM= Gray Level Dependence Matrix; GLRLM=Gray-Level Run Length Matrix; GLSZM=Gray-Level Size Zone Matrix; NGTDM=Neighboring Gray-Tone Difference Matrix.

TableS2: BCR_PET Model selected robust radiomic features

Filter	Class	Radiomic Feature	IT 0	IT 1	tot	pMW
original	glszm	LargeAreaHighGrayLevelEmphasis	2.31E+5±2.06E+5	2.38E+6±1.55E+7	1.31E+6±1.1E+7	0.018
wavelet-LLH	glcm	ClusterShade	-1.26E+7±1.64E+7	-2.88E+6±1.48E+7	-7.74E+6±1.63E+7	0.003
wavelet-LHL	firstorder	Mean	-8.58E+2±5.31E+2	-4.84E+2±4.21E+2	-6.71E+2±5.12E+2	0.039
wavelet-LHL	firstorder	RootMeanSquared	2.05E+3±1.08E+3	1.21E+3±9.23E+2	1.63E+3±1.09E+3	0.032
wavelet-LHL	firstorder	Variance	4.42E+6±3.71E+6	1.9E+6±2.81E+6	3.16E+6±3.51E+6	0.028
wavelet-LHL	glcm	Autocorrelation	8.03E+4±7.7E+4	3.35E+4±8.45E+4	5.69E+4±8.38E+4	0.033
wavelet-LHL	glcm	ClusterProminence	3.21E+9±3.72E+9	1.14E+9±4.02E+9	2.17E+9±3.99E+9	0.015
wavelet-LHL	glcm	Contrast	4.41E+3±3.15E+3	1.87E+3±2.43E+3	3.14E+3±3.08E+3	0.008
wavelet-LHL	glcm	DifferenceVariance	1.75E+3±1.36E+3	6.44E+2±9.06E+2	1.2E+3±1.28E+3	0.009
wavelet-LHL	gldm	GrayLevelVariance	7.08E+3±5.93E+3	3.04E+3±4.5E+3	5.06E+3±5.62E+3	0.028
wavelet-LHL	gldm	HighGrayLevelEmphasis	8.82E+4±8.35E+4	3.7E+4±9.04E+4	6.26E+4±9.03E+4	0.035
wavelet-LHL	gldm	SmallDependenceHighGrayLevelEmphasis	8.52E+4±8.11E+4	3.55E+4±8.83E+4	6.03E+4±8.79E+4	0.03
wavelet-LHL	glrlm	GrayLevelVariance	7.08E+3±5.93E+3	3.04E+3±4.5E+3	5.06E+3±5.62E+3	0.028
wavelet-LHL	glrlm	HighGrayLevelRunEmphasis	8.82E+4±8.35E+4	3.69E+4±9.04E+4	6.26E+4±9.03E+4	0.034
wavelet-LHL	glrlm	LongRunHighGrayLevelEmphasis	8.86E+4±8.38E+4	3.72E+4±9.07E+4	6.29E+4±9.06E+4	0.039
wavelet-LHL	glrlm	ShortRunHighGrayLevelEmphasis	8.81E+4±8.34E+4	3.69E+4±9.03E+4	6.25E+4±9.02E+4	0.033
wavelet-LHL	glszm	GrayLevelVariance	7.14E+3±5.94E+3	3.05E+3±4.52E+3	5.1E+3±5.64E+3	0.028
wavelet-LHL	glszm	HighGrayLevelZoneEmphasis	8.82E+4±8.34E+4	3.69E+4±9.03E+4	6.25E+4±9.02E+4	0.031
wavelet-LHL	glszm	LargeAreaHighGrayLevelEmphasis	1.02E+5±8.31E+4	1.79E+5±9.41E+5	1.41E+5±6.65E+5	0.001
wavelet-LHL	glszm	SmallAreaHighGrayLevelEmphasis	8.67E+4±8.22E+4	3.61E+4±8.92E+4	6.14E+4±8.9E+4	0.033
wavelet-LHL	ngtdm	Complexity	5.99E+5±7.33E+5	2.73E+5±6.98E+5	4.36E+5±7.3E+5	0.041
wavelet-LHL	ngtdm	Strength	6.59E+2±4.41E+2	3.34E+2±3.91E+2	4.96E+2±4.46E+2	0.048
wavelet-LHH	firstorder	10Percentile	-5.88E+2±3.27E+2	-2.85E+2±1.81E+2	-4.36E+2±3.04E+2	0.002
wavelet-LHH	firstorder	90Percentile	6.83E+2±3.43E+2	3.78E+2±2.67E+2	5.3E+2±3.42E+2	0.014
wavelet-LHH	firstorder	Energy	1.27E+8±1.39E+8	5.95E+7±1.5E+8	9.3E+7±1.48E+8	0.038

wavelet-LHH	firstorder	InterquartileRange	6.34E+2±3.16E+2	3.27E+2±2.13E+2	4.81E+2±3.09E+2	0.002
wavelet-LHH	firstorder	Maximum	2.14E+3±1.3E+3	1.09E+3±9.02E+2	1.61E+3±1.23E+3	0.009
wavelet-LHH	firstorder	MeanAbsoluteDeviation	3.96E+2±1.82E+2	2.12E+2±1.39E+2	3.04E+2±1.86E+2	0.003
wavelet-LHH	firstorder	Range	3.37E+3±2.07E+3	1.8E+3±1.38E+3	2.59E+3±1.92E+3	0.03
wavelet-LHH	firstorder	RobustMeanAbsoluteDeviation	2.61E+2±1.26E+2	1.38E+2±9.08E+1	2.0E+2±1.25E+2	0.002
wavelet-LHH	firstorder	RootMeanSquared	5.42E+2±2.59E+2	2.84E+2±1.91E+2	4.13E+2±2.61E+2	0.003
wavelet-LHH	firstorder	TotalEnergy	1.03E+9±1.14E+9	4.86E+8±1.23E+9	7.6E+8±1.21E+9	0.038
wavelet-LHH	firstorder	Variance	3.57E+5±2.46E+5	1.13E+5±1.45E+5	2.35E+5±2.36E+5	0.001
wavelet-LHH	glcm	ClusterProminence	1.66E+7±2.42E+7	2.76E+6±8.67E+6	9.68E+6±1.94E+7	<0.001
wavelet-LHH	glcm	ClusterShade	3.05E+4±3.15E+4	9.36E+3±2.56E+4	1.99E+4±3.05E+4	0.014
wavelet-LHH	glcm	ClusterTendency	1.35E+3±9.81E+2	4.55E+2±6.21E+2	9.01E+2±9.31E+2	0.002
wavelet-LHH	glcm	Contrast	1.03E+3±8.81E+2	3.07E+2±4.31E+2	6.67E+2±7.79E+2	0.001
wavelet-LHH	glcm	DifferenceAverage	2.0E+1±9.84E+0	1.08E+1±7.28E+0	1.54E+1±9.77E+0	0.007
wavelet-LHH	glcm	DifferenceVariance	4.23E+2±4.46E+2	1.23E+2±1.89E+2	2.73E+2±3.73E+2	0.004
wavelet-LHH	glcm	SumSquares	6.1E+2±4.81E+2	2.04E+2±3.01E+2	4.07E+2±4.48E+2	0.001
wavelet-LHH	gldm	DependenceEntropy	6.02E+0±5.98E-1	5.5E+0±6.73E-1	5.76E+0±6.85E-1	0.025
wavelet-LHH	gldm	GrayLevelVariance	5.71E+2±3.94E+2	1.81E+2±2.32E+2	3.76E+2±3.77E+2	0.001
wavelet-LHH	gldm	HighGrayLevelEmphasis	4.43E+3±4.19E+3	1.58E+3±2.13E+3	3.0E+3±3.6E+3	0.033
wavelet-LHH	gldm	SmallDependenceHighGrayLevelEmphasis	4.09E+3±3.87E+3	1.43E+3±2.03E+3	2.76E+3±3.35E+3	0.026
wavelet-LHH	glrlm	GrayLevelVariance	5.72E+2±3.95E+2	1.81E+2±2.33E+2	3.77E+2±3.78E+2	0.001
wavelet-LHH	glrlm	HighGrayLevelRunEmphasis	4.43E+3±4.2E+3	1.58E+3±2.13E+3	3.0E+3±3.61E+3	0.032
wavelet-LHH	glrlm	LongRunHighGrayLevelEmphasis	4.49E+3±4.25E+3	1.61E+3±2.15E+3	3.05E+3±3.65E+3	0.038
wavelet-LHH	glrlm	ShortRunHighGrayLevelEmphasis	4.42E+3±4.18E+3	1.57E+3±2.13E+3	2.99E+3±3.59E+3	0.033
wavelet-LHH	glszm	GrayLevelVariance	5.89E+2±4.08E+2	1.87E+2±2.37E+2	3.88E+2±3.89E+2	0.001
wavelet-LHH	glszm	HighGrayLevelZoneEmphasis	4.46E+3±4.22E+3	1.59E+3±2.14E+3	3.02E+3±3.63E+3	0.032
wavelet-LHH	glszm	LargeAreaHighGrayLevelEmphasis	3.23E+4±7.97E+4	3.08E+5±2.07E+6	1.7E+5±1.46E+6	0.003
wavelet-LHH	glszm	SmallAreaHighGrayLevelEmphasis	4.29E+3±4.07E+3	1.51E+3±2.09E+3	2.9E+3±3.51E+3	0.028
wavelet-LHH	ngtdm	Complexity	5.86E+4±4.73E+4	1.84E+4±4.05E+4	3.85E+4±4.82E+4	0.001
wavelet-LHH	ngtdm	Contrast	2.68E+0±1.77E+0	1.12E+0±1.57E+0	1.9E+0±1.84E+0	0.001
wavelet-LHH	ngtdm	Strength	7.27E+1±5.3E+1	2.89E+1±2.94E+1	5.08E+1±4.8E+1	0.005
wavelet-HLH	firstorder	Mean	5.16E+1±4.12E+1	1.87E+1±3.88E+1	3.52E+1±4.31E+1	0.017
wavelet-HHL	glcm	ClusterProminence	1.43E+6±2.04E+6	2.15E+5±5.83E+5	8.22E+5±1.61E+6	0.045
wavelet-HHL	glcm	ClusterShade	5.97E+3±8.81E+3	1.43E+3±3.69E+3	3.7E+3±7.09E+3	0.006
wavelet-HHL	glcm	Contrast	1.77E+2±2.02E+2	6.47E+1±9.84E+1	1.21E+2±1.67E+2	0.047
wavelet-HHH	firstorder	Minimum	-3.05E+2±1.52E+2	-1.69E+2±1.27E+2	-2.37E+2±1.55E+2	0.028
wavelet-HHH	firstorder	Variance	7.86E+3±6.15E+3	2.9E+3±3.9E+3	5.38E+3±5.7E+3	0.007
wavelet-HHH	glcm	Autocorrelation	2.19E+2±1.52E+2	8.75E+1±1.21E+2	1.53E+2±1.52E+2	0.007
wavelet-HHH	glcm	ClusterProminence	6.18E+3±6.22E+3	1.59E+3±4.28E+3	3.88E+3±5.79E+3	0.001
wavelet-HHH	glcm	ClusterTendency	2.89E+1±2.12E+1	1.2E+1±1.65E+1	2.05E+1±2.07E+1	0.015
wavelet-HHH	glcm	Contrast	2.38E+1±1.68E+1	8.85E+0±1.17E+1	1.63E+1±1.63E+1	0.006
wavelet-HHH	glcm	DifferenceAverage	3.16E+0±1.49E+0	1.85E+0±1.2E+0	2.5E+0±1.5E+0	0.03
wavelet-HHH	glcm	DifferenceVariance	9.36E+0±6.43E+0	3.7E+0±5.02E+0	6.53E+0±6.4E+0	0.007
wavelet-HHH	glcm	JointAverage	1.32E+1±6.05E+0	7.73E+0±5.11E+0	1.05E+1±6.21E+0	0.019
wavelet-HHH	glcm	SumAverage	2.62E+1±1.2E+1	1.56E+1±1.03E+1	2.09E+1±1.24E+1	0.027
wavelet-HHH	glcm	SumSquares	1.36E+1±9.68E+0	5.44E+0±7.65E+0	9.52E+0±9.6E+0	0.01
wavelet-HHH	gldm	GrayLevelVariance	1.26E+1±9.74E+0	4.73E+0±6.23E+0	8.67E+0±9.04E+0	0.006
wavelet-HHH	gldm	HighGrayLevelEmphasis	2.3E+2±1.58E+2	9.18E+1±1.24E+2	1.61E+2±1.57E+2	0.007
wavelet-HHH	gldm	LargeDependenceHighGrayLevelEmphasis	8.15E+2±5.15E+2	4.13E+2±3.47E+2	6.14E+2±4.81E+2	0.028
wavelet-HHH	gldm	SmallDependenceHighGrayLevelEmphasis	1.59E+2±1.18E+2	5.58E+1±9.16E+1	1.08E+2±1.17E+2	0.005

wavelet-HHH	glrlm	GrayLevelVariance	1.27E+1±9.81E+0	4.8E+0±6.27E+0	8.76E+0±9.11E+0	0.006
wavelet-HHH	glrlm	HighGrayLevelRunEmphasis	2.3E+2±1.58E+2	9.19E+1±1.24E+2	1.61E+2±1.57E+2	0.007
wavelet-HHH	glrlm	LongRunHighGrayLevelEmphasis	2.48E+2±1.66E+2	1.01E+2±1.31E+2	1.75E+2±1.66E+2	0.005
wavelet-HHH	glrlm	RunEntropy	3.49E+0±6.4E-1	2.87E+0±7.22E-1	3.18E+0±7.48E-1	0.041
wavelet-HHH	glrlm	ShortRunHighGrayLevelEmphasis	2.26E+2±1.56E+2	8.98E+1±1.23E+2	1.58E+2±1.55E+2	0.008
wavelet-HHH	glszm	GrayLevelVariance	1.41E+1±1.06E+1	5.63E+0±6.81E+0	9.87E+0±9.84E+0	0.008
wavelet-HHH	glszm	HighGrayLevelZoneEmphasis	2.31E+2±1.58E+2	9.3E+1±1.25E+2	1.62E+2±1.58E+2	0.01
wavelet-HHH	glszm	SizeZoneNonUniformityNormalized	5.92E-1±1.2E-1	4.51E-1±1.35E-1	5.21E-1±1.45E-1	0.002
wavelet-HHH	glszm	SmallAreaHighGrayLevelEmphasis	1.94E+2±1.37E+2	7.25E+1±1.07E+2	1.33E+2±1.37E+2	0.007
wavelet-HHH	ngtdm	Complexity	4.68E+2±3.91E+2	1.71E+2±3.09E+2	3.2E+2±3.81E+2	0.007
wavelet-HHH	ngtdm	Contrast	1.56E-1±1.06E-1	7.52E-2±5.71E-2	1.16E-1±9.37E-2	0.009
wavelet-HHH	ngtdm	Strength	4.19E+0±3.39E+0	1.84E+0±2.3E+0	3.02E+0±3.12E+0	0.036

BCR= Best Clinical Response; GLCM=Gray-Level Co-occurrence Matrix; GLDM= Gray Level Dependence Matrix; GLRLM=Gray-Level Run Length Matrix; GLSZM=Gray-Level Size Zone Matrix; NGTDM=Neighboring Gray-Tone Difference Matrix.

TableS3: GRADE_CT Model selected robust radiomic features

Filter	Class	Radiomic feature	GRADE 0	GRADE 1	tot	pMW	pSP
original	shape	Maximum2DDiameterRow	3.89E+1±2.16E+1	5.12E+1±2.67E+1	4.5E+1±2.49E+1	0.039	0.037
original	firstorder	Minimum	-7.34E+2±3.43E+2	-4.75E+2±6.42E+2	-6.05E+2±5.27E+2	0.049	0.048
wavelet-LLH	firstorder	Skewness	-5.03E-1±1.04E+0	1.19E-1±1.33E+0	-1.92E-1±1.23E+0	0.021	0.019
wavelet-LLH	glcm	ClusterShade	-1.69E+3±5.52E+3	7.72E+2±2.16E+3	-4.59E+2±4.34E+3	0.009	0.008
wavelet-LLH	glcm	Correlation	3.33E-1±2.06E-1	2.36E-1±1.5E-1	2.84E-1±1.86E-1	0.023	0.021
wavelet-LHL	glcm	ClusterShade	-1.43E+1±2.47E+2	-5.34E+2±1.6E+3	-2.74E+2±1.16E+3	0.011	0.01
wavelet-LHL	glcm	Imc1	-4.91E-1±2.01E-1	-3.83E-1±1.79E-1	-4.37E-1±1.97E-1	0.01	0.008
wavelet-LHL	glcm	MCC	8.6E-1±1.79E-1	7.81E-1±1.97E-1	8.2E-1±1.91E-1	0.023	0.021
wavelet-LHH	firstorder	Minimum	-1.81E+2±1.17E+2	-1.34E+2±7.83E+1	-1.58E+2±1.02E+2	0.024	0.022
wavelet-LHH	firstorder	Skewness	1.23E-1±5.84E-1	3.9E-1±6.06E-1	2.56E-1±6.06E-1	0.016	0.014
wavelet-LHH	glcm	Autocorrelation	9.42E+1±1.31E+2	4.87E+1±4.98E+1	7.15E+1±1.01E+2	0.017	0.016
wavelet-LHH	glcm	ClusterShade	9.71E+0±4.67E+1	1.84E+1±4.07E+1	1.4E+1±4.37E+1	0.008	0.007
wavelet-LHH	glcm	Imc1	-4.01E-1±1.84E-1	-3.14E-1±1.72E-1	-3.58E-1±1.82E-1	0.043	0.042
wavelet-LHH	glcm	JointAverage	8.43E+0±4.85E+0	6.09E+0±2.91E+0	7.26E+0±4.15E+0	0.008	0.007
wavelet-LHH	glcm	MCC	7.88E-1±1.88E-1	6.96E-1±2.26E-1	7.42E-1±2.12E-1	0.046	0.044
wavelet-LHH	glcm	SumAverage	1.68E+1±9.79E+0	1.23E+1±5.94E+0	1.45E+1±8.36E+0	0.012	0.011
wavelet-LHH	gldm	HighGrayLevelEmphasis	9.66E+1±1.32E+2	5.24E+1±5.42E+1	7.45E+1±1.03E+2	0.025	0.024
wavelet-LHH	gldm	LargeDependenceLowGrayLevelEmphasis	2.98E-1±5.65E-1	1.11E+0±2.69E+0	7.05E-1±1.97E+0	0.002	0.002
wavelet-LHH	gldm	LowGrayLevelEmphasis	6.22E-2±1.02E-1	9.14E-2±1.18E-1	7.68E-2±1.11E-1	0.008	0.007
wavelet-LHH	gldm	SmallDependenceHighGrayLevelEmphasis	6.84E+1±1.05E+2	3.65E+1±4.29E+1	5.25E+1±8.1E+1	0.036	0.035
wavelet-LHH	glrlm	HighGrayLevelRunEmphasis	9.67E+1±1.32E+2	5.24E+1±5.42E+1	7.45E+1±1.03E+2	0.026	0.024
wavelet-LHH	glrlm	LongRunHighGrayLevelEmphasis	1.06E+2±1.39E+2	5.78E+1±5.63E+1	8.21E+1±1.08E+2	0.024	0.022
wavelet-LHH	glrlm	LongRunLowGrayLevelEmphasis	6.93E-2±1.14E-1	1.15E-1±1.59E-1	9.23E-2±1.4E-1	0.009	0.008
wavelet-LHH	glrlm	LowGrayLevelRunEmphasis	6.24E-2±1.03E-1	9.09E-2±1.15E-1	7.67E-2±1.09E-1	0.009	0.008
wavelet-LHH	glrlm	ShortRunHighGrayLevelEmphasis	9.47E+1±1.31E+2	5.13E+1±5.37E+1	7.3E+1±1.02E+2	0.031	0.03
wavelet-LHH	glrlm	ShortRunLowGrayLevelEmphasis	6.09E-2±9.98E-2	8.63E-2±1.07E-1	7.36E-2±1.04E-1	0.01	0.009
wavelet-LHH	glszm	HighGrayLevelZoneEmphasis	9.73E+1±1.33E+2	5.3E+1±5.46E+1	7.52E+1±1.03E+2	0.03	0.028
wavelet-LHH	glszm	LargeAreaLowGrayLevelEmphasis	1.6E+1±9.72E+1	1.81E+3±1.12E+4	9.14E+2±7.89E+3	0.005	0.004
wavelet-LHH	glszm	LowGrayLevelZoneEmphasis	6.6E-2±1.06E-1	8.99E-2±9.46E-2	7.79E-2±1.0E-1	0.016	0.014
wavelet-LHH	glszm	SmallAreaHighGrayLevelEmphasis	8.29E+1±1.19E+2	4.48E+1±4.93E+1	6.38E+1±9.23E+1	0.03	0.029

wavelet-LHH	glszm	SmallAreaLowGrayLevelEmphasis	5.13E-2±7.71E-2	6.65E-2±5.71E-2	5.89E-2±6.78E-2	0.017	0.016
wavelet-HHL	glszm	ZoneVariance	4.15E+3±2.56E+4	4.2E+4±2.59E+5	2.31E+4±1.84E+5	0.041	0.04
wavelet-HHH	firstorder	Mean	-1.3E-1±1.3E+0	4.53E-3±8.01E-1	-6.28E-2±1.08E+0	0.041	0.04
wavelet-HHH	firstorder	Median	-9.32E-2±6.28E-1	-2.2E-2±7.95E-1	-5.76E-2±7.13E-1	0.021	0.02

GRADE= Tumor Grade score; GLCM=Gray-Level Co-occurrence Matrix; GLDM= Gray Level Dependence Matrix ; GLRLM=Gray-Level Run Length Matrix; GLSZM=Gray-Level Size Zone Matrix; NGTDM=Neighboring Gray-Tone Difference Matrix.

TableS4: GRADE_PET Model selected robust radiomic features

Filter	Class	Radiomic Feature	GRADE 0	GRADE 1	tot	pMW	pSP
original	shape	Maximum2DDiameterRow	3.96E+1±2.15E+1	5.32E+1±2.89E+1	4.64E+1±2.62E+1	0.04	0.038
original	gldm	GrayLevelNonUniformity	2.65E+1±1.44E+2	6.28E+2±2.2E+3	3.27E+2±1.58E+3	0.05	0.048
wavelet-LLH	glcm	MCC	9.82E-1±1.14E-1	9.33E-1±1.78E-1	9.57E-1±1.5E-1	0.011	0.01
wavelet-LHL	glcm	DifferenceAverage	3.27E+1±1.96E+1	2.44E+1±1.75E+1	2.86E+1±1.89E+1	0.039	0.038
wavelet-LHL	glcm	Id	1.25E-1±1.38E-1	1.94E-1±2.09E-1	1.59E-1±1.8E-1	0.015	0.014
wavelet-LHL	glcm	Idm	7.33E-2±1.42E-1	1.41E-1±2.22E-1	1.07E-1±1.88E-1	0.017	0.015
wavelet-LHL	glcm	Imc1	-8.86E-1±1.37E-1	-8.15E-1±1.9E-1	-8.51E-1±1.68E-1	0.049	0.048
wavelet-LHL	glcm	InverseVariance	5.64E-2±4.47E-2	8.48E-2±7.49E-2	7.06E-2±6.29E-2	0.029	0.027
wavelet-LHL	glcm	MCC	9.88E-1±7.18E-2	9.44E-1±1.33E-1	9.66E-1±1.08E-1	0.018	0.017
wavelet-LHL	gldm	GrayLevelNonUniformity	1.79E+1±7.95E+1	3.21E+2±1.11E+3	1.7E+2±7.98E+2	0.024	0.022
wavelet-LHL	glrlm	GrayLevelNonUniformity	9.9E+0±3.11E+1	1.19E+2±3.99E+2	6.44E+1±2.86E+2	0.023	0.022
wavelet-LHL	glszm	ZoneVariance	1.2E+3±7.43E+3	1.57E+5±5.57E+5	7.91E+4±3.99E+5	0.046	0.044
wavelet-LHH	glcm	MCC	9.57E-1±1.39E-1	8.94E-1±2.16E-1	9.25E-1±1.84E-1	0.033	0.031
wavelet-HLL	glcm	MCC	9.86E-1±8.72E-2	9.39E-1±1.49E-1	9.62E-1±1.23E-1	0.019	0.018
wavelet-HLH	firstorder	Kurtosis	4.81E+0±1.64E+0	3.97E+0±9.61E-1	4.39E+0±1.4E+0	0.025	0.024
wavelet-HLH	firstorder	Skewness	6.58E-1±3.52E-1	3.78E-1±3.08E-1	5.18E-1±3.57E-1	0.001	0.001
wavelet-HLH	glcm	MCC	9.67E-1±1.33E-1	8.89E-1±2.11E-1	9.28E-1±1.8E-1	0.01	0.009
wavelet-HHL	firstorder	Skewness	6.67E-1±3.95E-1	3.07E-1±3.92E-1	4.87E-1±4.31E-1	<0.001	<0.001
wavelet-HHL	glcm	ClusterShade	2.85E+3±6.63E+3	9.8E+2±3.14E+3	1.92E+3±5.24E+3	0.019	0.018
wavelet-HHH	firstorder	Median	1.7E+0±6.96E+0	2.25E-1±3.74E+0	9.63E-1±5.6E+0	0.028	0.027
wavelet-HHH	glcm	Correlation	1.57E-1±1.08E-1	1.07E-1±6.73E-2	1.32E-1±9.25E-2	0.004	0.004
wavelet-LLL	glcm	Imc1	-9.54E-1±1.29E-1	-8.92E-1±2.17E-1	-9.23E-1±1.8E-1	0.043	0.042
wavelet-LLL	gldm	GrayLevelNonUniformity	1.44E+1±7.81E+1	3.16E+2±1.1E+3	1.65E+2±7.89E+2	0.021	0.02
wavelet-LLL	glrlm	GrayLevelNonUniformity	7.73E+0±3.71E+1	1.06E+2±3.64E+2	5.69E+1±2.62E+2	0.02	0.019

GRADE= Tumor Grade score; GLCM=Gray-Level Co-occurrence Matrix; GLDM= Gray Level Dependence Matrix ; GLRLM=Gray-Level Run Length Matrix; GLSZM=Gray-Level Size Zone Matrix; NGTDM=Neighboring Gray-Tone Difference Matrix.

TableS5: AUC and Classification Accuracy with 95% confidence intervals in internal validation

ML Model	Metrics	RF [95% CI]	XGB [95% CI]
BCR_CT	AUC	0.746 [0.597, 0.895]	0.712 [0.557, 0.867]
	CA	0.667 [0.506, 0.828]	0.727 [0.575, 0.879]
BCR_PET	AUC	0.883 [0.805, 0.961]	0.865 [0.783, 0.947]
	CA	0.818 [0.725, 0.911]	0.758 [0.655, 0.861]
GRADE_CT	AUC	0.777 [0.603, 0.951]	0.830 [0.673, 0.987]
	CA	0.759 [0.580, 0.938]	0.759 [0.580, 0.938]
GRADE_PET	AUC	0.752 [0.572, 0.932]	0.778 [0.604, 0.952]
	CA	0.773 [0.598, 0.948]	0.773 [0.598, 0.948]

AUC= Area Under the Curve; BCR= Best Clinical Response; CA=Classification Accuracy; GRADE= Tumor Grade score; RF=Random Forest; XGB=Extreme Gradient Boosting