

Supplementary Material - Literature Review of MRI Radiomics across different disease sites with varying outcomes.

Table S1: Brain Cancer

First Author	Cancer site	No of centers	Sample size	Treatment modality	Outcomes	MRI (Magnetic Field)	Image Preprocessing	Radiomics features extractor software; no of features	Feature selection method	Features used	Predictive Model	Model Evaluation results
Patel et.al 2021 [28]	Glioblastoma	1	76	Chemoradiotherapy	Early true progression, pseudoprogression	1.5T MRI CE-T1WI, T2WI, DWI	Image Re-sampling, Intensity Normalization	Pyradiomics 307 features	PCC, Recursive feature elimination with a random forest classifier	Clinical – Age Molecular – MGMT Methylation Radiomics – CE-T1WI Sphericity, ADC_first_order_Kurtosis, ADC_GLCM_Correlation, ADC_NGTDMD_Contrast, T2WI_GLDM Dependence Entropy	Naive Bayes Classifier	Overall AUC across fivefold validation = 0.80 (95% CI: 0.74-0.86)
Ammari et al. 2021 [29]	Glioblastoma	1	194	Chemotherapy - Bevacizumab	OS PFS	Two MRI scanners 1.5T & 3.0T	Z-score normalization spatial resampling (voxel size 1x1x1 mm ³)	Olea Sphere 109 features	C-index Covariance	Radiomics FLAIR_Original first-order_10 th percentile, Gadolinium_original_shape_sphericity, FLAIR_Area_to_volume_ratio, FLAIR_NGTDMD_texture, FLAIR_NGTDMD_strength Clinical Deficit, Symptoms, Delay_R	Random Forest Gradient Boosting Adaboost, Logistic Regression K-neighbors Naïve Bayes SVM	AUC score on the test
					Three classes 9 months 12 months 15 months	Pre-contrast & post-contrast T1WI T2WI FLAIR DWI	Fixed Bin size of 37					OS 9 months Logistic regression AUC = 0.78
												12 months SVM AUC = 0.85
												15 months RFT AUC = 0.76
Ammari et al. 2021 [67]	Glioblastoma	2	Public data (2019 BraTS Challenge) and Validation - 116	OS		Two MRI Scanner	Pixel-wise normalization Co-registration (BraTS :	Pyradiomics 448 features	Concordance Index	Submask NCT/NET/ED - Gadolinium_Sphericity, Flair_Minimum, Flair_strength, Gadolinium_strength, Flair_contrast, Flair_coarseness Submask ED- Gadolinium_Sphericity, Flair_major axis length	KNN, random forest, logistic regression, gradient boosting, AdaBoost, Naïve Bayes, SVM	PFS Regression model
						1.5 T 3.0T	FLAIR + CE-T1WI +mask; Val : CE-					6 months AUC = 0.56 9 months AUC = 0.69
					BraTS 9 months 12 months 15 months	Pre-contrast 3DT1WI, post-contrast						AUC on Test
					Private data							9 months RFT AUC = 0.85 12 months RFT AUC = 0.74

						Axial CE T1WI, T2WI, DWI			Graded Prognostic Assessment (GPA) scores. Number of metastases	kernel Multilayer perceptron	Radiomics AUC = 0.90
									Radiomics – 223 features		
									Overall LC/LF Lesion- Margin_Wavelet_ILHL_GLCM_MaximumProbability_T2 Edema_Wavelet_IHHL_Histogram_Maximum_T2 Tumor_Histogram_Minimum_T2 Tumor-Margin _Wavelet_IHLH_Histogram_Minimum_T2 Lesion-Margin _Wavelet_IHLL_Histogram_Range_T2		AUC.632+ (Optimal qMRI Biomarker)
Karami et al. 2019 [69]	Brain Metastasis	1	100	SRT	Local Control Local Failure	1.5 T MRI GCE T1WI, T2WI	Linear Interpolation resampling 0.5 X 0.5x 0.5 mm ³	MATLAB 3072 features	PCC Mann-Whitney U test (p-value) Forward feature selection AUC.632+	SVM	Overall, LC/LF AUC = 0.79 6-Month LC/LF AUC = 0.80 12-Month LC/LF AUC = 0.81
									6-Month LC/LF Tumor-Margin _Wavelet_ILHL_GLCM_MaximumProbability_T2 Tumor-Margin _Wavelet_IHLH_Histogram_Minimum_T1 Edema_LBP_Median_T1 Tumour_LBP_Median_T1		
									12-Month LC/LF Lesion- Margin_Wavelet_IHLL_GLCM_MaximumProbability_T2 Edema_Wavelet_IHLH_Histogram_Maximum_T2 Edema_Wavelet_IHLH_Histogram_MeanAbsoluteDeviation_T2 Tumor-Margin _Geometric_Convexity_T1		
Suter et al. 2020 [66]	Glioblastoma	2 Train set – Private Test set - BraTS	N1 = 63 N2 = 76	Temozolomide-based chemoradiation	Overall survival	MRI	Resampling to 1mm isovoxels Skull scrapping Registration to CE-T1WI	Pyradiomics 265,604 features	ReliefF Fisher Score Gini index Chi-Square score joint mutual information	KNN, SVC with linear and radial basis function RBF kernels, Gaussian processes, decision trees, random forest, multilayer perceptron, AdaBoost, naïve	AUC drop of 0.56 on the BraTS dataset

							Bias field correction				Conditional Infomax feature extraction.	Bayes, quadratic discriminant analysis QDA, XGBoost, Logistic Regression
											double input symmetric relevance	
											mutual information maximization conditional mutual information	
											Interaction capping	
											t-test score	
											mRMR	
											mutual information feature selection	
Cepeda et al. 2023 [64]	Glioblastomas	5	55 Training = 40 Testing = 15	Adjuvant treatment with temozolomide and radiotherapy after surgery	Local Recurrence regions	1.5 T 3 T 3 T 1.5 T 3 T MRIs	z-score normalization resampling 1x1x1mm ³	Pyradiomics 4730 features		19 first-order statistical features 75 texture features	RF, XGBoost, CatBoost, LightGBM	CatBoost region-based evaluation AUC 0.81±0.09
Sun et al. 2021 [70]	Glioblastoma	1	77	Gross total or subtotal resection CCRT with TMZ, 6 cycles adjuvant TMZ after surgery	True Progression Pseudo progression	MRI 3T axial T1WI and T2WI, FLAIR CE-T1WI	Normalization	Analysis Kinetics 9675 features	PCC RF feature importance	50 features	Conditional inference RF classifier 50 trees	ACC 0.73(95% CI: 0.45, 0.91)

Park et al. 2021 [71]	Glioblastoma	2	N1 = 86 N2 = 41	Concurrent chemoradiotherapy/ radiotherapy	Recurrent glioblastoma Radiation necrosis	3T MRI T1WI T1C T2WI ADC	N4 bias correction Signal normalization Resamples 1x1x1mm3	Pyradiomics 263	F-score Lasso MI	LASSO features first-order_kurtosis First-order_mean_absolute_deviation. First-order_range GLCM_inverse_difference_normalized. GLCM_informal_measure_of_correlation1 GLCM_informal_measure_of_correlation2 GLRLM_run_variance. GLSZM_gray_level_non-uniformity GLSZM_low_gray_level_zone_emphasis GLSZM_size_zone_non-uniformity GLSZM_small_area_high_gray_level_emphasis NTGDM_complexity NTGDM_strength Shape_flatness Shape_major_axis_length Shape_maximum_2D_diameter(slice) Shape_mesh_volume Shape_sphericity	KNN SVM AdaBoost	LASSO feature selection + SVM AUC – 0.80 (0.65-0.95)
Li et al. 2023 [72]	High-grade glioma	1	162	Surgery, postoperative adjuvant temozolomide chemoradiation	6 th , 9 th , 12 th , 15 th , 18 th month progression and recurrence	3T MRI T1WI, CET1WI, T2WI, FLAIR	Histogram normalization 0-255 Resampling 0.5x 0.5x3mm3	Pyradiomics 2344 features	Mann-Whitney test LASSO	-	KNN RF SVC, fully connected network FCN	FCN Radiomics Model AUC = 0.77 Clinical + Radiomics = 0.78
Hettal et al. 2020 [73]	Brain oligometastasis	1	20	SBRT	Radiation necrosis vs Progression	1.5 or 3T MRI CE-T1WI	Discretized no of bins to 8 using BitDepthRescale_Range Resampling	IBEX software 1766 features	Fisher score ReliefF T-score chi-square Wilcoxon Gini index Mutual information maximization	-	Decision tree Bayesian, discriminant analysis, nearest neighbor, neural network, partial least square and principle component regression, random forest, SVM, bagging and boosting	Bagging AUC 0.83(0.65-1)

Table S2: Nasopharyngeal Carcinoma

First Author	Cancer site	No of centers	Sample size	Treatment modality	Outcomes	MRI (Magnetic Field)	Image Preprocessing	Radiomics features extractor software; no of features	Feature selection method	Features used	Predictive Model	Model Evaluation results
Li et al 2022 [74]	Nasopharyngeal Carcinoma	1	156	IMRT NTZ treatment	PFS	3 T MRI T1WI, Proton Density, DCE-MR	<p>K^{trans}(efflux rate constant), K_{ep}(reflux rate constant)</p> <p>V_e (the extracellular extravascular volume)</p> <p>V_p (intravascular plasma volume fraction)</p> <p>Maps were extracted from the DCE-MR images.</p>	AK Software 360 features	<p>Z-score normalization</p> <p>PCC</p> <p>Univariate Cox regression (p<0.05)</p> <p>LASSO Cox regression</p>	<p>K^{trans} features: Long Run Emphasis_AllDirection_offset1_SD, Long Run Emphasis_angle0_offset1, Angular Second Moment, Low Level Gray Level Emphasis_AllDirection_offset_SD, Low Run Low Gray Level Emphasis_angle0_offset1, High Intensity Small Area Emphasis, Small Area Emphasis</p> <p>V_e features: Long Run Emphasis_AllDirection_offset1_SD, Long Run Low Grey Level Emphasis_AllDirection_offset1_SD, Small Area Emphasis, Low Intensity Area Emphasis, Uniformity, High Intensity Small Area Emphasis</p> <p>$K^{trans} + V_e$ features: Ktrans_Long Run Emphasis_AllDirection_offset1_SD, Ktrans_Cluster Prominence_angle90_offset1, Ve_Long Run Emphasis_AllDirection_offset1_SD, Ktrans_Long Run Emphasis_angle0_offset1, Ktrans_Angular Second Moment, Ktrans_Long Run Low Gray Level Emphasis_angle0_offset1, Ve_Long Run Low Level Gray Level Emphasis_AllDirection_offset_SD, Ve_Low Intensity Small Area Emphasis, Ve_Small Area Emphasis, Ve_uniformity, Ve_High Intensity Small Area Emphasis, Ktrans_High Intensity Small Area Emphasis, Ktrans_small Area Emphasis</p> <p>Clinical variables: Clinical stage, T stage, treatment with nimotuzumab</p>	<p>Radscore and Clinical Variables by Multivariate Cox Regression</p> <p>Kaplan-Meier Analysis</p>	<p>Combined Radscore</p> <p>$K^{trans} + V_e + \text{Clinical} = 0.732$ (95% CI 0.599-0.864)</p> <p>Nomogram cutoff score = 3.1)</p> <p>High-risk (n= 38 24.36%)</p> <p>Low risk(n = 118, 75.64%)</p>
Du et al. 2019 [30]	Nasopharyngeal Carcinoma	2	N1 = 277 N2 = 60	IMRT Concurrent or adjuvant	PFS 3-year disease progression	3T MRI CE-T1WI T2WI	Resampled spatially 1x1x4mm ³	Pyradiomics 525 features	<p>PCC</p> <p>ICC</p> <p>Hierarchical Clustering</p>	<p>Clinical: T stage, Overall stage</p> <p>Radiomic: shape sphericity, CE-T1W first order mean absolute deviation. CE-T1W wavelet LL GLCM sum entropy. CE-T1 W wavelet LL GLRLM GLNUN</p>	Support vector machine	Radiomic + Clinical AUC = 0.80 (95% CI: 0.73, 0.89)

Table S3: Hepatocellular/Liver Cancer

First Author	Cancer site	No of Centers	Sample size	Treatment modality	Outcomes	MRI (Magnetic Field)	Image Preprocessing	Radiomics feature extractor software; no of features	Feature selection method	Features used	Predictive Model	Model Evaluation results
Chen et al. 2023 [31]	Hepatocellular carcinoma	1	144	Trans arterial Chemoembolization TACE	Complete response Partial response Progressive disease Stable disease	MRI 1.5 T 3.0T Axial T2-weighted sequence mDIXON-T1WI	Resampled 1x1x1m m ³ Fixed bin width 25	Pyradiomics 440 features	ICC Handpicked, mRMR(KNN, SVM)	-	KNN SVM LASSO DNN	DNN AUC = 0.796 Clinical + DNN ACU = 0.735
Liu et al. 2022 [76]	Hepatocellular carcinoma	2	144 N1= 94 N2=46	Trans arterial Chemoembolization	Tumor response and survival	1.5T MRI T1W1, T2WI, DWI, CE-T1WI 3.0T T1WI, T2WI, CE-T1WI	-	Pyradiomics 1210 features	mRMR LASSO	T2_original_shape_Maximum2DDiameterRow T2_wavelet.LHL_firstorder_Median T2_wavelet.LLL_firstorder_Kurtosis ap_wavelet.HLL_firstorder_Skewness ap_wavelet.LLH_glrIm_ShortRunEmpbasis ap_original_glcM_Imc1 pvp_original_shape_Maximum2DDiameterRow pvp_original_glcM_Idn pvp_original_shape_Flatness dp_original_shape_Flatness dp_wavelet.LLH_glszm_LargeAreaHighGrayLevelEmphasis dp_wavelet.HLL_glszm_SmallAreaLowGrayLevelEmphasis T2_wavelet.LHL_firstorder_Median T2_wavelet.HLL_ngtdm_Busyness dp_original_glcM_Imc1	Univariate and Multivariate Logistic regression	Clinical Model AUC 0.609 Radiomics model AUC 0.754 Combined AUC 0.781
Bodalal et al. 2023 [77]	Colorectal liver metastasis	1	112	Liver resection	Tumor Hypoxia	3.0 T MRI T2WI DWI ADC	-	Pyradiomics 4032 features	Chi-square Correlation without outcome RF Linear regression	Features selected by at least four out of seven feature selection techniques.	DWI b200 Logistic Regression with Decision Tree DWI ADC Gaussian Naive Bayes with Logistic Regression	Radiomics signatures DWI b200 AUC = 0.79 (95% CI: 0.61-0.93) DWI ADC AUC = 0.72 (95% CI: 0.50-0.90)

Table S4: Breast Cancer

First Author	Cancer site	No of centers	Sample size	Treatment Modality	Outcomes	MRI (Magnetic Field)	Image Preprocessing	Radiomics features extractor software; no of features	Feature Selection Method	Features used	Predictive Model	Model Evaluation Results
McAnena et al. 2022 [78]	Breast cancer	1	74	Neoadjuvant Chemotherapy	Complete pathological response pCR	MRI 1.5T	FBN 32 Resampled 2x2x2 mm ³ Lagrangian interpolation	LIFEx 61 features	LASSO	Discretized kurtosis NGTDM contrast GLSLM short zone grey level emphasis GLZLM zone percentage	SVM	Radomic model AUC 0.753 Radiomics + estrogen receptor status AUC 0.811

Table S5: Other cancer sites

First Author	Cancer Site	No of Centers	Sample Size	Treatment Modality	Outcomes	MRI (Magnetic Field)	Image Preprocessing	Radiomics Features Extractor Software ; No of Features	Feature Selection Method	Features Used	Predictive Model	Model Evaluation Results
Wang et al. 2021 [79]	Locally Advanced Rectal Cancer LARC	1	183	Neoadjuvant Chemotherapy	Good/Poor responders PFS	Two MRI 3.0 T T2WI DWI CE-T1WI (1 pre, 3 post)	Resampling 1x1x1mm ³ Gaussian filtering with sigma values 0.5, 1.0, 1.5	3D Slicer 942 features	mRMR LASSO	T2_original_GLSZM_Large Area Emphasis, T2_log_sigma_0.5mm_3D_GLCM_JointEntropy, CE_T1WI_original_shape_SurfaceArea, CE_T1WI_original_shape_MajprAxisLength, CE_T1WI_log_sigma_1.5mm_3D_GLRLM_LongRunGrayLevelEmphasis, CE_T1WI_log_sigma_1.5mm_3D_GLCM_Autocorrelation, CE_T1WI_log_sigma_1.0mm_3D_GLRLM_ShortRunEmphasis, CE_T1WI_log_sigma_1.0mm_3D_GLDM_Dependence Variance, CE_T1WI_log_sigma_5mm_3D_GLSZM_GrayLevelNonUniformityNormalized, CE_T1WI_log_sigma_0.5mm_3D_GLDLM_SmallDependenceEmphasis CE_T1WI_log_sigma_0.5mm_3D_GLCM_JointAverage ADC_original_GLRLM_LowGrayLevelRunEmphasis ADC_log_sigma_0.5mm_3D_glrmlm_LongRunLowGrayLevelEmphasis	LR RF Nomogram	LR Radiomics AUC = 0.842(95%CI: 0.741-0.943) Nomogram AUC = 0.898 (95%CI: 0.819 - 0.978)
Fang et al. 2020 [80]	Locally Advanced Rectal Cancer LARC	1	120	Concurrent Chemotherapy and radiation therapy CCRT	Treatment response Three Classes Complete response Partial response Progressive disease	3.0 T MRI Sagittal T2WI, axial T1WI, axial T2-FS, DWI ADC,	Normalized image intensity	In-house MATLAB B 2017a code 1026 features	PCC LASSO	Sagittal_T2_GLRLM_LongRunHighGrayLevelEmphasis, Axial_T1_GLRLM_RunPercentage, Axial_F2-FS_LL_GLRLM_ShortRunLowGrayLevelEmphasis, AxialDWIb0_GLRLM_LongRunHighGrayLevelEmphasis, AxialDWIb800_GLRLM_LongRunEmphasis, AxialDWIb800_ShortRunLowGrayLevelEmphasis, ADC_GLCM_Variance, Sagittal_T1_GLRLM_RunLengthNonuniformity, Axial_T1_HH_GLRLM_RunPercentage, enhancedMRI_SurfaceArea, enhancedMRI_LLH_Skewness, Coronal_T1_GLCM_dissimilarity, enhancedMRI_GLCM_homogeneity	RF LR SVM	RF AUC on test set = 0.798 (95% CI: 0.678-0.917)

Jajodia et al. 2021 [33]	Uterine Cervical Cancer	1	52	chemoradiation	Clinical prognostications	Recurrence	1.5 T MRI	ADC maps calculations	Pyradiomics	PCC	Radiomics original_gldm_SmallDependenceLowGrayLevelEmphasis original_glszm_LowGrayLevelZoneEmphasis original_glszm_SmallAreaLowGrayLevelEmphasis wavelet_HHH_gldm_ClusterShade wavelet_LLL_gldm_DependenceEntropy wavelet_LLL_firstorder_Uniformity wavelet_LLL_gldm_GrayLevelNonUniformityNormalized wavelet_HLL_glszm_GrayLevelVariance wavelet_HLH_gldm_SmallDependenceHighGrayLevelEmphasis wavelet_HLH_firstorder_Median wavelet_HLH_glszm_GrayLevelVariance wavelet_HLH_glszm_SmallAreaHighGrayLevelEmphasis wavelet_HHH_glszm_ZoneEntropy wavelet_HHL_gldm_RunEntropy wavelet_HHL_glszm_GrayLevelVariance wavelet_HHL_glszm_ZoneEntropy original_firstorder_Energy original_firstorder_TotalEnergy wavelet_LHH_firstorder_TotalEnergy wavelet_HHH_glszm_LargeAreaHighGrayLevelEmphasis wavelet_HHL_firstorder_TotalEnergy wavelet_LLL_firstorder_Energy wavelet_LLL_firstorder_TotalEnergy original_gldm_DependenceEntropy	Monotone Multi-layer perceptron neural network	Recurrence Radiomics +ADC1 AUC = 0.8 Kappa value = 0.55 Metastasis Radiomics + ADC1 + ADC2 + ChangeADC AUC = 0.84 Kappa = 0.65 FIGO Stage Radiomics + ADC1 + ADC2 + ChangeADC AUC = 0.71 Kappa = 0.25 Lymph Node Radiomics + ADC1 + ADC2 + ChangeADC AUC = 0.75 Kappa = 0.6
Speckter et al. 2022 [81]	meningiomas	1	93	Gamma knife radiotherapy	Response to radiosurgery	3T MRI	T1WI CE-T1WI	-	Pyradiomics	LASSO	Radiomics LoG_sigma_1.0mm_3D_firstorder,InterquartileRange, logarithm_NGTDm_Busyness Non-Radiomic Karnofsky performance status	Radiomics Score	Combined model AUC = 0.88
Yang et al. 2021 [82]	Vestibular schwannoma	1	336	Gamma Knife Radiosurgery	Tumor Regression (Without Pseudoprogression, With Pseudo regression) Tumor Non-Response	1.5 T MRI	T1WI, T2WI, CE-T1WI	Resampling 0.50 x 0.50 x 3.00 mm³ T1WI and T2WI are co-registered on CE-T1WI	MR Radiomics Platform	Two sample t-tests with Bonferroni correction LASSO	Tumor regression vs non-response T2W- Histogram Standard deviation, T2W-LLL-Texture-GLRLM long run emphasis, CE-T1WI_ LLH Texture-LBP-Mean of LBP, CE-T1WI_ HLL-Texture LBP_Uniformity of LBP, CE-T1WI_ LLL Histogram Minimum Tumor regression with and without pseudoprogression CE-T1WI_Tecture_GLRLM Long run low gray level emphasis.	SVM with radial basis function and Bayesian optimization	CASE 1 AUC = 0.913 CASE 2 AUC = 0.881

External testing =84	z-score normalizati on	wavelet- HHH_gldm_DependenceVariance CET1W1, wavelet_LLL_firstorder_energy CET1W1 wavelet-LLH-glszm-largedependence high gray level emphasis CET1W1 original shape Least axis length T2W1 wavelength LLH_glszm size zone nonuniformity T2W1	radiomics features. IA-intratumoral area PA, peritumoral area;	FM (IA with 5 mm PA) AUC =0.83 (0.72–0.92)
		IA with 3 mm PA original_shape_Flatness CE-T1WI, original_shape_LeastAxisLength CE-T1WI, original_gldm_LargeDependenceHighGrayLevelE mphasis CE-T1WI, original_glszm_ZoneEntropy CE-T1WI, wavelet-LLH_firstorder_Skewness CE- T1WI, wavelet-LLL_firstorder_Maximum CE- T1WI		
		IA with 5 mm PA original_shape_LeastAxisLength CE-T1WI, original_glszm_ZoneEntropy CE-T1WI, wavelet- LHL_firstorder_Skewness CE-T1WI, wavelet- HLL_gldm_DependenceEntropy CE-T1WI, wavelet-LLL_firstorder_Energy CE-T1WI, wavelet-LLL_firstorder_Maximum CE-T1WI, wavelet-LLL_firstorder_TotalEnergy CE-T1WI, original_shape_Maximum2DDiameterRow T2WI		