

**Table S1: Best parameters selected for ML Algorithms**

Algorithm	Best parameters
Decision tree	max_depth: 2
K-nearest neighbor	n_neighbors: 5
Multi layer perceptron	hidden_layer_sizes: 100
Naive Bayes	NA
Random Forest	n_estimators: 100
	kernel: 'rbf' gamma: 'scale'
Support vector machine	C: 1.2
SMOTE	sampling_strategy: 'auto'

**Table S2: All features selected from Original, LoG-filtered and Wavelet-filtered images (M\_ALL set)**

pN-Stage		pT-Stage	Overall Stage	
CT	PET	PET	CT	PET
original_shape_Maximum2DDiameterSlice	original_shape_MajorAxisLength	original_shape_LeastAxisLength	original_shape_LeastAxisLength	original_shape_Maximum2DDiameterSlice
original_shape_Sphericity	original_shape_Maximum2DDiameterRow	wavelet-LLH_gldm_LargeDependenceHighGrayLevelEmphasis	original_shape_Maximum2DDiameterSlice	original_firstorder_Minimum
wavelet-LLH_gldm_Imc1	original_shape_Maximum2DDiameterSlice	wavelet-LHL_firstorder_Mean	original_gldm_InverseVariance	original_gldm_SmallDependenceLowGrayLevelEmphasis
wavelet-LHH_glszm_SizeZoneNonUniformityNormalized	original_firstorder_Energy	wavelet-LHL_gldm_MCC	original_gldm_MCC	original_glszm_SmallAreaLowGrayLevelEmphasis
wavelet-HHL_firstorder_Mean	original_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-LHH_gldm_Correlation	original_gldm_LongRunHighGrayLevelEmphasis	original_ngtdm_Contrast
wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-LHH_gldm_SmallDependenceLowGrayLevelEmphasis	original_ngtdm_Strength	wavelet-LHH_glszm_SmallAreaLowGrayLevelEmphasis
log-sigma-3-0-mm-3D_firstorder_Kurtosis	wavelet-HHL_glszm_SmallAreaEmphasis	wavelet-HHH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-LLH_firstorder_Skewness	wavelet-HLL_firstorder_Median
log-sigma-1-5-mm-3D_gldm_Imc1	wavelet-HHH_firstorder_Mean	log-sigma-1-0-mm-3D_gldm_DependenceVariance	wavelet-LHH_firstorder_Skewness	wavelet-HLL_gldm_Imc1
	wavelet-HHH_gldm_LargeDependenceLowGrayLevelEmphasis	log-sigma-0-5-mm-3D_glszm_LowGrayLevelZoneEmphasis	wavelet-LHH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis
	log-sigma-1-5-mm-3D_glszm_SizeZoneNonUniformityNormalized		wavelet-HLL_firstorder_Kurtosis	wavelet-HHL_glszm_SizeZoneNonUniformityNormalized
			wavelet-HLL_firstorder_Median	wavelet-HHL_glszm_SmallAreaEmphasis
			wavelet-HLL_firstorder_Skewness	wavelet-HHL_glszm_SmallAreaLowGrayLevelEmphasis
			wavelet-HHL_firstorder_Mean	wavelet-HHH_glszm_SizeZoneNonUniformityNormalized
			wavelet-HHL_firstorder_Median	wavelet-HHH_glszm_SmallAreaLowGrayLevelEmphasis
			wavelet-HHH_firstorder_Mean	log-sigma-2-5-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis
			wavelet-LLL_gldm_Imc1	log-sigma-1-5-mm-3D_glszm_SizeZoneNonUniformityNormalized
			wavelet-LLL_gldm_InverseVariance	log-sigma-1-5-mm-3D_glszm_SmallAreaEmphasis
			log-sigma-3-0-mm-3D_firstorder_Kurtosis	log-sigma-1-5-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis
			log-sigma-3-0-mm-3D_gldm_Imc2	log-sigma-1-0-mm-3D_glszm_SizeZoneNonUniformityNormalized
				log-sigma-0-5-mm-3D_gldm_LargeDependenceLowGrayLevelEmphasis

**Table S3: All features selected from Original images (M\_O set)**

pN-Stage		pT-Stage	Overall Stage	
CT	PET	PET	CT	PET
original_shape_MajorAxisLength	original_shape_MajorAxisLength	original_shape_Elongation	original_shape_LeastAxisLength	original_shape_LeastAxisLength
original_shape_Maximum2DDiameterColumn	original_shape_Maximum2DDiameterRow	original_shape_LeastAxisLength	original_shape_MajorAxisLength	original_shape_MajorAxisLength
original_shape_Maximum2DDiameterRow	original_shape_Maximum2DDiameterSlice	original_firstorder_Kurtosis	original_shape_Maximum2DDiameterSlice	original_shape_Maximum2DDiameterRow
original_shape_Maximum2DDiameterSlice	original_shape_Sphericity	original_gldm_DependenceEntropy	original_firstorder_Energy	original_shape_Maximum2DDiameterSlice
original_shape_Sphericity	original_shape_SurfaceVolumeRatio	original_ngtdm_Coarseness	original_firstorder_Maximum	original_shape_SurfaceVolumeRatio
original_firstorder_InterquartileRange	original_firstorder_Energy		original_glcml_Idmn	original_firstorder_10Percentile
original_glcml_MCC	original_firstorder_Minimum		original_glcml_InverseVariance	original_firstorder_Minimum
	original_firstorder_Range		original_glcml_MCC	original_firstorder_Range
	original_glcml_InverseVariance		original_glszm_SizeZoneNonUniformityNormalized	original_firstorder_Uniformity
original_gldm_SmallDependenceLowGrayLevelEmphasis				original_glcml_Contrast
				original_glcml_Correlation
				original_glcml_InverseVariance
				original_gldm_DependenceEntropy
				original_gldm_GrayLevelNonUniformity
				original_gldm_SmallDependenceLowGrayLevelEmphasis
				original_glszm_LargeAreaLowGrayLevelEmphasis
				original_glszm_SmallAreaLowGrayLevelEmphasis
				original_ngtdm_Busyness
				original_ngtdm_Coarseness

**Table S4: All features selected from LoG-filtered images (M\_L set)**

pN-Stage		pT-Stage	Overall Stage	
CT	PET	PET	CT	PET
log-sigma-3-0-mm-3D_firstorder_90Percentile	log-sigma-3-0-mm-3D_firstorder_Energy	log-sigma-3-0-mm-3D_ngtdm_Coarseness	log-sigma-3-0-mm-3D_firstorder_90Percentile	log-sigma-3-0-mm-3D_glcml_ldmn
log-sigma-3-0-mm-3D_firstorder_Kurtosis	log-sigma-3-0-mm-3D_firstorder_Maximum	log-sigma-1-5-mm-3D_glszm_SmallAreaEmphasis	log-sigma-3-0-mm-3D_firstorder_Energy	log-sigma-3-0-mm-3D_gldm_DependenceEntropy
log-sigma-3-0-mm-3D_firstorder_Uniformity	log-sigma-3-0-mm-3D_firstorder_Mean		log-sigma-3-0-mm-3D_firstorder_Kurtosis	log-sigma-3-0-mm-3D_gldm_GrayLevelNonUniformity
log-sigma-3-0-mm-3D_glcml_Correlation	log-sigma-3-0-mm-3D_glcml_Correlation		log-sigma-3-0-mm-3D_firstorder_Maximum	log-sigma-3-0-mm-3D_gldm_SmallDependenceLowGrayLevelEmphasis
log-sigma-3-0-mm-3D_glcml_ldmn	log-sigma-3-0-mm-3D_gldm_DependenceEntropy		log-sigma-3-0-mm-3D_firstorder_Mean	log-sigma-2-5-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis
log-sigma-3-0-mm-3D_glcml_lmc2	log-sigma-3-0-mm-3D_gldm_SmallDependenceLowGrayLevelEmphasis		log-sigma-3-0-mm-3D_firstorder_Skewness	log-sigma-1-5-mm-3D_glszm_SizeZoneNonUniformityNormalized
log-sigma-3-0-mm-3D_gldm_DependenceVariance	log-sigma-3-0-mm-3D_glszm_LargeAreaEmphasis		log-sigma-3-0-mm-3D_firstorder_Uniformity	log-sigma-1-5-mm-3D_glszm_SmallAreaEmphasis
log-sigma-3-0-mm-3D_gldm_LargeDependenceHighGrayLevelEmphasis	log-sigma-3-0-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis		log-sigma-3-0-mm-3D_glcml_Correlation	log-sigma-1-5-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis
log-sigma-1-5-mm-3D_glcml_lmc1	log-sigma-3-0-mm-3D_ngtdm_Strength		log-sigma-3-0-mm-3D_glcml_lmc2	log-sigma-1-0-mm-3D_glcml_InverseVariance
log-sigma-1-0-mm-3D_glcml_lmc1	log-sigma-2-0-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis		log-sigma-3-0-mm-3D_gldm_DependenceNonUniformityNormalized	log-sigma-1-0-mm-3D_gldm_SmallDependenceLowGrayLevelEmphasis
log-sigma-1-0-mm-3D_glcml_InverseVariance	log-sigma-1-5-mm-3D_gldm_LargeDependenceLowGrayLevelEmphasis		log-sigma-3-0-mm-3D_gldm_LargeDependenceHighGrayLevelEmphasis	log-sigma-1-0-mm-3D_glszm_SizeZoneNonUniformityNormalized
log-sigma-0-5-mm-3D_firstorder_Kurtosis	log-sigma-1-5-mm-3D_glszm_LargeAreaHighGrayLevelEmphasis		log-sigma-3-0-mm-3D_gldm_RunEntropy	log-sigma-1-0-mm-3D_glszm_SmallAreaEmphasis
	log-sigma-1-5-mm-3D_glszm_SizeZoneNonUniformityNormalized		log-sigma-3-0-mm-3D_glszm_ZoneEntropy	log-sigma-0-5-mm-3D_glcml_InverseVariance
	log-sigma-1-0-mm-3D_glcml_ldmn		log-sigma-3-0-mm-3D_ngtdm_Coarseness	log-sigma-0-5-mm-3D_gldm_LargeDependenceLowGrayLevelEmphasis
	log-sigma-1-0-mm-3D_glszm_SmallAreaLowGrayLevelEmphasis		log-sigma-1-5-mm-3D_glcml_Autocorrelation	log-sigma-0-5-mm-3D_glszm_GrayLevelNonUniformity
	log-sigma-0-5-mm-3D_gldm_DependenceNonUniformityNormalized		log-sigma-1-5-mm-3D_glcml_lmc1	log-sigma-0-5-mm-3D_glszm_LargeAreaHighGrayLevelEmphasis
	log-sigma-0-5-mm-3D_glszm_GrayLevelNonUniformity		log-sigma-0-5-mm-3D_firstorder_Kurtosis	log-sigma-0-5-mm-3D_glszm_SizeZoneNonUniformityNormalized
	log-sigma-0-5-mm-3D_glszm_LargeAreaHighGrayLevelEmphasis		log-sigma-0-5-mm-3D_glcml_ClusterShade	log-sigma-0-5-mm-3D_glszm_SmallAreaEmphasis
	log-sigma-0-5-mm-3D_glszm_SizeZoneNonUniformityNormalized		log-sigma-0-5-mm-3D_glcml_InverseVariance	
	log-sigma-0-5-mm-3D_glszm_SmallAreaEmphasis		log-sigma-0-5-mm-3D_gldm_DependenceNonUniformityNormalized	
	log-sigma-0-5-mm-3D_ngtdm_Busyness			

**Table S5: All features selected from Wavelet-filtered images (M\_W set)**

pN-Stage		pT-Stage	Overall Stage	
CT	PET	PET	CT	PET
wavelet-LLH_firstorder_Kurtosis	wavelet-LLH_gldm_Imc1	wavelet-LLH_gldm_GrayLevelNonUniformity	wavelet-LLH_firstorder_Kurtosis	wavelet-LLH_gldm_GrayLevelNonUniformity
wavelet-LLH_gldm_Imc1	wavelet-LLH_gldm_LargeDependenceHighGrayLevelEmphasis	wavelet-LLH_gldm_LargeDependenceHighGrayLevelEmphasis	wavelet-LLH_firstorder_Skewness	wavelet-LHL_gldm_Correlation
wavelet-LLH_gldm_Imc2	wavelet-LLH_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-LLH_glszm_LargeAreaHighGrayLevelEmphasis	wavelet-LHL_gldm_Imc1	wavelet-HLL_firstorder_Median
wavelet-LLH_glszm_SizeZoneNonUniformityNormalized	wavelet-LHH_firstorder_Median	wavelet-LLH_ngtdm_Coarseness	wavelet-LHL_gldm_InverseVariance	wavelet-HLL_gldm_Idmn
wavelet-LHL_firstorder_90Percentile	wavelet-LHH_gldm_ClusterShade	wavelet-LHL_firstorder_Mean	wavelet-LHL_gldm_RunLengthNonUniformity	wavelet-HHL_gldm_Idmn
wavelet-LHL_firstorder_Maximum	wavelet-LHH_gldm_Imc1	wavelet-LHL_gldm_MCC	wavelet-LHH_firstorder_Skewness	wavelet-HHL_gldm_DependenceVariance
wavelet-LHL_gldm_Imc1	wavelet-LHH_glszm_SizeZoneNonUniformityNormalized	wavelet-LHH_gldm_ClusterShade	wavelet-LHH_gldm_Idmn	wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis
wavelet-LHH_gldm_LargeDependenceEmphasis	wavelet-HLL_firstorder_Mean	wavelet-LHH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-LHH_glszm_SizeZoneNonUniformityNormalized	wavelet-HHL_glszm_SmallAreaEmphasis
wavelet-LHH_gldm_RunEntropy	wavelet-HLL_firstorder_Median	wavelet-LHH_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-HLL_firstorder_Kurtosis	wavelet-HHH_gldm_LargeDependenceLowGrayLevelEmphasis
wavelet-LHH_glszm_SizeZoneNonUniformityNormalized	wavelet-HLL_gldm_Idmn	wavelet-HLL_firstorder_Skewness	wavelet-HLL_firstorder_Maximum	wavelet-HHH_glszm_SmallAreaLowGrayLevelEmphasis
wavelet-LHH_glszm_SmallAreaEmphasis	wavelet-HLL_gldm_Idmn	wavelet-HLL_gldm_Idmn	wavelet-HLH_firstorder_Median	wavelet-LLL_glszm_LargeAreaHighGrayLevelEmphasis
wavelet-LHH_ngtdm_Busyness	wavelet-HLH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-HLL_gldm_MCC	wavelet-HLH_firstorder_Skewness	
wavelet-HLH_firstorder_Mean	wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-HLH_gldm_Idmn	wavelet-HHL_firstorder_Mean	
wavelet-HHL_firstorder_Mean	wavelet-HHL_glszm_SmallAreaEmphasis	wavelet-HLH_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-HHL_firstorder_Median	
wavelet-HHL_gldm_DependenceNonUniformityNormalized	wavelet-HHH_firstorder_Mean	wavelet-HHH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-HHL_firstorder_Skewness	
wavelet-HHL_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-HHH_gldm_LargeDependenceLowGrayLevelEmphasis	wavelet-HHH_glszm_LargeAreaEmphasis	wavelet-HHL_gldm_Imc1	
wavelet-HHH_glszm_SizeZoneNonUniformityNormalized	wavelet-HHH_gldm_SmallDependenceLowGrayLevelEmphasis	wavelet-LLL_firstorder_Maximum	wavelet-HHH_firstorder_Mean	
wavelet-HHH_glszm_SmallAreaLowGrayLevelEmphasis	wavelet-LLL_firstorder_90Percentile	wavelet-LLL_firstorder_Minimum	wavelet-LLL_gldm_Imc1	
	wavelet-LLL_firstorder_Energy		wavelet-LLL_gldm_Imc2	
	wavelet-LLL_gldm_Idmn		wavelet-LLL_gldm_InverseVariance	
	wavelet-LLL_gldm_Imc1		wavelet-LLL_gldm_MCC	
	wavelet-LLL_gldm_SmallDependenceLowGrayLevelEmphasis		wavelet-LLL_gldm_LargeDependenceHighGrayLevelEmphasis	
	wavelet-LLL_glszm_SmallAreaLowGrayLevelEmphasis			