**Supplementary**

**Table S1**. Extracted image features.

|  |  |  |
| --- | --- | --- |
| **Category** | **Comment** | **Features** |
| **Histogram** | Histogram features describe the distribution of voxel intensities in the ROI. | Energy, Entropy, Minimum, Percentiles, Maximum, Mean, Median, Range, Mean Absolute Deviation, Robust Mean Absolute Deviation, Root Mean Squared, Skewness, Kurtosis, Variance, Uniformity |
| **Volumetric** | Volumetric features describe the shape of the ROI in 3D. These features are quantitative descriptors in a radiology report. | Volume, Surface Area, Surface Area to Volume Ratio, Maximum 3D Diameter, Maximum 2D Diameter |
| **Morphologic** | Morphologic features describe the shape of the ROI in 3D. Usually, these features are semantic descriptors in a radiology report. | Sphericity, Compactness, Spherical Disproportion, Major Axis, Least Axis, Minor Axis, Elongation, Flatness |
| **Texture** | **GLCM** | Texture features describe the quantitative information about the spatial arrangement of the ROI. The texture is a set of metrics calculated to the image.  | Autocorrelation, Joint Average, Sum Average, Joint Entropy, Sum Entropy, Joint Energy, Sum Squares, Cluster Shade, Cluster Tendency, Contrast, Correlation, Difference Average, Difference Entropy, Difference Variance, Homogeneity, Maximum Probability, Inverse Difference Moment, Inverse Difference Moment Normalized, Inverse Difference, Inverse Difference Normalized, Informal Measure of Correlation, Maximum Probability |
| **GLSZM** | Small Area Emphasis, Large Area Emphasis, Gray Level Non-Uniform, Gray Level Non-Uniform Normalized, Size Zone Non-Uniform, Gray Level Non-Uniform Normalized, Zone Percentage, Gray Level Variance, Zone Entropy, Zone Variance, Low Gray Level Zone Emphasis, High Gray Level Zone Emphasis, Small Area Low Gray Level Emphasis, Small Area High Gray Level Emphasis, Large Area Low Gray Level Emphasis, Large Area High Gray Level Emphasis |
| **GLRLM** | Short Run Emphasis, Long Run Emphasis, Gray Level Non-Uniformity, Gray Level Non-Uniformity Normalized, Run Length Non-Uniformity, Run Length Non-Uniformity Normalized, Run Percentage, Gray Level Variance, Run Variance, Run Entropy, Low Gray Level Run Emphasis, High Gray Level Run Emphasis, Short Run Low Gray Level Emphasis, Short Run High Gray Level Emphasis, Long Run Low Gray Level Emphasis, Long Run High Gray Level Emphasis |

**Table S2.** Chosen image filters.

|  |  |
| --- | --- |
| **Filter** | **Comment** |
| LoG | Emphasize areas of gray level change |
| Logarithm | Rescale on the range of the original image |
| Exponential |
| Wavelet | Separate the image by frequency bands |
| Gabor |

### Supplementary

Definitions of the selected features

***Histogram Features interpretation***

**Maximum**:

$$Max(X)$$

**Median:**

$$Median(X)$$

**10Percentiles:**

$$0.1X$$

**Range:**

$$Max(X)-Min(X)$$

Skewness:

$$\frac{\frac{1}{N\_{p}}\sum\_{i=1}^{N\_{p}}(X(i)-\overbar{X})^{3}}{(\sqrt{{1}/{N\_{p}\sum\_{i=1}^{N\_{p}}(X(i)-\overbar{X})^{2}}})^{3}}$$

***Texture Features***

**ZoneVariance**:

$$\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}p(i,j)(j-μ)^{2}$$

Here, $μ=\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}p(i,j)j$

**SmallAreaLowGrayLevelEmphasis：**

$$\frac{\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}\frac{P(i,j)}{i^{2}j^{2}}}{N\_{z}}$$

**SizeZoneNonUniformNormalized:**

$$\frac{\sum\_{j=1}^{N\_{g}}(\sum\_{i=1}^{N\_{g}}P(i,j))^{2}}{N\_{z}^{2}}$$

**Correlation:**

$$\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}p(i,j)ij$$

**ClusterShade:**

$$\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}(i+j-μ\_{x}-μ\_{y})^{3}p(i,j)$$

**LargeAreaHighGrayLevelEmphasis:**

$$\frac{\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}\frac{P(i,j)j^{2}}{i^{2}}}{N\_{z}}$$

**Imc2:**

$$\sqrt{1-e^{-2(HXY2-HXY)}}$$

Here, $HXY2 = -\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{g}}p\_{x}(i)p\_{y}(j)log\_{2}(p\_{x}(i)p\_{y}(j)+ε)$, $HXY= -\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{g}}p(i,j)log\_{2}(p(i,j)+ε)$

**GrayLevelVariance:**

$$\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{r}}p(i,j|θ)(i-μ)^{2}$$

Here, $μ=\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{r}}p(i,j|θ)i$

**ZoneEntropy:**

$$-\sum\_{i=1}^{N\_{g}}\sum\_{j=1}^{N\_{s}}p(i,j)log\_{2}(p(i,j)+ε)$$