Radiomics

In the field of medicine, radiomics is a method that extracts a large number of features from radiographic medical images using data-characterization algorithms.

A radiomics model typically follows these steps:

Image Acquisition: Medical images, such as CT or MRI scans, are acquired from patients.

Image Segmentation: Regions of interest (ROIs) within the medical images are delineated or segmented. This step involves defining the boundaries of structures or lesions to focus the radiomic analysis on specific areas of interest.

Feature Extraction: A wide range of quantitative features is extracted from the segmented regions. These features can include statistical measures, shape descriptors, texture features, and more. The goal is to capture information about the intensity, shape, and texture of the structures in the images.

Feature Selection: Not all extracted features may be relevant for the specific diagnostic or predictive task. Feature selection techniques are often employed to identify the most informative features while reducing dimensionality.

Model Building: Machine learning or statistical models are trained using the selected radiomic features and relevant clinical data. The choice of the model (e.g., decision trees, random forests, support vector machines, deep learning) depends on the specific task and dataset.

Validation: The performance of the radiomics model is evaluated using validation datasets to assess its accuracy, sensitivity, specificity, and other relevant metrics.

Radiomics models can be used for various clinical applications, including:

Disease Diagnosis: Radiomics models can aid in the diagnosis of diseases by providing quantitative information about lesions or abnormalities in medical images.

Prognosis: Radiomics features can be used to predict the likely outcome of a disease, such as disease progression or patient survival.

Treatment Response Assessment: Radiomics can help monitor how well a patient is responding to treatment by analyzing changes in image features over time.

Risk Stratification: Radiomics can be used to stratify patients into risk categories, helping clinicians make more personalized treatment decisions.

Biomarker Discovery: Radiomics can identify image-based biomarkers that correlate with disease characteristics or treatment response.

Radiomic features

see Radiomic features.

Recent developments in radiomics-based image analysis have enabled new possibilities to non-invasively determine the histopathology and/or genetic profile of a number of different tumor entities [1].

Radiomics quality score

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Radiomics studies should adhere to the radiomics quality score (RQS), (TRIPOD) Transparent reporting of a multivariable prediction model for individual prognosis or diagnosis checklist, and The Image Biomarker Standardization Initiative (IBSI) guidelines. to facilitate the translation of radiomics into the clinical field [2].

Glioma Radiomics

Glioma Radiomics.

Meningioma Radiomics

Meningioma Radiomics.

Spontaneous intracerebral hemorrhage expansion radiomics

Spontaneous intracerebral hemorrhage expansion radiomics

1)
Lohmann P, Galldiks N, Kocher M, Heinzel A, Filss CP, Stegmayr C, Mottaghy FM, Fink GR, Jon Shah N, Langen KJ. Radiomics in neuro-oncology: Basics, workflow, and applications. Methods. 2021 Apr;188:112-121. doi: 10.1016/j.ymeth.2020.06.003. Epub 2020 Jun 6. PMID: 32522530.
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