



Applied Chest Imaging Laboratory

Boston, Massachusetts. USA



BRIGHAM AND
WOMEN'S HOSPITAL



HARVARD
MEDICAL SCHOOL

Parenchymal Analysis

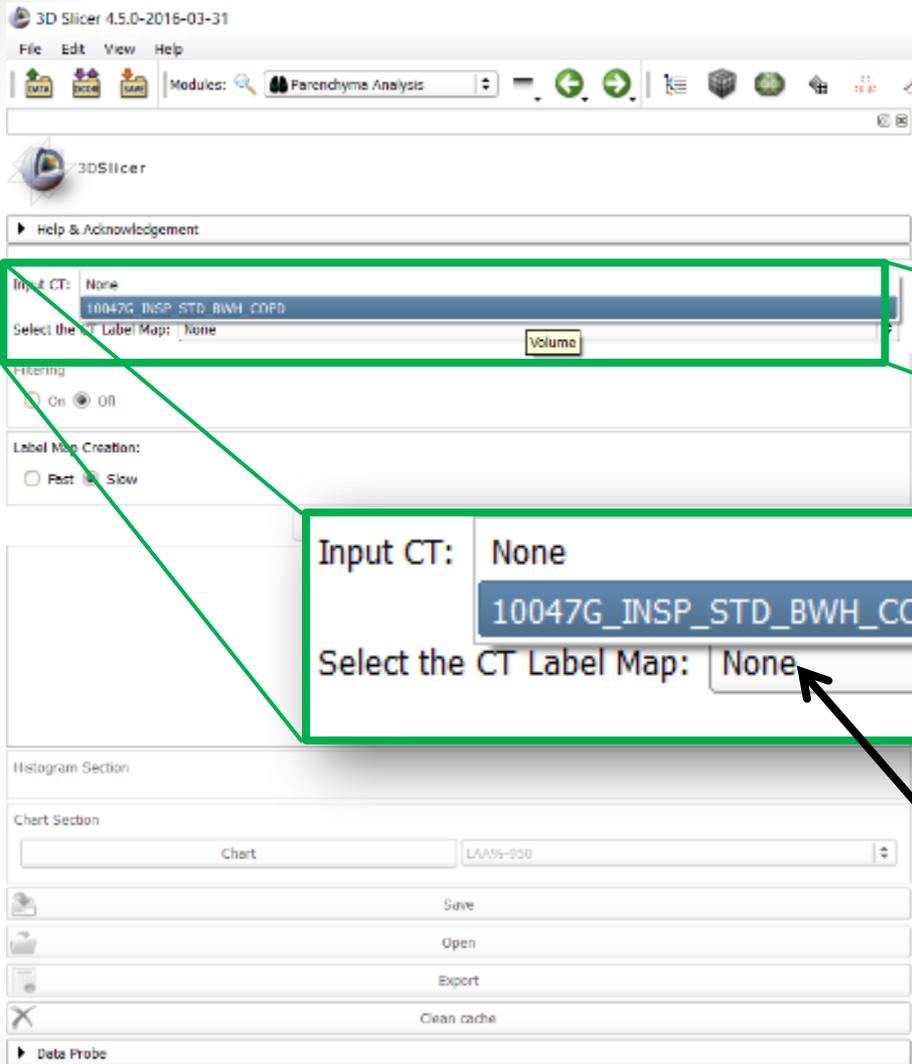
A Chest Imaging Platform Slicer Extension module

Overview

- Goal: The parenchyma analysis module performs densitometry in chest CT scans by isolating the lung region and computing different phenotypes based on the histogram of the density measurements.
- Densitometry is used to quantify:
 - Emphysema: Emphysema is computed in full inspiratory scans as the percentage of voxels below a given threshold, typically -950 HU or -910 HU. Other surrogate metrics of emphysema are mean lung density and lung mass (mean lung density * volume)
 - Gas Trapping: Gas trapping is computed in expiratory scans as the percentage of voxels below -856 HU.
 - Interstitial Lung Disease: ILD is computed in full inspiratory scans as the percentage of voxels between -600HU and -250 HUs.



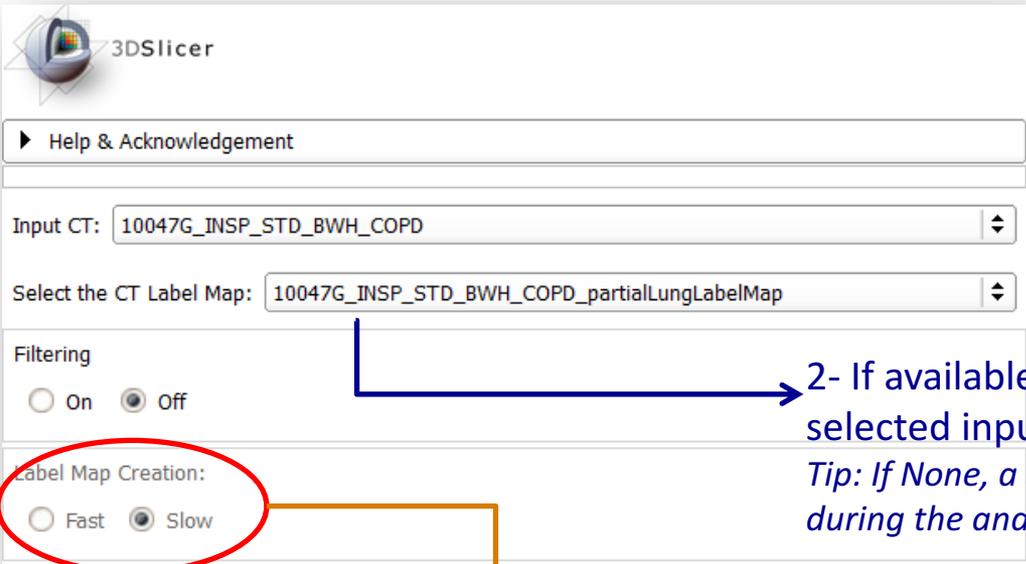
Parenchyma Analysis



1- Select an input CT image



Parenchyma Analysis



2- If available, select the partialLungLabelMap for the selected input CT

Tip: If None, a new LabelMap would be automatically created during the analysis

Note: When a partialLungLabelMap is already selected, options for label map creation are disabled.



Parenchyma Analysis

Input CT: 10047G_INSP_STD_BWH_COPD

Select the CT Label Map: None

Filtering

On Off

Label Map Creation:

Fast Slow

Apply

3- Filtering options.

Tip: By default filtering is set to "off", turn to "on" to activate filter



Parenchyma Analysis

Tip: when filtering is "on" a new frame opens up

Filtering

On Off

Filter for Phenotype Analysis

NLM Median Gaussian

Dimensions:

Strength:

Select filter: non-local means (NLM), median or Gaussian filter

Select whether to apply filter in 2D or 3D

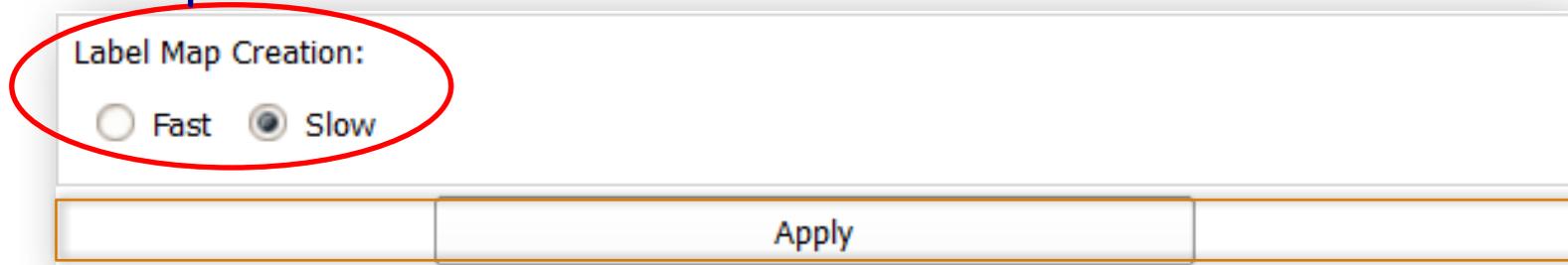
Select filtering strength: Smooth, medium, Heavy

Check "Filter for phenotype Analysis" if filtering should not be used for creating the label map



Parenchyma Analysis

Creating partialLungLabelMap. Select method.
Tip: Slow method takes more time to finish but is more accurate.

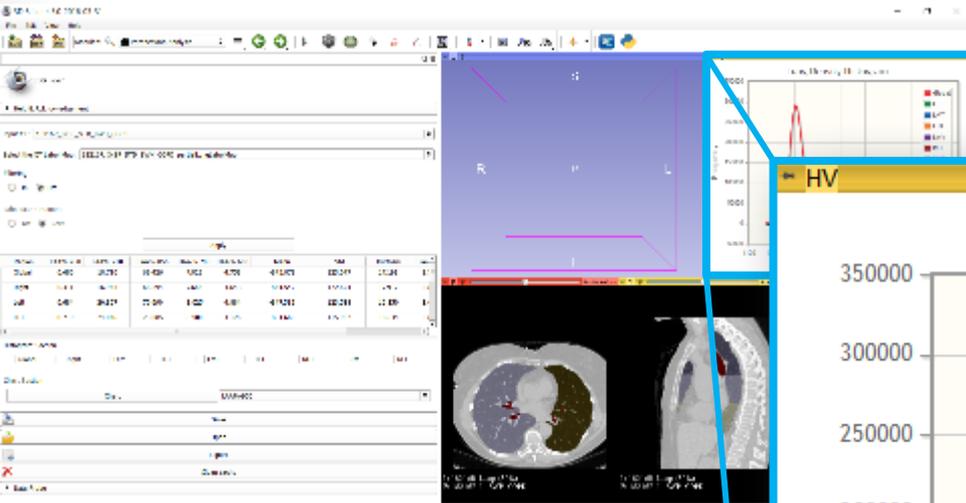


The screenshot shows a software interface for 'Label Map Creation'. It features two radio buttons: 'Fast' (unselected) and 'Slow' (selected). A red oval highlights these options. A blue arrow points from the 'Slow' option to the text above. Below the radio buttons is an 'Apply' button, which is highlighted with an orange border. An orange arrow points from the 'Apply' button to the text below.

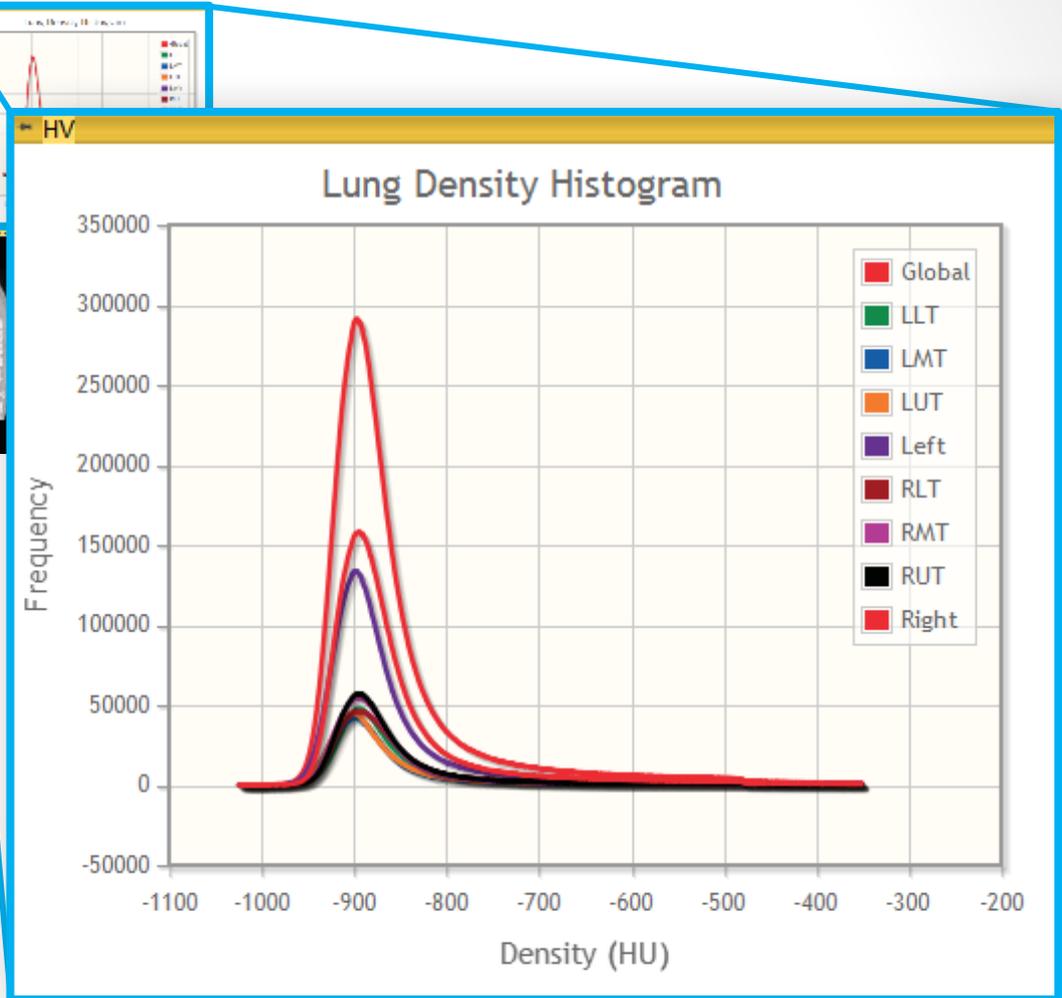
8- Click Apply to start the parenchyma analysis



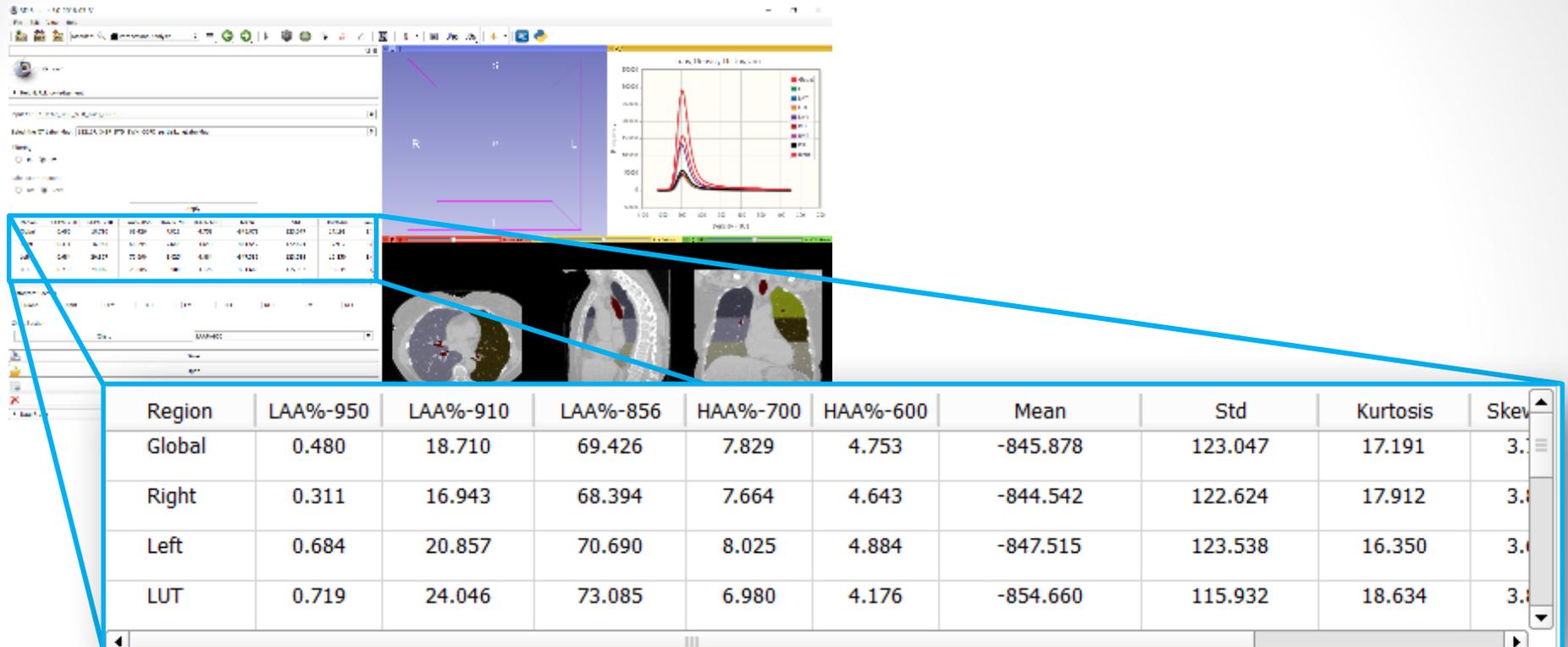
Parenchyma Analysis



The lung density histogram is created for each region



Parenchyma Analysis



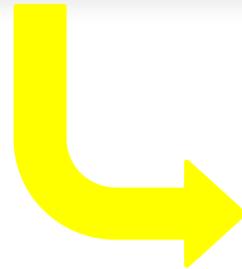
A table with the metrics for each region is also created and presented on the interface

Parenchyma Analysis

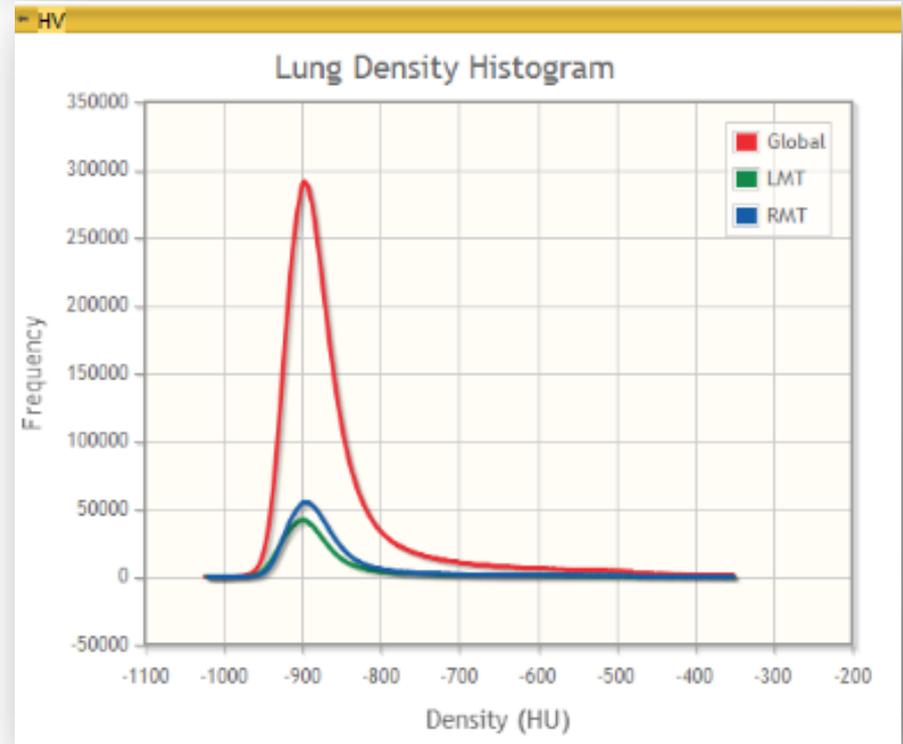
RUT	0.223	16.196	68.958	7.128	4.255	-847.104	115.718	18.687	3.4
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Histogram Section

Global Right Left LUT LMT LLT RUT RMT RLt



In the Histogram Section, regions whose histogram has to be shown can be checked



Parenchyma Analysis

View a Chart with the obtained results

Global Right Left LUT LMT LLT RUT RMT RLT

Chart Section

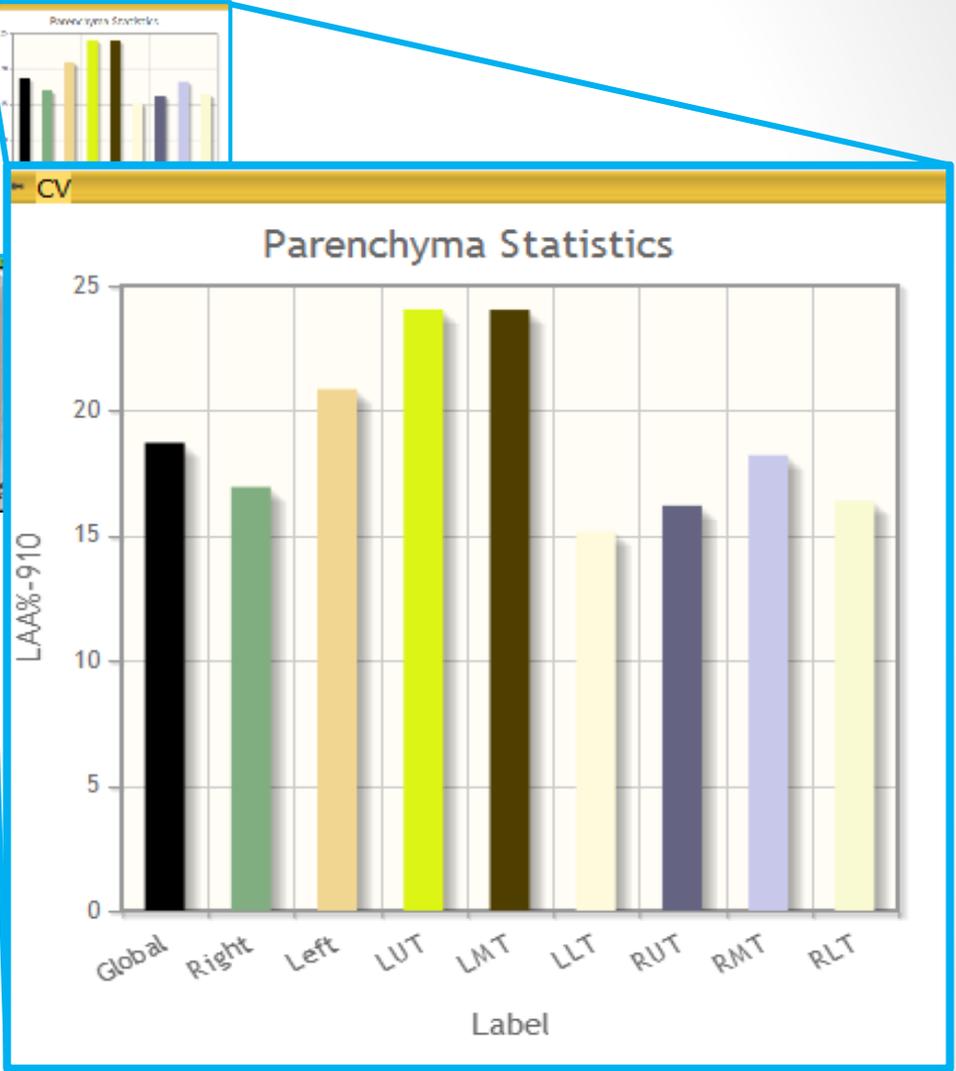
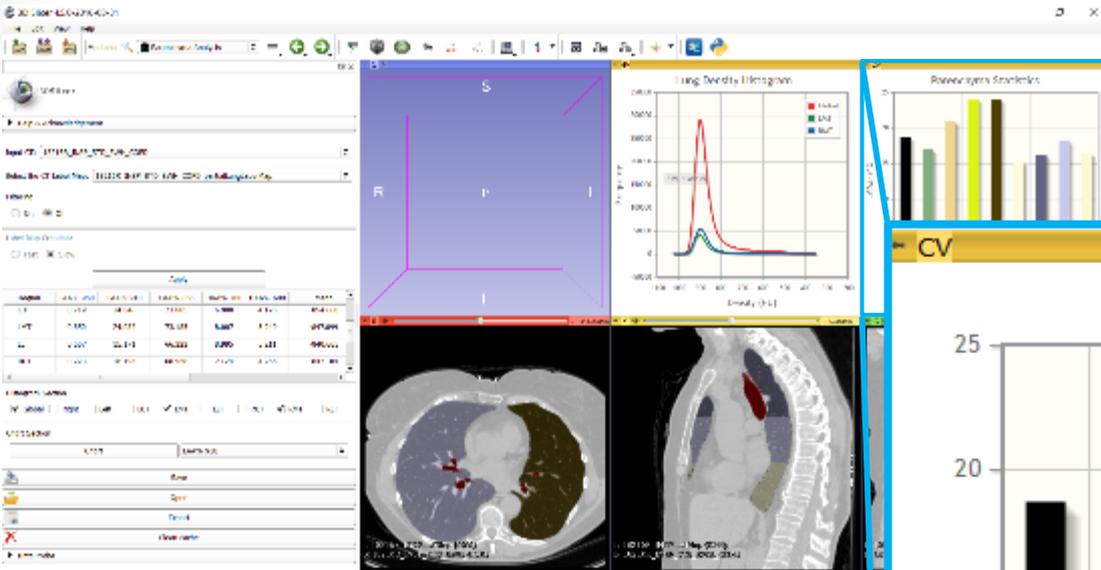
Chart LAA%-910

10- Click on "Chart" to see the results of the selected statistic

9- Select the desired statistic



Parenchyma Analysis



A chart showing the selected statistics for each region is created



Parenchyma Analysis

Histogram Section

Global Right Left LUT LMT LLT RUT RMT RLT

Chart Section

Chart: LAA%-910

Save

Open

Export

Clean cache

Save option: click on "Save" to save the computed statistics.

Open option: Click on "open" to open previously done statistics

Export option: Click "export" to export the computed statistics

Click "clean caché" to remove all saved statistics



Parenchymal Analysis

- The Parenchymal Analysis module is part of the Chest Imaging Platform extension for 3D Slicer (www.chestimagingplatform.org)
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