

Menu

File

Load at startup <checkbox>:

When checked, the software will quick load previous input and layout settings at startup.

Quick Load <button>:

Quick load previous input and layout settings (LastSaved.xsetting & LastSaved.xlayout).

Quick Save <button>:

Quick save current input and layout settings (LastSaved.xsetting & LastSaved.xlayout).

Save & Exit <button>:

Quick save current input and layout settings, then exit.

Exit <button>:

Exit.

Setting

Save Setting... <button>:

A dialog box will prompt to allow you to select the file and location where you want to save the current input setting. Default to "preset" subfolder of the software as .xsetting file.

Load Setting... <button>:

A dialog box will prompt to allow you to select the input setting file and location where you want to load and update the current session. Default to "preset" subfolder of the software as .xsetting file.

Load Settings found in "preset" folder (.xsetting) <button>:

This area is populated by input setting files (.xsetting) found in the "preset" subfolder of the software. You can select any of these files to load it.

Layout

Save Layout... <button>:

A dialog box will prompt to allow you to select the file and location where you want to save the current panel layout. Default to "preset" subfolder as .xlayout file.

Load Layout... <button>:

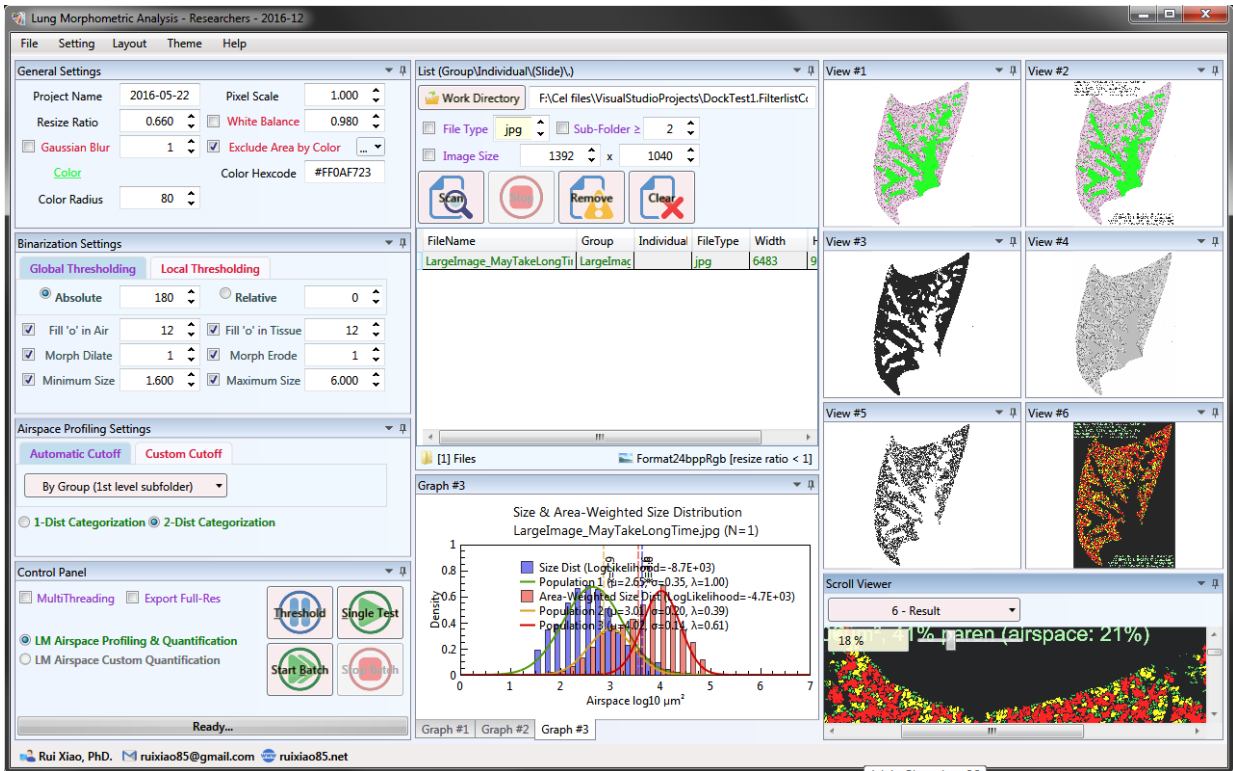
A dialog box will prompt to allow you to select the panel layout file and location where you want to load and update the current session. Default to "preset" subfolder of the software as .xlayout file.

Load Layout found in "preset" folder (.xlayout) <button>:

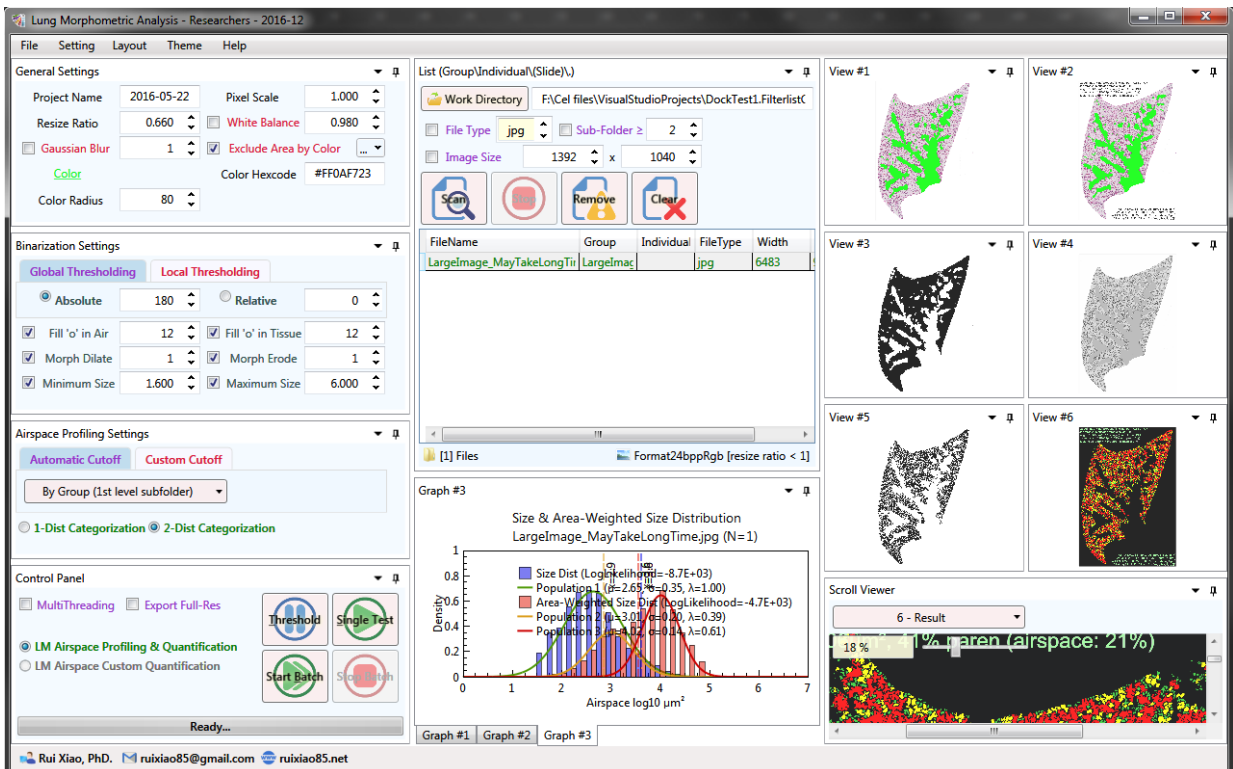
This area is populated by panel layout files (.xlayout) found in the "preset" subfolder. You can select any of these files to load it.

Theme

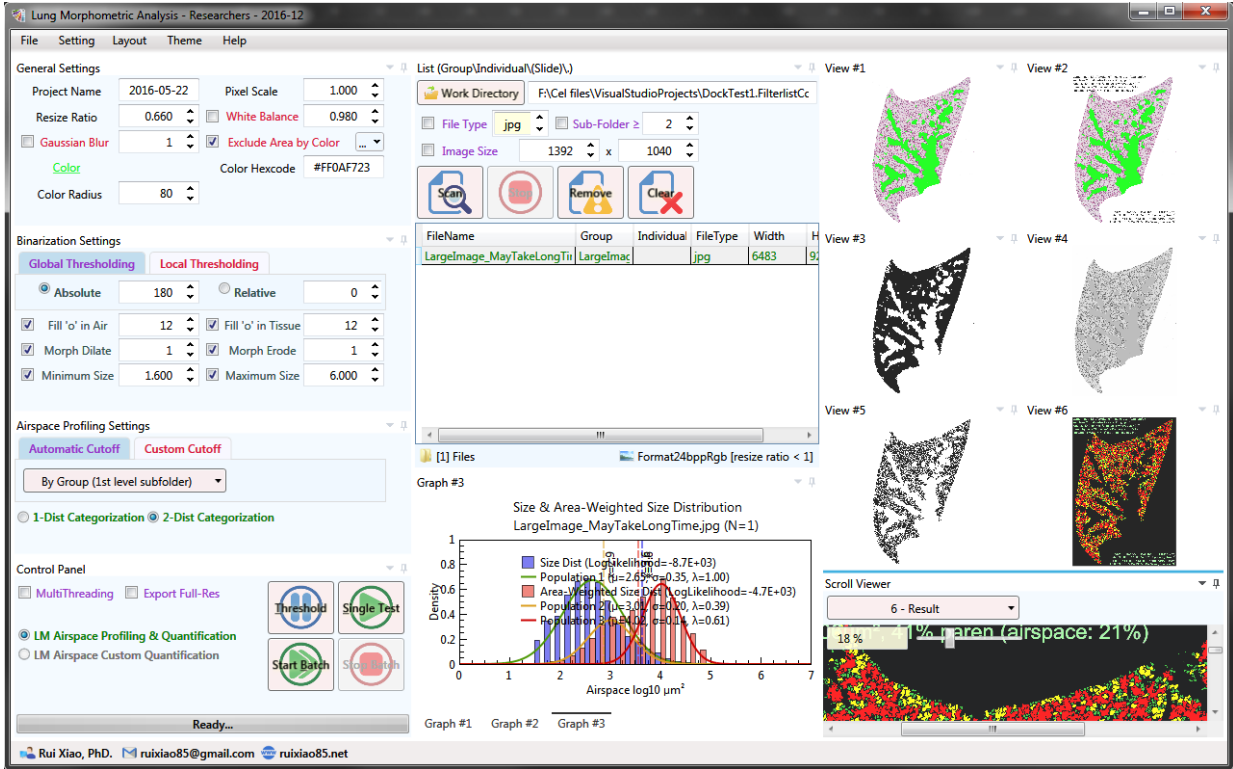
Aero <button>:



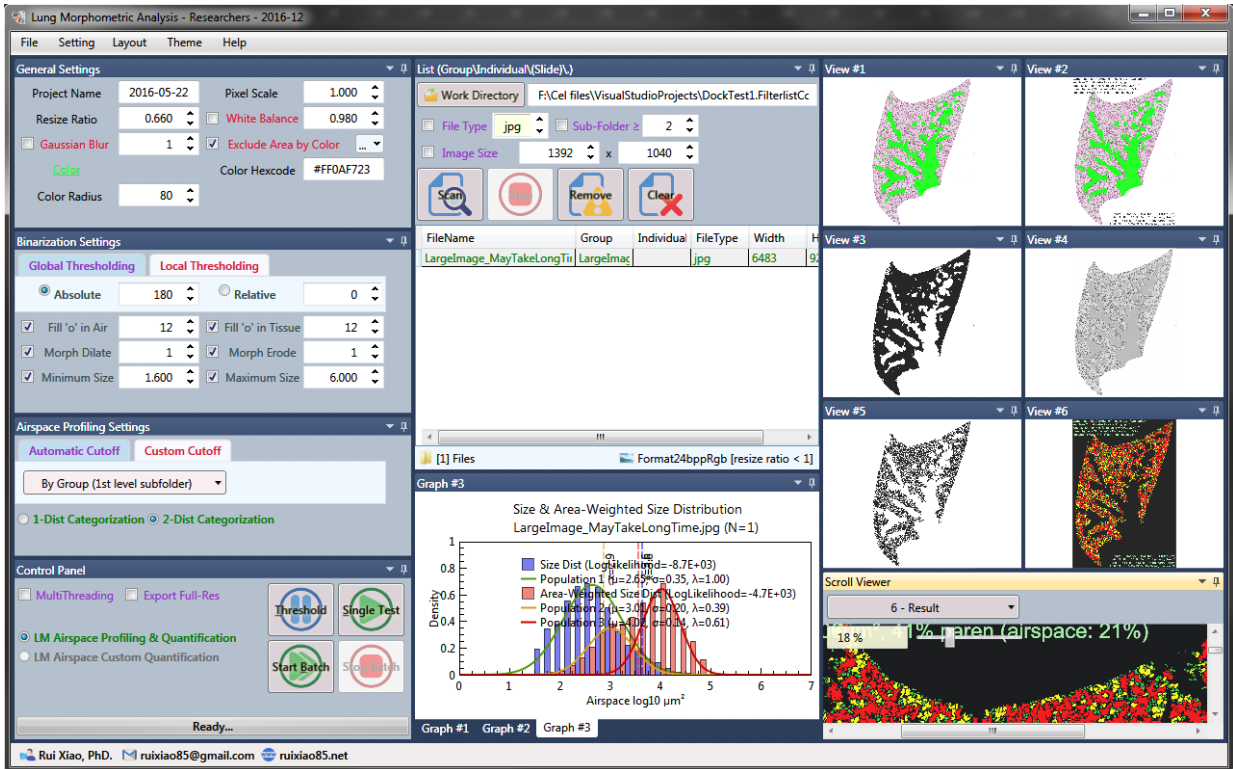
Generic <button>:



Metro <button>:



VS2010 <button>:



Help

About <button>:

This will prompt a message box that shows basic information about the software.

Check for updates <button>:

This will connect to ruixiao85.net to check for newer version of the software.

License <button>:

Using more advanced features or for business purpose may require a license.

General Settings

Project Name <text input>:

Every time when you batch process, the exported results will be saved into a subfolder with the specified project name. Default to your current date. By assigning different project names, the results generated at different time points will be saved into different folders and therefore will avoid overwriting existing files.

Pixel Scale <float input>:

This represent the actual dimension of each pixel ($\mu\text{m}/\text{px}$) on the original image file, regardless of the resize ratio.

Resize Ratio <float input>:

In case the original image file is too large or your computer has limited processing power, you may need to down-size the image for further analysis. For example, if this value is set to 0.5, your original image will be down-sampled to half the resolution. Although down-sized image would result in a different final pixel scale ($\mu\text{m}/\text{px}$), the software will automatically adjust for that. Default value is 1 (no resizing).

White Balance <float input>:

Enable it if the bright area of your image is not neutral white. For example, a value of 0.9 in this field means the 90% brightest values from each color channel (RGB) will be set to 255 (pure white).

Gaussian Blur <integer input>:

Enable it if you want to apply Gaussian blur to the image. The value represent the blur radius in pixels.

Exclude Area... <color picker>:

Enable it if you want to exclude a certain colored area, often the lung parenchyma from the whole lung. A color picker will pop out to allow you to select a color.

Exclude Area <colored text>:

This sample text shows the color you specified to exclude, either from color picker or hexcode input.

Color Hexcode <text input>:

You can edit the color hexcode in the range of #00000000 ~ #FFFFFFF (ARGB).

Color Radius <integer input>:

This sets how fuzzy or tolerant in Euclidean distance you want to select colors from the specific color.

Binarization Settings

Thresholding method can only be chosen between one of the two, thus the tab items. Global thresholding is preferred if the brightness across the entire image is even. Otherwise, when there is heavy vignetting (light fall-off), you will get better result with local adaptive thresholding.

Global Thresholding:

Global thresholding can be based on one of the two calculation methods, thus the radio buttons.

Absolute <radio button, integer input>:

0 ~ 255, the absolute value whether image on a gray scale will be turned into black and white only.

Relative <radio button, integer input>:

-255 ~ 255, instead of an absolute value, the value here is the offset (+/-) compared to the mean brightness value of each image.

Local Thresholding:

Local adaptive thresholding utilizes a moving window and brightness difference to determine whether a pixel is called black or white. Both brightness difference and window size are needed to perform local adaptive thresholding.

Brightness Difference <float input>:

This specifies the pixel brightness difference that thresholding is based on.

Window Size <integer input>:

This specifies how large in pixels the moving window is.

Fill 'o' in Air <checkbox, integer input>:

Enable this will ignore small artifacts in the airspace, such as dirt, cells, that are smaller than the specified size in pixels.

File 'o' in Tissue <checkbox, integer input>:

Enable this will ignore small artifacts in the tissue, such as small holes, lightly stained cells, that are smaller than the specified size in pixels.

Morphological Dilate <checkbox, integer input>:

Enable this will dilate (increase) the tissue area in pixels. As this process introduces bias, use minimum amount or pairs with the erode method.

Morphological Erode <checkbox, integer input>:

Enable this will erode (decrease) the tissue area in pixels. As this process introduces bias, use minimum amount or pairs with the dilate method.

Minimum Size <checkbox, float input>:

Enable this will exclude all airspaces smaller than the specified size ($\log_{10} \mu\text{m}^2$, same as the x-axis on the graph panels). Extra-small airspaces, smaller than the ordinary alveolar size, should be excluded before categorization.

Maximum Size <checkbox, float input>:

Enable this will exclude airspaces larger than the specified size ($\log_{10} \mu\text{m}^2$, which is consistent with the graph panels). Extra-large airspaces, larger than even the conducting airways, commonly is the huge area surrounding the lung image, which should be excluded from the lung area and profiling process.

Airspace Profiling Settings

Automatic Cutoff <tab> <combo box>

By default, perform unbiased categorization first and use the calculated threshold values for quantification. The recommended folder structure is "WorkDirectory/ Groups/ Individuals/ Slides/ Images (jpg/tif)".

For all selected images

Group airspaces from all selected images for categorization and quantification.

For each Group (1st level subfolder)

Group airspaces from images by group (1st level subfolder) for categorization and quantification.

For each Individual (2nd level subfolder)

Group airspaces from images by individual (2nd level subfolder) for categorization and quantification. Recommended for micrograph showing small area of view.

For each file

Use airspaces from each image file for categorization and quantification. Recommended for large scanned image.

Custom Cutoff <tab>

In addition, quantification can be perform on pre-defined thresholds.

Alveolar Threshold <float input>:

Use this value as alveolar threshold ($\log_{10} \mu\text{m}^2$).

Ductal/Destructive Threshold <float input>:

Use this value as ductal/destructive threshold ($\log_{10} \mu\text{m}^2$).

Single-distribution categorization <radio button>:

Perform single-distribution categorization.

Double-distribution categorization <radio button>:

Perform double-distribution categorization.

List

Work Directory <button>:

This will prompt a folder selection dialog box for you to choose from. The selected work directory will update the next text field.

Work Directory <text input>:

You can also directly edit the work directory here.

Filter by File Type jpg/tiff <checkbox spinner>:

Enable this to filter images by file types (jpg/tif).

Filter by levels of subfolders <checkbox integer input>:

Enable this to filter images by (>, minimum) levels of subfolders.

Filter by image size (width x height, px) <checkbox integer input>:

Enable this to filter images by the width and height specified.

Scan <button>:

Start scanning for images in the work directory and apply enabled filters. This process will clear the list before populating the new list.

Stop <button>:

Stop scanning & filtering for images when the scanning is in progress.

Remove <button>:

You can select some images and remove it/them from the list.

Clear <button>:

This will stop all running processes and clear the list.

List <gridview>:

This area displays all scanned and filtered image files, with regard to FileName, Group, Individual, FileType, Width, Height.

List status <status bar>:

This area displays # of images found/filtered, info/# of images selected.

Control Panel

MultiThreading <checkbox>:

Enable this to maximize the performance of batch processing but the processing preview will not be displayed. Disable this to perform batch processing one image after another with processing preview displayed on screen.

Export Full-resolution <checkbox>:

Enable this to export resulting images in full resolution. Disable this to export resulting images in half resolution, which is sufficient in most cases.

Perform LM Airspace Profiling & Quantification <radiobutton>:

Perform LM Airspace Profiling & Quantification when any of the four buttons was pressed. This is linked to Automatic Cutoff in Airspace Profiling Settings.

Perform LM Airspace Custom Quantification < radiobutton >:

Perform LM Airspace Custom Quantification when any of the four buttons was pressed. This is linked to Custom Cutoff in Airspace Profiling Settings.

Threshold <button>:

While only one file is selected from the list, perform the following image processing steps and display results: pre-processing -> thresholding/binarization. This is useful if you want only want

to test these two steps, without spending extra-time on airspace profiling analysis. Shortcut: Control + T.

Single Test <button>:

While only one file is selected from the list, perform the following image processing steps and display results: pre-processing -> thresholding/binarization -> parenchymal airspace profiling. Since only one file is selected, unbiased categorization of the airspace profiling is only based on the single image. Shortcut: Control + S.

Start Batch <button>:

When one or more files were selected from the list, this will batch process all the selected images including performing image analysis and exporting resulting images, data-tables and graphs (to WorkDirectory\ProjectName\...). When performing airspace profiling & quantification (automatic cutoff), pay attention to how you need to group the airspaces for categorization. Shortcut: Control + B.

Stop Batch <button>:

When clicked, the batch processing will be cancelled.

Status <progressbar text>:

During batch processing, this area will show overall progress (%), time remaining, and the grouping method for categorization.

Graph Panels

The three graph panels will be displaying the histograms and fitted Gaussian distributions. These panels may not display correctly if it is too small. Resize the panels to a bigger size to solve the problem.

Graph #1

Raw size distribution

Graph #2

Area-weighted size distribution

Graph #3

Raw size distribution & Area-weighted size distribution

View Panels

The six view panels will be displaying the resulting images from different steps of image processing. You can click the image to toggle among original view, magnified views.

View #1

This shows the original image.

View #2

This shows pre-processed image after applying general settings, overlaid with results when available.

View #3

This shows the area for exclusion, for example, too large (not lung), exclude color match (non parenchyma). Black: Accepted area; White: Excluded area.

View #4

This shows the grayscale image from view #2.

View #5

This shows the B/W image from view #4, applying all the binarization settings.

View #6

This shows the image of final results, overlaid with results when available. The airspaces are either randomly colored or color-coded by their sizes.

Scroll Viewer

Use this panel to examine each image from all six views with additional functionality, such as zooming, panning, and quick switching among views. Zoom: Wheel up/down; Pan: Mouse down and drag; Switch: Control + 1~6.

Viewer target selection <combobox>:

View #1-6

Display scale <text>:

This shows the magnification in percentage.

Display scale <bar input>:

This shows the magnification on a scale bar and allow you to drag to change the magnification.