Analyze 15.0

USER'S GUIDE

AnalyzeDirect

Analyze 15.0
User's Guide

Analyze 15.0 is a robust research software for advanced biomedical imaging visualization, manipulation and measurement. It has been carefully designed to provide an intuitive and facile interface that allows full exploration of biomedical imaging data. The software features integrated modules that provide access to complementary tools for fully interactive multi-dimensional display, processing, segmentation, registration and measurement of biomedical imaging modalities including MRI, CT, PET, SPECT, ultrasound and digital microscopy. The applications of Analyze 15.0 are broad in scope, wide in scale and penetrating in impact.

Tutorial data

Example exercises are provided through out this user's guide. To work through these exercises, download the example data from https://analyzedirect.com/data/.
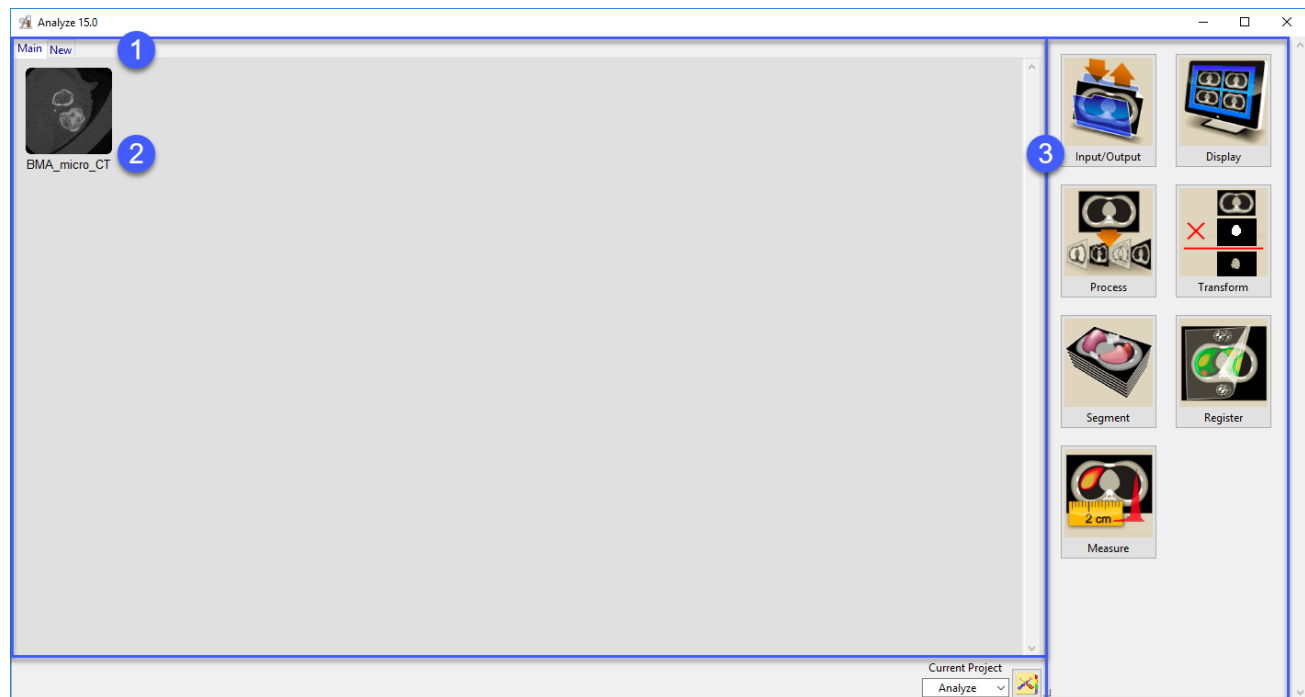
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Analyze 15.0 Basics

The Analyze 15.0 workspace is the first operational window that appears when Analyze 15.0 is opened. The main window does not perform any imaging functions; rather, it coordinates all the modules within the Analyze 15.0 package and acts as a file manager for loaded data.
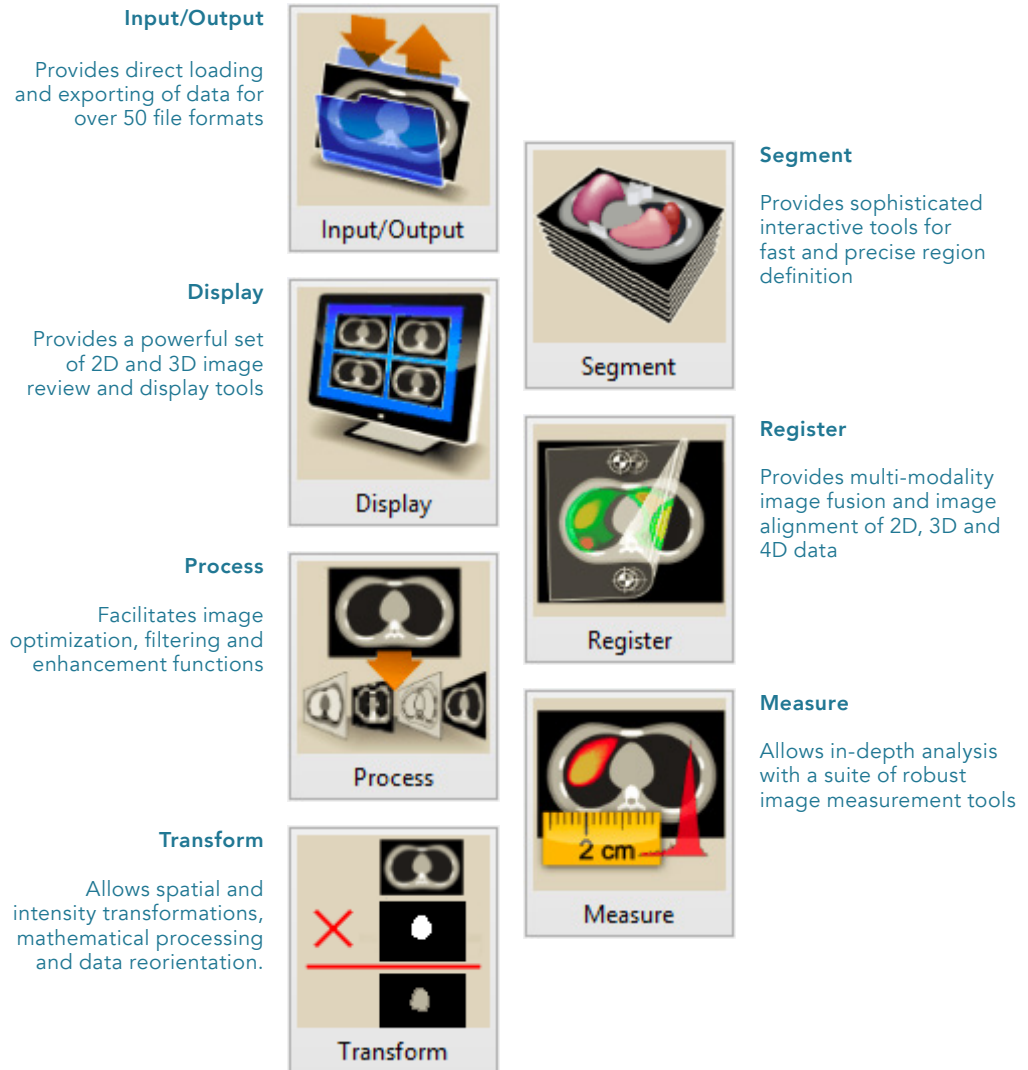
Once data is loaded into Analyze 15.0, it will appear in the tabbed workspace (1) as a thumbnail (2) in the workspace and is available to all of the modules (3). To load data into a module, select the icon in the workspace (the thumbnail will appear framed in red when selected) and open the desired module from the Analyze 15.0 side menu.

Analyze 15.0 Modules

Analyze 15.0 has been carefully designed to provide an intuitive and facile interface that significantly improves usability and performance.

The software features integrated modules that provide access to complementary tools for fully interactive multi-dimensional display, processing, segmentation, registration and measurement of image data.

Input/Output

Provides direct loading and exporting of data for over 50 file formats

Input/Output

Display

Provides a powerful set of 2D and 3D image review and display tools

Display

Process

Facilitates image optimization, filtering and enhancement functions

Process

Transform

Allows spatial and intensity transformations, mathematical processing and data reorientation.

Transform

Segment

Provides sophisticated interactive tools for fast and precise region definition

Segment

Register

Provides multi-modality image fusion and image alignment of 2D, 3D and 4D data

Register

Measure

Allows in-depth analysis with a suite of robust image measurement tools

2 cm

Measure

Right Mouse Button Menu

The Analyze 15.0 workspace includes additional options which can be accessed by right-clicking within the workspace. The menu provides the following options:

Unload — Unload selected data from the workspace

Info — Display the header information for a selected data set

Rename — Change the name of a selected data set

Edit Header — Modify the header information of a selected data set (see Header Edit below)

Duplicate — Will duplicate the currently selected data set

Append — Append selected data

Un-append — Un-append 4D multi-volume data sets or RGB data sets

Select All — Select all data sets in the workspace

Invert Selected — Invert your selection of data in the workspace

Arrange — Arrange data sets by Name, Size or Modify Time

Session Log — Store information that might be useful to the Analyze 15.0 support team and software developers, should a problem ever arise with one of the modules

Current Directory — View and modify the Current Directory location

License Manager — Open the Analyze 15.0 License Manager

Analyze 15.0 Update — Check to make sure the software is up to date; will also download and install any necessary updates

Options — Configure Analyze 15.0 features, Object Map loading, and Window management options (see Options below)

Help — Open the Analyze 15.0 User's Guide

Get Help — Open the AnalyzeDirect Support Page

About — View version, system and environment information
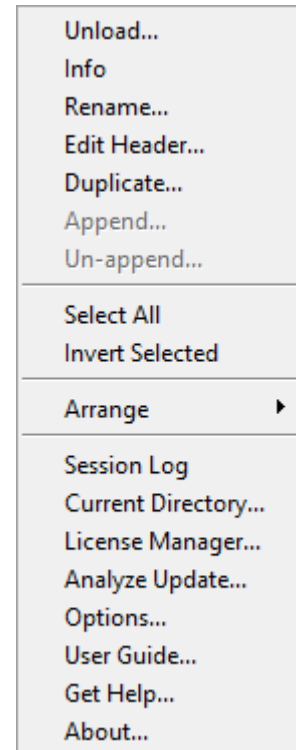
Header Edit

When Edit Header is selected from the right-mouse menu, the Header Edit window will open. Header Edit enables the modification of the selected data's header information, including adding user defined fields or removing selected fields from the header. Header Edit is primarily used for adjusting dynamic range values, adding or correcting voxel dimension information, or modifying orientation (AVW image data only) for loaded volumes.

Exercise caution when modifying header files, as inconsistent values may cause unpredictable results. If used on non-AVW image data, Header Edit may not work.
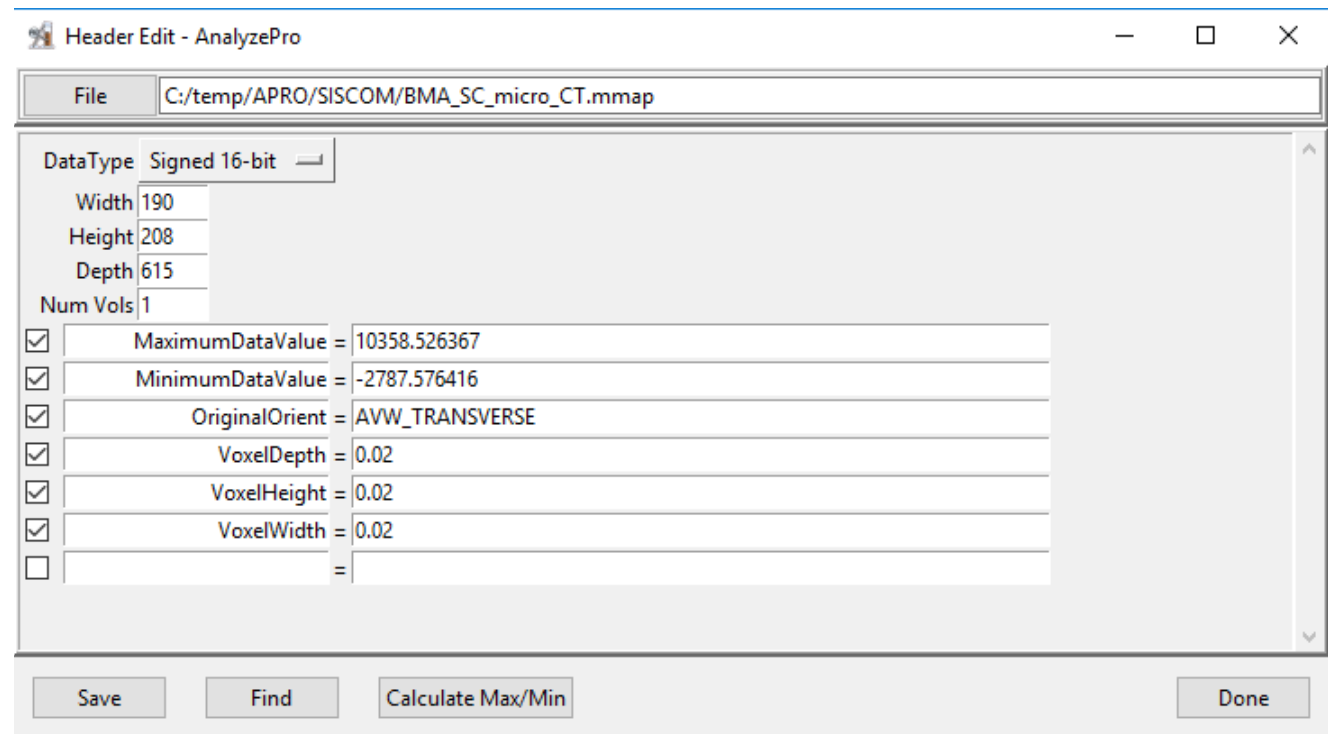
File - opens a File selection window enabling the selection of a header file (.hdr) to be examined and/or modified.

DataType - Displays the data type of the selected file. Choose from the drop-down list to change the data type.

Width - Displays the image width value.

Height - Displays the image height value.

Depth - Displays the number of images in the volume

Num Vols - Displays the number of volumes contained in the file..

Depending on the type of file selected the following fields are available, but selection options may vary:

Save - Records all changes made to the header file.

Calculate Max/Min – Calculates and reports the file's maximum and minimum values. The following options are available:

Ignore – Does not apply values to header.

Apply – Applies values to the header.

Done – Closes the Header Edit window.

Options

When Options is selected from the right-mouse menu, the Options window will open. The Options window allow users to enable and disable Analyze and Module Options.

Analyze Options

Show Icon Message(s) – Enable or disable the display of pop-up messages returned when the mouse cursor is moved over a thumbnail in the workspace (1).

Fixed Icon Font – Enable or disable a default fixed icon font for loaded image data (2).

Auto Update – Enable or disable Analyze 15.0 from automatically checking for updates when the software is opened (3). It is recommended that this option is enabled.

Module Options

Auto Load Object Maps - Determines whether Object Maps are automatically loaded (Yes), not loaded (No), or the user is prompted (Prompt) to load an object map when a module is opened.
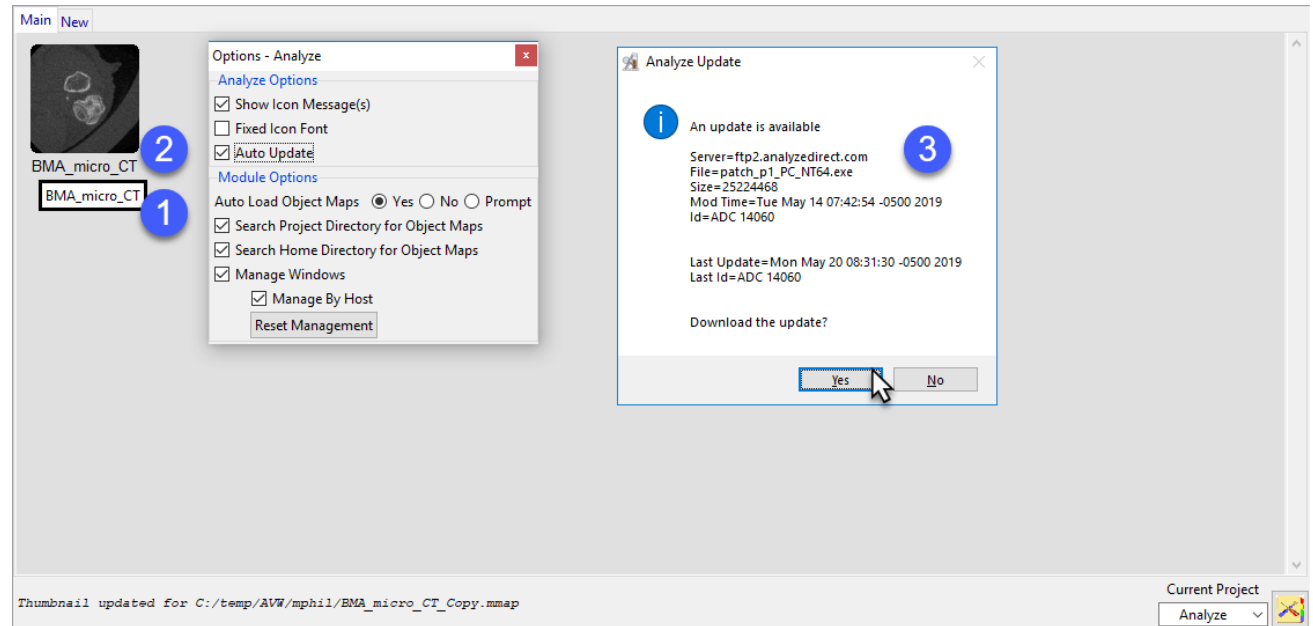
Search Project Directory for Object Maps – Allows modules to search the current project directory for an object map when opened.

Search Home Directory for Object Maps - Allows modules to search the user's Home directory for an object map when opened.

Manage Windows - When enabled, Analyze and all modules remember the positions and size of each window.

Manage By Host – Stores separate window manOptionsagement information for each unique computer. This may be necessary if a user runs on more than one system and each system has different configurations (number of displays, display orient, and screen resolution).

Reset Management - Deletes the position and size information for the system resetting window management information.

Main Analyze 15.0 Window Actions and Quick Keys

Left click — Selects a file.

[Ctrl] + a — Selects all of the files in the workspace.

[Ctrl] + Left Mouse Click — Selects/deselects each file that has been clicked.

[Shift] + Left Mouse Click — Selects all files between first and last selections.

[Ctrl] + [Alt] + c — Recalculates the data sets minimum and maximum information.

[Shift] + [Ctrl] + [Alt] + p — Forces a patch update.

[Ctrl] + x — Duplicates selected file.

Double-clicking on a data set in the workspace restarts the last module used with that data. If there is not a module associated with the data, the Display module will open by default.

Workspace Tabs

The main Analyze 15.0 Workspace can be partitioned into multiple workspaces using the tabs at the top of the main workspace, each of which can be given a name relevant to the task the workspace represents. To add a workspace, click New. To rename a tab, right-click the tab and select Rename.

This permits efficient organization of loaded data sets into task-specific groups. Icons representing the loaded data sets can be manually organized in each workspace panel by dragging the icons to the desired location. Data sets can further be moved between workspaces by dragging to the tab associated with the workspace.
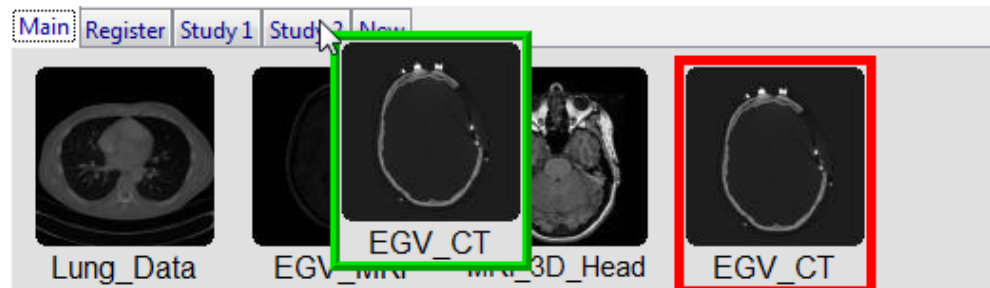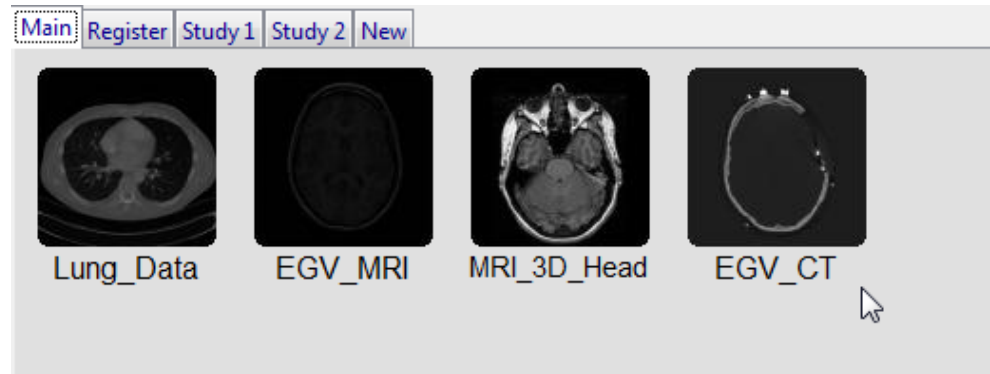
Projects

Workspaces can be organized into specific projects via the Current Project controls in the lower right of the Analyze 15.0 window. Analyze 15.0 creates a default workspace/project from the computer username.

Projects can be added to a user-specific project list (click the workspace tool icon), with the workspace storage location for loaded images under the full control of the user.
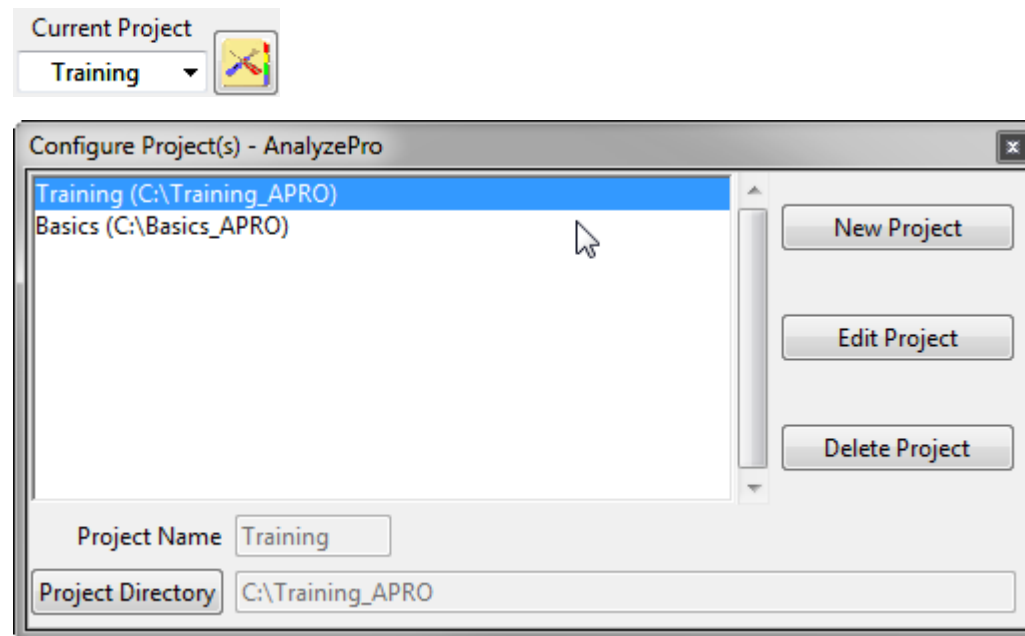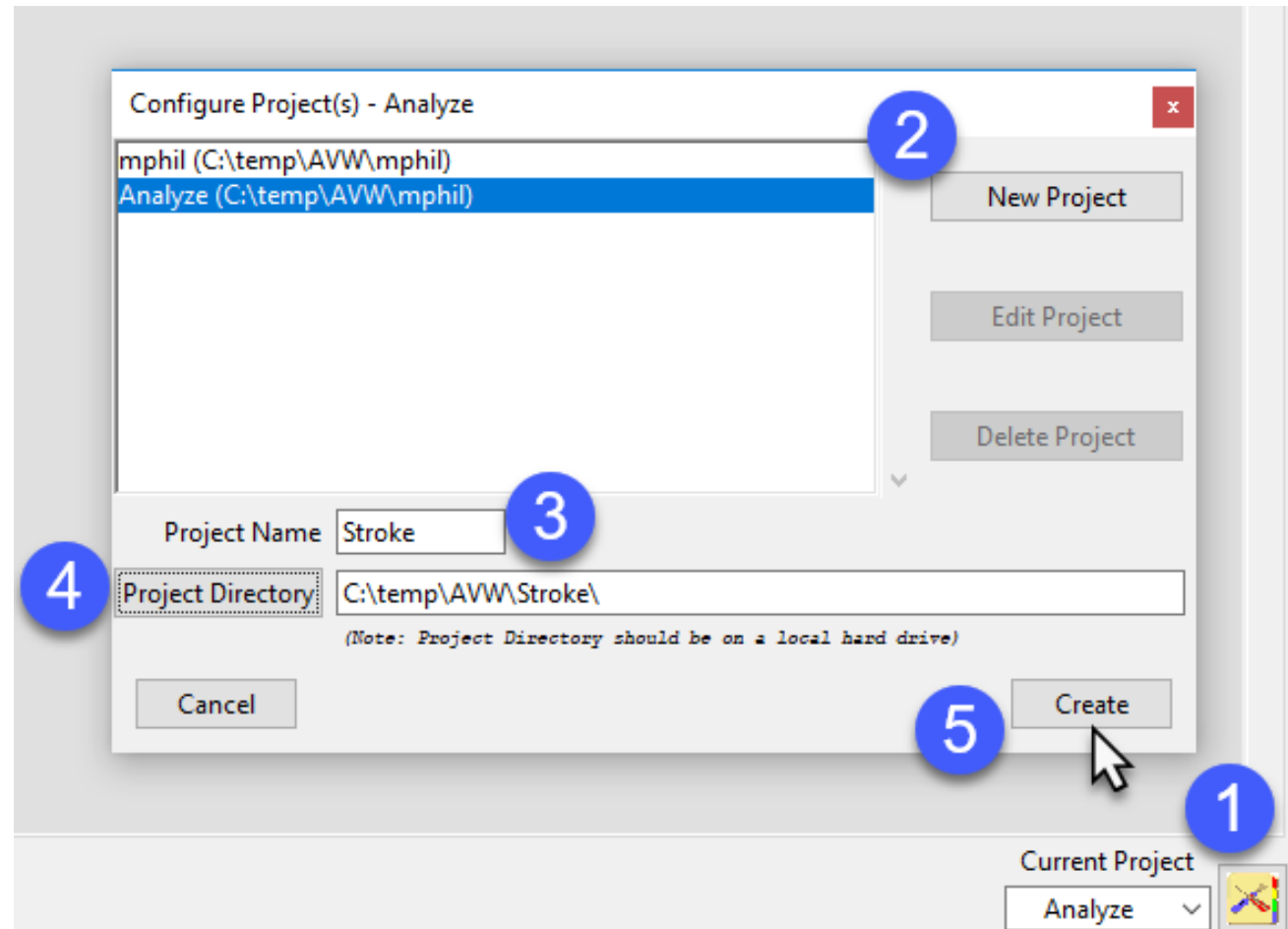
Creating a project

To create a new project, click on the Project Configuration button (1).

Next, click New Project (2).

Name the project (3) and then use the Project Directory button (4) to specify the location where the project will reside on disk. Note that this is the location where all data loaded into the project will be stored so ensure that the location has enough free disk space to handle the data you plan to load for the project. Also, it is recommended that the project be stored on a local disk and not on a network drive.

Click Create (5). The Project file will be created and now be available in the Current Project drop-down.

Deleting a project

Note, please exercise caution when deleting a project.

To delete a project, click the Project Configuration button (1).

Select the Project you wish to delete (2) and then click delete (3).

A Delete Project file confirmation window will be returned. This window will ask you to confirm the deletion of the selected project file (Yes) or cancel the delete (No). Not that clicking Yes will only delete the project file of the selected project. This delete will not deleted the projects workspaces or loaded data. Select Yes to proceed with the deletion of the project.
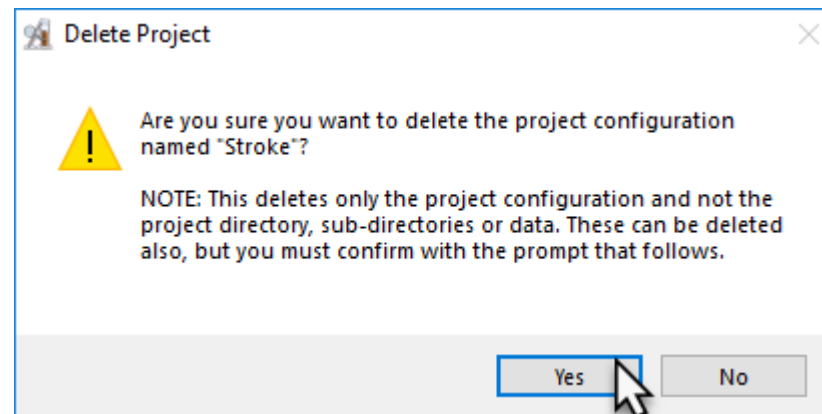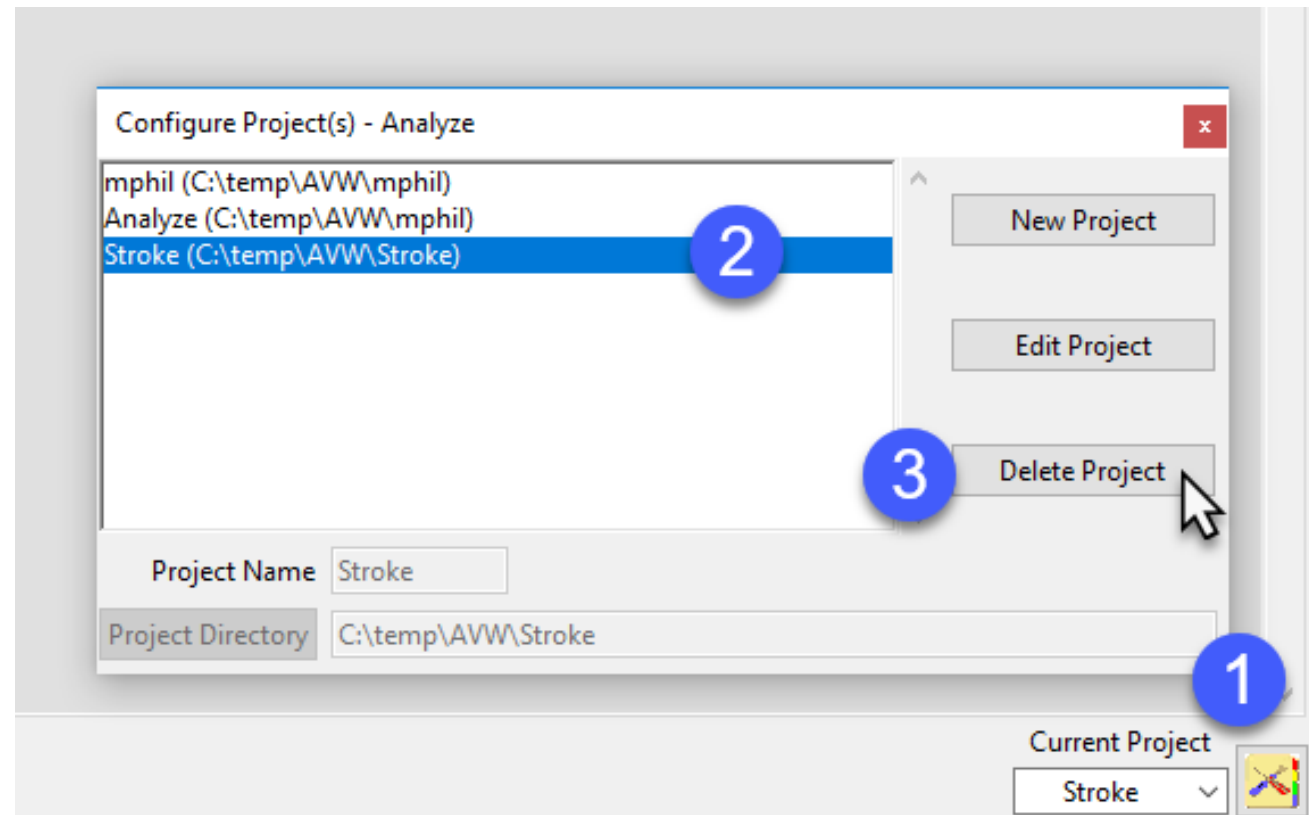
Figure 1

Next, another Delete Project window will be returned. This window will allow users to delete (Yes), not delete (No), or Cancel the deletion of the project directory and data. Note that selecting Yes to delete the Project Directory will delete all workspaces, data, and other files associated with the project saved under the project file location. Select Yes to continue with the delete.

The selected project and all workspaces and data will be deleted.
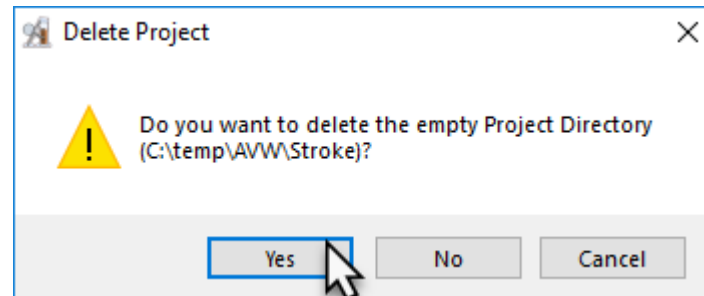
Object Maps

Analyze 15.0 uses a file called an object map to partition image data into groups of voxels within a segmentation component map. After creation of the object map through segmentation, it can be used to drive visualization, registration, surface generation and statistical analysis.

The object map is an associated volume with the same dimensions as the image data. Each voxel of the object map contains an 8-bit value which encodes it as belonging to 1 of 256 total possible objects. Every voxel in the data set is initially assigned to the first object (Original), leaving 255 additional objects that can be used for 2D region or 3D volume of interest definition.

Object maps are loaded separately from the image data to which they are associated using the File > Load Object Map option in each functional

Original image

Grayscale segmentation

Object map segmentation
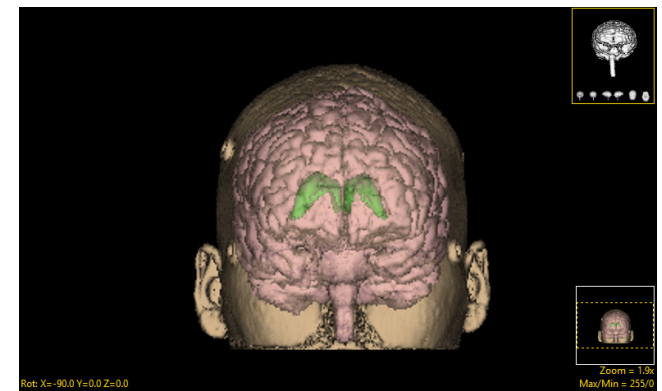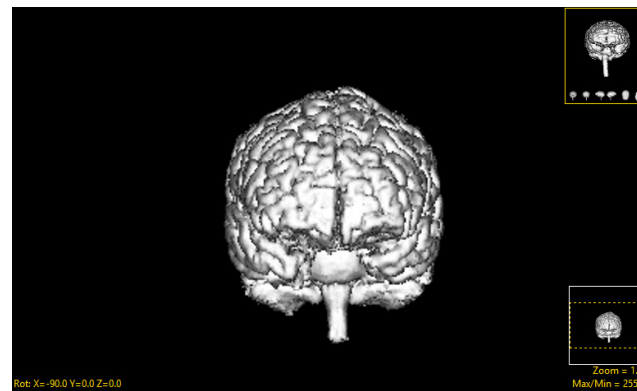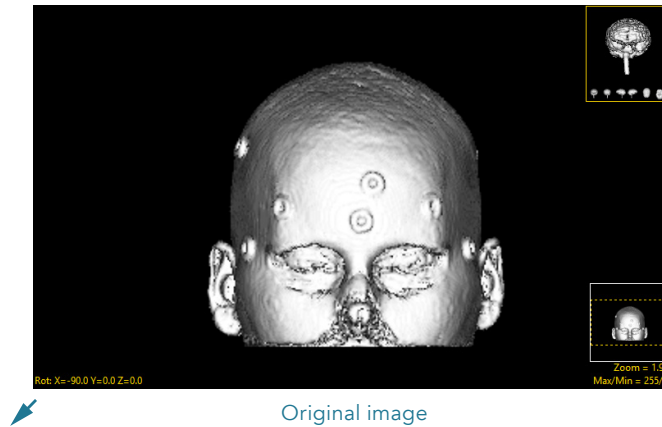
module. When the object map is loaded, the objects defined in it are overlaid on the image data. As can be seen in the above figures, grayscale segmentation destroys all voxels

that are not part of the object of interest, whereas object maps preserve the original data by assigning the segmented voxels to objects.