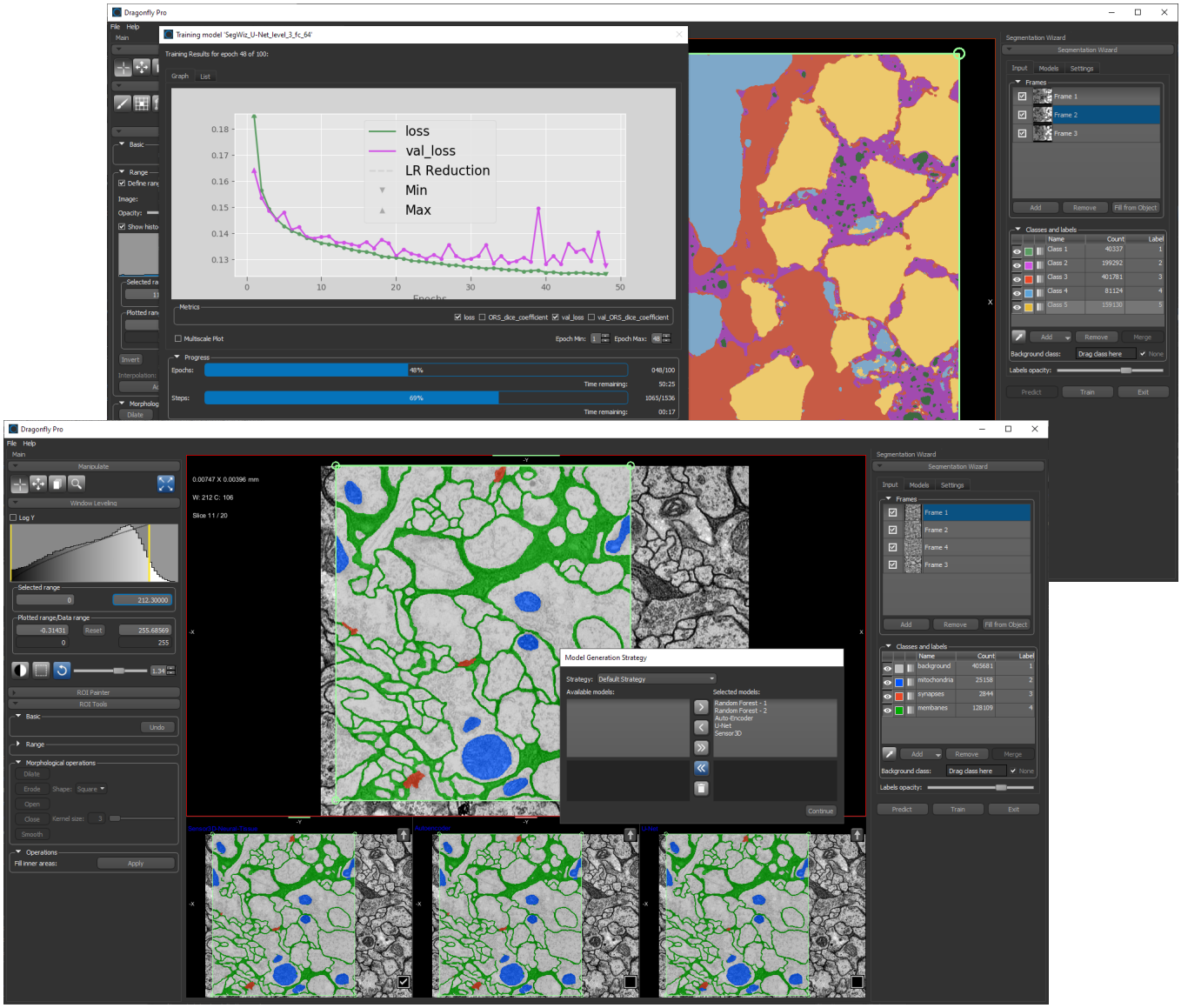
DRAGONFLY 2020.2

RELEASE NOTES



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This document describes the new features, product enhancements, and other improvements implemented in the Dragonfly and Dragonfly Pro 2020.2 software release. You should read these release notes before you install this new version.

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New Features and Product Enhancements

The 2020.2 software release for **Dragonfly** and **Dragonfly Pro** provides the following new features and product enhancements for the Segmentation Wizard, Deep Learning, automation, CT reconstruction, and other features.

Segmentation Wizard

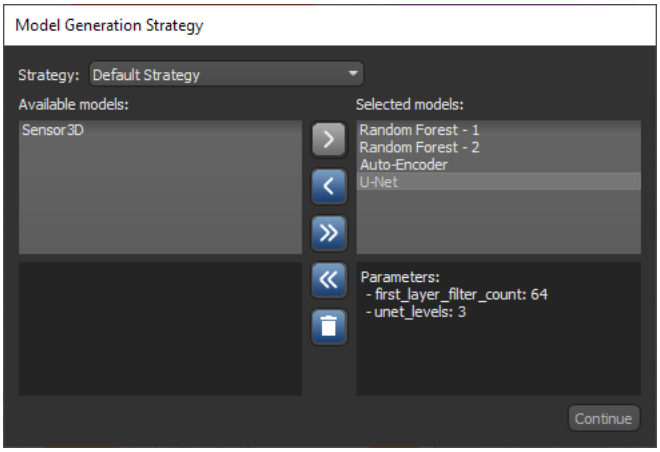
This Dragonfly release features a number of significant advancements for the Segmentation Wizard, which provides an easy-to-use, guided workflow for implementing powerful deep learning and machine learning segmentation of multi-dimensional images.

Model Generation Strategy

This new option for the Segmentation Wizard lets you choose a model generation strategy when training is first started, as well as which models to include in subsequent training cycles.

The Model Generation Strategy dialog, shown below, first appears when you click **Train** in the Segmentation Wizard. You should note that the dialog will continue to appear for additional training cycles as long as any strategy can still generate more models.

Model Generation Strategy dialog



You can do the following in the Model Generation Strategy dialog:

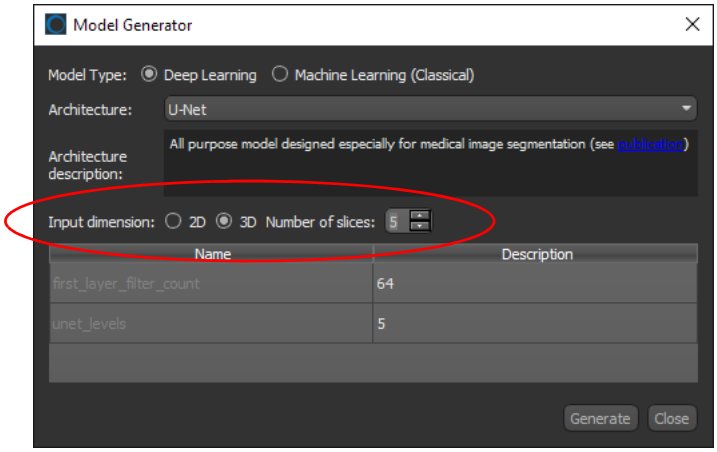
- Select a strategy for the current Segmentation Wizard session. You should note that additional strategies will be implemented in future product releases.
- Select a model to view its parameters.
- Move models between the **Available models** list and the **Selected models** list, either with the right and left arrows or by drag-and-drop. Only selected models will be trained in the current training cycle.
- Delete models from the selected strategy for the current Segmentation Wizard session. You can do this to streamline model training.

Support for Multi-Slice Inputs

Available in the Model Generator dialog, this new option for the Segmentation Wizard lets you increase the input dimension of the training dataset(s) from a single slice to multiple slices.

Click the **Generate New Model** button on the Models tab to open the Model Generator dialog. Choose **3D** as the **Input dimension** and then select the number of slices. This option is circled on the following screen capture.

Model Generator dialog



You should note that the reference slice for multi-slice training is automatically set as the middle slice for the number of slices selected and that the spacing or *offset* between slices is set to 1. In this case, slices are taken sequentially. Dragonfly's Deep Learning Tool and Machine Learning Segmentation Tool provide more control for selecting the reference slice and spacing.

NOTE Currently, only U-Net 3D is a fully 3D model that uses 3D convolutions. The number of input slices for this model is determined by the input size, which must be cubic. For example, 32x32x32. U-Net uses 2D convolutions, but can take 3D input patches for which you can choose the number of slices. You should also note that in some cases, 3D models can be more reliable for segmentation tasks.

Support for Multi-Modality Models

In some cases, you may want to choose multiple inputs for the training data added to the Segmentation Wizard. For example, when you are working with data from simultaneous image acquisition systems you might want to select each modality as an input. You can now select multiple inputs for the Segmentation Wizard, either in the Data Selection dialog if you start the wizard from the menu item (see Access the Wizard from the Menu Bar on page 10), or by selecting the multiple inputs in the Data Properties and Settings panel and then opening the wizard from the contextual menu.

In both cases, the number of modalities for Deep Learning and Machine Learning models is generated automatically. However, you should note that you can choose different feature trees for Machine Learning models in the Model Generator dialog, as shown in the following screen capture.

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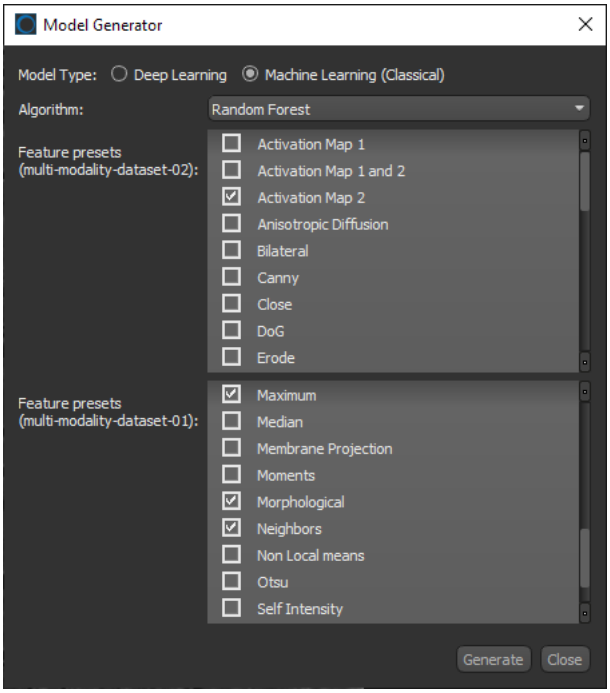
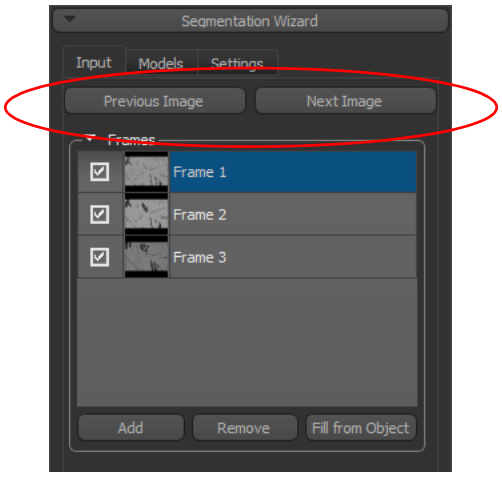
Model Generator dialog



You should note the following whenever you work with multi-modality models:

- All input datasets must be registered and have the same geometry and shape.
- While labeling classes, you can switch the dataset in the view with the **Next Image** and **Previous Image** buttons on the Input tab, circled below, as well as with keyboard shortcuts 'Show Next Image Modality' and 'Show Previous Image Modality' (see Configurable Actions on page 35).

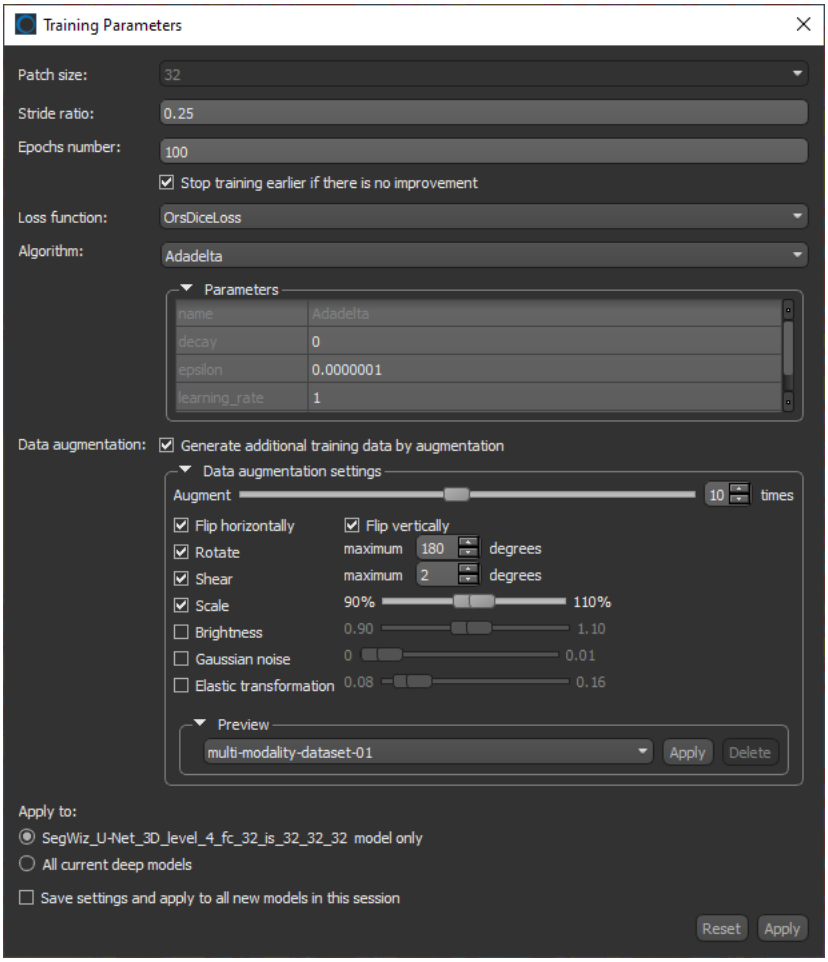


- Defined ranges for each dataset will be retained whenever you navigate between the different input images. You should also note that the opacity of the range highlight is now selectable (see Thresholding on page 22).
- Reopened Segmentation Wizard sessions will open automatically on the last modality that was visible in the workspace.

Edit Training Parameters

As an additional improvement for the Segmentation Wizard in Dragonfly 2020.2, you can now edit the training parameters of Deep Models. Right-click the Deep Model you need to edit on the Model tab and then choose **Update Training Parameters** in the pop-up menu to open the Training Parameters dialog, shown below.

Training Parameters dialog



NOTE Refer to the Dragonfly Help system for information about loss functions, optimization algorithms, and the data augmentation settings. These topics are available in **Deep Learning** in the section on **Artificial Intelligence**.

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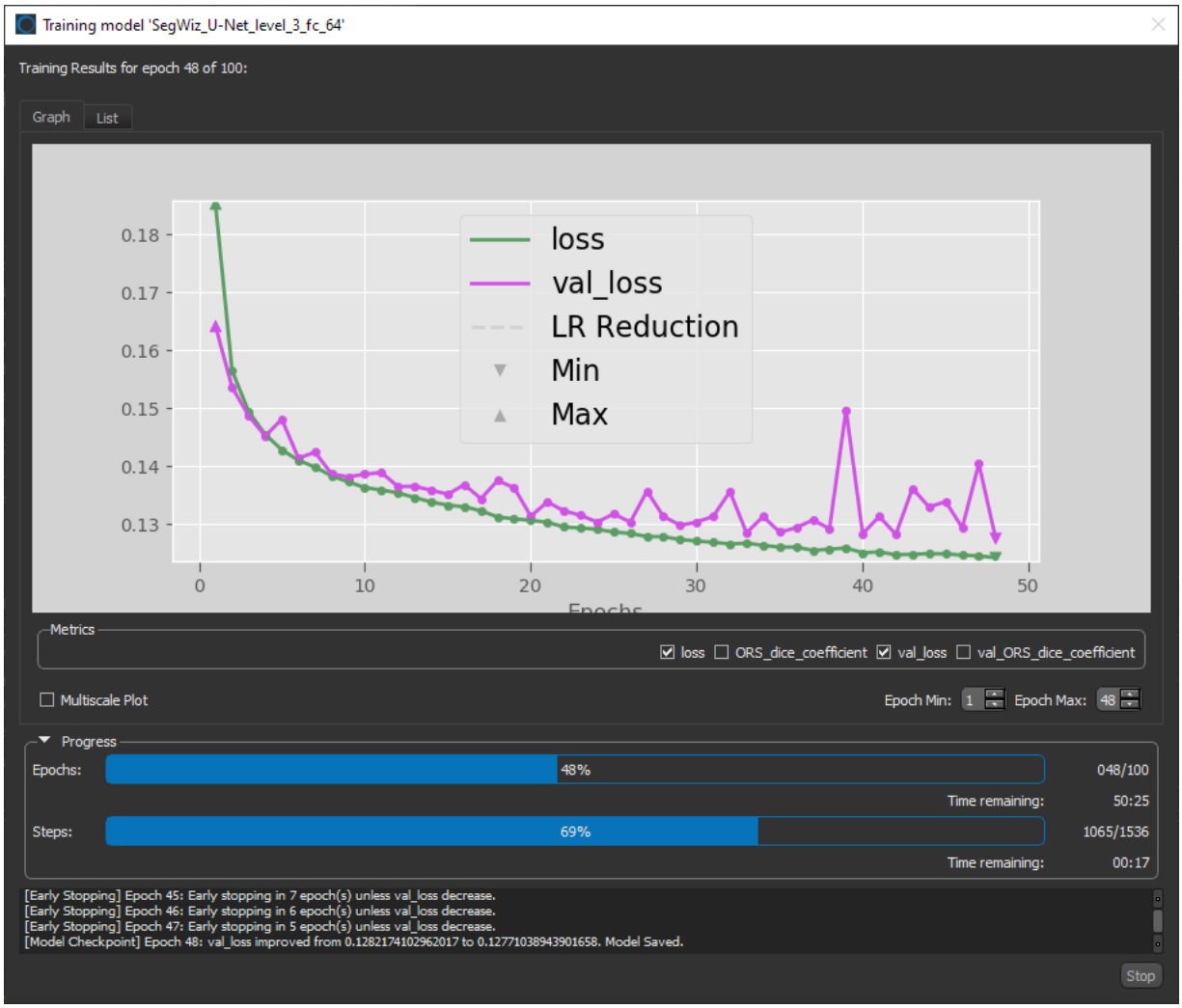
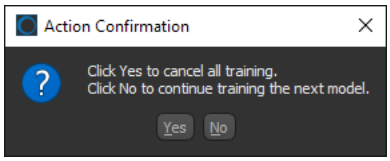
Training Progress

The Training Progress dialog for the Segmentation Wizard was updated for this product release to provide more detailed feedback about the real-time status of training for each model selected for the current training cycle. An example of the feedback provided when training a U-Net deep learning model is shown in the following screen capture. You can also monitor progress in List view, which provides the details of each epoch.

Training dialog



NOTE The option to cancel training was also updated to let you choose to either cancel all training or to cancel training for the current model only. These options are available in the Action Confirmation dialog, as shown below, which appears whenever you click **Cancel** or **Stop** during training.

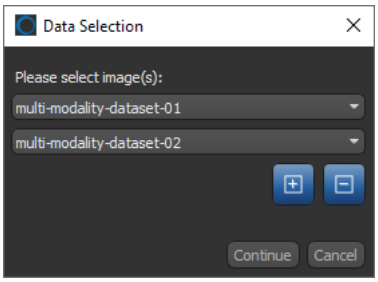


Access the Wizard from the Menu Bar

This software release provides to option to open the Segmentation Wizard from either selected datasets or from the menu bar.

Choose **Artificial Intelligence > Segmentation Wizard** on the menu bar to first open the Data Selection dialog, shown below. You can then select the image or images you want to include in the current Segmentation Wizard session.

Data Selection dialog



Deep Learning Tool

The following enhancements are available for the Deep Learning Tool in Dragonfly 2020.2.

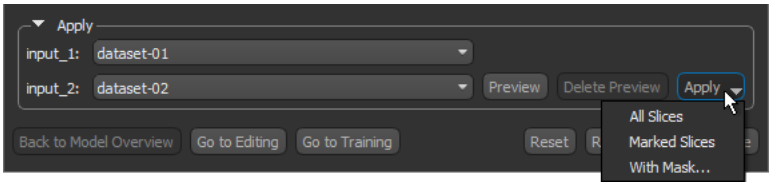
Custom Deep Model Architectures

Dragonfly's Deep Learning Tool now supports custom deep model architectures for models that do not follow standard architectures, for example YOLOv3, and for new workflows, such as noise-to-noise models.

Apply Options

The Apply options for trained models have been updated to let you choose to process all slices, marked slices, or to limit processing within an ROI mask. These options are shown below, as they appear in the Deep Learning Tool dialog.

Deep Learning Tool dialog



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Automation and Macros

This software release provides a number of new features and updates for automating workflows.

Extract Object History

The new **Extract Action Log from Object** feature for Dragonfly 2020.2 lets you automate complex scenarios that make use of multiple tools by extracting an object's history as a macro. Extracted macros can then be replayed to create a new or modified object by applying the logged operations.

Do the following to extract the history of an object and play the logged operations:

1. Create or modify the required object with Dragonfly's extensive toolset.

   For example, you could experiment with a recipe that creates regions of interest within selected ranges and then overwrites them on a small portion of a dataset.

2. Right-click the required object in the Data Properties and Settings panel and then choose **Extract Action Log from Object** in the pop-up menu.

   A macro is generated with the name "Filtered session history of session YYYY-MM-DD-HH-MM-SS for *object xx*", where *object xx* is the item from which the history was extracted.

3. Open the Macro Player. The macro can be edited, if required, and then played. You should note that if your experiment was applied to a small portion of a dataset, you can remove the cropping block so that the logged operations are applied to the full dataset.

Principle of Operation

When a new session is started or a session is loaded, the tag "Session started" is added to the Action log with the current date and time. This serves as the session ID. If objects are loaded, the identity of those objects (GUID) are written in a starting inventory in the Action log, with logger variable names.

The session history is saved whenever a session is saved, and includes everything from the end of the Action log up to the last "Session started" entry. The starting inventory is also saved, as well as the ending inventory, with the identity of the objects saved with the session (GUID) and the logger variable names. You should note that when a session is loaded, the past history is recovered and the history of the current session is kept as a separate history.

When an object history is extracted, the whole history of the session is taken from the end to the beginning, one session history at a time:

1. The text of the current Action Log is taken and separated in a macro.
2. The name of the variable (for example, "ROI-05") to extract from the Action Log is obtained from the GUID found in the ending inventory.
3. The blocks are analyzed from the end to the beginning and for each block, the following are retrieved:
   - The non-constant declared input variables.
   - The names of the variables part of non-constant declared input variable collections.

- The assigned variables.
- The declared output variables.
- The assignments of declared output variables collections.
- If there is at least one of these names found in the dependence, that block is kept as follows:

  The full block is kept “as is”, unless only assignments are required, in which case the code is stripped to keep only pure assignments, or loading occurs, in which case the assignment is replaced by a call to an macro block with the UUID of the macro of the history of that object.

  The declared input variables and the names found in the declared input variables collections are added in the set of dependent variables to look for in preceding blocks.

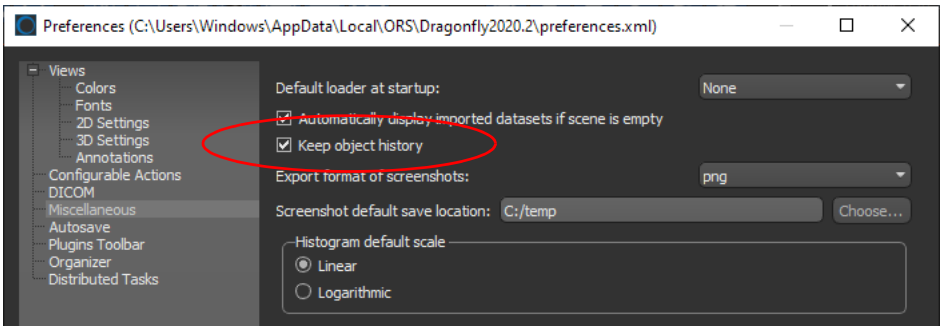
  The declared input variables, the names of variables found in declared input variable collections, the declared outputs variables and the names of the variables found as assignments of declared output variable collections are added in a set of variables that could be deleted.

You should note that when the evaluation of the blocks is done for a single session history, the logger variables found in the starting inventory are identified and passed to the previous session history using their GUID. A second pass is done through the whole list of blocks to identify the pure deletion blocks to keep, that is, those affecting the variables present in the whole history.

Keep Object History

A new preference, “Keep object history”, is available in the **Miscellaneous** settings to save the object history in exported *.ORSObject formatted files. You should note that saving object histories can time-consuming and that the GUID of all objects is always preserved when a session is saved or loaded.

Miscellaneous preferences

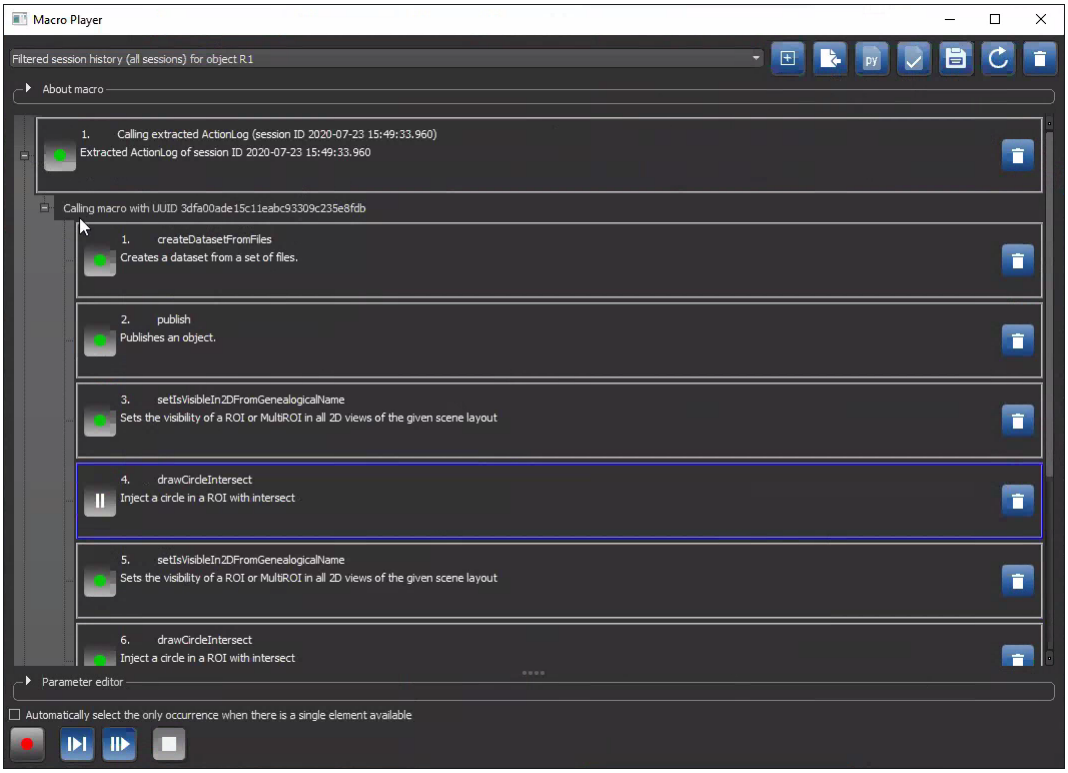


Macro Player

The Macro Player now features an expandable tree view that lets you *dive-into* macro blocks extracted from object histories (see Extract Object History on page 11) and for macros that call other macros. As shown in the following screen capture, you can expand a block to view each individual step within it.

Choose **Utilities > Macro Player** on the menu bar to open the Macro Player, shown below. You can expand and collapse blocks as required.

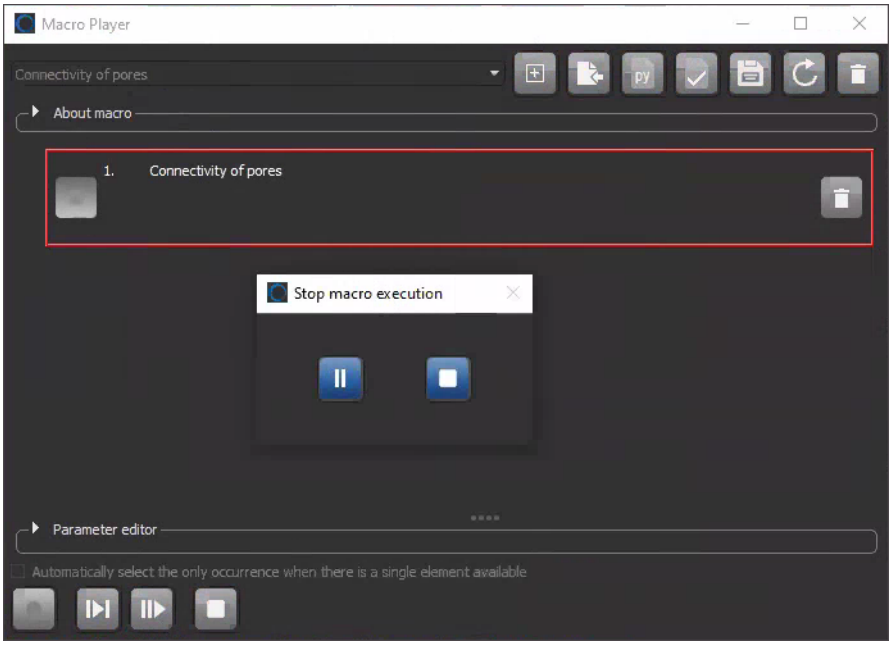
Macro Player



NOTE You can use the **Parameter Editor** at any step in an expanded macro block to edit a logged operation.

The reformatted Macro Player also now includes the options to pause or stop the execution of a macro block. For example, for macros exported from the Macro Builder. These controls appear in the **Stop macro execution** dialog, as shown below, whenever you play a macro.

Macro Player



Macro Builder Blocks

This product release also includes new blocks for the **Macro Builder**, which are described below.

Prompt user for... Available in both **Literals** and **Dragonfly > Value Chooser**, this block can be added to prompt users to select an object, such as a dataset, shape, region of interest, multi-ROI, mesh, annotation, vector filed, graph, or overlay, when a macro is executed. You can customize the prompt and the title of the message box.

Pause execution... This new block can be found under **Miscellaneous** and when added, will make the Macro Player pause at that point. For example, a pause could be added to a macro that extracts a number of cropped regions or sub-volumes. The pause would allow users to select a region.

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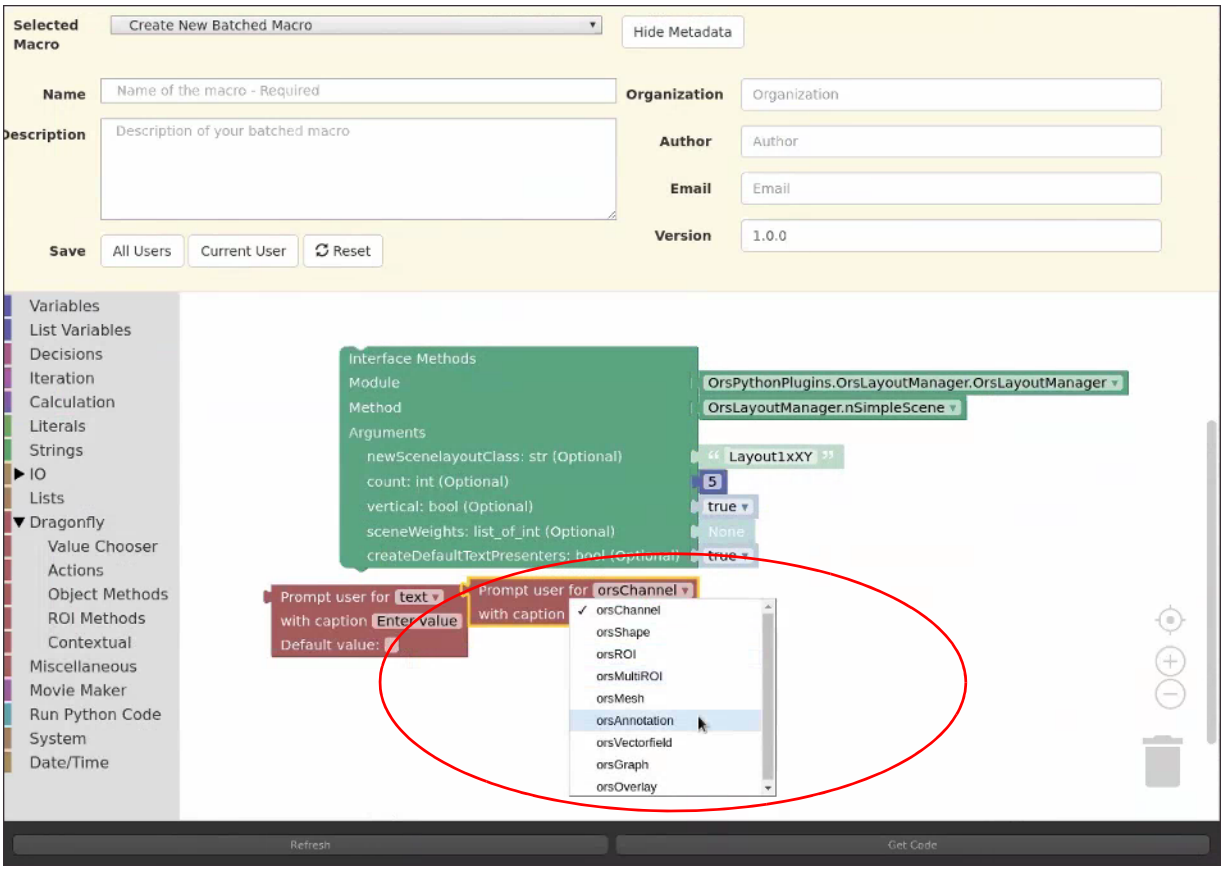
Choose **Utilities > Macro Builder** on the menu to open the Macro Builder dialog. The additional options for the **Prompt user for** block are circled below.

Macro Builder dialog



CT Reconstruction

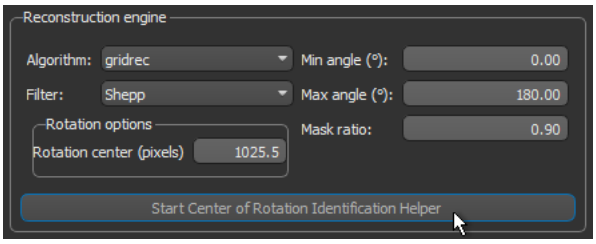
This software release provides a number of enhancements for reconstructing cone beam and parallel beam projections with the CT Reconstruction module.

Center of Rotation Finder

You can now choose from a number of algorithms to find the center of rotation for reconstructing parallel beam projections, as well as preview the results of centers of rotation computed from different offsets for both parallel and cone beam projections.

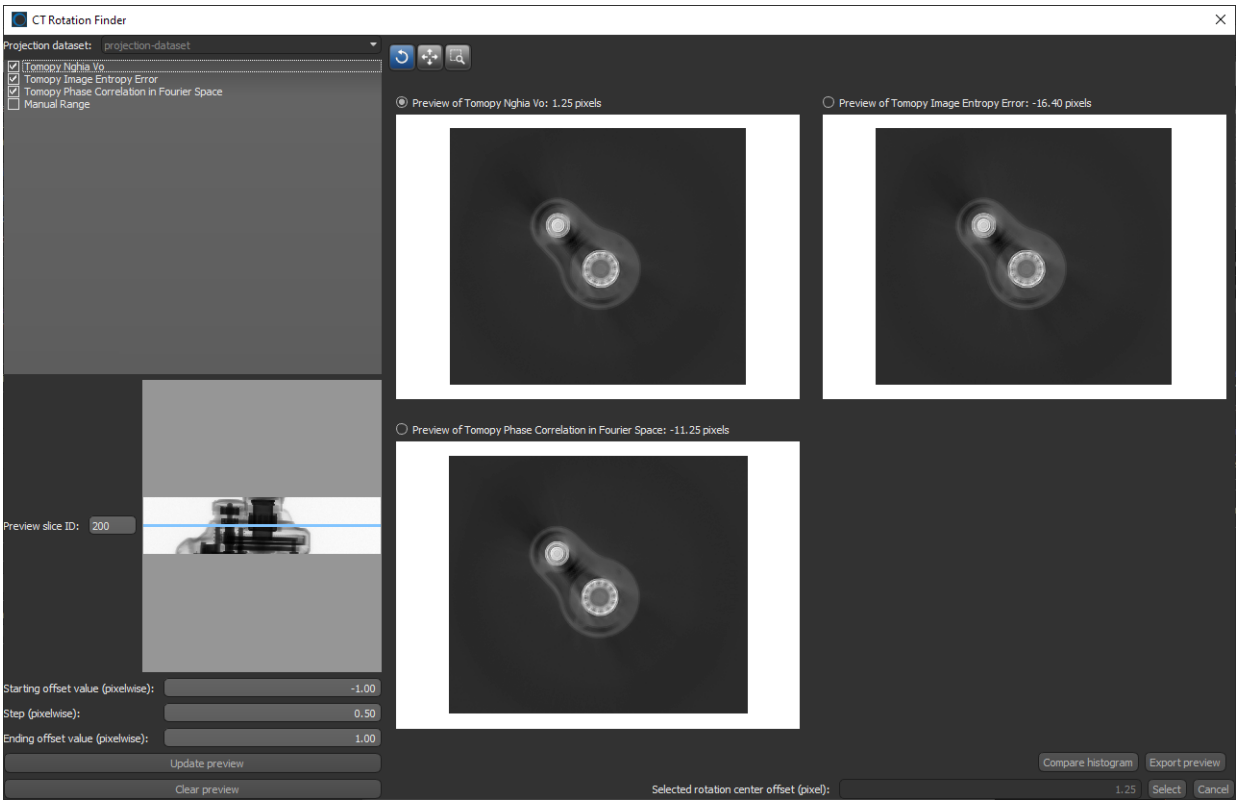
Choose **Workflows > CT Reconstruction** to start the CT Reconstruction module. The option to open the **CT Rotation Finder** dialog is highlighted on the screen capture below.

CT Reconstruction dialog



Options to find and preview centers of rotation are available in the CT Rotation Finder dialog, as shown below for parallel beam projections.

CT Rotation Finder dialog



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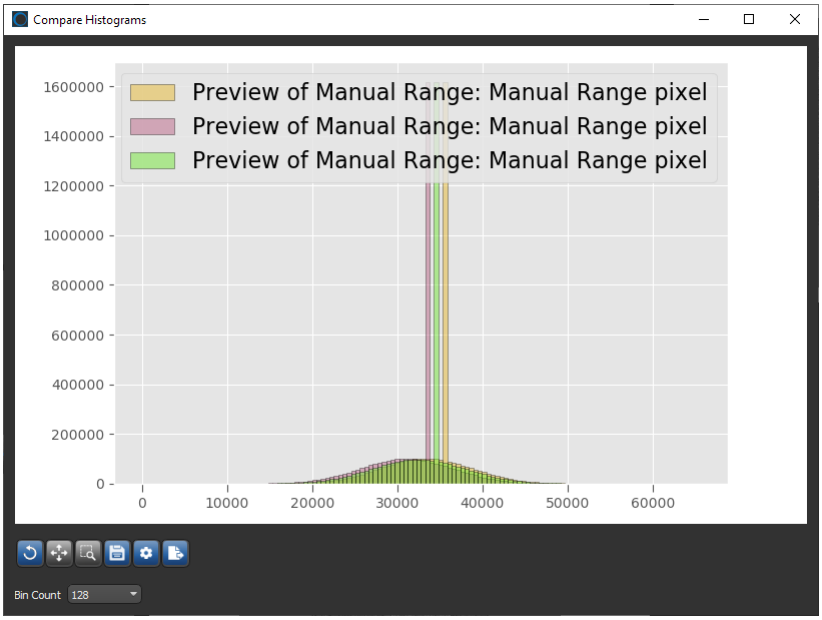
You can do the following in the CT Rotation Finder dialog:

- Choose an algorithm to automatically find the rotation axis location for parallel beam projections. These include using Nghia Vo's method, entropy error, and finding the offset between the first projection and a mirrored projection 180 degrees apart using phase correlation in Fourier space.
- Preview the results of applying manual offsets from the center value computed from the size of the dataset.
- Generate previews from any slice in the projection dataset.
- For comparison purposes, the histograms of generated previews can be evaluated in the Compare Histograms dialog, shown below.



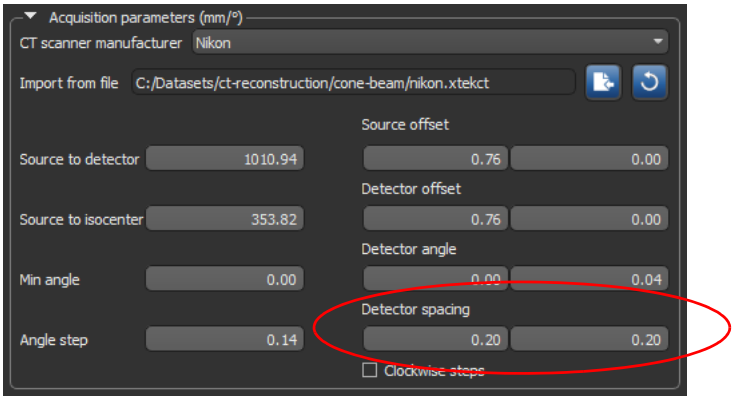
- Select the best preview and then export the rotation center to the CT Reconstruction dialog. You can also export a number of previews, which will include the center of rotation value. Whenever you need to test the selected parameters for a reconstruction engine, you can generate a number of previews at different settings and then import the inputs from the best preview. For comparison purposes, you can plot the intensity profiles of the previews along a ruler or compare their histograms.

NOTE Although the center of rotation is computed automatically from the source and detector offset settings for cone beam projections, it is recommended that you use the CT Rotation Finder if your previews or reconstructions are not satisfactory.

Detector Spacing

When importing the acquisition parameters for cone beam projections, detector spacing is now parsed automatically from the selected metadata file. This parameter is circled below.

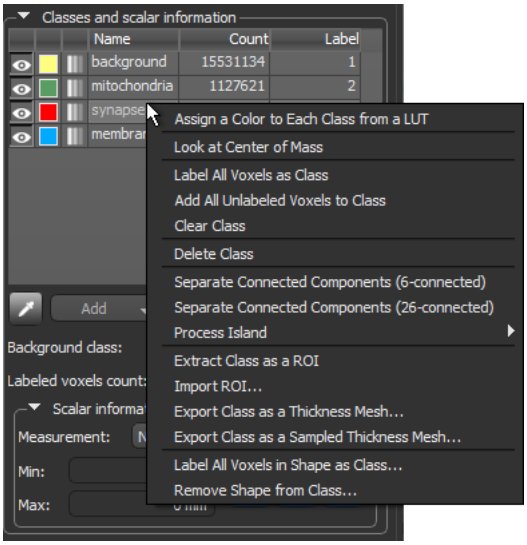
CT Reconstruction acquisition parameters for cone beam



Multi-ROIs

A number of new options for multi-ROIs — **Separate Connected Components**, **Process Islands**, **Export Class as Thickness Mesh**, and **Remove Shape from Class** — are available in the contextual menu for selected classes, as shown below. These options are described in the following text.

Classes pop-up menu



Separate Connected Components

As a new option for multi-ROIs in Dragonfly 2020.2, you can separate the connected components, such as fibers, vesicles, and puncti, within a class or selected classes. Separation is done based on *connectivity* — 6-connected or 26-connected. In image processing, connectivity is the way in which voxels in 3-dimensional images relate to

their neighbors and are labeled as separate components. You should note that a set of voxels in an image that are connected to each other is often called a *connected component*.

6-connected... Propagation is done by strictly using the 6 faces adjacent to the current seed and will result in the maximum number of connected components.

26-connected... Propagation is done in all directions, using the 6 faces, 12 edges, and 8 corners adjacent to the current seed. This will result in the fewest number of connected components.

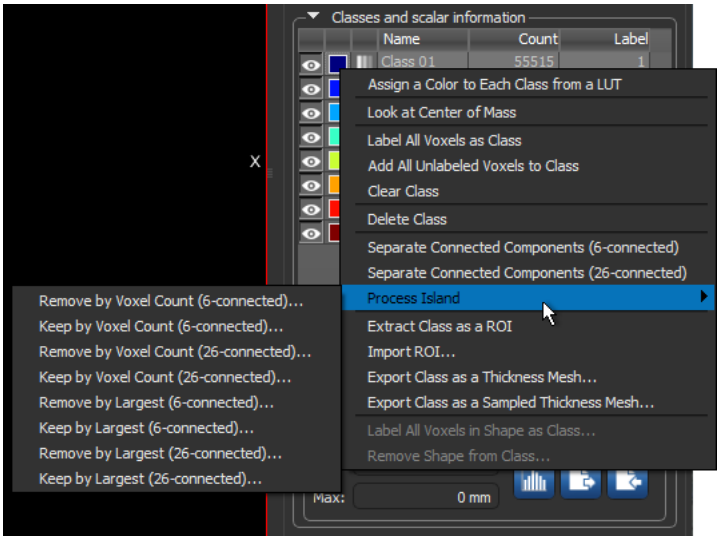
NOTE In either case, each separated component will be assigned to a new label.

Process Islands

In cases in which you need to refine threshold segmentation results or need to isolate objects of a certain size, you can now remove small objects from a selected class, as well as isolate larger objects. These operations can be based on voxel counts or by rank.

The options for processing islands within a selected class are shown in the screen capture below and are described in the following text.

Options for processing Islands



Right-click a class in the Classes and scalar information box and then choose **Process Islands** in the pop-up menu. You can then choose to remove or keep objects as described below.

Remove by Voxel Count (6-connected or 26-connected)... Removes all objects, as determined by the 6-connected or 26-connected method, that have a voxel count lower than a selected threshold. Voxel counts can be selected in the **Minimal Voxel Count** dialog.

Keep by Voxel Count (6-connected or 26-connected)... Keeps all objects, as determined by the 6-connected or 26-connected method, that have a voxel count higher than a selected threshold. Voxel counts can be selected in the **Maximal Voxel Count** dialog.

Remove by Largest (6-connected or 26-connected)... Removes a selected number of the largest connected components, as determined by the 6-connected or 26-connected method and as ranked by voxel count. The number of components to remove can be selected in the **Remove Biggest Count** dialog.

Keep by Largest (6-connected or 26-connected)... Keeps a selected number of the largest connected components, as determined by the 6-connected or 26-connected method and as ranked by voxel count. The number of components to retain can be selected in the **Isolate Biggest Count** dialog.

NOTE Components with an identical voxel count are considered as unique objects when they are ranked.

Export Classes as Thickness Meshes

For analysis purposes, you can now export selected classes as color-coded thickness meshes that show referential values of the local thickness between boundary points. Thickness is calculated as the diameter of a hypothetical sphere that fits within each boundary point. The measurements available in the Scalar information box on the Data Properties and Settings panel include the minimum and maximum values of the local thickness. You can also filter displayed ranges in the Measurement Inspector.

Do the following to export a class or classes as a thickness mesh:

1. Right-click the required class or selected classes in the Classes and scalar information box and then do one of the following:
   - Choose **Export Class as a Thickness Mesh** to export the mesh without sampling.
   - Choose **Export Class as a Sampled Thickness Mesh** to export the mesh with sampling. You can then select the required sampling values for the X, Y, and Z axes in the Export as Sampled Thickness Mesh dialog.
2. Do the following if you need to smooth the mesh for export:
   - Choose a smoothing method — **Laplacian Smoothing** or **Hamming Windowed Smoothing**.

     NOTE You can adjust additional properties for Hamming Windowed Smoothing in the Advanced Parameters dialog. Click the **Advanced Properties** button to open the dialog.
   - Choose the number of iterations required.
3. Click the **OK** button to export the selected class or classes as a thickness mesh.

   When processing is complete, the exported thickness mesh will appear on the Data Properties and Settings panel. Thickness meshes can be examined in 2D and 3D views.

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Remove Shape from Class

This new option for selected classes lets you clear all labeled voxels within a shape. Do the following to modify the labeling of a class within a shape:

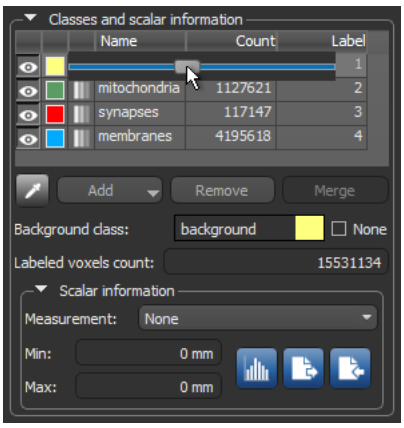
1. Create the required shape, such as a box, capsule, cylinder, or sphere.
2. Right-click the required multi-ROI class in the Classes and scalar information box and then choose **Remove Shape from Class** in the pop-up menu.
3. Select the shape you created in the Choose a Shape dialog and click **OK**.

Opacity Settings for Labels

Available in both the main context and in the Segmentation Wizard, this new option for visualizing multi-ROIs lets you adjust the opacity of each labeled class independently.

Click the **Opacity** icon in the classes list to open the Opacity slider, as shown below. You can then adjust opacity from 0 to 100 percent with the slider.

Opacity slider for multi-ROI classes

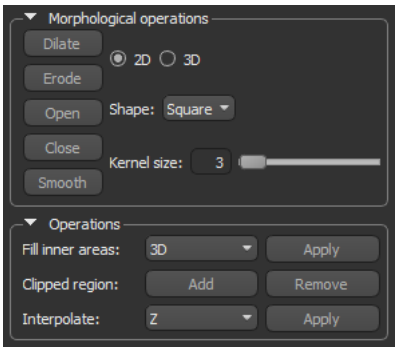


NOTE Whenever you change the opacity of a class, the global opacity settings selected in the 2D opacity and 3D opacity boxes will not be applied. However, you can right-click a class with an individually set opacity and then choose **Use Global Opacity** in the pop-up menu to reinstate the global opacity settings.

Morphological Operations

This software release adds support for applying morphological operations, such as **Dilate**, **Erode**, **Close**, **Open**, and **Smooth**, to selected multi-ROI classes. In addition, operations such as **Fill inner areas**, are also enabled for multi-ROI classes. These options are available in the Morphological operations and Operations boxes on the Segment tab, as shown below, and in the ROI Tools panel in the Segmentation Wizard.

Morphological operations and Operations boxes



NOTE Whenever multiple classes are selected, Dilate, Erode, and other operations will be executed in order selected, for example, A then B then C.

ROIs and Multi-ROIs

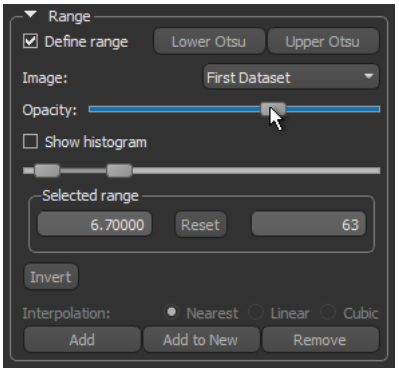
A number of new options are available for applying thresholds for creating and painting regions of interest and multi-ROIs, as well as for visualizing ROIs and multi-ROIs in 2D views.

Thresholding

You can now control the opacity of the selected range highlight when defining a domain of intensity on 2D views for creating threshold segmentations and for working with the ROI Painter tools.

Choose the image that will provide the intensity range in the Image drop-down menu and the adjust the opacity of range highlight with the Opacity slider, as shown below.

Range box



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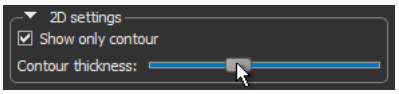
Adjustable Contour Thickness

This software release provides the option to adjust the thickness of the contours of an ROI or multi-ROI that is shown as outlines in the 2D views of a scene. Select the required ROI or multi-ROI and then check the **Show only contour** in the 2D settings box on the Data Properties and Settings panel. You can then adjust the thickness of the contour with the Contour thickness slider, as shown below.

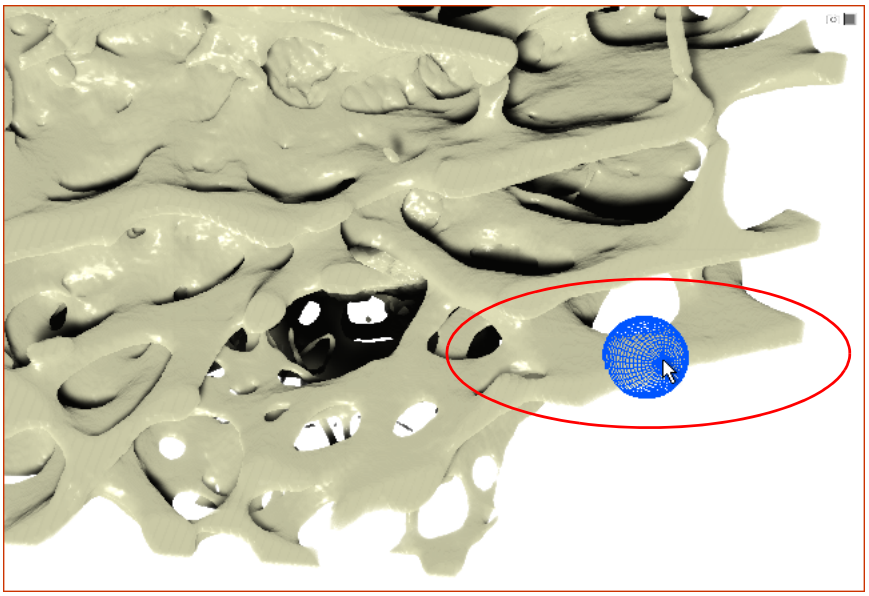
2D settings



ROI Painter

To facilitate painting in 3D views with the Brush tools, the size of the brush is now shown while you work.

Spherical Brush tool in 3D view



NOTE Brush sizes can be adjusted with your mouse scroll wheel.

Image Filtering

The following updates are available for filtering image data in Dragonfly 2020.2.

Mean shift... Multi-threading is now available for the **Mean Shift** filter, which should result in faster computations. You should note that mean shift filtering can be used for edge-preserving smoothing and is based on a data clustering algorithm.

Adaptive... The Gaussian method implemented in the **Adaptive** filter for thresholding has been replaced with a more robust method from another library.

Annotations

A number of new options for working with annotations are available in this product release. These are described below.

Create Rulers Between Points

As a new feature for Dragonfly 2020.2, you can now create a ruler between two selected points. Do the following to create a ruler between two points:

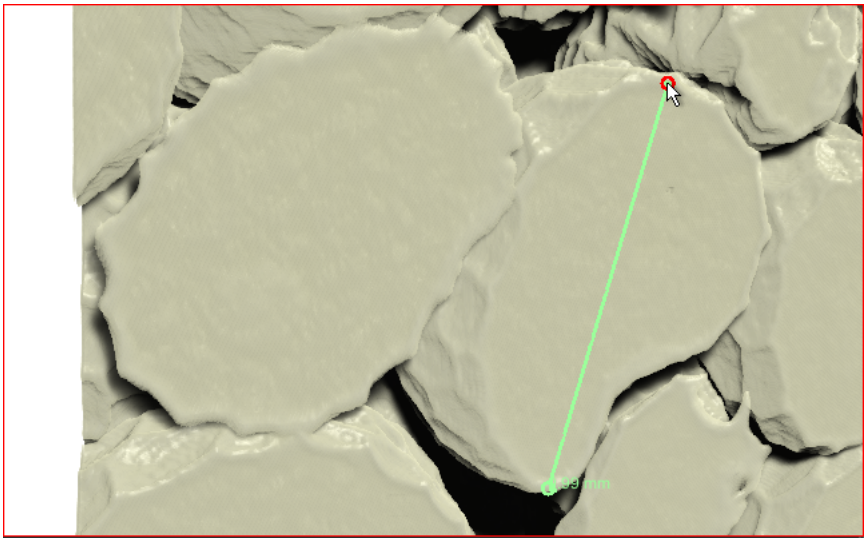
1. Select two points within a Points set, either in a 2D view or in the Points list.
2. Right-click the Points set in the Data Properties and Settings panel and then choose **Create a Ruler Between Two Points** in the pop-up menu.

   The ruler that connects the two selected points is added to the list of objects in the Data Properties and Settings panel.

Pick and Move Annotations in 3D

In this software release, you can now re-position rulers and points in 3D views, as shown below.

Selected ruler in a 3D view



Align View with Least Mean Square

This new option for Dragonfly 2020.2 lets you align a 2D view with the landmarks defined with a Points set. The alignment is done by minimizing the sum of the squared residuals, which is equal to the mean displacement.

Select the required 2D view and then right-click a Points set in the Data Properties and Settings panel and then choose **Align Current View with Least Mean Square** in the pop-up view to align the selected view.

NOTE You will need to add at least three points to a Points set to enable this option.

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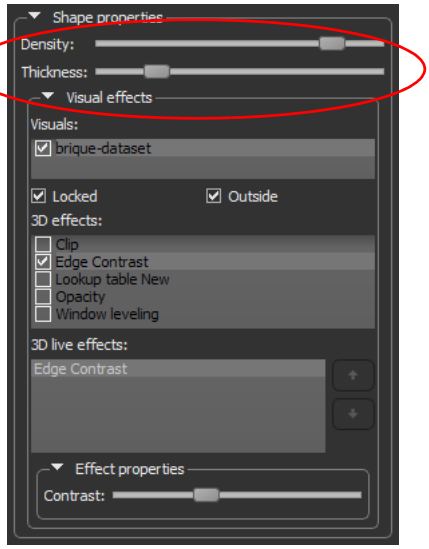
Shapes

The new Shape properties box on the Data Properties and Settings panel, shown below, groups together new settings for shapes, as well as the visual effect options available in previous Dragonfly versions.

The new options for adjusting shapes, which include **Density** and **Thickness**, are circled on the following screen capture.

Shape properties



Density... Lets you control the spacing within the grid that defines capsules, cylinders, and spheres. Applicable to 3D views only.

Thickness... Lets you control the thickness of the shape outline in 2D and 3D views and the thickness of the grid in 3D views.

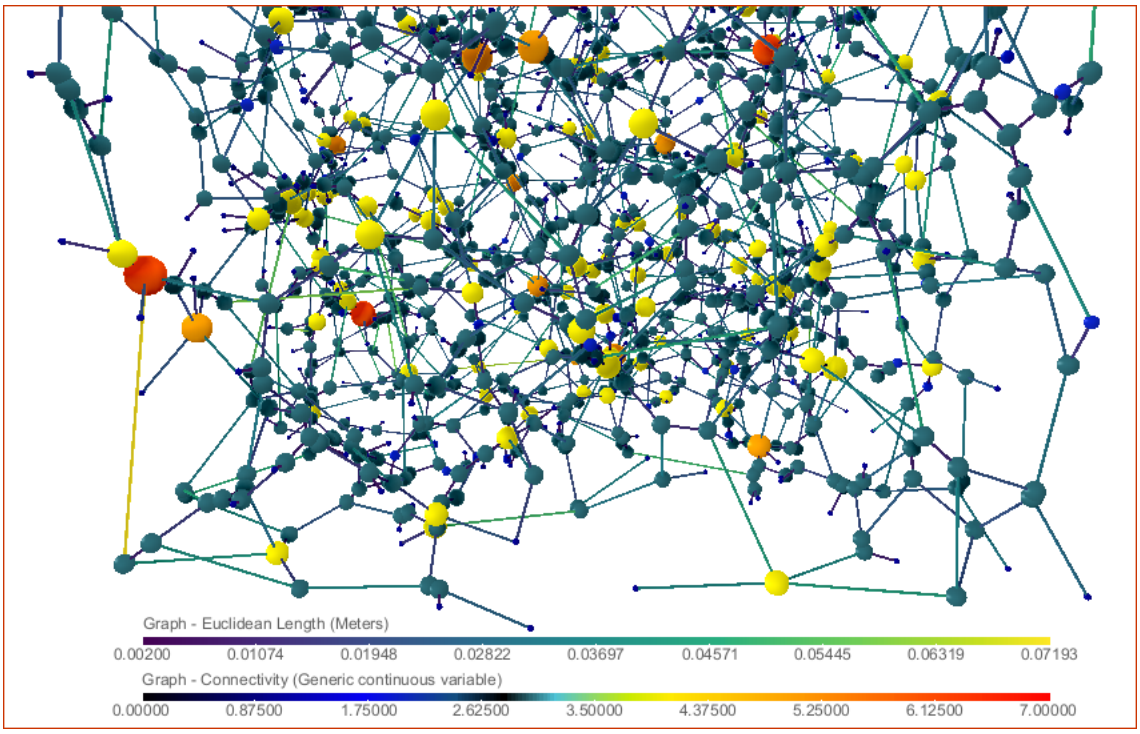
Graphs

A number of improvements for viewing and evaluating graphs are included in this software release. These include improved rendering and additional settings for customizing the 3D view of a graph.

Rendering

Some of the improvements for visualizing graphs include better depth sorting when zooming, rounder nodes, and superior rendering edges on top of vertices. An example of these enhancements is shown in the following screen capture.

Sparse graph created from a pore network model



Settings

Other options for evaluating graphs include using a constant vertex measurement, which can help reveal details that are obscured by segments with larger radii.

The **Use constant vertex measurement** option is available on the Data Properties and Settings panel in the Settings box and is circled on the following screen capture.

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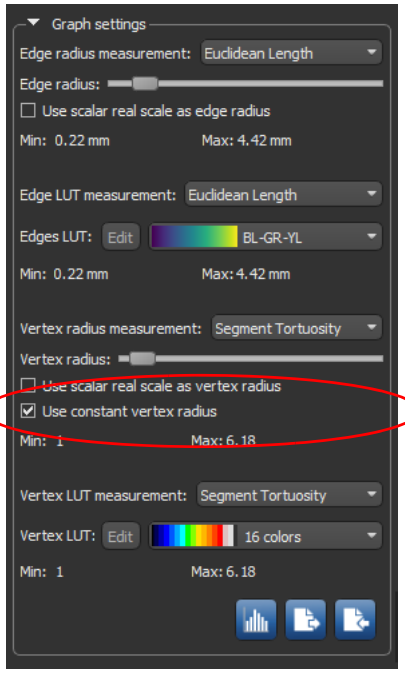
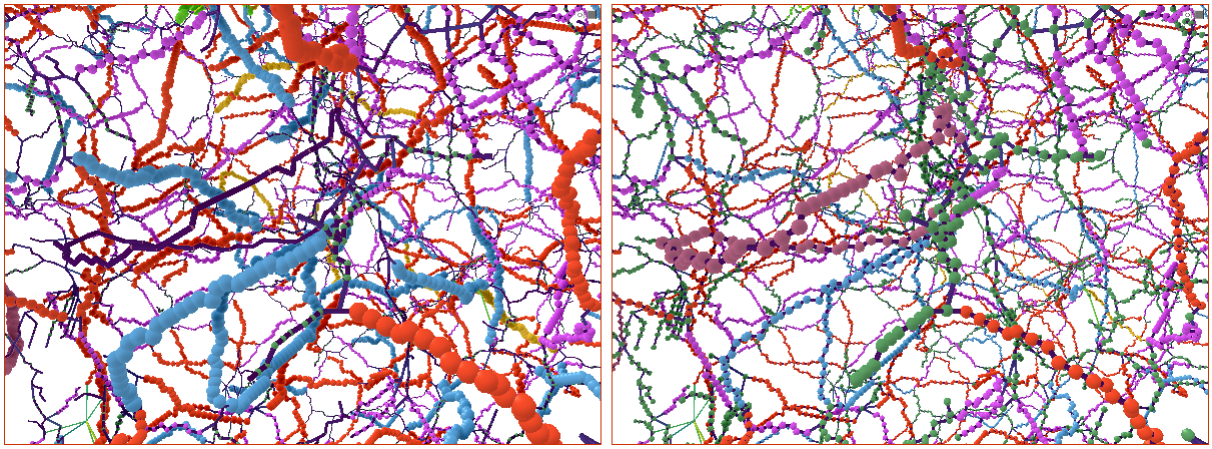
Graph settings



The following example shows the advantage of applying a constant vertex radius when evaluating a graph. You should note that the vertex radius can be adjusted with the slider.

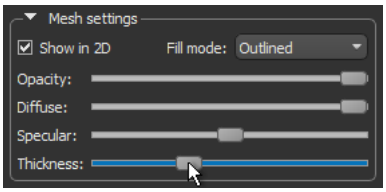
Before (left) and after (right) applying a constant vertex radius



Meshes

For evaluating meshes in 3D views, this Dragonfly release includes the option to adjust the thickness of edges whenever *Wireframes* or *Outlined* is selected as the Fill mode. This new **Thickness** slider is available in the Mesh settings box, as shown below.

Mesh settings



Camera Pivot Point

In previous Dragonfly releases, it was only possible to change the camera pivot point in the 2D views of a scene. You can now adjust the pivot point in the 3D view of a scene.

Select the **Pivot Point** tool on the Manipulate panel, as shown below, and then adjust the pivot point as required in any view.

Manipulate panel

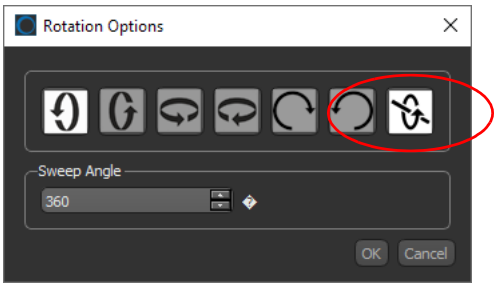
Look at Pivot Point... This new configured action lets you automatically center the camera on the pivot point in 3D views.

Movie Maker

This new release also features a number of improvements and enhancements for the Movie Maker.

Rotation options... The option to add rotations around an object's axis instead of the camera axis is now available in the Rotation Options dialog, shown below. To open the dialog, click the **Rotate** button on the Movie Panel panel. You will then need to click the **Rotate around the object's axis** button, circled below, to change the default rotation around the camera axis. You can then select the required rotation.

Rotation Options dialog



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Licensing Changes

The following licensing changes are effective as of the Dragonfly 2020.2 release.

Plug Analysis Wizard

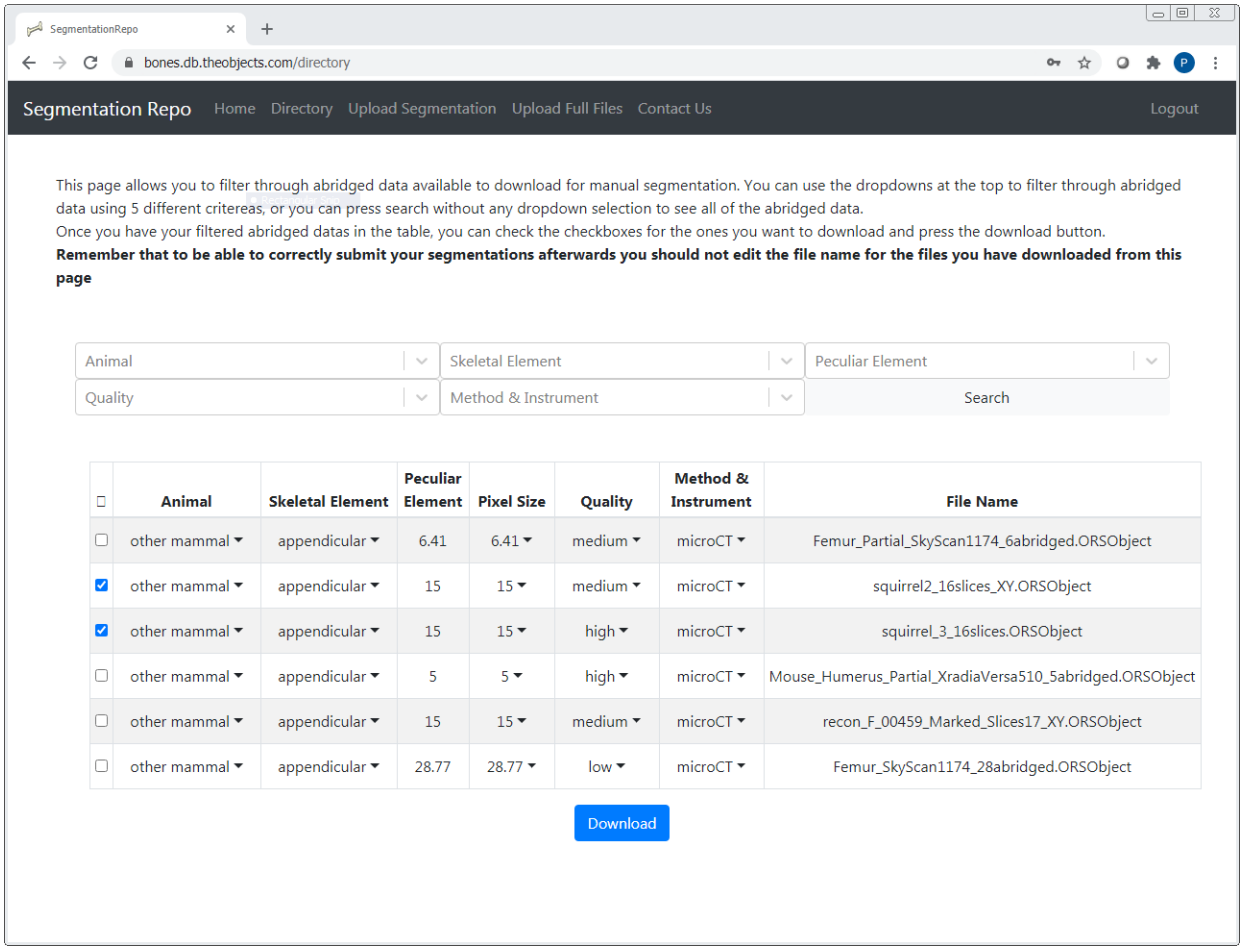
The Plug Analysis wizard, which provides a dedicated workflow for analyzing core plugs acquired from rock samples and other porous media, will now be bundled with non-commercial licenses and will not require an additional activation key. You should note that commercial users require a separate license for each optional feature that is available for Dragonfly.

Universal Net Project

The recently launched **Universal Net Project** is a collaboration between Object Research Systems and µCT data contributors. The purpose of the project is to design and train a deep neural network that will be capable of unsupervised or automated segmentation of new random µCT datasets. To be able to do so, the network has to be trained on a diverse library of µCT data. Contributors are invited to enrich ORS' existing library of µCT data with scans representing diverse combinations of µCT equipment, acquisition parameters, scan content, artifacts, and so on. This diversity is projected to enable broad network training and the anticipated result is a generalized universal network capable of precise segmentation. By participating in this project you will be contributing to the success of your own future research and that of your colleagues.

You can access the Universal Net Project at bones.db.theobjects.com. The Directory page of the repository is shown in the following screen capture.

Universal Net Project



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How to Participate

If you want to participate in the Universal Net Project, you can join as one of the two contributor types.

Full dataset contributor accounts... Are for participants who want to provide the project with their full scans. Provided data will be manually abridged and then made available for download for manual segmentation by segmentation contributors. Segmented data will then be used as training data for the network. You should note that segmentation contributors will not have access to submitted full datasets.

Segmentation contributor accounts... Are for participants who want to help the project by manually segmenting abridged data.

NOTE For users who want to create an account as a contributor of full datasets, the site administrator will need to review their credentials.

Menu Bar Changes

New items for the menu bar implemented in Dragonfly 2020.2 are listed below.

Artificial Intelligence Menu

New items available on the **Artificial Intelligence** menu are listed below.

Artificial Intelligence menu

	Description
Segmentation Wizard	Opens the Data Selector dialog, in which you can select the image or images that will be added to the Segmentation Wizard before it launches (see Access the Wizard from the Menu Bar on page 10).

Changes to Contextual Menus

The following changes for the contextual menus are implemented in Dragonfly 2020.2.

Data Properties and Settings Panel

The following contextual menu items are now available for selected image data, annotations, regions of interest, multi-ROIs, meshes, shapes, vector fields, and graphs on the Data Properties and Settings panel.

Dataset Pop-Up Menu

A number of new items, listed below, are available in the **Dataset** pop-up menu.

Dataset pop-up menu changes

	Description
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

Annotation Pop-Up Menu

A number of new items, listed below, are available in the **Annotation** pop-up menu.

Annotation pop-up menu changes

	Description
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11). You should note that this item is available for all annotations.
Points	
Align Current View with Least Mean Square	Automatically aligns the selected 2D view with the landmarks defined with a Points set (see Align View with Least Mean Square on page 24).
Create a Ruler Between Two Selected Points	Automatically creates a ruler between two selected points (see Create Rulers Between Points on page 24).

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ROI Pop-Up Menu

A number of new items, listed below, are available in the **Region of Interest** pop-up menu.

ROI pop-up menu changes

	Description
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

Multi-ROI Pop-Up Menus

A number of new items, listed below, are available in the **Multi-ROI** pop-up menu in the Data Properties and Settings panel.

Multi-ROI pop-up menu changes

	Description
Assign Unit to Scalar Values	Transforms selected scalar values by assigning a new unit to a measurement. For example, if a length measurement is equal to 0.0025 meters and you assign centimeters as the unit to the scalar value, then the measurement shown will be 0.25 meters. You should note that measurements will always appear in your selected units, for example 25 centimeters.
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

New items are also available in the pop-up menu for selected classes in the Classes and scalar information box. These are listed in the following table.

Classes pop-up menu changes

	Description
Separate Connected Components (6-connected)	Lets you separate the connected components within a selected class or classes based on 6-connected connectivity (see Separate Connected Components on page 18).
Separate Connected Components (26-connected)	Lets you separate the connected components within a selected class or classes based on 26-connected connectivity (see Separate Connected Components on page 18).
Process Islands	Lets you remove small objects from a selected class, as well as isolate larger objects (see Process Islands on page 19).
Extract Class as an ROI	Item renamed, was previously available as 'Extract as ROI'.
Export Class as a Thickness Mesh	Lets you export selected classes as color-coded thickness meshes that show referential values of the local thickness between boundary points(see Export Classes as Thickness Meshes on page 20).
Export Class as a Sampled Thickness Mesh	Lets you export selected classes as sampled color-coded thickness meshes that show referential values of the local thickness between boundary points(see Export Classes as Thickness Meshes on page 20).
Remove Shape from Class	Lets you clear all labeled voxels within a selected shape (see Remove Shape from Class on page 21).

Mesh Pop-Up Menu

A number of new contextual items, listed below, are available for meshes.

Mesh pop-up menu changes

	Description
Assign Unit to Scalar Values	Transforms selected scalar values by assigning a new unit to a measurement. For example, if a length measurement is equal to 0.0025 meters and you assign centimeters as the unit to the scalar value, then the measurement shown will be 0.25 meters. You should note that measurements will always appear in your selected units, for example 25 centimeters.
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

Shape Pop-Up Menu

A number of new items, listed below, are available in the **Shape** pop-up menu.

Pop-up menu changes for shapes

	Description
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

Vector Field Pop-Up Menu

A number of new items, listed below, are available in the **Vector Field** pop-up menu.

Pop-up menu changes for vector fields

	Description
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

Graph Pop-Up Menu

A number of new items, listed below, are available in the **Graph** pop-up menu.

Pop-up menu changes for graphs

	Description
Assign Unit to Scalar Values	Transforms selected scalar values by assigning a new unit to a measurement. For example, if a length measurement is equal to 0.0025 meters and you assign centimeters as the unit to the scalar value, then the measurement shown will be 0.25 meters. You should note that measurements will always appear in your selected units, for example 25 centimeters.
Extract Action Log from Object	Extracts the object's history as a macro that can be replayed to create a new or modified object by applying the logged operations (see Extract Object History on page 11).

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Preferences Changes

A number of new items, listed below, and other changes have been implemented for setting the application preferences.

Click **Preferences** on the Status bar or choose **File > Preferences** on the Menu bar to open the Preferences dialog.

Views Preferences

Changes for the **Views** preferences are indicated in the following table.

Views preferences changes

	Description
2D Settings	
ROI and Multi-ROI contour thickness	Lets you select a default contour thickness, in screen percentage, for when regions of interest and multi-ROIs are shown as outlines in 2D views (see Adjustable Contour Thickness on page 23).

Configurable Actions

New items for the **Configurable Actions** preferences are indicated in the following table.

Configurable Actions changes

	Description
Invert range	Inverts the defined range of the selected image for threshold segmentations and painting (see Thresholding on page 22).
Look at pivot	Centers the camera on the pivot point (see Camera Pivot Point on page 28).
Show next image modality	Changes the view in the Segmentation Wizard to the next image for multi-modality training (see Support for Multi-Modality Models on page 6).
Show previous image modality	Changes the view in the Segmentation Wizard to the previous image for multi-modality training (see Support for Multi-Modality Models on page 6).

Miscellaneous

Changes for the **Miscellaneous** preferences are indicated in the following table.

Miscellaneous preferences changes

	Description
Keep object history	Saves the object history in exported *.ORSObject files (see Extract Object History on page 11).

System Requirements

This release supports the base system requirements (see http://www.theobjects.com/dragonfly/system-requirements.html).

Extending Dragonfly

Dragonfly's Infinite Toolbox, an open exchange platform for the Dragonfly user community, lets you submit, browse, and download extensions that implement new features and workflows for all of your image processing or analysis needs.

Choose **Utilities > Infinite Toolbox** on the menu bar to open Dragonfly's Infinite Toolbox.

Requesting New Features

Let us know if you have a suggestion for a new feature, or an idea for an improvement to an existing workflow.

Learning Dragonfly

Just by taking a quick look around www.theobjects.com/dragonfly/, you'll find some great free resources, such as our latest instructional videos, recorded webinars, and user forums.

Dragonfly Workshops

Our hands-on training workshops are a great way to get up and running quickly. Combining in-depth instruction with class exercises, our product specialists will quickly teach you how to use key Dragonfly features and functions to optimize your image visualization and analysis tasks.

NOTE All scheduled Dragonfly workshops have been postponed or cancelled due to worries about the coronavirus pandemic. We will resume our workshop schedule as soon as possible. You can check for updates at http://www.theobjects.com/dragonfly/workshops.html.

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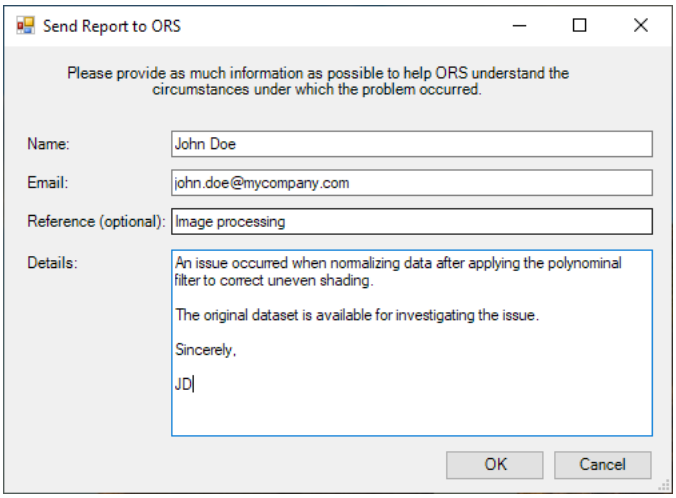
Reporting Issues

Dragonfly includes an integrated reporting module that lets you include comments and other information along with generated DMP and log files whenever you encounter an issue that results in a crash or application freeze.

Send Report to ORS dialog



You should note that you can also report an issue at any time by choosing **Help > Report an Issue** on the menu bar.

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