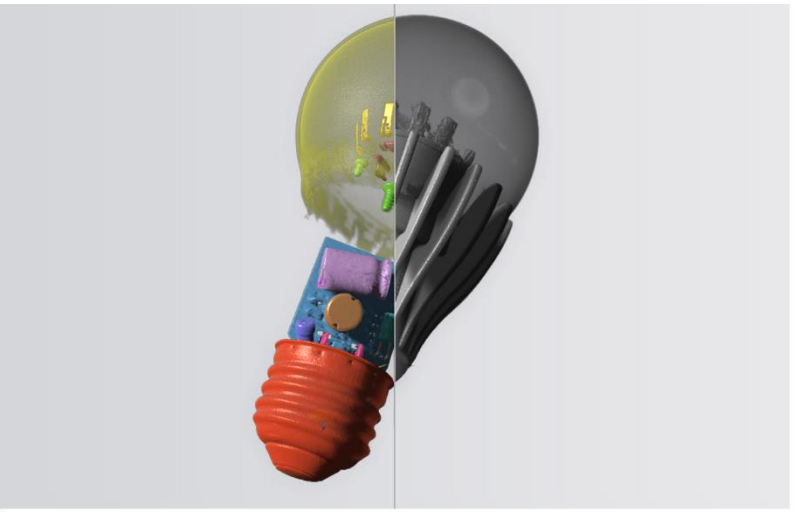
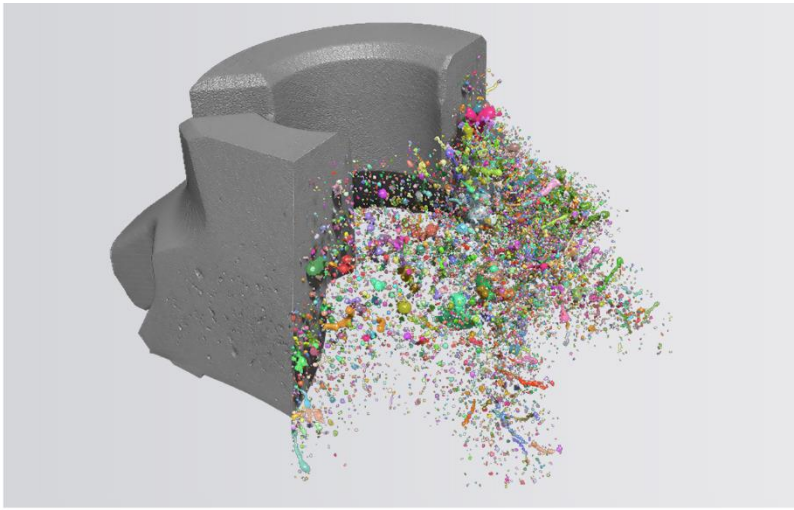
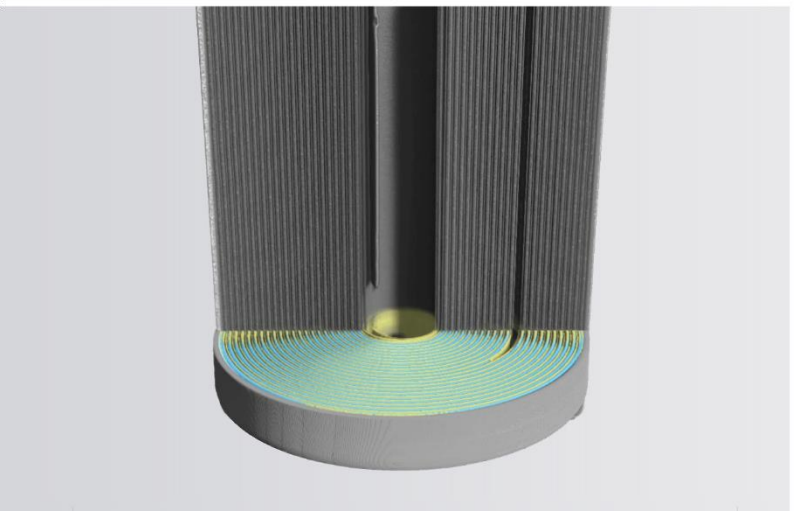
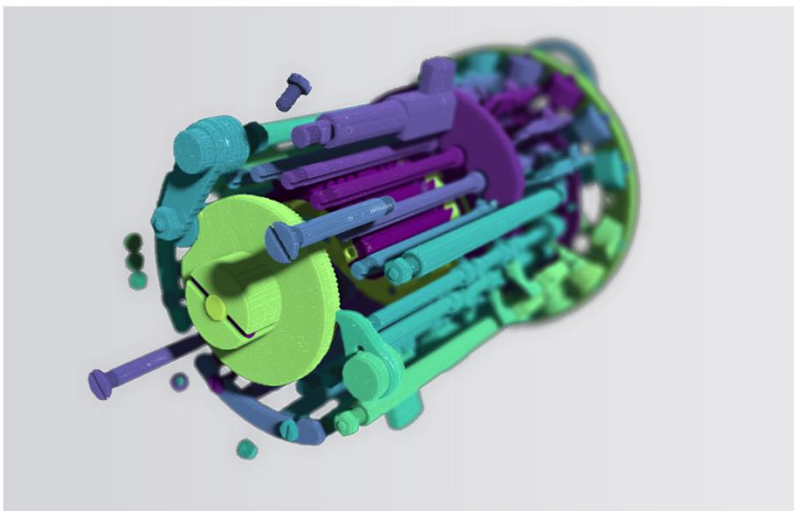
Release Notes
Version 2025.1

Dragonfly 3D World

Learn all about the new features, product enhancements, and other improvements implemented in the latest **Dragonfly 3D World** and **Dragonfly 3D World ZEISS edition** software release.

Copyright

© 2025 Comet Technologies Canada Inc. All rights reserved.

The present end-user documentation is confidential and proprietary information of Comet Technologies Canada Inc. (the “Company”). Only licensees of the Company have a right to use the information contained herein. Only licensees have the right to copy and/or transfer the information for internal use, unless otherwise agreed with the Company. Any unauthorized use, disclosure, transfer, or reproduction of this confidential information may give rise to a right in the Company to seek a legal remedy against such use, disclosure, transfer, or reproduction.

Except as expressly provided otherwise in writing, the information provided in this document is provided AS IS, without any condition or warranty, whether written, oral, implied, legal, or statutory. The Company makes no warranty as to its accuracy. Any use of the documentation or the information contained herein is at the risk of the user. Documentation may include technical or other inaccuracies or typographical errors. Information is subject to change without notice.

Trademarks

Dragonfly, Dragonfly 3D World, and the Dragonfly logos are trademarks of Comet Technologies Canada Inc.

Third-Party Trademarks

Python is a trademark or registered trademark of the Python Software Foundation. Adobe, Acrobat, Flash, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries. Intel, Pentium, and Pentium 4 are registered trademarks or trademarks of Intel Corporation or its subsidiaries in the United States and other countries. NVIDIA and GeForce are registered trademarks or trademarks of NVIDIA Corporation in the United States and/or other countries. Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Advanced Micro Devices, AMD, and ATI are either registered trademarks or trademarks of Advanced Micro Devices Incorporated in the United States and/or other countries. VMware is a registered trademark and VMmark is a trademark of VMware, Inc. VMware VMmark is a product of VMware, an EMC Company. VMmark utilizes SPECjbb©2005 and SPECweb®2005, which are available from the Standard Performance Evaluation Corporation (SPEC). All other brand names, product names, or trademarks belong to their respective holders and should be noted as such.

Notices

Portions of Dragonfly’s 3D engine licensed from the University of Münster.

Dragonfly is NOT a medical device.

Cover Images

Clockwise from the top left: Split view of segmented LED lightbulb (left) and 3D rendering (right): automated porosity segmentation of a casting: segmented curta mechanical pocket calculator (data acquired on a Comet Yxlon FF35 system): and segmented battery cell.

Update Notice for 2025.1.2081

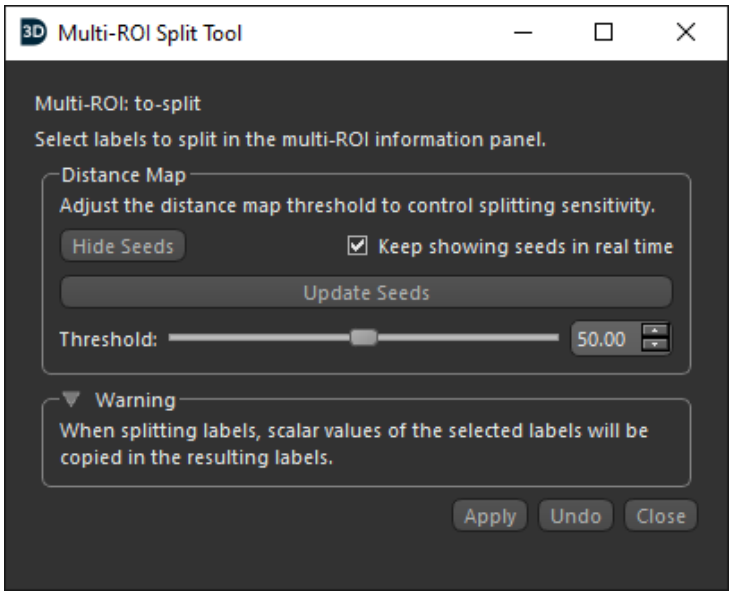
The Dragonfly team is pleased to announce the **2025.1.2081** maintenance release of Dragonfly 3D World and Dragonfly 3D World ZEISS edition. This release includes the licensing changes, security updates, and bug fixes described in this topic. New features, product enhancements, and other highlights for version 2025.1 are described in the preceding sections of this document (see New Features and Product Enhancements).

Licensing Changes

A number of items that were previously exclusive are now available for all versions of Dragonfly 3D World. These include the multi-ROI split tool, bone mineral density measurements, and 2D non-local means filter.

Multi-ROI Split Tool

The Multi-ROI Split Tool can be used to separate clustered objects in multi-ROIs. Right-click a clustered object in the Classes and scalar information box and then choose **Launch Split Tool** in the pop-up menu to open the Multi-ROI Split Tool dialog, shown below. All features self-contained within the seed points, which are identified through a distance map, can be split from the cluster. Refer to the topic Split Tool in this publication for additional information about this feature.



Multi-ROI Split Tool dialog

Bone Mineral Density Measurements

Bone mineral density (BMD.Me) and tissue mineral density (TMD.BV and TMD.Co) measurements are now available for all versions of Dragonfly 3D World. BMD and TMD correspond to the input cortical and trabecular bone regions and the input cortical and trabecular bone regions, respectively, and are defined as the volumetric density of calcium hydroxyapatite (CaHA) in a biological tissue in terms of $mg.cm^{-3}$. These measurements are calibrated by means of phantoms with known density values of CaHA.

2D Non-Local Means Filter

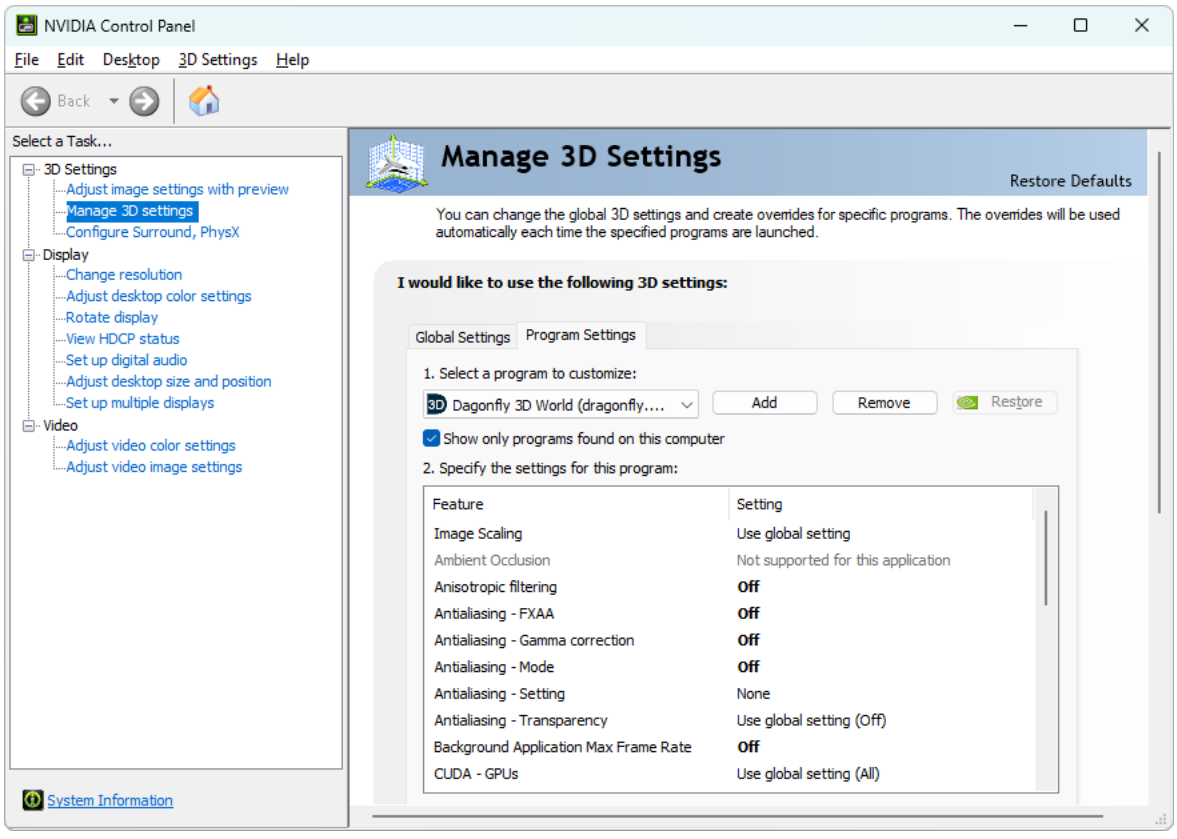
Unlike the Mean filter, which takes the mean value of a group of pixels surrounding a target pixel to smooth images, the 2D Non-Local Means filter takes the mean of all pixels on a slice-by-slice basis, weighted by how similar they are to the target pixel. Applying this filter can result in greater post-filtering clarity with minimal loss of detail when compared with mean filtering. In many cases, the Non-Local Means filter should often be your first choice for smoothing noisy images. Options for the 2D Non-Local Means filter are available on the Image Filtering panel.

NOTE The non-local means filtering works most effectively if the noise present in the data is white noise, in which case most features present in the image will be preserved, even small and thin ones.

Customized Program Settings for Optimizing GPU Performance

This software release includes automatically set customized NVIDIA settings for Dragonfly 3D World. Setting program-specific settings optimizes GPU performance for Dragonfly's specific demands without affecting global system settings. The primary advantages include enhanced 3D rendering speed, optimal GPU utilization, high-performance for texture filtering, and other benefits.

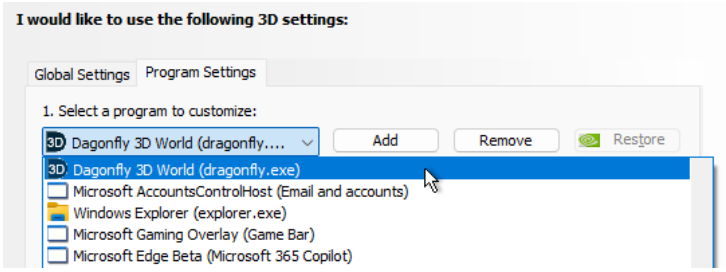
You can review the program-specific settings for Dragonfly 3D World on the Program Settings tab in the NVIDIA Control Panel, as shown below.



Manage 3D Settings

Do the following to review the optimized program-specific settings for Dragonfly 3D World:

1. Open the NVIDIA Control Panel.
2. Go to **3D Settings > Manage 3D Settings** in the NVIDIA Control Panel.
3. Click the **Program Settings** tab.
4. Choose **Dragonfly 3D World (dragonfly.exe)** in the 'Select a program to customize' drop-down menu, as shown below.



NOTE Information about the 3D settings is available on NVIDIA's Manage 3D Settings reference web page (https://www.nvidia.com/content/Control-Panel-Help/vLatest/en-us/mergedProjects/nv3d/Manage_3D_Settings_(reference).htm).

'All Users' Location Support

This maintenance release for Dragonfly 3D World ends support for storing user data in the `ProgramData` folder (also known as `%AllUsersProfile%`). Although storing user data in the `ProgramData` folder is often standard practice for sharing information across all users, it can introduce several security risks. And unlike the `%AppData%` folder that is private to a single user, anything stored in `ProgramData` is potentially visible or modifiable by other users on the same machine.

Due to the above concerns, the `pycaches` location was moved from `ProgramData` to the `%AppData%` folder. In addition, saving LUTs, macros, deep learning models, 3D presets, and other items directly from the application to the `ProgramData` folder is no longer supported.

NOTE LUTs, macros, deep learning models, 3D presets, and other items saved in the `ProgramData` folder of an older version of Dragonfly3D World will be copied to the `%AppData%` folder of the current user when this version of Dragonfly 3D World is installed.

NOTE This change does not affect activating Dragonfly3D World for all users. In this case, the '*credentials.xml*' file that contains the license and activation keys will be written in the `ProgramData` folder. Everything else will be written on a per user basis to `%AppData%`.

Support for Machine Learning

You should note that machine learning is no longer under active development and is deprecated in this software release. You should also note that machine learning will likely be removed in future versions of Dragonfly.

Issues Resolved in 2025.1.2081

The following issues were resolved in the 2025.1.2081 version of Dragonfly 3D World and Dragonfly 3D World ZEISS edition.

PRODUCT ACTIVATION

Failure to launch for floating licenses using a proxy configuration

With floating licenses, Dragonfly can run on multiple computers that '*share*' the license. Some facilities install the Dragonfly license server on a network share that accesses the internet through a proxy. In this case, failures to launch the application after the initial activation have been resolved.
Ref. DRAG-15870.

PRODUCT ACTIVATION

The proper message is not displayed when Dragonfly 3D World is unlicensed

The maintenance release provides an update for Linux users who have not yet activated their Dragonfly 3D World license. In previous versions, the message stated that the license is expired or not valid. The updated message provides the correction that the application is unlicensed. Ref. DRAG-15966.

PRODUCT UPDATES

Checking for updates

You can check for new releases on a regular basis to ensure that your version of Dragonfly has the latest updates (see Checking for Updates). In cases in which any error prevents you from accessing the internet, Dragonfly will now provide the option to check for updates by scanning a QR code (see Offline Updates).
Ref. DRAG-16032.

SECURITY AND PRIVACY

Dragonfly accessed the camera when recording

Applications that access the camera when they do not require camera functionality can be a significant security and privacy concern. This maintenance release includes a safeguard to ensure that Dragonfly's Screen Recorder does not access the camera during recording.
Ref. DRAG-16226.

PERFORMANCE

Poor performance for 3D rendering and other functions

A number of users have reported sluggish behavior when manipulating 3D renderings, saving screenshots, and navigating within Windows File Explorer. To address these issues, this software maintenance release includes the option to apply program-specific settings for Dragonfly 3D World. Setting program-specific settings lets you optimize GPU performance for Dragonfly's specific demands without affecting global system settings (see Customized Program Settings for Optimizing GPU Performance).
Ref. DRAG-16140.

DATA IMPORT

Failure to load MRC files that could be loaded previously

A reported failure to load MRC (*.mrc extension) files in version 2025.1 0f Dragonfly 3D World 2025.1 that could be loaded in version 2024.1 was resolved in this maintenance release.
Ref. DRAG-16009.

DEEP LEARNING

Mitigation for systems running outdated GPU drivers

Deep learning applications in Dragonfly 3D World require CUDA runtime version 11.8 or later, which are available in recent NVIDIA drivers. If Dragonfly now encounters a system running an outdated driver that does not meet this requirement, the CPU will be used for deep learning applications.
Ref. DRAG-16050.

NOTE Deep learning applications will usually run significantly slower on CPU. Updating your drivers is recommended for optimizing performance.

DEEP LEARNING

Segment Anything Model (SAM) and Cellpose-SAM

This maintenance software release provides a more streamlined approach for installing the Meta AI's Segment Anything Model (SAM) and Cellpose-SAM models on offline systems. SAM offers a foundational model for precise image segmentation without the need for additional training (see Segment Anything Model (SAM), while Cellpose-SAM provides highly accurate and automated general-purpose of cells and other similarly shaped objects, such as powders and aggregates (see Cellpose-SAM).
Ref. DRAG-15917.

Do the following to download and install SAM on an offline system:

- Download the file 'sam_vit_h_4b8939.pth' that is available at: https://downloads.theobjects.io/ai/segment_anything/sam_vit_h_4b8939/sam_vit_h_4b8939.pth
- Transfer the file to a portable device, such as a USB key.
- Install the 'sam_vit_h_4b8939.pth' file in the directory: `%localappdata%\Comet\Dragonfly2025.1\pythonUserExtensions\PythonPluginExtensions\DeepTrainer\SegmentAnything\sam_vit_h_4b8939`.

Do the following to download and install Cellpose-SAM on an offline system:

- Download the file 'cpsam' that is available at: https://downloads.theobjects.io/ai/misc_model/cpsam
- Transfer the file to a portable device, such as a USB key.
- Install the 'cpsam' file in the directory: `%localappdata%\Comet\Dragonfly2025.1\pythonUserExtensions\PythonPluginExtensions\DeepTrainer\Cellpose-SAM\models`.

SEGMENTATION WIZARD

Saved session could not be reopened

A user was unable to reopen a saved session file after training a model in the Segmentation Wizard in which frames were labeled on multiple datasets with different geometries. This maintenance release includes a resolution for this issue.
Ref. DRAG-16130.

ROI PAINTER

Painting with a defined range

In previous software releases, it was possible to paint with a range defined on an image whose shape did not match the ROI or multi-ROI selected for painting. This caused a number of issues, including software crashes. This maintenance release closes this gap and limits painting to ROIs and multi-ROIs that have the same shape as the image selected in the Range pan

Regions of Interest

Processing islands in 2D to refine regions of interest does not behave as expected

This maintenance release corrects the behavior for processing islands in 2D to refine regions of interest. In previous releases, processing options such as '*Remove by Largest*' and '*Keep by Largest*' were not applied strictly on a slice-by-slice basis.
Ref. DRAG-15835.

Annotations

Annotations are shown as '*modified*' even when no change was applied

To protect processed data, new and modified objects listed on the Data Properties and Settings panel are identified '*unsaved*'. However, an issue was identified in which annotations that were only clicked, and not modified in any way, were erroneously marked as unsaved. This issue was resolved in this maintenance release for Dragonfly 3D World.
Ref. DRAG-16121.

Meshes

Progress bar froze when remeshing with Poisson surface reconstruction

Poisson surface reconstruction offers a number of advantages for remeshing and it can create exceptionally smooth surfaces that robustly approximate noisy data. An issue noted during processing that resulted in a frozen progress bar was fixed in this software maintenance release.

Slice Registration

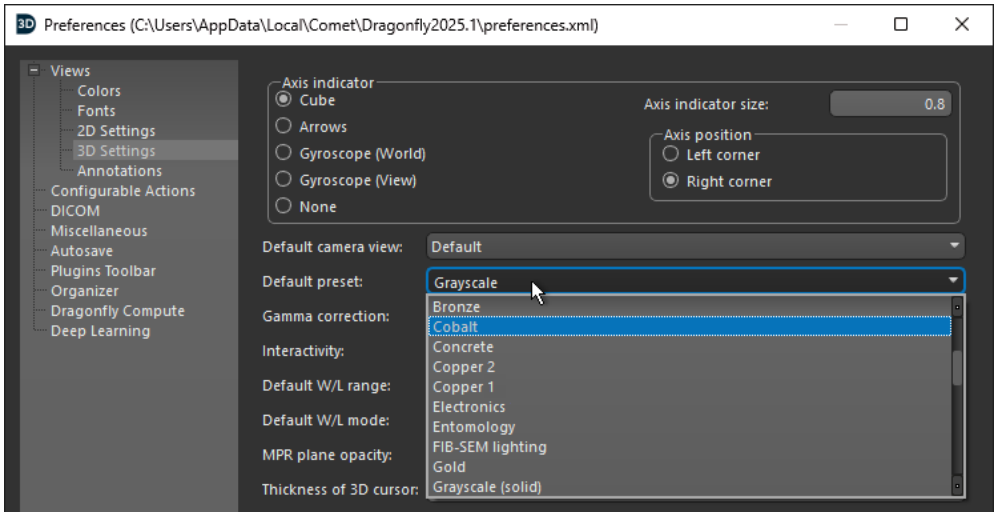
Selecting 'Optical Flow' as the registration method resulted in extraneous image channels

A noted issue with some methods for registering slices to align an image stack, in which extraneous image channels were created during processing, was resolved in this maintenance software release.
Ref. DRAG-16040.

Preferences

Cannot select a default preset for 3D views

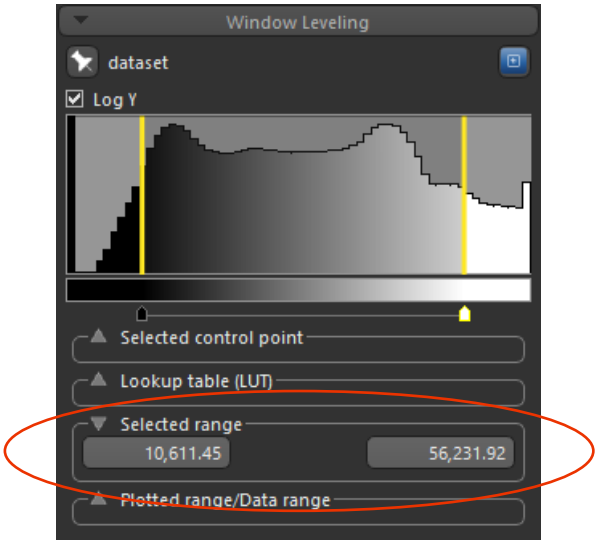
Presets for 3D views let you quickly apply groups of settings, such as solidity, diffuse, specular, and shininess, as well as 3D settings, lookup tables, and lighting settings, to improve the visualization of 3D renderings. The option to select a default preset, as shown below, was reinstated in this maintenance software release. Ref. DRAG-16063.



3D Settings preferences

Selected window leveling range is not always updated

Some users have reported that the selected range shown in the Window Leveling panel, circled below, is not always updated when the yellow threshold bars on the histogram are moved. This issue was corrected in this maintenance release. Ref. DRAG-16010.



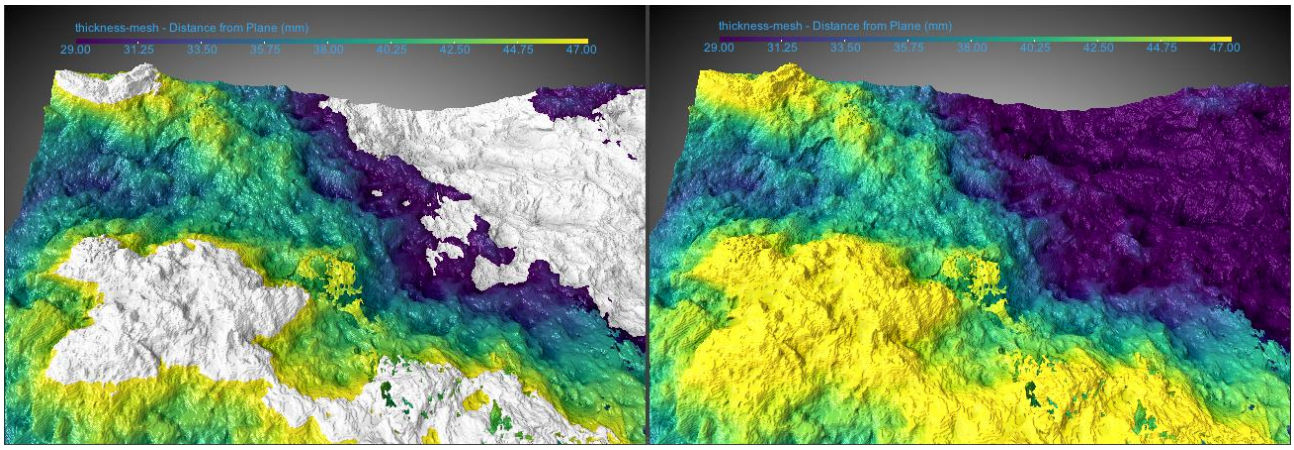
Window leveling panel

Update Notice for 2025.1.2063

The Dragonfly team is pleased to announce the **2025.1.2063** release of Dragonfly 3D World and Dragonfly 3D World ZEISS edition. This release includes the updates and bug fixes described below. New features, product enhancements, and other highlights for version 2025.1 are described in the preceding sections of this document.

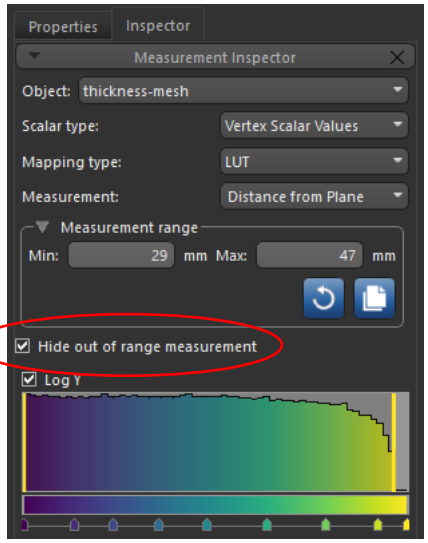
Updates for 2025.1.2063

This software release includes an update for inspecting scalar meshes that are rendered in 3D views. In previous versions, the colors applied to hidden vertices or faces would correspond to the minimum or maximum threshold values. In this version, the sections of the mesh in which the selected scalar values are out-of-range are rendered in a solid base color. As shown below, hiding out-of-range measurements removes any ambiguity about the corresponding scalar values.



Out-of-range measurements hidden (left) and when out-of-range measurements are not hidden (right)

The option to hide out-of-range measurements, circled below, is available on the Measurement Inspector panel.



Measurement Inspector panel

Resolved Issues in 2025.1.2063

The following issues were resolved in the 2025.1.2063 version of Dragonfly 3D World and Dragonfly 3D World ZEISS edition.

PRODUCT INSTALLATION

Issue installing Dragonfly 3D World without any user interaction

This software release reinstates a command-line argument — /AU — that forces shortcuts to be created for all users when running silent installs.

Crash at startup due to outdated OpenGL driver

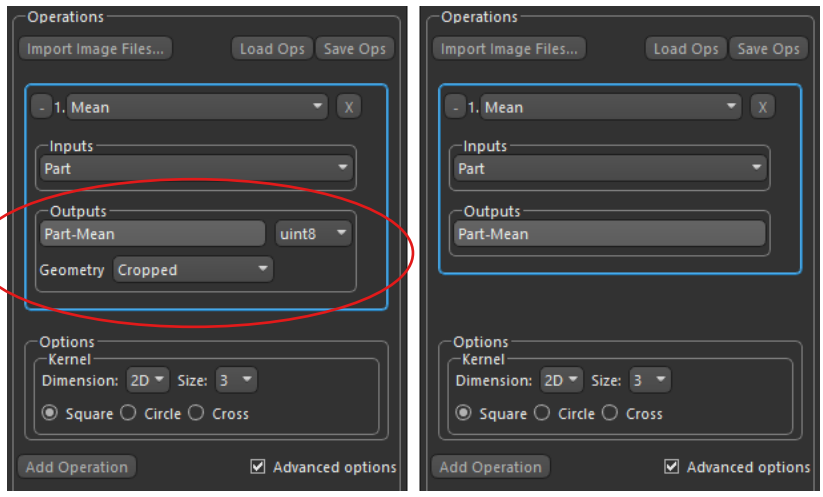
New features and other updates sometimes rely on newer OpenGL functions that are not supported by older graphics drivers or hardware. When the software tries to call an unsupported function, the graphics driver or system may not know how to handle the instruction, leading to a crash, error, or instability. Crashes associated with this issue should no longer occur. However, you will still need to update the drivers for your graphics hardware to run Dragonfly.

Crash loading a Bruker dataset

The 2025.1 release for Dragonfly 3D World includes support for loading image files exported from Bruker microCT and 3D X-ray microscopy systems (see Support for Bruker Files). Images can be loaded by simply adding the .log file contained in the same directory as the image files to Dragonfly's Image Loader. However, crashes could occur if additional bitmap images with different geometries that were not part of the image stack were present in the image files directory. Improvements for importing Bruker log files have mitigated this issue.

Crash applying GPGPU filters

The GPGPU framework currently only supports image filtering outputs to the same data type and geometry. Crashes could occur if outputs for GPGPU filters were manually set to a different data type or geometry with the advanced options. For example, setting the output of a GPGPU filter to 8 bits when the input is 16 bits. To resolve this issue, the advanced options are no longer available for GPGPU filters, as shown below.



Output options for non-GPGPU image filters (circled on left) and output options for GPGPU image filters (on right)

NOTE Refer to the topic GPGPU Accelerated Image Filters for information about the available GPGPU image filters.

PLANES

Crash when creating a plane

In the initial release of version 2025.1, Dragonfly would crash whenever a plane was created. This issue was corrected and verified for this software release. Ref. DRAG-15670.

Crash when creating a new session

A software crash was reported by a user who was working in multi-scene workspace in which meshes were loaded in each scene. This issue was corrected and verified for this software release. Ref. DRAG-15656.

Crash when right-clicking in an empty object list

A user reported that the application would crash whenever they right-clicked in an empty object list. This issue was corrected and verified for this software release. Ref. DRAG-15664.

DATA IMPORT

Cannot load data by dragging and dropping folders

The option to load data by dragging and dropping folders onto the Dragonfly workspace was restored in this software update. Ref. DRAG-15795.

DATA IMPORT

UI not updated for handling axis changes in TXM files

Additional support for importing TXM files was updated in this update for Dragonfly 3D World ZEISS edition.

PRODUCT ACTIVATION

Uninformative error message is generated when a Dragonfly license cannot be activated

The Dragonfly team noted that a detailed error message is not displayed whenever a user attempts to activate a license that is already in use on another system. This has resulted in some difficulties to diagnose activation problems. An updated error message now informs users whenever a license is already activated elsewhere. They can then decide to terminate that session or to wait for the license to be available.

PRODUCT PERFORMANCE

Dedicated GPU is not used by the 3D engine

Optimal 3D rendering performance in Dragonfly is usually achieved by using a dedicated NVIDIA or AMD graphics processing unit (GPU) instead of an onboard GPU. This software release includes a notification that appears whenever Dragonfly's 3D engine is using the onboard GPU instead of a dedicated one.

DEEP LEARNING

Fixed learning rate (LR) schedulers do not update the LR each epoch

When training a model, the learning rate should be updated at each epoch according to the chosen learning rate scheduler and the selected settings. However, a user noted that fixed learning rate schedulers that do not use a monitor, such as Constant LR, Exponential LR, Polynomial LR, and others, do not update the LR at each epoch. This issue has been resolved in this version of Dragonfly. Ref. DRAG-15678.

DEEP LEARNING

Training stopped unexpectedly after one epoch

In this case, early stopping conditions were erroneously met because an empty patch was generated in training. This software update resolves the issue by preventing empty patches from being generated.

DEEP LEARNING

The inference generated by a U-Net 3D model trained for sematic segmentation was unsatisfactory

The reported issue with the inference of a U-Net 3D model was corrected and then verified by applying the 3D model with and without a mask, as well as within a range and to the full dataset. Ref. DRAG-15647.

DEEP LEARNING

Selected training parameters are not always reported accurately in the training summary

Discrepancies between the selected training parameters and the summary shown in the Training dialog were reported. The summarized training parameters are now consistent with those selected. Ref. DRAG-15650.

DEEP LEARNING

Visual feedback missing when training super resolution models

Visual feedback, in which a model's inference is displayed in the Training dialog in real time as each epoch is completed, lets you monitor and evaluate the progress of deep model training. However, this feature did not work as expected when training super resolution models in the initial 2025.1 software release. This issue was corrected for this update. Ref. DRAG-15714.

DEEP LEARNING

Deep model training stopped too early

This issue (Ref. DRAG-15732) was traced to the default settings of some of the learning rate (LR) schedulers. These settings were updated as follows from the previous defaults:

Setting	Previous	Current
Exponential Learning Rate		
gamma	0.9	0.97
Polynomial Learning Rate		
total_iters	5	100
power	1.0	2.0
Step Learning Rate		
step_size	10	30

MACHINE LEARNING

Could not train, apply, or save a machine learning (ML) or deep model in Linux

The cause of this issue, which was found to be folder/file permission settings that prevented model architecture updates, was corrected in this software release. Ref. DRAG-15626.

SEGMENTATION WIZARD

In one case, training multiple models failed

After starting a training session in the Segmentation Wizard with multiple deep models, a user reported that training stopped after the first model was trained. The cause was determined to be an issue with copying the edited training parameters of the first model to all deep models. This issue has been resolved, and multi-model training sessions will now proceed normally. Ref. DRAG-15675.

SEGMENTATION WIZARD

The slice index is inverted compared to that in the main context

A user noted that the view orientations and Z slice index in the Segmentation Wizard did not match those of the 2D views in the main context. The issue occurred because the Segmentation Wizard did not use the 2D Settings preferences for view orientations. The Segmentation Wizard now respects the preferences set for the 2D views. Ref. DRAG-15653.

MULTI-ROIS

Classes do not appear in the Classes and scalar information table when selected with the Pick tool

This software ensures that the rows of the Classes and scalar information table automatically scroll to the class selected by the Pick tool. Ref. DRAG-15608.

SCALAR VALUES

Computing 2D measurements on data that is anisotropic freezes the application

In this case, a user reported that the application became unresponsive when they attempted to compute 2D measurements for a dataset that was anisotropic in XY. This issue was resolved and retested successfully with equivalent data in this software release. Ref. DRAG-15613.

ANALYZE AND CLASSIFY MEASUREMENTS

Issues noted when merging and inverting selections

A number of issues, summarized below, were resolved for analyzing and classifying measurements.

- In the initial release of version 2025.1, the **Merge** function in the Analyze and Classify Measurements dialog did not work. It is now possible to merge selected objects in a multi-ROI. Ref. DRAG-15758.
- In some cases, inverting selections for large tables was found to be unacceptably slow. Performance was improved in this software release. Ref. DRAG-15747.

MESHES

Setting the threshold for surface determination is difficult if the image slope is exceedingly small

Some reconstructed datasets can have exceedingly small image slopes, sometimes in the range of 1.4E-05. In these cases, it was difficult to manually set a threshold for generating surfaces in the initial 2025.1 software release. This issue was resolved and is no longer an impediment for generating high precision meshes with Dragonfly's new Surface Determination tool (see Surface Determination Tool). Ref. DRAG-15738.

MESHES

Opening the Surface Determination panel for the first time is terribly slow

The Surface Determination panel now appears also immediately in this software release and any issues with an unresponsive or laggy interface were resolved. See Surface Determination Tool for information about this new feature. Ref. DRAG-15649.

MESHES

Exporting multiple regions of interest as optimal meshes resulted in extra outputs

Due to a coding error, the number of optimal meshes exported from multi-selected regions of interest was incorrect. For example, if you selected five ROIs for export, then 25 optimal meshes — N × N — would be generated. This error was corrected for this software update.

MESHES

Issues with LUTs applied to scalar meshes

A number of issues, summarized below, were resolved for inspecting scalar meshes.

- The colors of look-up tables (LUTs) applied to meshes generated from multi-ROIs do not match the original object's scalar values. Ref. DRAG-15676.
- The legend for the scalar values 'intersection with ROI or shape' does not correspond to the applied LUT. Ref. DRAG-15718.

- The mesh's base color is applied to the vertices/faces with the highest scalar values. Ref. DRAG-15775.
- Incorrect scalar value range normalization in 3D views.
- LUTs are not updated when synchronizing scalar meshes in 3D views.

MESHES

Not possible to paint new values with the 3D Mesh Painter

The 3D Mesh Painter lets users edit the scalar values of 3D tetrahedral meshes or to create new scalar slots for painting values. However, some regression introduced in the initial 2025.1 release compromised this functionality. The software update reverses this issue and painting new values with the 3D Mesh Painter was restored. Ref. DRAG-15630.

MESHES

Items removed from the release version of Dragonfly 3D World

The previous version of Dragonfly 3D World included options to generate mesh raycasting simulations and to iteratively snap meshes to image gradients. These items are only intended for internal evaluation and testing purposes and were removed from the release version of Dragonfly. Ref. DRAG-15610/15627.

IMAGE FILTERING

Correction for GPGPU Canny and DoG filters

A number of image filters have been integrated within the GPGPU framework in this software release (see GPGPU Accelerated Image Filters). In most cases, you should not notice any differences between the image filtering outputs of GPGPU versus CPU processing. However, an issue was discovered for the GPGPU versions of the Canny and difference of Gaussian (DoG) filters. This issue, which resulted in no outputs for those filters, was resolved in this software update.

IMAGE FILTERING

Was not possible to apply arithmetic operations in image filtering workflows

An issue with adding arithmetic operations to an image filtering workflow, in which it was not possible to select the number of inputs for the operation or to write an arithmetic expression, was resolved in this software update. Ref. DRAG-15778.

3D Rendering

Viewing multi-ROIs properly in 3D can take a number of extraneous steps

This reported issue, in which it was not possible to initially view new classes and scalar information added to multi-ROIs, was resolved in this software update. Ref. DRAG-15615

Screenshots

Issue noted when exporting screenshots from 3D views in orthographic mode

This software update corrects an issue noted for screenshots exported from 3D views in orthographic mode. The noted issue, poor rendering of the legend whenever the scale bar was present in the view, was corrected. Ref. DRAG-15759.

Export

File extensions are not appended when saving data

This software release includes a fix to always append file extensions whenever data is saved or exported.

Movie Maker

The LUTs of multi-ROIs are altered when opening Movie Maker timelines in saved sessions

A number of users reported that the colors of look-up tables (LUTs) applied to multi-ROIs are shifted or displayed incorrectly after opening Movie Maker timelines in saved sessions. This issue was resolved by refactoring the channel ROI index so that it is restored correctly when the saved session is loaded. Ref. DRAG-15639.

Contents

1 New Features and Product Enhancements 9

2 Deep Learning 10

2.1 Migration to PyTorch from TensorFlow 10

2.2 Segment Anything Model (SAM) 11

2.2.1 Downloading SAM for Online Systems 12

2.2.2 Downloading and Installing SAM on Offline Systems 12

2.2.3 Using the Segment Anything Point & Click Tools 13

2.2.4 Using the Segment Anything Region Tools 15

2.2.5 Configurable Actions for Segment Anything Painting Tools 17

2.2.6 References 18

2.3 Cellpose-SAM 19

2.3.1 Cellpose-SAM Parameters 20

2.3.2 Downloading Cellpose-SAM for Online Systems 21

2.3.3 Downloading and Installing Cellpose-SAM on Offline Systems 21

2.3.4 Reference 22

2.3.5 Copyright Notice 22

2.4 Ready-to-Use Deep Models 23

2.5 Custom Deep Model Architectures 24

2.5.1 Deep Model(s) for Image Classification 25

2.5.2 Noise2Void for Denoising 27

2.5.3 YOLO (You Only Look Once) for Object Detection 28

2.6 Probabilities Outputs 29

2.7 Deep Learning Tool UI Changes 30

2.8 Sharing Deep Models 31

2.9 Anatomical Structures Segmentation 32

2.9.1 References 33

2.10 AI Visual Assistant 34

2.10.1 References 34

2.11 Deep Learning Requirements for 2025.1 35

3 Segmentation Wizard 37

3.1 Training Settings 37

3.1.1 Batch Size 37

3.1.2 Estimated Memory Ratio 38

3.2 Custom Class Weights 38

3.3 Saving Frames ... 39

4 GPGPU Acceleration ... 40
4.1 GPGPU Preferences ... 41
4.2 GPGPU Accelerated Image Filters ... 41
4.3 GPGPU Acceleration for Processing Images ... 42
4.4 Processing ROIs with GPGPU Acceleration ... 43

5 Meshes ... 44
5.1 Surface Determination Tool ... 44
5.2 Optimal Meshes ... 50
5.3 Mesh Tools ... 51
5.4 Height Maps ... 51
5.5 Improvements for Viewing Meshes ... 52
5.5.1 Outline Mode ... 52
5.5.2 Lighting with Shadows ... 53
5.5.3 Imported Meshes ... 53
5.6 Exporting Meshes with Colors in PLY ... 54
5.7 Exporting 3D Tetrahedral Meshes ... 54

6 Volume Sculptor ... 55

7 Effect Splitter ... 57
7.1 Configurable Actions for the Splitter ... 58

8 Brightness, Contrast, and HSL Settings ... 59

9 3D Settings for Images ... 61
9.1 Unsharp ... 61
9.2 Noise Reduction ... 62
9.3 Edge Contrast ... 62

10 Projected Grids ... 63

11 2D Processing of ROIs and Multi-ROIs ... 64
11.1 Process Islands in 2D ... 64
11.2 Connected Components 2D ... 65
11.3 2D Distance Maps ... 65
11.4 2D Watersheds ... 66
11.4.1 Adaptive Watershed 2D ... 66
11.4.2 Compute Watershed 2D and Watershed Transform 2D ... 66
11.4.3 Compute Watershed 2D with Plane ... 67
11.5 2D Graphs ... 68

11.6 Skeletonize ROI 2D ... 69
12 Multi-ROIs ... 70
12.1 Instance Labeler ... 70
12.2 Split Tool ... 72
12.3 Create Colored Multi-ROI From RGB Channels ... 74
12.4 Longest Length Measurements ... 74
12.5 Create Boxes From Classes ... 75
12.6 Class Selection Options ... 76
13 Regions of Interest ... 77
13.1 Create Seeds for Watersheds (Ultimate Erode) ... 77
13.2 Opacity and Color Settings ... 78
13.2.1 Smoothing ... 78
13.2.2 Edge Contrast ... 79
13.3 Skeletonize and Prune ROI ... 79
14 Statistical Properties for ROIs and Multi-ROIs ... 80
15 Analyze and Classify Measurements ... 81
15.1 Compute Correlation Matrix ... 81
15.2 Pick Tool ... 82
15.3 Opacity Controls for Multi-ROIs ... 82
15.4 Multi-ROI Tools ... 83
15.5 Assign Unit ... 83
15.6 Export Table ... 84
16 CSV Export Preferences ... 85
17 Slice Analysis ... 86
18 Histogram Analysis ... 87
18.1 Otsu Threshold ... 87
18.2 Class Creation ... 88
19 Intensity Profiles ... 89
20 Exporting Intensity Counts ... 90
21 Vector Fields ... 91
22 Annotations ... 92
22.1 Use Snapping ... 92
22.1.1 Snapping Preferences ... 92
22.2 Create Rulers Between Spheres ... 93

22.3 Arrows 93
22.4 Points Series 95
22.4.1 Create Planes From Points 95
22.4.2 Floating Captions 95
23 Shapes 96
23.1 Extract 3D Projections from Cylinders and Spheres 96
23.2 Attach Plane 97
24 Translate/Rotate Tools 98
25 Views 100
25.1 View at 100% 100
25.2 Show 2D View Planes Permanently 101
25.3 Setting the Visibility of Multiple Objects 102
26 Auto Executor 103
27 Macro Recorder 105
28 Picture-In-Picture Mode 106
29 Movie Maker 107
29.1 Advanced Animation Options 107
29.2 Starting the Movie Maker 108
29.3 Save as MP4 108
30 Screen Recorder 109
31 Bone Analysis Wizard 110
31.1 Workspace Update 110
31.2 Opacity Control for Kohler Segmentation Method 111
31.3 Updates for Global Measurements 111
32 Automated Porosity Segmentations 112
32.1 Ambient Occlusion (AO) Fields 112
32.2 Automated Porosity Segmentation Methods 113
33 Open Fiber Segmentation 114
33.1 PuMA (Porous Microstructure Analysis) 115
33.2 Pore Network Modeling 115
34 Additional File Support 116
34.1 Support for XRV Files 116
34.2 Support for Bruker Files 116

34.3 Support for Nikon Files ... 117
34.4 Support for North Star Imaging Files ... 117
35 Deriving, Resampling, and Extracting Datasets ... 117
36 Auto Load Session Files ... 118
37 Dragonfly Social ... 119
38 Checking for Updates ... 121
38.1 Updating Online Systems ... 121
38.2 Offline Updates ... 122
38.3 License Keys ... 123
39 Location of Python Distribution and Code ... 123
40 Menu Bar Changes ... 124
40.1 File Menu ... 124
40.2 Workflows Menu ... 124
40.3 Artificial Intelligence Menu ... 125
40.4 Utilities Menu ... 125
41 Changes to Contextual Menus ... 126
41.1 Dataset Contextual Menu ... 126
41.2 ROI Contextual Menu ... 126
41.3 Multi-ROI Contextual Menus ... 127
41.4 Meshes Contextual Menu ... 128
41.5 Shapes Contextual Menu ... 128
41.6 Annotations Contextual Menu ... 129
41.7 2D Views Contextual Menu ... 129
41.8 3D Views Contextual Menu ... 129
42 Preferences Changes ... 130
42.1 Views Preferences ... 130
42.1.1 2D Settings ... 130
42.1.2 3D Settings ... 131
42.1.3 Annotations ... 131
42.2 Miscellaneous Preferences ... 132
42.3 Deep Learning Preferences ... 132
43 System Requirements ... 133
44 Third-Party Packages ... 133
45 Publicly Available Source Code ... 134

45.1 PyTorch 134
45.2 Qt 134
45.3 Porous Microstructure Analysis (PuMA) 134
45.4 Netgen/NGSolve 134
46 Learning Dragonfly 135
46.1 Dragonfly Workshops 135
46.2 Online Training 135
47 Requesting New Features 135
48 Reporting Issues 136

1 New Features and Product Enhancements

This software release for Dragonfly 3D World and Dragonfly 3D World ZEISS edition includes new features and performance enhancements that are sure to boost your productivity. Just a small sample of the highlights for version 2025.1 include:

- The initial migration to PyTorch from TensorFlow for deep learning applications (see Migration to PyTorch from TensorFlow).
- The incorporation of Meta AI's Segment *Anything Model (SAM)*, which offers a foundational model for image segmentation and is sure to reduce challenging and time-consuming labeling tasks (see Segment Anything Model (SAM)), as well as Cellpose-SAM for highly accurate and automated general-purpose segmentation of cells and cellular-like objects (see Cellpose-SAM).
- Custom deep model architectures for image classification tasks (see Deep Model(s) for Image Classification) and an instance labeler to prepare training sets for classification (see Instance Labeler).
- The implementation of a GPGPU (general-purpose computing on graphics processing units) framework, which provides significantly faster processing times for compute-intensive tasks such as image filtering, skeletonization, segmentation, and other complex operations (see GPGPU Acceleration).
- Surface determination tool for generating perfectly accurate meshes (see Surface Determination Tool) and optimal meshes that provide a balance between complexity and a system's capability to render meshes in 3D (see Optimal Meshes).
- Processing of regions of interest and multi-ROIs in 2D (see 2D Processing of ROIs and Multi-ROIs).
- A 'Picture-in-Picture' mode for 2D animations and screenshots in which an overlay of the 3D view can be added to any 2D view (see Picture-In-Picture Mode).
- Volume sculpting, an effect splitter, optimized 3D settings, as well as brightness, contrast, and HSL controls to make your 3D renderings even more sensational.

2 Deep Learning

This software release includes the migration to PyTorch from TensorFlow, the incorporation of Meta AI's *Segment Anything Model (SAM)* for streamlining image labeling tasks, Cellpose-SAM for highly accurate and automated general-purpose segmentation of cells and cellular-like objects, custom deep model architectures for image classification tasks, the option to generate probabilities maps, easy sharing of trained deep models with other Dragonfly users, as well as other enhancements.

2.1 Migration to PyTorch from TensorFlow

To ensure that Dragonfly continues to offer state-of-the-art implementations for transformative image processing, this software release marks the migration to PyTorch from TensorFlow for deep learning applications. Although TensorFlow remains a powerful alternative for some applications, PyTorch's community and research focus, along with its seamless integration within Python-based workflows and better memory management, makes it a more attractive choice for Dragonfly. Some noted advantages of adopting PyTorch include the following:

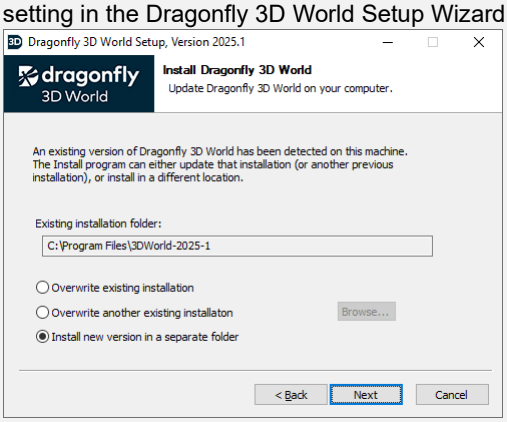
- PyTorch is widely adopted in the research community and academia, with many innovative models and tools released in PyTorch first.
- PyTorch benefits from rapid development and frequent updates that incorporate user feedback and features that enhance performance and usability.
- PyTorch is widely adopted by industry leaders such as Apple, Meta AI, Open AI, Intel, and Amazon.
- PyTorch offers better GPU memory allocation and management than TensorFlow. Unlike TensorFlow, PyTorch releases GPU memory at the end of training or inference and does not require users to close and restart Dragonfly to recover GPU memory. You should note that the preference for executing deep learning tasks in an external process were removed for this version of Dragonfly.
- The TorchMetrics package from Lighting AI provides a collection of 100+ PyTorch metrics implementations for evaluating the performance of segmentation and regression models.
- TensorFlow no longer provides native Windows support for GPUs as of version 2.10.

You should be able to complete your deep learning workflows with PyTorch without any issues in this software release. Training, evaluation, and inference for new regression and semantic segmentation models are fully supported, including training parameters, model checkpoints, sparse labeling, class weights, and so on. currently available model architectures include Attention U-Net, Autoencoder, Sensor 3D, Trans U-Net , U-Net, U-Net 3D, U-Net SR, and U-Net++. Available custom architectures include Noise2Void for denoising and YOLOv7 for object detection, as well as EfficientNetV2 for training classification models. A selection of PyTorch versions of pre-trained models are also available for download.

Transparent conversion of existing TensorFlow models to PyTorch for supported model architectures is selectable when Dragonfly 3D World 2025.1 is first launched. In some cases, you may note that the performance of converted Autoencoder, Sensor3D, and Trans U-Net models are not as good as the original TensorFlow versions. If this occurs, fine tuning converted models with data should resolve any noted issue.

NOTE Contact us if you typically use a model architecture that is no longer available in version 2025.1 or if you experience any issues converting your existing TensorFlow models to PyTorch.

NOTE For users updating to version 2025.1, the Dragonfly Team recommends installing this version in a separate folder instead of overwriting a previous installation. This will let you continue using TensorFlow in cases in which the conversion of older models to PyTorch is not satisfactory. Installing this version in a separate folder is the default setting in the Dragonfly 3D World Setup Wizard, as shown below.



2.2 Segment Anything Model (SAM)

Labeling training sets for deep learning and machine learning, as well as for other purposes, can often be a challenging and time-consuming task. With the incorporation of Meta AI's *Segment Anything Model (SAM)*, Dragonfly 3D World now offers a foundational model for image segmentation, which '*can cut out any object in any image, with a single click'* without the need for additional training.

The Segment Anything Model (SAM) in Dragonfly 3D World lets you label images by generating segmentation masks for objects based on point and region prompts and then using those prompts to identify relevant object(s) and generate precise segmentations. As shown below, the Segment Anything tools can be used to quickly and accurately label nuclei, granules, mitochondria, pockets, and other components present within an image.

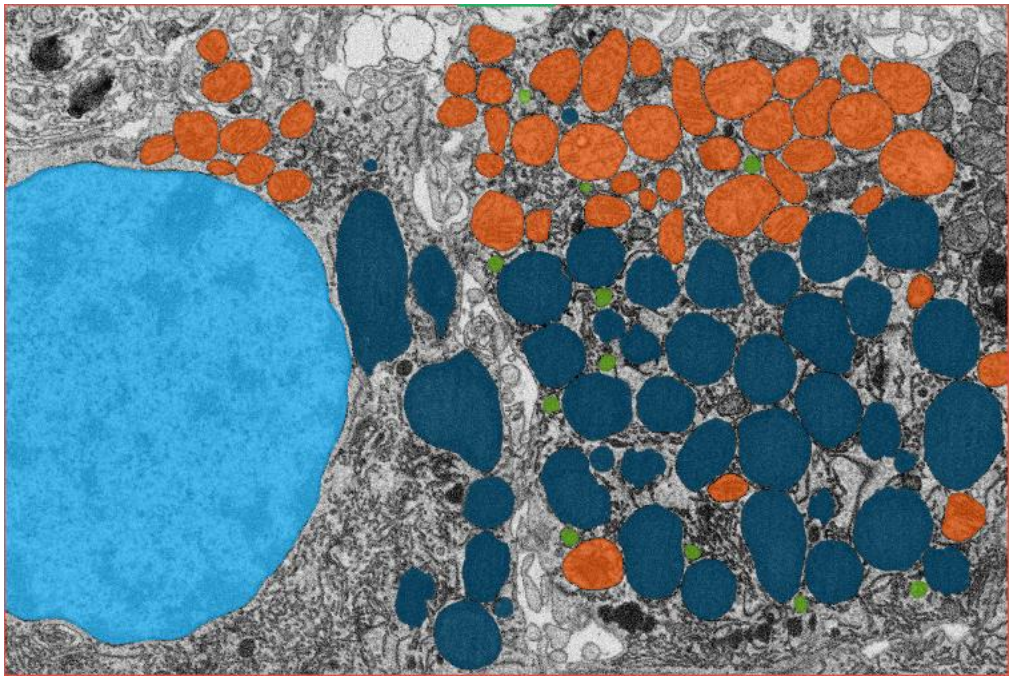
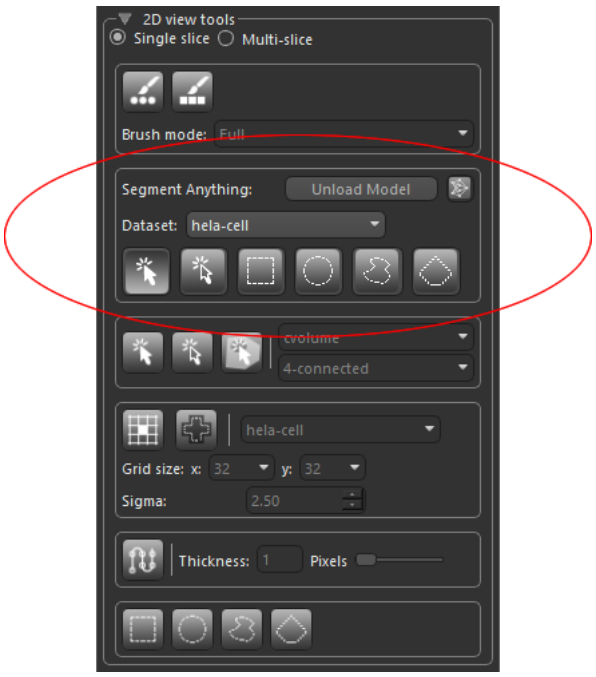


Image partially segmented within minutes with the Segment Anything tools

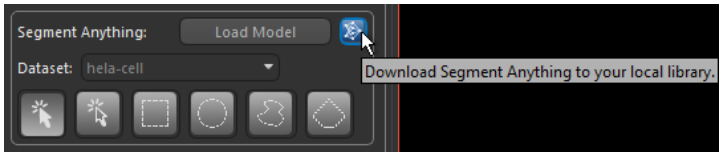
The SAM painting tools are available on the ROI Painter panel in the main context and in the Segmentation Wizard, as shown and circled on the following screenshot.



Segment Anything painting tools (circled) on the ROI Painter panel

2.2.1 Downloading SAM for Online Systems

You will first need to download the Segment Anything model before using the ROI Painter tools in *Segment Anything mode* for the first time. If your system is connected to the internet, simply click the **Download Segment Anything** button, as shown below, to automatically download and install the model to your local library.



Download Segment Anything button on the ROI Painter panel

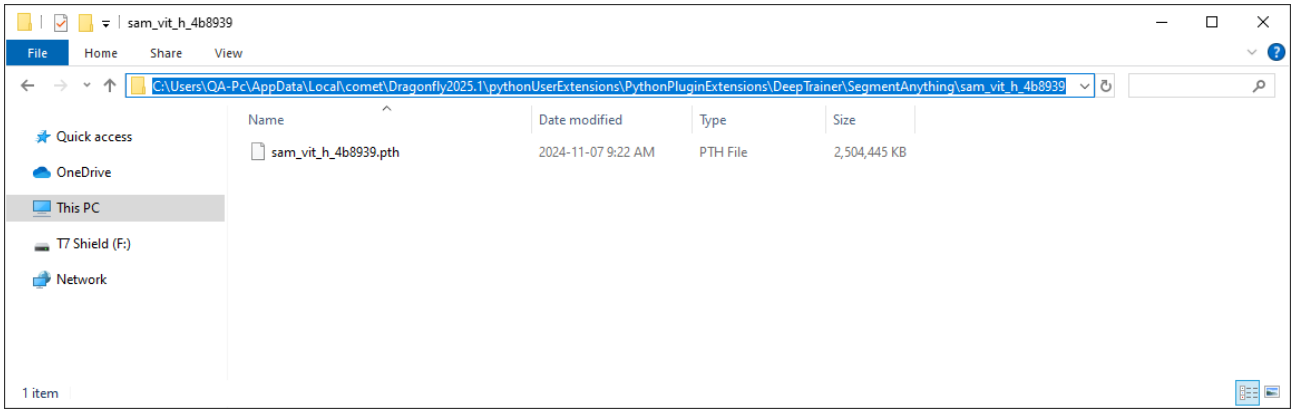
2.2.2 Downloading and Installing SAM on Offline Systems

You will first need to download and install the Segment Anything model before using the ROI Painter tools in *Segment Anything mode* for the first time. If your system is not connected to the internet, you will need to first download the .pth file that contains the serialized state of the SAM PyTorch model from our online downloads directory and then transfer and install the downloaded file on your offline system.

Do the following to download and install SAM on an offline system:

- Download the file 'sam_vit_h_4b8939.pth' that is available at: https://downloads.theobjects.io/ai/segment_anything/sam_vit_h_4b8939/sam_vit_h_4b8939.pth
- Transfer the file to a portable device, such as a USB key.

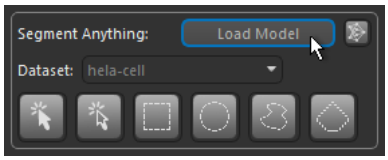
- Create and then install the ‘sam_vit_h_4b8939.pth’ file on your offline system in the directory: `%localappdata%\Comet\Dragonfly2025.1\pythonUserExtensions\PythonPluginExtensions\DeepTrainer\SegmentAnything\sam_vit_h_4b8939`.



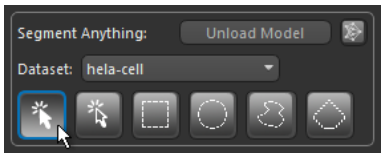
2.2.3 Using the Segment Anything Point & Click Tools

You can use the Point & Click and Point & Click Outline tools to provide a point prompt for the Segment Anything Model. The Segment Anything model will then identify and label the object(s) that are detected.

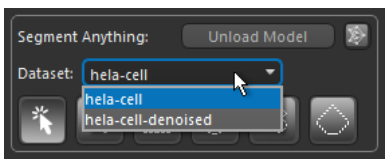
1. Download the Segment Anything model, as described in Downloading SAM for Online Systems and Downloading and Installing SAM on Offline Systems.
2. Select the region of interest or multi-ROI class which you plan to annotate.
3. Select the 2D view on which you will paint.
4. Select ‘**Single slice**’ in the 2D view tools box on the ROI Painter panel, if required.
5. Do the following in the Segment Anything box:
    - Click the **Load Model** button if the Segment Anything model is not currently loaded.



    - Select the **Point & Click** or **Point & Click Outline** tool, as shown below.



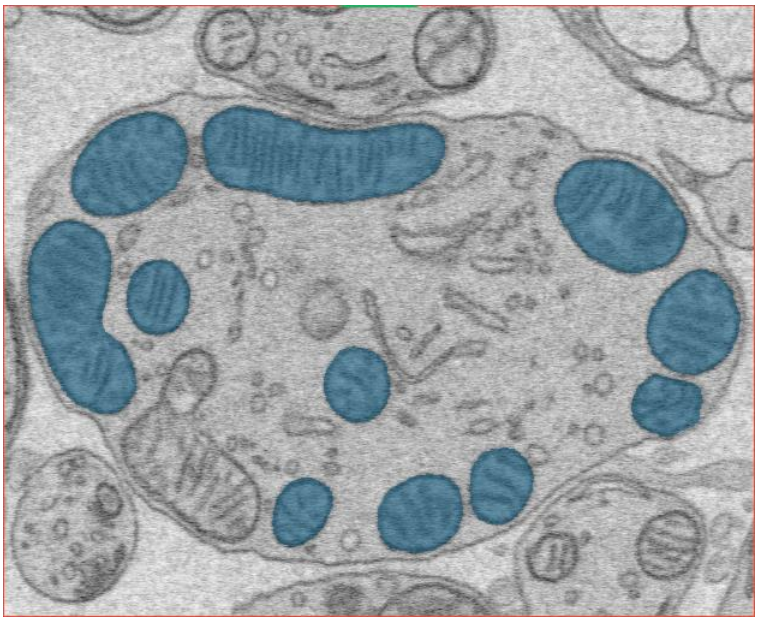
    - Choose the dataset that will provide the input image in the Dataset drop-down menu, if required and as shown below.



6. Click the object that you want to segment in the 2D view, as shown below.

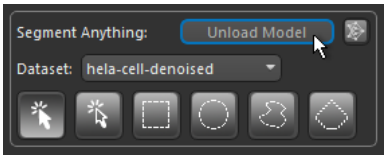


The object is detected automatically and then labeled, as shown below.



7. Label additional objects, as required.

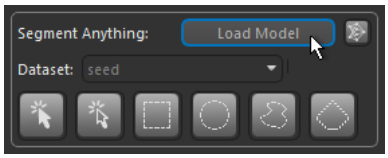
8. Unload the Segment Anything model when you have finished painting, as shown below.



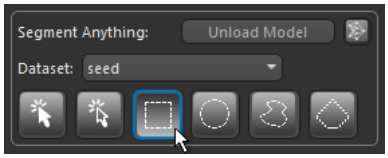
2.2.4 Using the Segment Anything Region Tools

You can use the Region tools to provide region prompts defined by rectangles, ellipses, polygons, and freehand areas for the Segment Anything Model. The Segment Anything model will then identify and label the object(s) detected within the region.

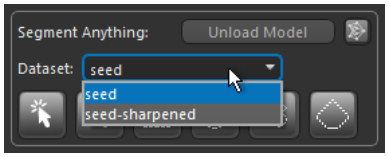
1. Download the Segment Anything model, as described in Downloading SAM for Online Systems and Downloading and Installing SAM on Offline Systems.
2. Select the region of interest or multi-ROI class which you plan to annotate.
3. Select the 2D view on which you will paint.
4. Select '**Single slice**' in the 2D view tools box on the ROI Painter panel, if required.
5. Do the following in the Segment Anything panel:
    - Click the **Load Model** button if the Segment Anything model is not currently loaded.



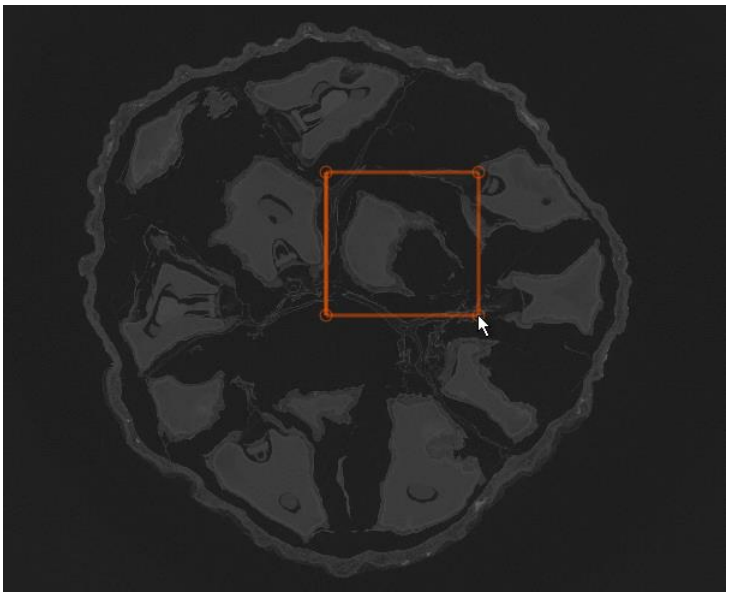
    - Select the required region tool, as shown below.



    - Choose the dataset that will provide the input image in the Dataset drop-down menu, as shown below.



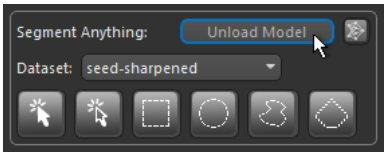
6. Draw a region around the object that you want to label in the 2D view, as shown below.



The object is detected automatically and then labeled, as shown below.



7. Label additional objects, as required.
8. Unload the Segment Anything model when you have finished painting, as shown below.



2.2.5 Configurable Actions for Segment Anything Painting Tools

The following configured actions are available for working with Segment Anything's Point & Click tools.

Action	Key	Mouse
Add to in Point & Click mode (in ROI Painter – SAM)	Left Ctrl	Left mouse
Add to in Point & Click Outline mode (in ROI Painter – SAM)	Left Ctrl	Left mouse
Remove from in Point & Click mode (in ROI Painter – SAM)	Left Shift	Left mouse
Remove from in Point & Click Outline mode (in ROI Painter – SAM)	Left Shift	Left mouse
Switch to add to in Point & Click mode (in ROI Painter – SAM)	Left Ctrl	
Switch to add to in Point & Click Outline mode (in ROI Painter – SAM)	Left Ctrl	
Switch to remove from in Point & Click mode (in ROI Painter – SAM)	Left Shift	
Switch to remove from in Point & Click Outline mode (in ROI Painter – SAM)	Left Shift	

Configurable actions for the Segment Anything Point & Click tools

The following configured actions are available for working with Segment Anything's Region tools

Action	Key	Mouse
Add to elliptical region (in ROI Painter – SAM)	Left Ctrl	Left mouse
Add to freehand region (in ROI Painter – SAM)	Left Ctrl	Left mouse
Add to polygonal region (in ROI Painter – SAM)	Left Ctrl	Left mouse
Add to rectangular region (in ROI Painter – SAM)	Left Ctrl	Left mouse
Remove from elliptical region (in ROI Painter – SAM)	Left Shift	Left mouse
Remove from freehand region (in ROI Painter – SAM)	Left Shift	Left mouse
Remove from polygonal region (in ROI Painter – SAM)	Left Shift	Left mouse
Remove from rectangular region (in ROI Painter – SAM)	Left Shift	Left mouse
Switch to add to in Ellipse mode (in ROI Painter – SAM)	Left Ctrl	

Action	Key	Mouse
Switch to add to in Freehand mode (in ROI Painter – SAM)	Left Ctrl	
Switch to add to in Polygon mode (in ROI Painter – SAM)	Left Ctrl	
Switch to add to in Rectangle mode (in ROI Painter – SAM)	Left Ctrl	
Switch to remove from in Ellipse mode (in ROI Painter – SAM)	Left Shift	
Switch to remove from in Freehand mode (in ROI Painter – SAM)	Left Shift	
Switch to remove from in Polygon mode (in ROI Painter – SAM)	Left Shift	
Switch to remove from in Rectangle mode (in ROI Painter – SAM)	Left Shift	

Configurable actions for the Segment Anything Region tools

2.2.6 References

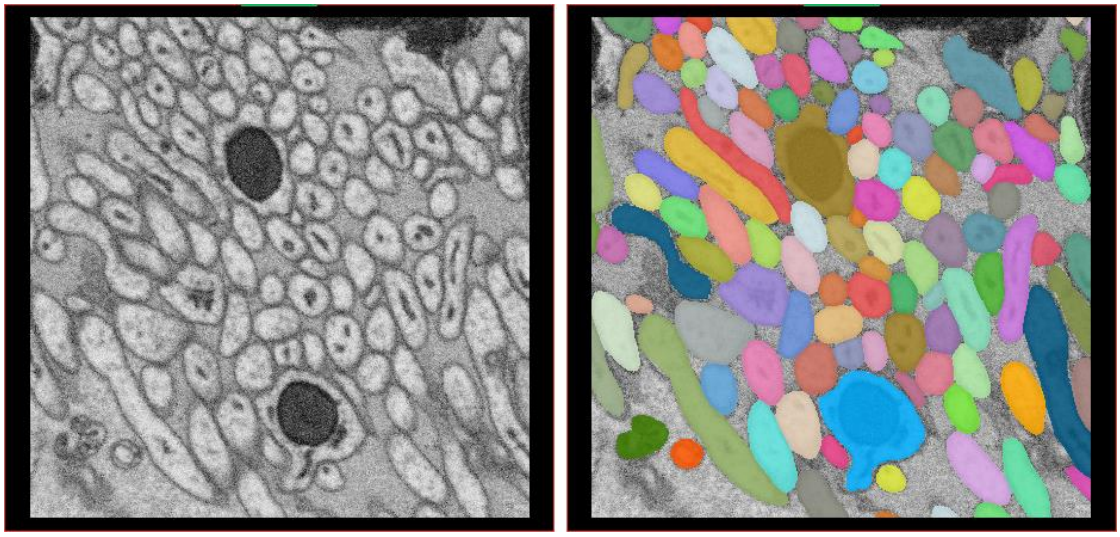
SAM was trained on a diverse, high-quality dataset of over one billion masks, which enables it to generalize new types of objects — whether from computed tomography, cell microscopy, or other modalities — without requiring additional training. This ability to generalize means that users do not need to collect their own segmentation data and fine-tune a model for their use cases. Refer to the following for additional information about SAM:

- Segment Anything website: https://segment-anything.com/.
- Alexander Kirillov et al., 2023. *Segment Anything*, arXiv:2304.02643 (https://arxiv.org/abs/2304.02643).

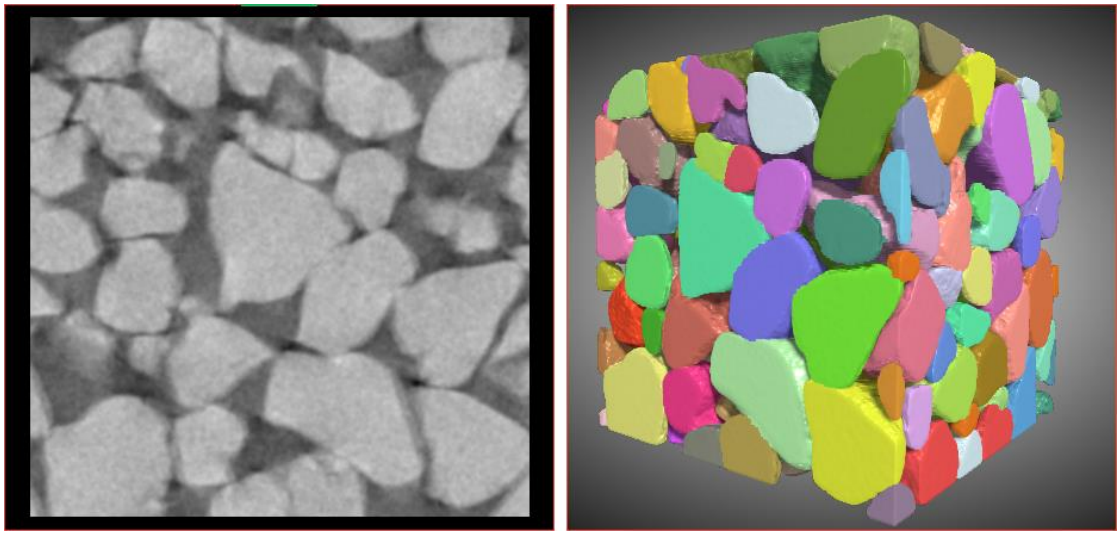
2.3 Cellpose-SAM

An important addition to Dragonfly 3D World's segmentation pipeline, **Cellpose-SAM** provides highly accurate and automated general-purpose segmentation of cells and other similarly shaped objects, such as powders and aggregates. Cellpose-SAM uses the transformer backbone of Segment Anything's foundational model to achieve superior generalization and accuracy without any additional training. This capability then lets you confidently measure characteristics such as area, perimeter, and circularity, and perform statistical analyses of size, morphology, number, and distribution. Unlike the original SAM, Cellpose-SAM doesn't require manual prompts for densely packed objects, making it more practical for common segmentation challenges. In addition, Cellpose-SAM is designed to be highly robust to variations in imaging conditions, as well as variations in sizes, noise, down sampling, and isotropic/anisotropic blur.

You can run Cellpose-SAM in 2D, in which the image in the current 2D view will be segmented, or you can run Cellpose-SAM in 3D, in which case the whole input dataset will be segmented. Examples of the capabilities of Cellpose-SAM's general-purpose segmentation are shown below.



Input image (left) and resulting 2D segmentation (right)



Input image (left) and resulting 3D segmentation (right)

NOTE You will need to download and install the Cellpose-SAM model before you can use it (see Downloading Cellpose-SAM for Online Systems and Downloading and Installing Cellpose-SAM on Offline Systems).

Do the following to run a Cellpose-SAM 2D segmentation in the current 2D view:

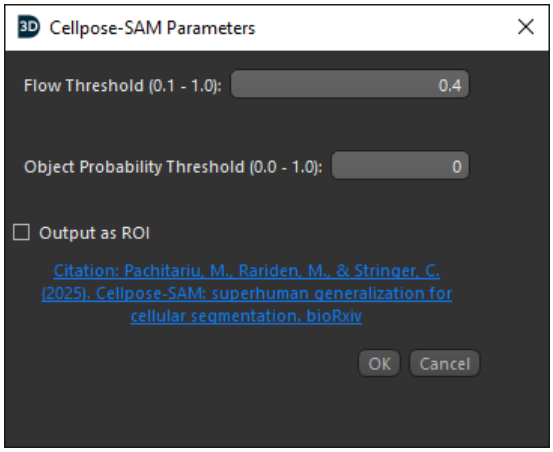
- Select the 2D view in which you want to run the segmentation.
- Right-click the required greyscale image or RGB image channels and then choose **Cellpose-SAM 2D (from Current View)** in the pop-up menu.
- Select the required settings in the Cellpose-SAM Parameters dialog (see Cellpose-SAM Parameters) and then click **OK** to initiate the segmentation of your data in the current 2D view. The result will be limited to the current slice.

Do the following to run a Cellpose-SAM segmentation in 3D:

- Right-click the required greyscale dataset and then choose **Cellpose-SAM 3D** in the pop-up menu.
- Select the required settings in the Cellpose-SAM Parameters dialog (see Cellpose-SAM Parameters) and then click **OK** to initiate the segmentation of your data in 3D. The result will be fully segmented distinct objects that are within the selected thresholds.

2.3.1 Cellpose-SAM Parameters

The parameters you need to select for running a Cellpose-SAM segmentation are available in the Cellpose-SAM Parameters dialog, shown below. In some cases, you may need to experiment with varying thresholds to achieve the best results.



Cellpose-SAM Parameters dialog

Parameter	Description
Flow Threshold	Controls how strict object detection will be. **Lower values (0.1 to 0.3)…** Will find only the most certain objects. **Higher values (0.5 to 1.0)…** Will find more objects, including uncertain ones. In most cases, you should start with the default flow threshold of 0.4 and then adjust as follows: • Increase the value if objects that should have been segmented were omitted. • Decrease the value if noise is detected.

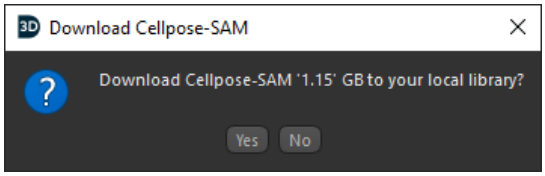
Parameter	Description
Object Probability Threshold	Controls the size and number of detected objects. **Lower values (0.0 to 0.2)…** Larger and more objects will be detected. **Higher values (0.3 to 1.0)…** Smaller and fewer objects will be detected. In most cases, you should start with the default object probability threshold of 0.0 and then adjust as follows: • Decrease the value if only small objects are detected. • Increase the value if objects detected are too large or merged.
Output as ROI	If selected, the segmentation output will be a region of interest. If not selected, the output will be a multi-ROI.

Cellpose-SAM parameters

2.3.2 Downloading Cellpose-SAM for Online Systems

You need to download the Cellpose-SAM model before using it for the first time. After the download is complete, the model will be installed automatically in your local library and the segmentation will run.

Choose any of the Cellpose-SAM options in the dataset contextual menu and then click **Yes** in the Download Cellpose-SAM dialog, shown below, to automatically download and install the model in your local library.

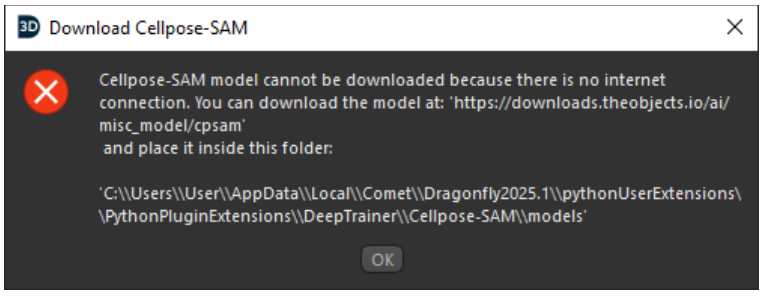


Download Cellpose-SAM dialog

2.3.3 Downloading and Installing Cellpose-SAM on Offline Systems

You need to download and install the Cellpose-SAM model before using it for the first time. If your system is not connected to the internet, you will need to download the '.cpsam' file that contains the serialized state of the model from our online downloads directory and then transfer and install the downloaded file on your offline system.

Choose any of the Cellpose-SAM options in the dataset contextual menu. The instructions for downloading and installing Cellpose-SAM on your system appear in Download Cellpose-SAM dialog, as shown below.



Download Cellpose-SAM dialog

Do the following to download and install Cellpose-SAM on an offline system:

- Download the file ‘cpsam’ that is available at: https://downloads.theobjects.io/ai/misc_model/cpsam
- Transfer the file to a portable device, such as a USB key.
- Create and then install the ‘cpsam’ file on your offline system in the directory: `%localappdata%\Comet\Dragonfly2025.1\pythonUserExtensions\PythonPluginExtensions\DeepTrainer\Cellpose-SAM\models`.

2.3.4 Reference

Marius Pachitariu, Michael Rariden, and Carsen Stringer, 2025. *Cellpose-SAM: superhuman generalization for cellular segmentation*. bioRxiv 2025.04.28.651001 (https://doi.org/10.1101/2025.04.28.651001).

2.3.5 Copyright Notice

Copyright © 2020 Howard Hughes Medical Institute

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

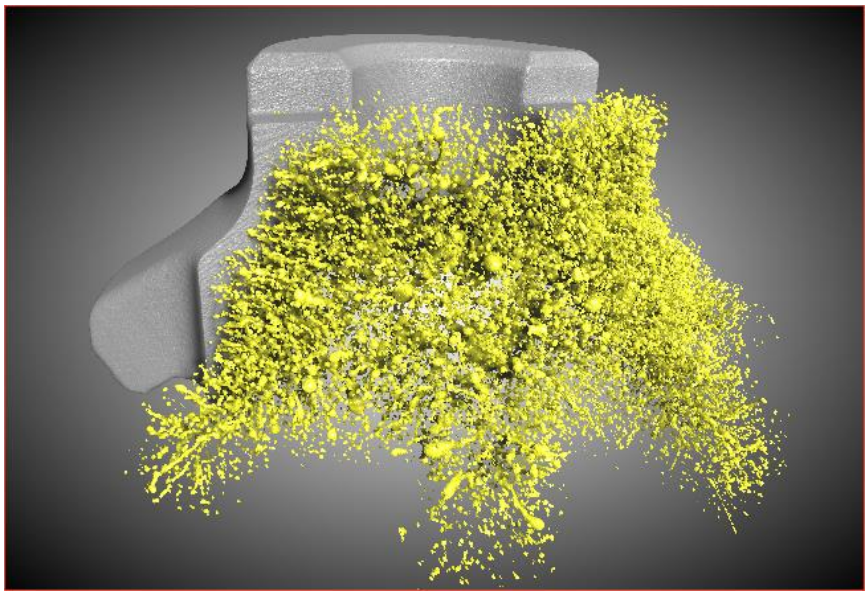
Neither the name of HHMI nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS “AS IS” AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

2.4 Ready-to-Use Deep Models

A new ready-to-use deep model for segmenting porosity in castings is now available for download. Inference includes shrinkage pores and features that can often be missed by regular thresholding due to a lack of contrast or resolution. Training was performed on a dataset with sequential training steps with an increasing number of frames and varying patch sizes and data augmentation.

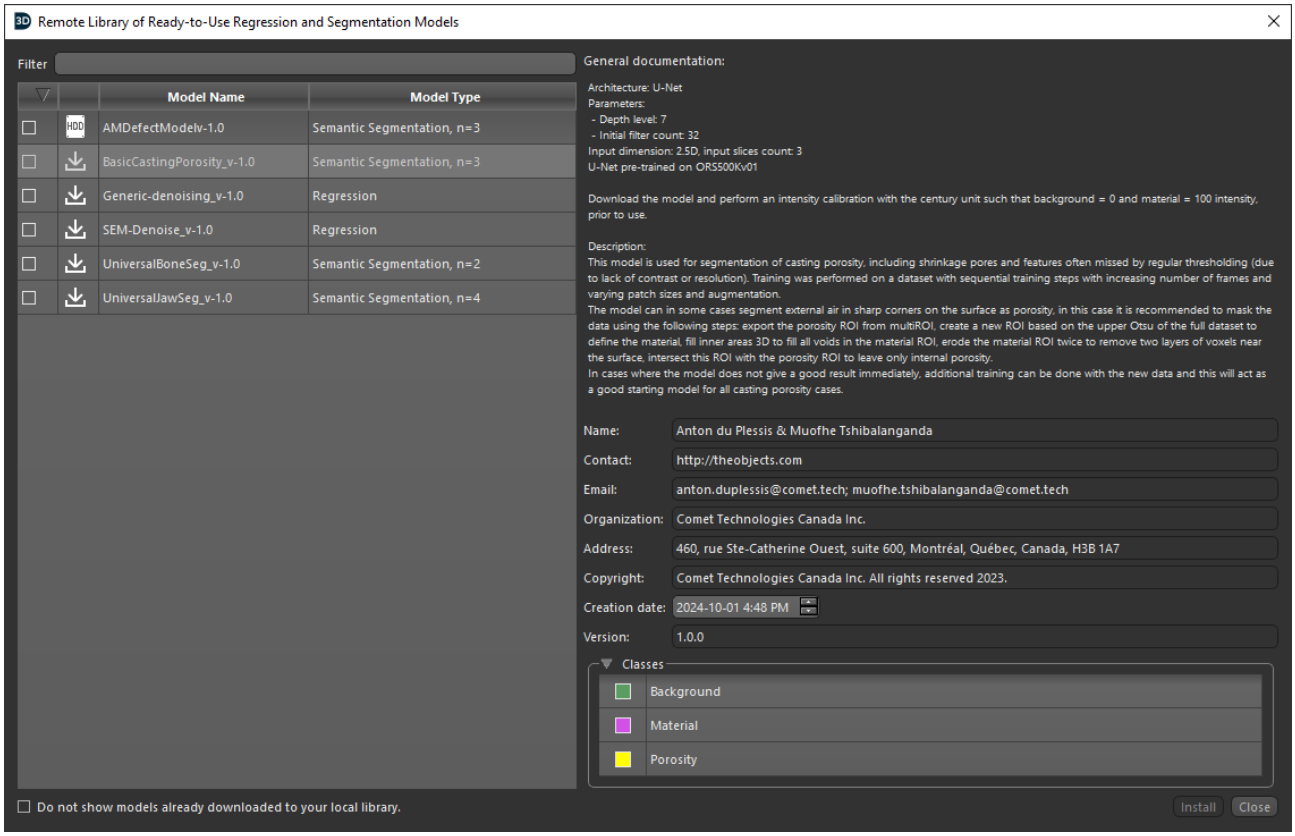
An example of the inference of the ready-to-use basic casting porosity model is shown below.



Inference of basic casting porosity model

The '*Basic Casting Porosity*' model features a U-Net architecture with a depth level of 7, an initial filter count of 32, and an input dimension of 2.5D. Input images should be calibrated with century units (CU) so that the background voxels are 0 and the material is 100.

The model is available in the Remote Library of Ready-to-Use Regression and Segmentation Models dialog, as shown in the following screenshot. Click the **Import Remote** button in the Deep Learning Tool, or the Open Remote Library icon on the Segment with AI panel, to open the dialog.

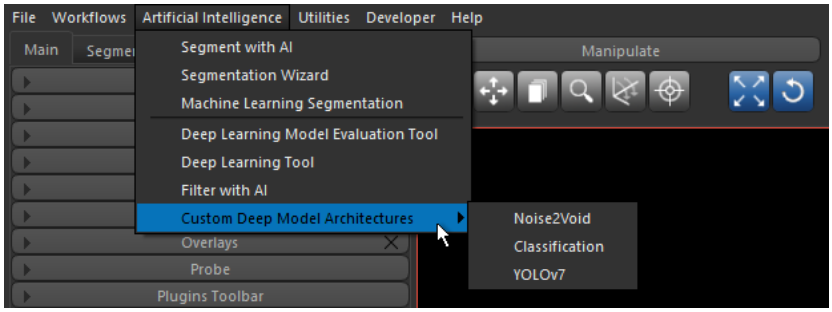


Remote Library of Ready-to-Use Segmentation Models dialog

2.5 Custom Deep Model Architectures

This software release includes new models for image classification, as well as updates for 3D World's deep model architectures for denoising (Noise2Void) and for object detection (YOLOv7).

Choose **Artificial Intelligence > Custom Deep Model Architectures** to access these new and updated model architectures.

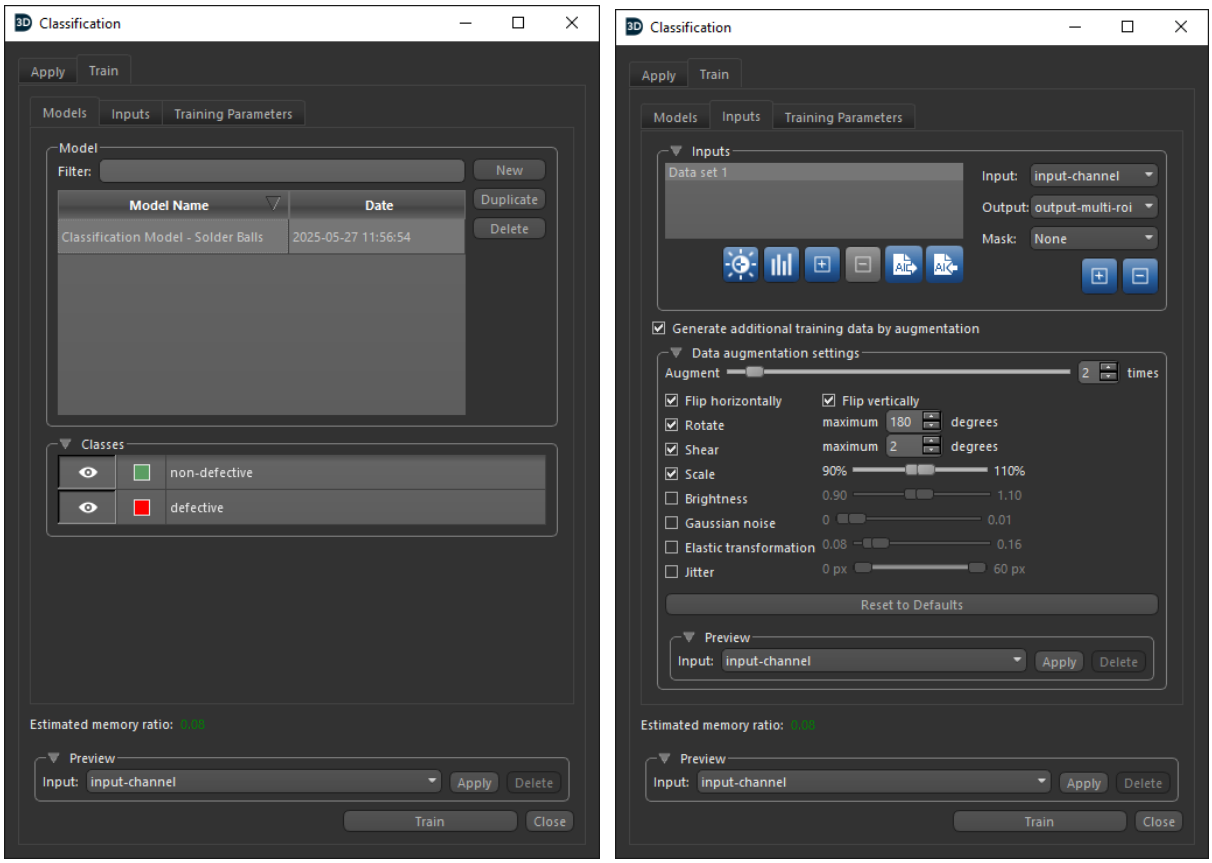


Custom Deep Model Architectures menu items

2.5.1 Deep Model(s) for Image Classification

This software release provides the custom deep model architectures **EfficientNet** for unparalleled efficiency and accuracy for image classification tasks.

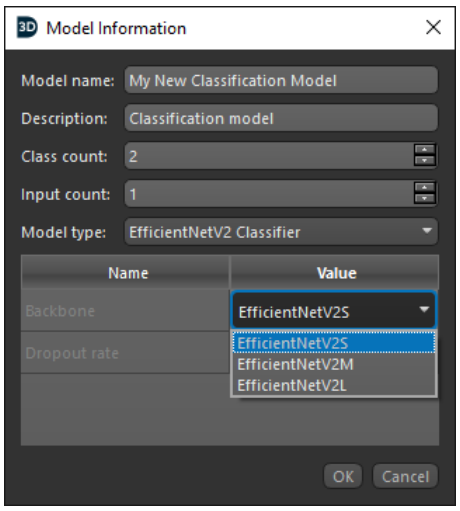
Choose **Artificial Intelligence > Custom Deep Model Architectures > Classification** on the menu bar to open the Classification dialog, shown below.



Classification dialog

You can generate new models and set the training parameters on the **Train** tab's **Models**, **Inputs**, and **Training Parameters** tabs, while you can apply trained classification models on the **Apply** tab. Typical inputs for classification are image data and a multi-ROI with a scalar values slot that classifies the labeled objects in the multi-ROI. Typical outputs for classification models are multi-ROIs with defined classes for the segmented objects. You should note that the task of classifying instances in multi-ROIs can be accelerated with 3D World's **Instance Labeler** tool (see Instance Labeler).

Click the **New** button to open the Model Information dialog, shown below. You can choose class and input counts, model types, model parameters, and other settings in the dialog.



Model Information dialog

References

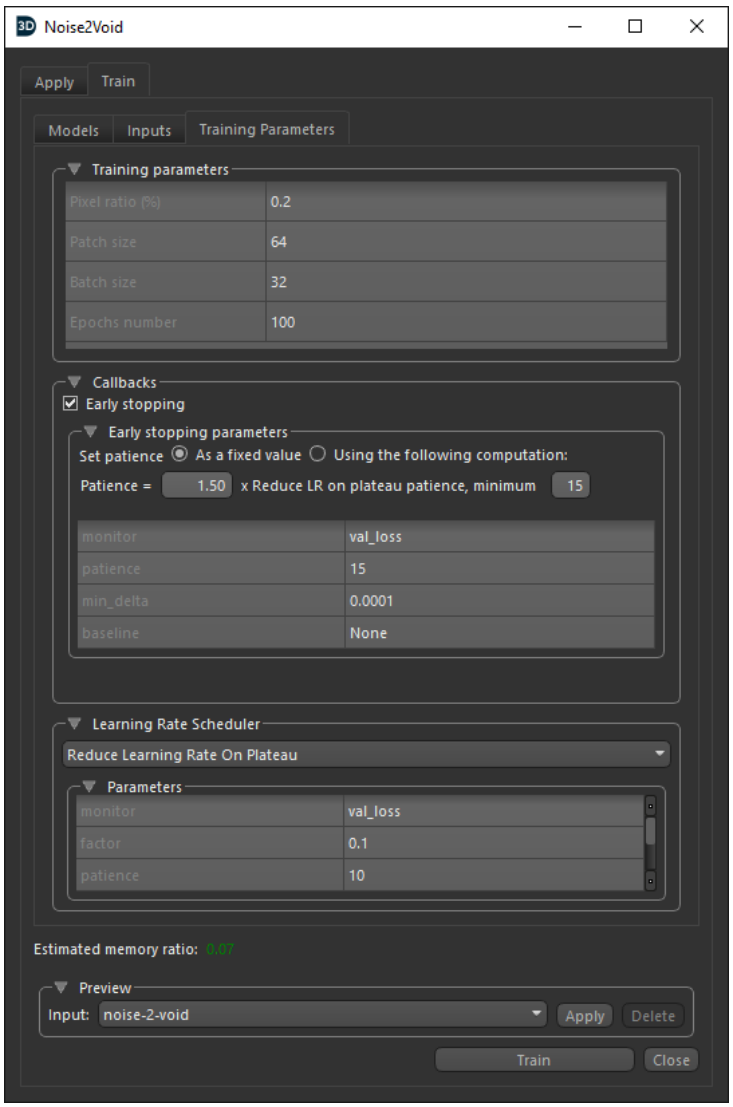
EfficientNetV2:
https://docs.pytorch.org/vision/main/models/efficientnetv2.html
https://arxiv.org/abs/2104.00298

Architectures comparison table:
https://docs.pytorch.org/vision/main/models.html#table-of-all-available-classification-weights

2.5.2 Noise2Void for Denoising

As an alternative to classic deep models for denoising, such as noise-to-low noise and noise-to-noise, Dragonfly 3D World also provides an approach known as Noise2Void in which training is done directly on the data to be denoised. Updates in version 2025.1 for training Noise2Void denoising models include advanced settings for configuring early stopping and learning rate parameters. These options are available on the Training Parameters tab.

Choose **Artificial Intelligence > Custom Deep Model Architectures > Noise2Void** on the menu bar to open the Noise2Void dialog, shown below.

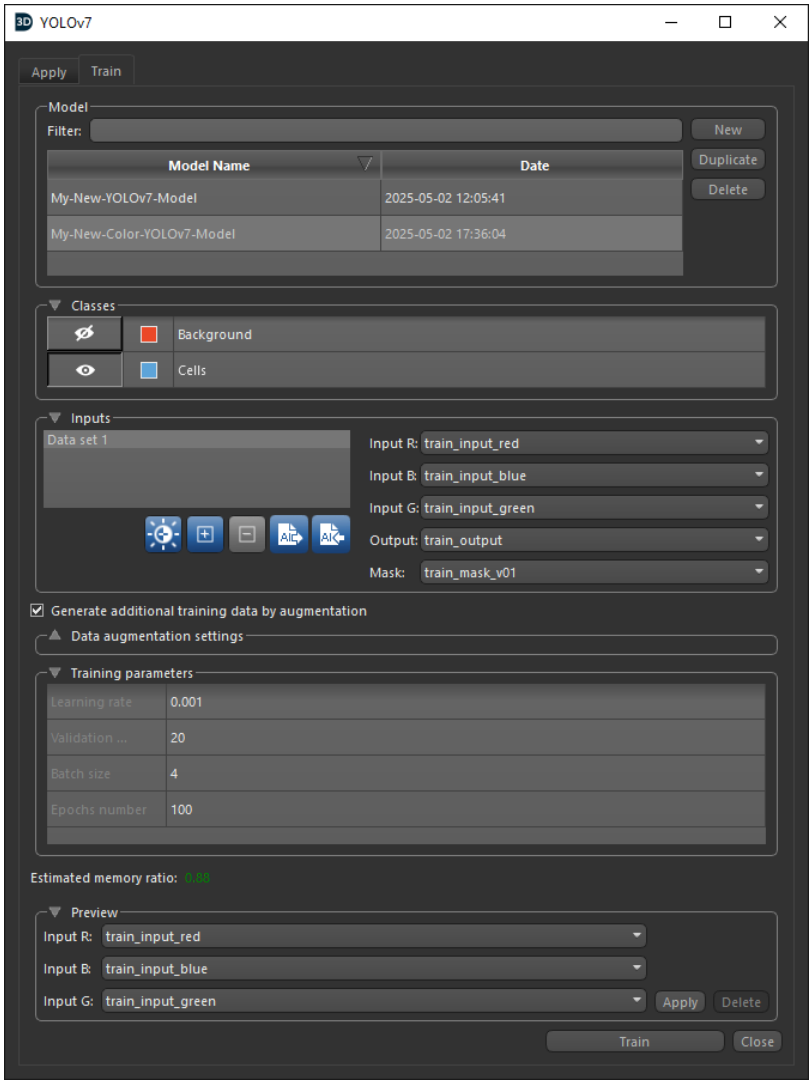


Noise2Void dialog

2.5.3 YOLO (You Only Look Once) for Object Detection

This software release provides an update for the previously available YOLO (You Only Look Once) custom deep model architecture for object detection. Now updated to YOLOv7, this powerful object detection model can be trained to predict bounding boxes around detected objects that indicate their location.

Choose **Artificial Intelligence > Custom Deep Model Architectures > YOLOv7** on the menu bar to open the YOLOv7 dialog, shown below.



YOLOv7 dialog

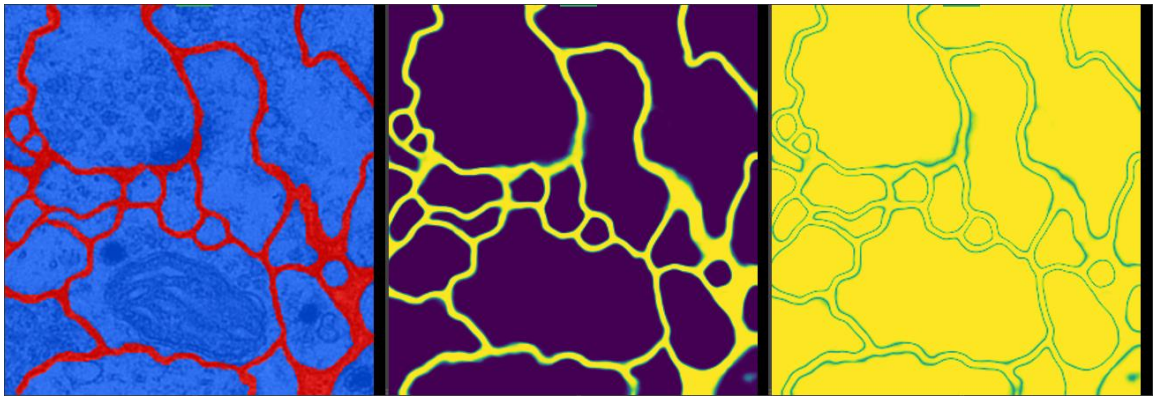
NOTE For best results, the slice size of your training set should be equal to the selected patch size. If required, you can add padding to the training set to match the available patch sizes or crop the input(s) to the available patch sizes. In addition, disabling data augmentation may also result in improved performance.

Reference

Chien-Yao Wang et al., 2022. *YOLOv7: Trainable bag-of-freebies sets new state-of-the-art for real-time object detectors*, arXiv 2207.02696 (https://doi.org/10.48550/arXiv.2207.02696).

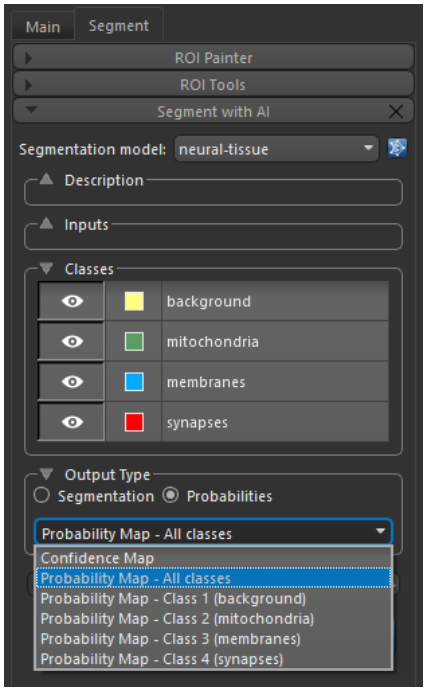
2.6 Probabilities Outputs

Probability can play a crucial role in deep learning by helping to quantify uncertainty in model predictions. This can be especially important in cases in which understanding the probabilities and/or confidence of a model's predictions can significantly impact decision making. As shown in the following example, probabilities and confidence maps are available for each output multi-ROI class, such as the membranes of a neural tissue training set.



Detail of the inference of a membrane segmentation (left) and the corresponding probabilities map (center) and confidence map (right) for the inference

The options to generate probabilities and confidence maps as the inferred output of a trained segmentation model are available on the Segment with AI panel as shown below. You can choose to compute maps for the full dataset, marked slices, or within a mask.

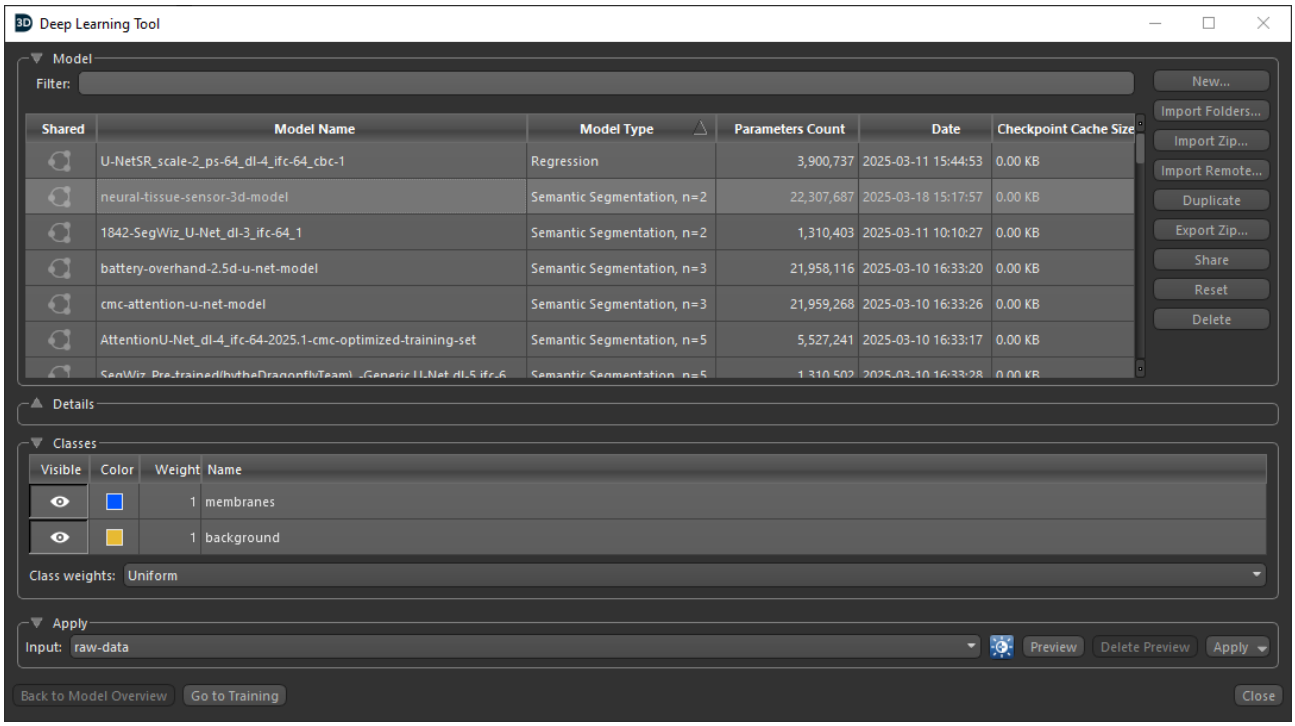


Segment with AI panel

NOTE Probabilities maps for all classes are output as time-enabled images in which the probabilities of each class will appear on different time steps. If your output multi-ROI has 5 classes, then the map will have 5 time steps.

2.7 Deep Learning Tool UI Changes

The migration to PyTorch, as well as the option to share deep models, has necessitated minor changes to the options available in the Deep Learning Tool dialog, shown and described below.



Deep Learning Tool dialog

The following changes were implemented in the Deep Learning Tool dialog for this software release.

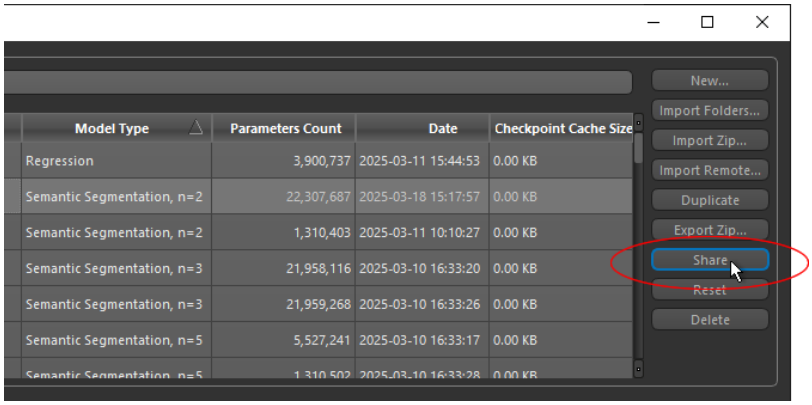
Import Keras… As part of the migration to PyTorch from TensorFlow, the option to import Keras models into the Deep Learning Tool was removed.

Share… This added item lets you share trained deep models with other Dragonfly users on the Dragonfly Social platform (see Sharing Deep Models).

Go to Editing… The Model Editing panel, which was used to edit network structures defined in the Keras API, is no longer available in Dragonfly 3D World as of version 2025.1.

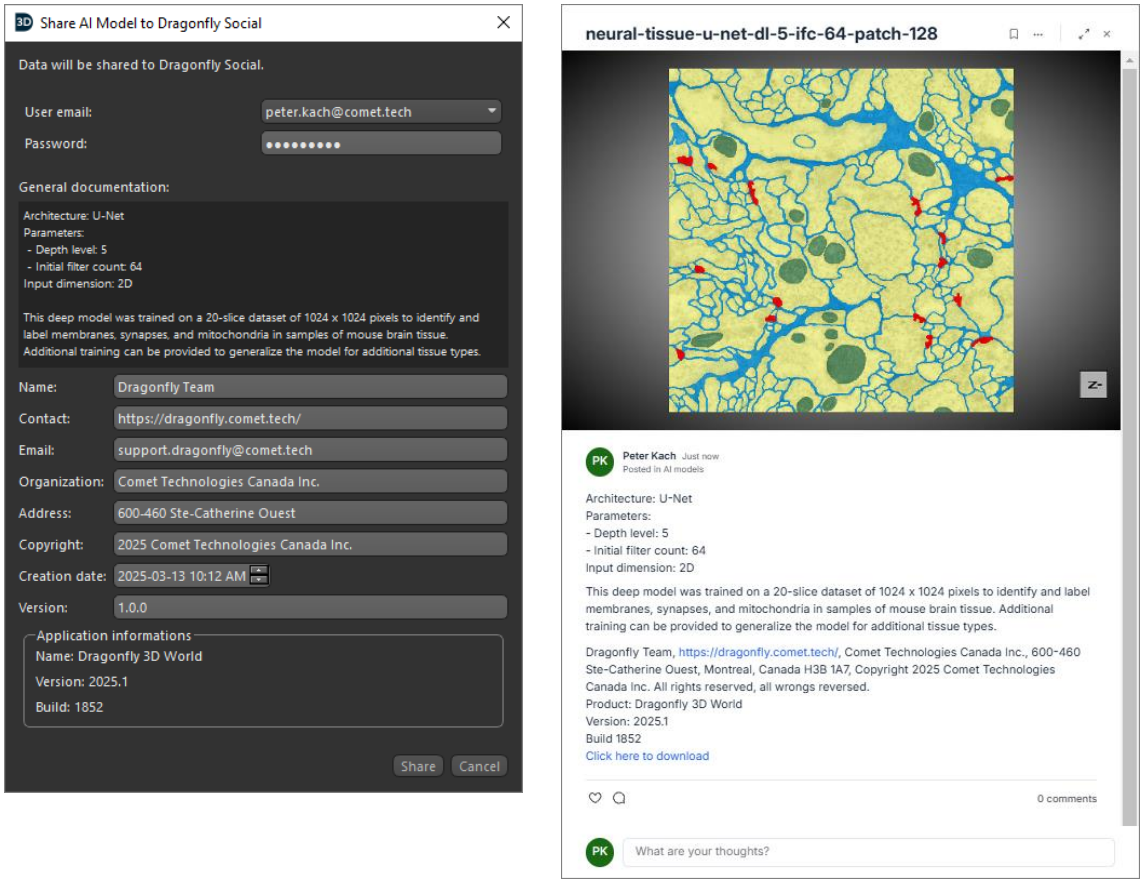
2.8 Sharing Deep Models

This software release provides the option to share trained deep models with other Dragonfly users on the Dragonfly Social platform. Click the **Share** button on the Deep Learning Tool dialog, as shown below, to open the Share AI Model to Dragonfly Social dialog.



Deep Learning Tool dialog

You can edit the general documentation in the Share AI Model to Dragonfly Social dialog, if required. Shared models are saved in compressed ZIP files and then posted on Dragonfly Social in the **AI Models** section. Postings automatically include a screenshot of the current view of the Dragonfly workspace.



Share AI Model to Dragonfly Social dialog (left) and posting on Dragonfly Social (right)

2.9 Anatomical Structures Segmentation

This software release includes a beta implementation of **TotalSegmentator**, a deep learning model designed for the automatic and robust segmentation of anatomical structures in both CT and MRI images. Introduced by Wasserthal et al., TotalSegmentator is capable of automatically segmenting up to 117 distinct anatomical structures, such as organs, bones, muscles, and vessels, making it a valuable tool for various applications. Thanks to training on a large and diverse dataset of CT volumetric scans collected longitudinally from routine examinations, TotalSegmentator is able to generalize well to different imaging protocols, body parts, and patient demographics. Implemented with the nnU-Net architecture, TotalSegmentator can achieve impressive accuracy exceeding 90% on test datasets, with both the model and training data publicly accessible for academic research.

Building upon this foundation, Häntze et al. more recently developed **MRSegmentator** to address the unique challenges of segmenting MRI images. MRSegmentator was trained on a heterogeneous dataset comprising 1200 manually annotated MRI scans from the UK Biobank, in-house MRI scans, and 1228 CT scans. While also utilizing the nnU-Net architecture, MRSegmentator demonstrates particular robustness in segmenting anatomically variable structures such as the liver and kidneys.

NOTE The TotalSegmentator and MRSegmentator are not medical devices and are not intended for use in the diagnosis or classification of any medical complaint or for any other medical use. The Anatomical Structures Segmentation plugin is for research purposes only and is provided '*as is*' without warranty of any kind.

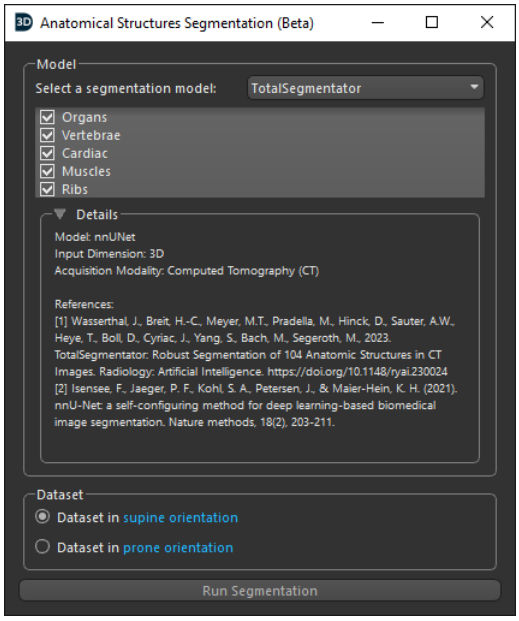
An example of the automated segmentation capabilities of TotalSegmentator is shown below. Typical inputs are 3D DICOM images or other datasets that accurately represent the size and shape of human anatomical structures and that were acquired with computed tomograph (CT) or magnetic resonance image (MRI) systems. The output of TotalSegmentator is a multi-ROI in which each anatomical structure is represented as a distinct class.



Segmentation of CT data with TotalSegmentator

Right-click the required CT or MRI image and then choose **Anatomical Structures Segmentation** in the pop-up menu to open the Anatomical Structures Segmentation dialog.

As shown in the following screen, you can choose the **TotalSegmentator** segmentation model for computed tomograph (CT) acquisitions, as well as the tissue types that you need to segment. For magnetic resonance imaging (MRI) acquisitions, you need to choose the **MRSegmentator** as the segmentation model. In either case, you also need to select the patient position — **supine** or **prone** — before you run the segmentation.



Anatomical Structures Segmentation dialog

2.9.1 References

Wasserthal et al., 2023. *TotalSegmentator: Robust Segmentation of 104 Anatomic Structures in CT Images*. Radiology: Artificial Intelligence (https://doi.org/10.1148/ryai.230024).

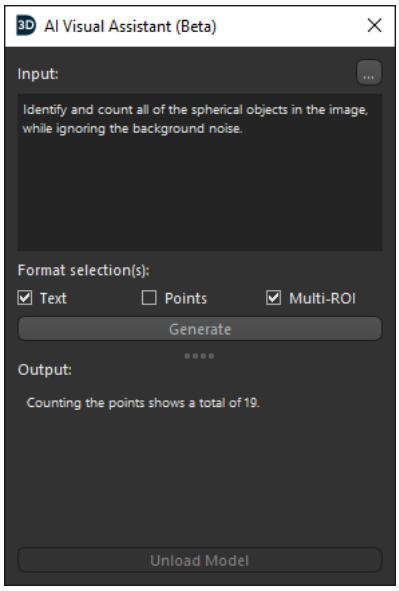
Isensee et al., 2021. *nnU-Net: a self-configuring method for deep learning-based biomedical image segmentation*. Nature methods, 18(2), 203-211.

Häntze et al., 2024. *MRSegmentator: Multi-Modality Segmentation of 40 Classes in MRI and CT*. arXiv:2405.06463.

2.10 AI Visual Assistant

This software release includes an initial implementation for Dragonfly 3D World's **AI Visual Assistant**. The AI Visual Assistant lets you enter prompts to identify key elements and extract visual insights from 2D images in the form of text, points, or multi-ROIs.

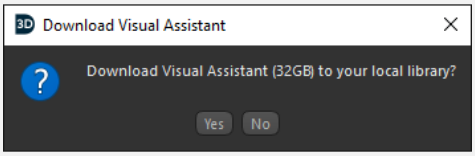
Choose **Artificial Intelligence > AI Visual Assistant** on the menu bar to open the AI Visual Assistant panel. The AI Visual Assistant, shown below, will appear on the left sidebar by default.



AI Visual Assistant dialog

You must select a 2D view as well as an image in the Data Properties and Settings panel to activate the **Generate** button. You can select multiple outputs, such as text and multi-ROIs. Output multi-ROIs consist of single labeled voxels placed in the center of each identified object.

NOTE You will need to download and install the Molmo model before you first use the AI Visual Assistant. You should also note that the model requires 32GB of free disk space, as shown below. Model weights, datasets, and source code are available at https://molmo.allenai.org/blog.



The model will be saved in %AppData%\Local\comet\Dragonfly2025.1\pythonUserExtensions\PythonPluginExtensions\DeepTrainer.

2.10.1 References

Matt Deitke et al., 2024. *Molmo and PixMo: Open Weights and Open Data for State-of-the-Art Vision-Language Models*. arXiv:2409.17146.

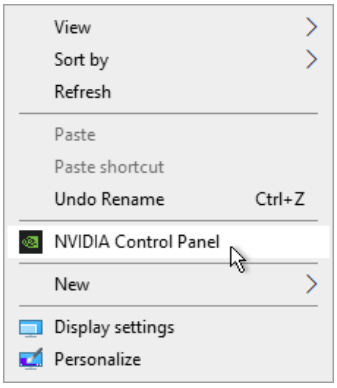
2.11 Deep Learning Requirements for 2025.1

Deep learning in Dragonfly 3D World requires a dedicated NVIDIA graphics card with CUDA or an Intel integrated graphics processor (IGP) with UHD Graphics.

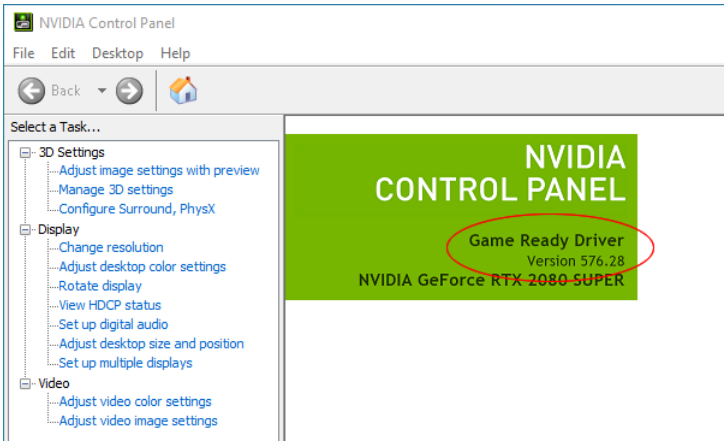
You should note that the installer for version 2025.1 includes two compiled versions of PyTorch — 'pytorch_118' for CUDA version 11.8 and 'pytorch_128' for version 12.8 and later. The appropriate version will be installed automatically on your system, which should be sufficient in most cases. However, if you want to run PyTorch with the latest CUDA version, you should update your installed graphics driver (if required) before installing Dragonfly 3D World 2025.1. CUDA version 12.8 is available in NVIDIA graphics drivers starting at version 570.

There are multiple ways to check the NVIDIA graphics driver and CUDA versions that are installed on your PC. The easiest method is by opening the NVIDIA Control Panel as follows:

- Right-click on your desktop.
- Choose **NVIDIA Control Panel** in the pop-up menu, as shown below.



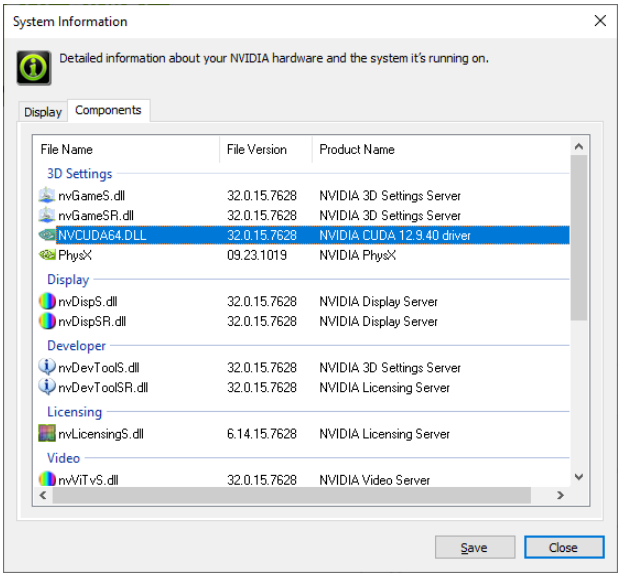
The version number of the installed NVIDIA graphics driver is listed the NVIDIA Control Panel dialog, as circled below.



CUDA version 12.8.0 is available in NVIDIA graphics drivers starting at version 570.

- To check the installed version of CUDA, click the '**System Information**' link on the bottom left corner of the NVIDIA Control Panel dialog to open the System Information dialog.

- Click the '**Components**' tab to view the component information about your NVIDIA graphics card. The installed version of CUDA will be listed in the dialog as shown below.

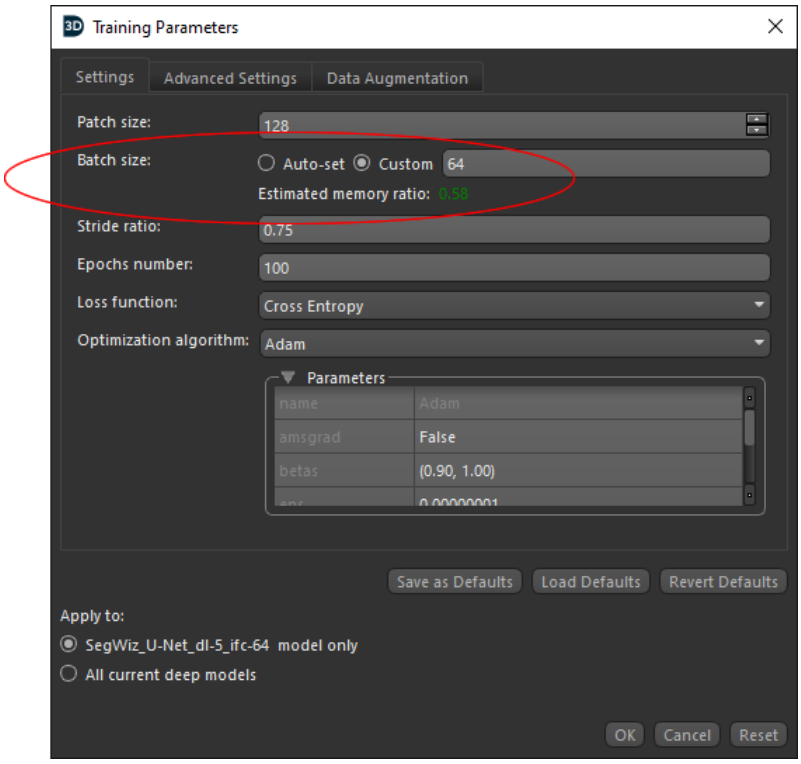


3 Segmentation Wizard

Training settings, custom class weights, and saving frames are available in this software release for Dragonfly's Segmentation Wizard. The Segmentation Wizard provides an easy-to-use, guided workflow for training deep models and machine learning models for image segmentation.

3.1 Training Settings

This software release includes the option to set the batch size for training deep models and to evaluate the estimated memory ratio. These updates are available in the Training Parameters dialog, as shown below. Right-click a deep model on the Models tab and then choose **Update Training Parameters** in the pop-up menu to open the dialog.



Settings tab in the Training Parameters dialog

3.1.1 Batch Size

During deep model training, patches are randomly processed in *batches* and the number of patches in a batch is set with the '*batch size*' parameter. You can now choose from the following options to set this parameter:

Auto-set… If selected, the batch size will be set automatically based on the available GPU memory and the selected model.

Custom… Lets you manually select a batch size. You should monitor the estimated memory ratio whenever you set this parameter yourself.

3.1.2 Estimated Memory Ratio

The estimated memory ratio is calculated as the ratio of the estimated memory needed to train the model at the current settings over the available GPU memory. This ratio is shown whenever '*Custom*' is selected as the '*Batch size*' setting. You should note that the memory needed to train a deep model is dependent on the depth of the model, the selected patch and batch sizes, the optimization algorithm, and other settings.

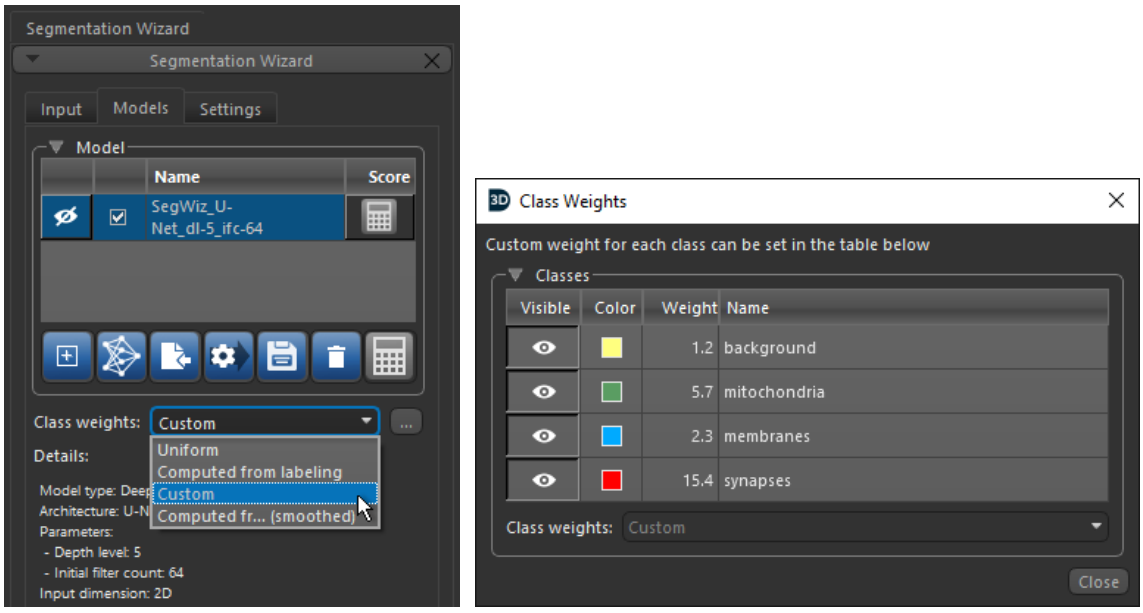
Green… The estimated memory requirements are within your system's capabilities, typically within the range of less than 0.90.

Yellow… The estimated memory requirements are approaching your system's capabilities. Ratios between 0.90 and 1.00 may or may not result in successful training. You can adjust the patch and/or batch size to reduce the estimated memory requirements.

Red… The estimated memory requirements exceed your system's capabilities. You should consider adjusting the model training parameters, such as the patch size, or selecting a shallower model. Training often fails when ratios are greater than 1.0.

3.2 Custom Class Weights

Previously available only in the Deep Learning Tool, you can now set custom class weights in the Segmentation Wizard to solve class imbalance problems and to accelerate training. This option is available on the Models tab in the Class weights drop-down menu, as shown below on the left. You can set the custom class weights in the Class Weights dialog, shown below on the right. Click the '*More*' button to open the dialog.

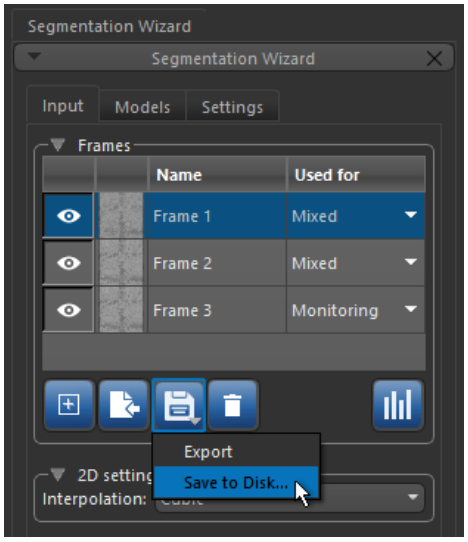


Class weights options (left) and Class Weights dialog (right)

NOTE You can increase the weight for a class if only a few labels are available, and conversely, you can decrease the weight for background and/or unimportant features.

3.3 Saving Frames

In previous Dragonfly 3D World versions, you could only export all segmented frames as a multi-ROI to the main context. As of version 2025.1, you can save all segmented frames directly to a local or remote drive. The option to save to disk is available in the **Export** sub-menu, as shown below.



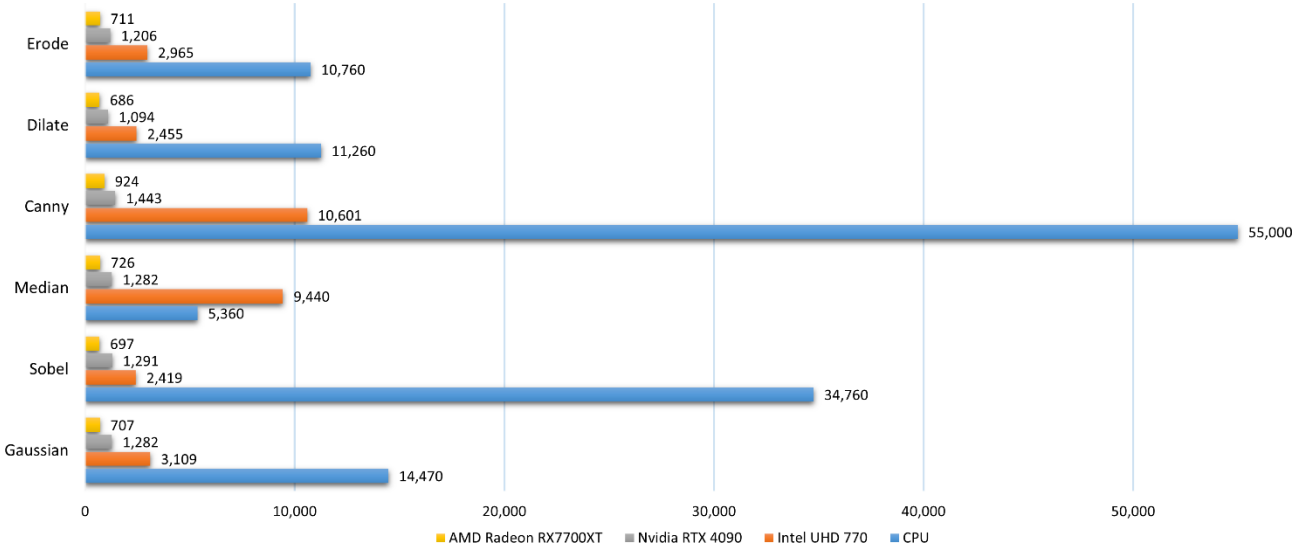
Save to Disk option for frames

4 GPGPU Acceleration

Thanks to the implementation of a GPGPU (general-purpose computing on graphics processing units) framework, this software release provides significantly faster processing times for image filtering, skeletonization, segmentation, mesh generation, and other compute-intensive tasks. Supported hardware on Windows and Linux includes AMD and NVIDIA GPUs, as well as Intel ARC GPUs and Intel integrated graphics UHD that support OpenGL 4.3 and up.

In most cases, GPGPU acceleration out performs CPU-based image processing by leveraging the parallel processing power of GPUs. GPUs have thousands of small processing cores that can execute the same instruction on multiple pixels simultaneously, which makes them highly efficient, especially for large images or complex algorithms.

As shown in the graph below, processing times on AMD and NVIDIA GPUs, as well as on Intel integrated graphics UHD, can experience multiple orders of magnitude improvement in performance compared to processing on CPU while maintaining accuracy and precision.

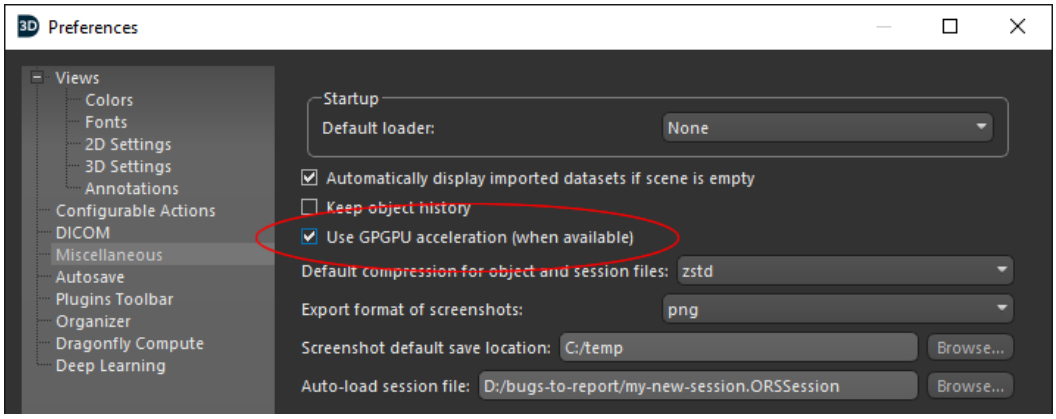


Comparative benchmark of GPU versus CPU processing of a USHORT 1024×1024×1024 dataset

NOTE Not all GPUs are equally suited for image processing. Selecting the appropriate hardware is crucial for achieving optimal performance.

4.1 GPGPU Preferences

You must select the Miscellaneous preference **Use GPGPU acceleration (when available)**, as shown below, to run applicable operations with GPGPU acceleration. If not selected, the CPU equivalent will be used.



Miscellaneous preferences

4.2 GPGPU Accelerated Image Filters

The following image filters have been integrated within the GPGPU framework.

In most cases, you should not notice any differences between the image filtering outputs of GPGPU versus CPU processing. You can verify this by comparing the structural similarity index (SSIM) of the GPGPU and CPU outputs in Dragonfly's Processed Image Comparator.

Filter	Description
Bilateral	This smoothing filter preserves edges and reduces noise by averaging pixels based on their spatial closeness and radiometric similarity.
Canny	This multi-stage edge detector uses a filter based on the derivative of a Gaussian in order to compute the intensity of the gradients. **NOTE** The settings for this filter now include the option to select the low and high thresholds for hysteresis thresholding. Hysteresis thresholding on the gradient magnitude determines which edge pixels are kept or removed from the output.
Close	This morphology filter smooths objects and fills-in small holes by performing dilation followed by erosion using the same structuring element for both operations.
Dilate	This morphology filter enlarges the boundaries of regions of foreground pixels, typically white pixels, using a structuring element.
DoG (Difference of Gaussian)	This edge detection filter first performs a Gaussian blur at a specified standard deviation (first sigma) and then another blur less than the first (second sigma). The final image is then calculated by replacing each pixel with the difference between the two blurred images and detecting where the values cross zero.
Erode	This morphology filter erodes away the boundaries of regions of foreground pixels, typically white pixels, using a structuring element.

Filter	Description
Gaussian	This smoothing filter applies a convolution operation with a Gaussian filter kernel to smooth images.
Kuwahara	This smoothing filter provides non-linear smoothing for adaptive noise reduction.
Laplacian	This edge detection filter highlights the regions in which there is a rapid intensity change using a discrete convolution kernel that approximates the second derivatives of the image in the definition of the Laplacian.
Mean	This smoothing filter replaces each pixel with the mean value of its neighbors.
Median	This smoothing filter replaces each pixel with the median value of its neighbors, which can be highly effective on salt-and-pepper noise.
Non-local means	A 3D version of the non-local means filter, which smoothes images by taking a mean of all pixels weighted by how similar the pixels are to the target pixel.
Open	This morphology filter performs an erosion operation, followed by a dilation to smooth objects and remove isolated pixels.
Sobel	This edge detection filter named after Irwin Sobel creates an image which emphasizes edges and transitions. **NOTE** The GPGPU version of the Sobel filter was updated to the 'classical' version of this filter.
Unsharp	This filter sharpens an image by subtracting a blurred version of itself from the original.

Available GPGPU operations for image filtering

4.3 GPGPU Acceleration for Processing Images

The following items are available for executing operations on images within the GPGPU framework.

Operation	Description
Surface determination	Accelerates surface determination for the generation of precise meshes (see Surface Determination Tool for additional information about surface determination in this 3D World release).

Available GPGPU operations for processing images

4.4 Processing ROIs with GPGPU Acceleration

The following items are available for executing operations on regions of interest within the GPGPU framework. In some cases, you may notice minor differences in the outputs of GPGPU versus CPU processing. This is due to the differences between the algorithms implemented.

Operation	Description
Ambient occlusion (AO) fields	Used for segmenting pores and cavities in 3D images (see Ambient Occlusion (AO) Fields for additional information about this newly implemented algorithm).
3D thinning	This operation for skeletonization, which is a preliminary step for computing graphs, is accelerated within the GPGPU framework. **NOTE** Although the overall shapes of skeletons generated from GPU and CPU processing are usually identical to each other, the GPU-based result often contains fewer unnecessary branches.
Distance maps	Distance map computations, which are used in a number of transform processes, are accelerated within the GPGPU framework.
Ultimate erode	This new operation automatically creates a seed multi-ROI that finds the centers of mass of the objects within a region of interest that would be separated by segmentation (see Create Seeds for Watersheds (Ultimate Erode)).

Available GPGPU operations for regions of interest

5 Meshes

New features and optimizations for generating and visualizing meshes available in this software release include an advanced surface determination tool for generating high precision meshes, optimal meshes for balancing complexity with your system's capability to render meshes in 3D, height maps for revealing deviations from a referenced plane, and improvements for viewing meshes in outline mode and with shadows.

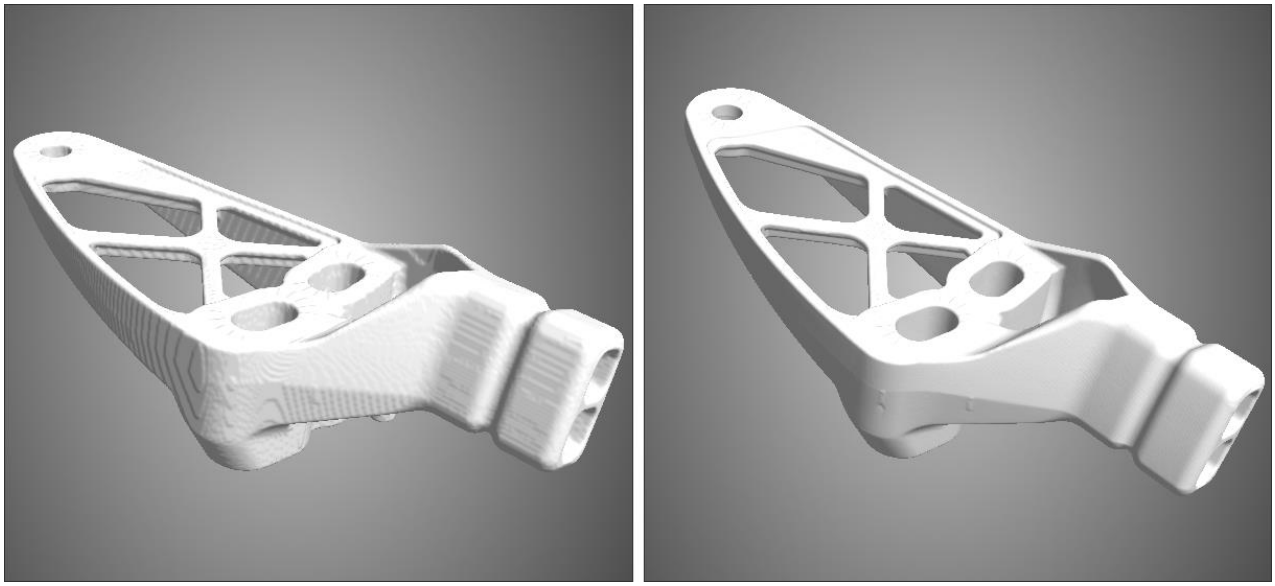
NOTE This software release also provides a configurable snapping behavior for the Points, Ruler, Angle, Path, and Arrow annotation tools. This lets you quickly and precisely place control points for the most accurate mesh measurements (see Use Snapping for additional information about this new feature).

5.1 Surface Determination Tool

With 3D World's new advanced Surface Determination tool, measurement uncertainty is reduced by providing adaptive surface determination options for generating high precision meshes with sub-voxel resolution from scans of castings and other single-phase materials. The Surface Determination tool lets you specify search distances for precise boundary detection, denoise input data, exclude internal voids, adjust thresholds and falloff snap factors, as well as quickly refine initial results for precise vertex positioning based on geometric accuracy.

The advantages of the Surface Determination tool, as compared to the marching cubes method, include better quality with the same number of polygons, decreased video memory requirements, as well as accelerated processing within the GPGPU framework (see GPGPU Acceleration).

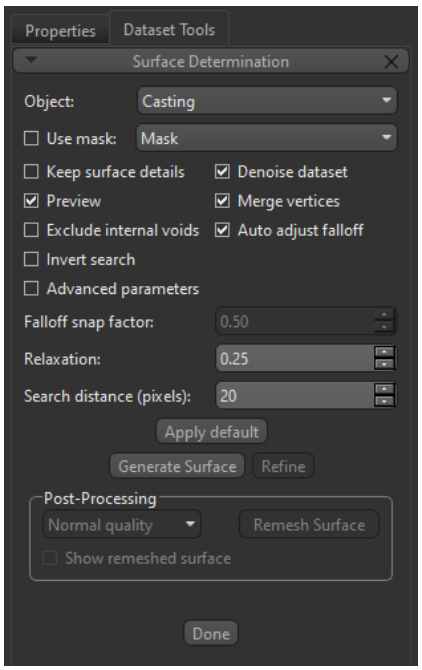
An example of meshes generated in a previous 3D World version versus with the Surface Determination tool in version 2025.1 is shown below.



Mesh generated from a scan in a previous version (left) and in version 2025.1 (right)

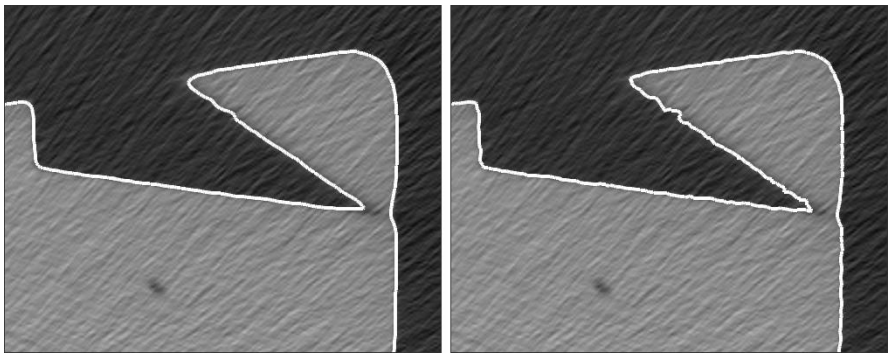
NOTE The Surface Determination Tool is not yet macro compliant. Macro compliance will be implemented in a future software release.

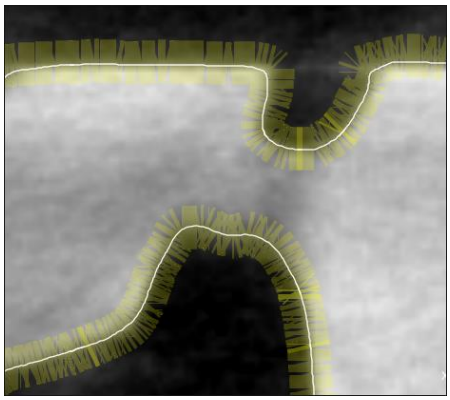
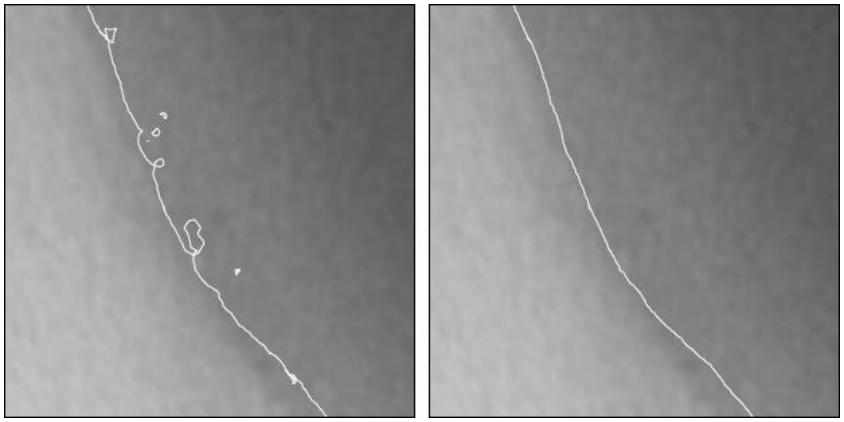
Right-click an image and then choose **Surface Determination** in the pop-up menu to open the Surface Determination panel on the Dataset Tools panel, as shown on the following page.

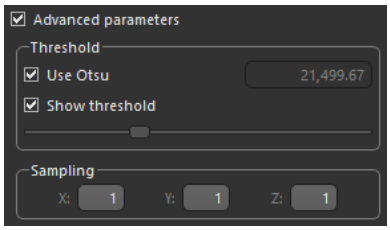
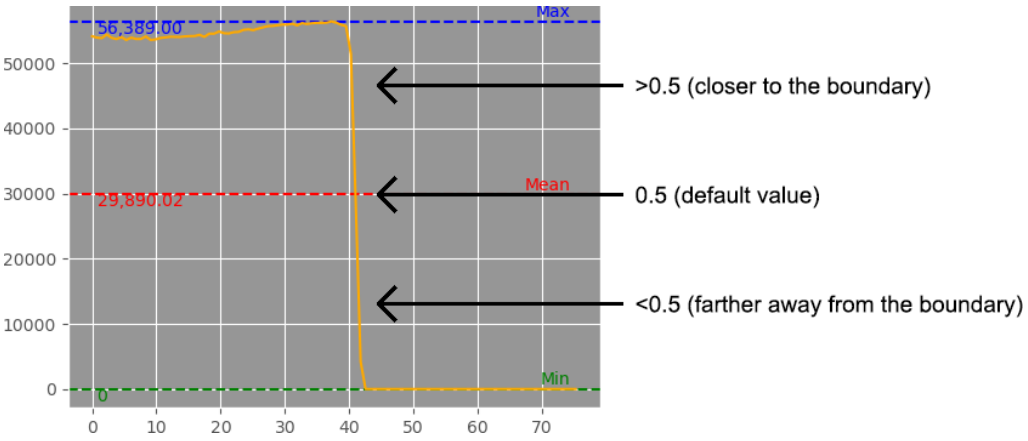


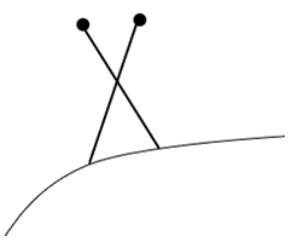
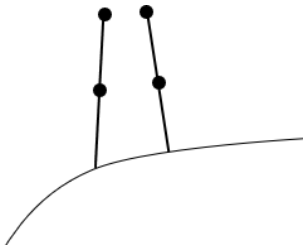
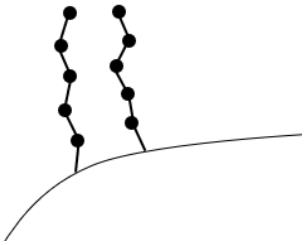
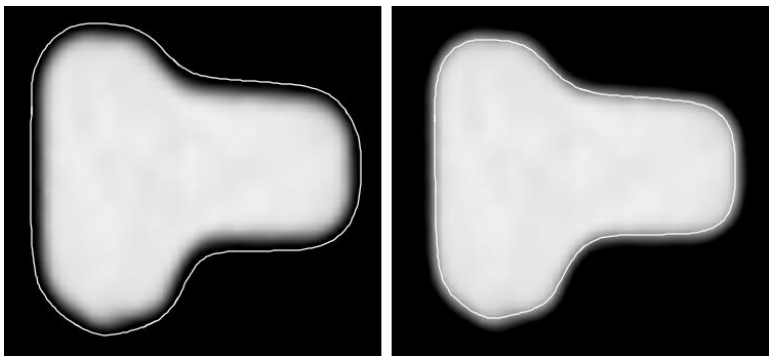
Surface Determination panel

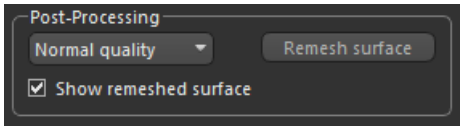
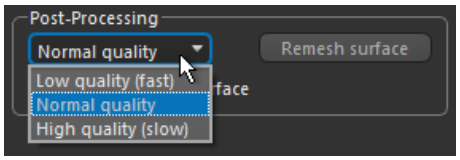
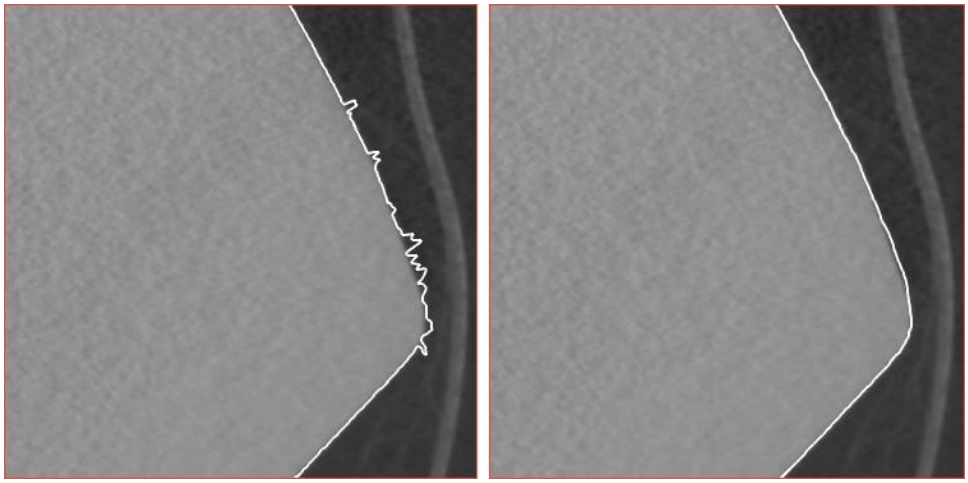
The following settings are available for generating meshes using the surface determination method. You should note that the default settings should work well in many cases.

Item	Description
Object	Indicates the currently selected input object. If required, you can select another object in the drop-down menu to generate a surface.
Use mask	If checked, lets you choose a region of interest to initialize the surface. For example, if you need to generate a surface from a segmentation. **NOTE** If the region of interest designated as the mask is a void, then you will need to select 'Invert search' to generate a surface.
Keep surface details	If checked, smoothing and other filtering pre-processing steps will not be applied when the mesh surface is generated. This setting is usually checked only when you want to preserve dataset details for surface roughness or other similar computations, as shown below.  *Keep surface details not applied (on left) and applied (on right)*

Item	Description
Denoise dataset	If checked, 3D non-local means filtering will be applied as a pre-processing step to reduce effects that can translate to noise.
Preview	Check this option to preview what the generated surface will look like and the extent of the search distance. An example of a preview is shown below. 
Merge vertices	If checked, excess vertices will be merged when the mesh is '*shrink-wrapped*' to the computed surface. **NOTE** Selecting this setting can help reduce the occurrence of 'loops' in generated meshes, as shown below.  *Original surface (on left) and the same surface after merging vertices (on right)*
Exclude internal voids	If checked, internal voids will be excluded from the generated mesh.
Auto adjust falloff	If checked, the falloff snap factor will be adjusted locally. If not checked, the global value set for 'Falloff snap factor' will be used. **NOTE** See 'Falloff snap factor' for additional information about this parameter.
Invert search	If checked, the default search direction will be inverted. **NOTE** Select this setting if you are using a mask that defines void space.

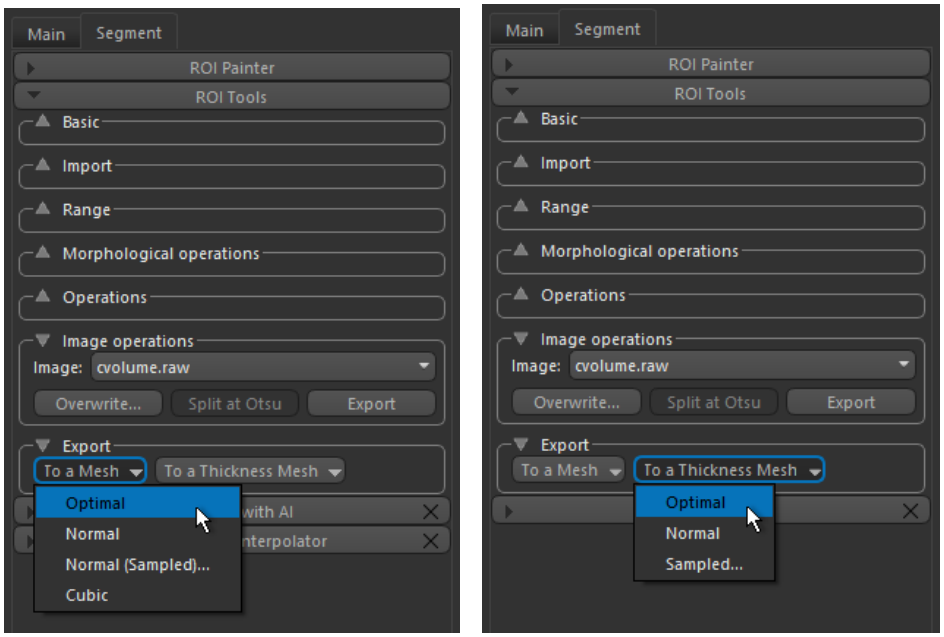
Item	Description
Advanced parameters	Check this option to access the advanced parameters, shown below.  **Use Otsu…** If checked, the computed Otsu threshold will be applied automatically to generate the initial surface. If unchecked, you can manually set the threshold value. **Show threshold…** If checked, a colored highlight will be applied within the defined range, as shown below.  **Sampling…** Lets you set the sampling rate that will be applied along each axis. At a setting of 4, one of every four pixels will be sampled. Each pixel value is analyzed when the sampling values are set at 1.
Falloff snap factor	Determines how aggressively snapping to the intensity falloff from the surface will be. As shown in the following intensity profile, the falloff snapping factor is average at a setting of 0.5. Snapping will be more aggressive with settings greater than 0.5 and less aggressive with settings lesser than 0.5. 

Item	Description
Relaxation	Determines the number of iterations that will be performed in each direction to search for the surface. Searching will be done once at a setting of 1.0, two iterations will be performed at a setting of 0.5, and five iterations will be performed at a setting of 0.2. over 50% of the search distance. will be twice as long as at a setting of 1.0. **NOTE** Increasing the number of iterations may increase accuracy, but more time will be required to compute the surface.  *Relaxation = 1.0* *Searches once. If 'crossovers' occur, as shown above, you should consider adding iterations.*  *Relaxation = 0.5* *Searches two times, i.e., 50% of the search distance for each iteration.*  *Relaxation = 0.2* *Searches five times, i.e., 20% of the search distance for each iteration.*
Search distance (pixels)	Lets you set a search distance to find the 'real' surface between the material and air. The effect of applying varying search distances is shown below. You can increase the search distance in cases in which the generated surface to too far from the real surface.  **NOTE** Click the **Preview** button to view a graphical representation of the search distance. The search distance should be large enough to include all of the object's edges, but not too large as this could slow down computations.
Apply Default	Click this button to reset all settings to their default values.
Generate Surface	Click this button to generate an initial surface. **NOTE** You can refine unsatisfactory surfaces by modifying the current settings for 'Preserve surface details', 'Falloff snap factor', 'Relaxation', or 'Search distance'.
Refine	Click this button to refine the currently computed surface after any changes were made to the settings for 'Preserve surface details', 'Falloff snap factor', 'Relaxation', or 'Search distance'. **NOTE** You will need to generate a new surface if you change the threshold value or change the current setting for 'Denoise dataset'.

Item	Description
Post-Processing	The options in the Post-Processing box, shown below, let you remesh the current surface with Poisson surface reconstruction at a selected quality setting to generate a more uniform topology.  **Quality settings…** Lets you choose the quality setting — **Low quality (fast)**, **Normal quality**, or **High quality (slow)** — that will be applied to remesh the surface.  **Remesh Surface…** Click this button to remesh the current surface. **Show remeshed surface…** Lets you toggle the visibility of the current surface, which is shown when unchecked, with the remeshed surface, which is shown when checked. **NOTE** In general, surfaces should only be remeshed when there were issues that cannot be corrected otherwise. As shown in the example below, noisy surfaces can be corrected with remeshing.  *Original surface (on the left) compared to remeshed surface (on the right)*
Done	Lets you apply all selected changes to the mesh and closes the Surface Determination panel. The computed mesh will then be available on the Properties panel for inspection and for taking measurements.

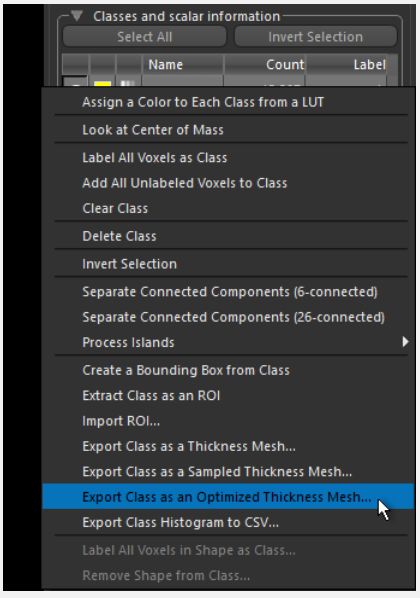
5.2 Optimal Meshes

Generated meshes are sometimes too complex and need to be decimated to be rendered in the 3D view on some systems. The new **Optimal** mesh options, shown below, provides a balance between complexity and a system's capability to render the mesh in 3D.



Optimal mesh export options

NOTE You can also export optimal thickness meshes from multi-ROI classes, as shown below.

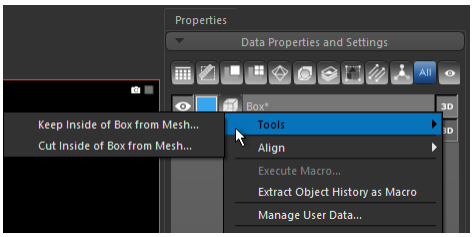


5.3 Mesh Tools

This software release includes new mesh tools that let you cut a mesh with a box.

Do the following to cut a mesh with the Mesh tools:

- Create and align a box shape that defines the area you want to cut.
- Right-click the box and choose **Mesh Tools** in the pop-up menu, as shown below to access the cut mesh options.



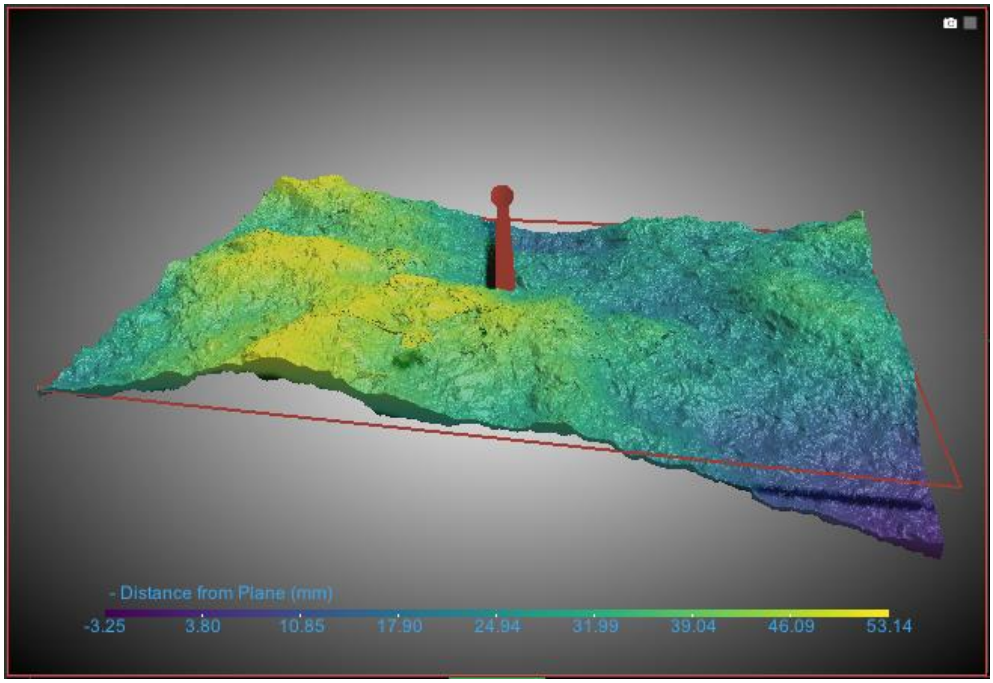
- Choose the required option as follows:

  Keep Inside of Box from Mesh… If selected, edges and vertices outside the box will be cut from the mesh.

  Cut Inside of Box from Mesh… If selected, edges and vertices inside the box will be cut from the mesh.

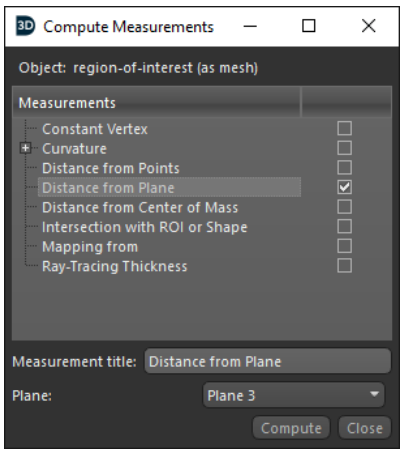
5.4 Height Maps

This software release provides the option to compute distances from a mesh to a plane parallel to it. As shown below, the distance from a plane can reveal surface undulations by showing how far they deviate from the plane.



Scalar values of distance computed from a plane

The option to compute distances from a plane is available in the Compute Measurements dialog, shown below. You will need to select the referenced plane in the Plane drop-down menu.



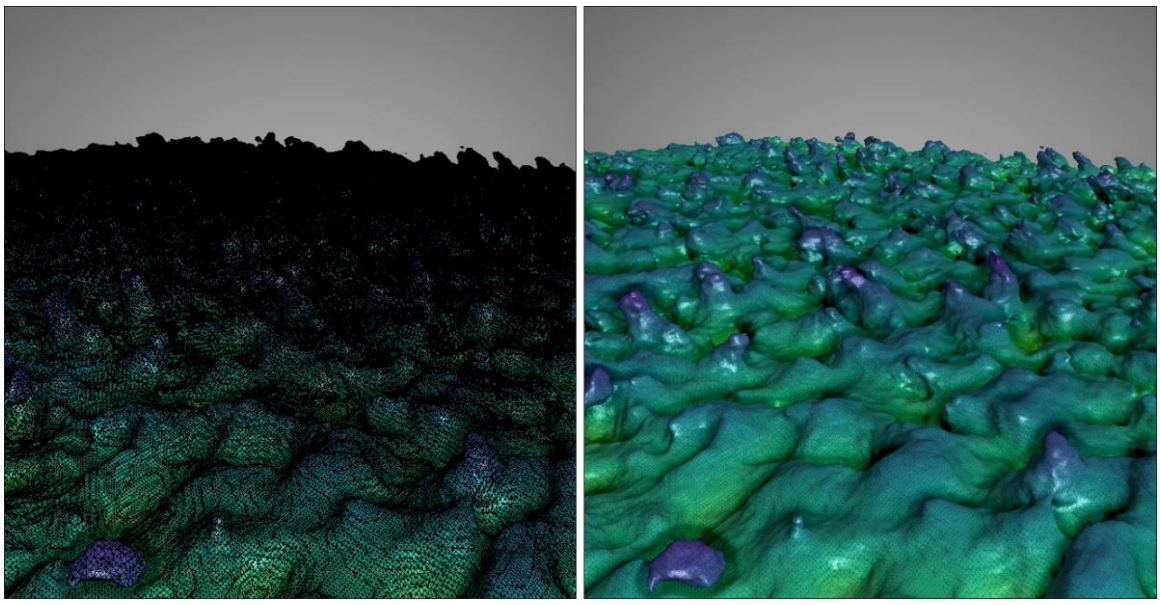
Compute Measurements dialog

5.5 Improvements for Viewing Meshes

A number of improvements for viewing meshes in Outline mode and with shadows are available in this software release.

5.5.1 Outline Mode

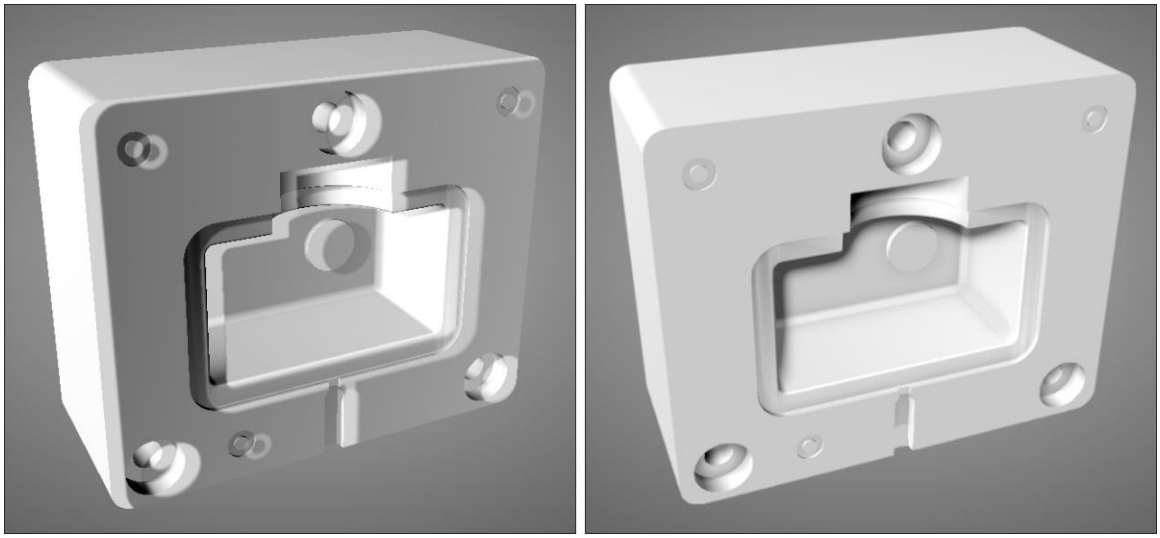
Improvements for viewing meshes in Outline mode, in which meshes are shown as both solid and in wireframe, are available in this software release. As shown below, surfaces are now more clearly distinguishable in the Outline mode.



Comparison of Outline mode for meshes in previous version (left) and in version 2025.1 (right)

5.5.2 Lighting with Shadows

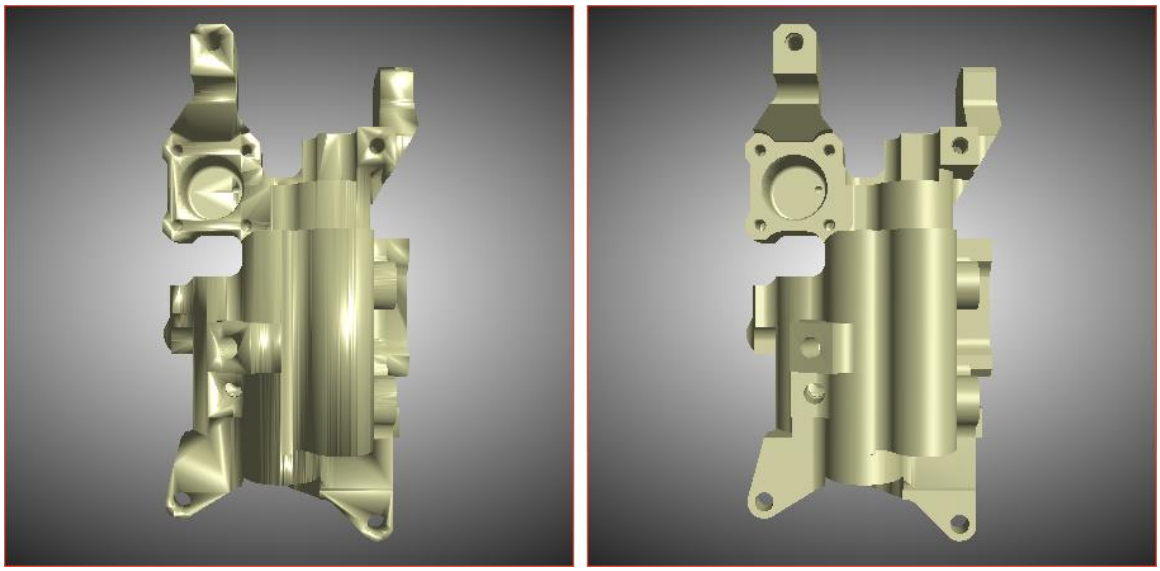
Improvements for viewing meshes with shadows is available in this software release. This improvement, which has low system requirements compatible with low powered GPUs, uses '*depth darkening*' to improve shadowing and produce a more accurate sense of 'depth'.



Comparison of Outline mode for meshes in previous version (left) and in version 2025.1 (right)

5.5.3 Imported Meshes

You should notice that the visualization of meshes created in CAD software and exported in the STL (*.stl extension) file format should be noticeably improved in this software release.



STL file in Dragonfly 3D World 2024.1 (left) and in 2025.1 (right)

NOTE This also includes improvements for imported annotations that were saved in the STL file format, such as landmarks.

5.6 Exporting Meshes with Colors in PLY

In previous versions of Dragonfly 3D World, it was only possible to export meshes with colors preserved in the VRML (*.wrl extension) file format. This software release provides the additional option to export meshes with colors preserved in the PLY (*.ply extension) file format.

Right-click the mesh you want to export and then choose **Export > Mesh to File with Color** in the pop-up menu. You can then choose the PLY or VRML file format and other settings in the Save As dialog.

NOTE Importing meshes with color is not supported by Dragonfly 3D World.

5.7 Exporting 3D Tetrahedral Meshes

This software release provides additional options for exporting 3D tetrahedral meshes created in Dragonfly's NGSolve plugin and in the Generate 3D Tetrahedral Mesh dialog. Right-click the required 3D tetrahedral mesh and then choose **Export > Tetrahedral Mesh to File** in the pop-up to the additional export formats, as listed in the following table.

File Format	Extension
OpenFOAM 1.5+ mesh	*.foam
Stereolithographic extended surface triangular mesh	*.stl
Neutral Format mesh	*.neu
Surface Mesh Format	*.mesh
Tochnog Format	*.dat
Abaqus Format	*inp
Fluent Format	*cas
Permas Format	*.mesh
FEAP Format	*.mesh
Elmer Format	*.grd
Gmsh2 Format	*.gmsh2

Export formats for 3D tetrahedral meshes

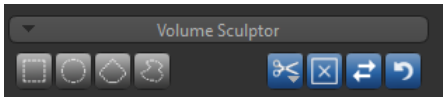
6 Volume Sculptor

The Volume Sculptor available in version 2025.1 lets you simplify the visualization of 3D renderings by automatically masking selected regions. As shown below, a selected region or its inverse can be quickly hidden from view with the tools available on the Volume Sculptor panel. You can also create new datasets by cutting sculpted regions from the original data.



Original rendering with drawn rectangular sculpting region (left), with sculpting applied (middle), and inverted sculpting applied (right)

The options on the Volume Sculptor panel, shown below, let you draw, clear, and invert the volume sculpting mask, as well as undo the last operation that was performed.



Volume Sculptor panel

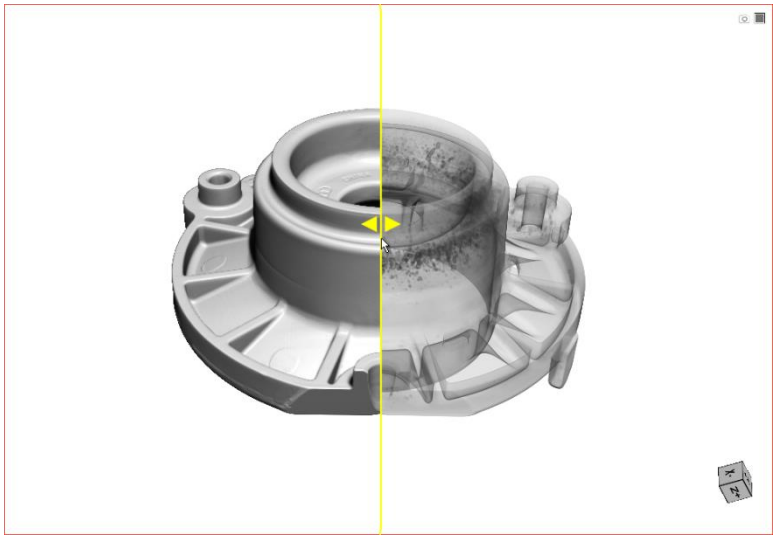
Tool/Operation	Icon	Description
Rectangular region		You use the Rectangle tool to select a rectangular portion of the rendering in 3D views. • While holding down LEFT CTRL, drag to shape and size the rectangular region. Release the mouse and keyboard key to create the region.
Ellipse region		You use the Ellipse tool to select an elliptical portion of the rendering in 3D views. • While holding down LEFT CTRL, drag to shape and size the elliptical region. Release the mouse and keyboard key to create the region.
Polygon region		You use the Polygon tool to select a polygonal portion of the rendering in 3D views. • While holding down LEFT CTRL, click on a succession of points to define the contour of the region. Release the keyboard key to create the region.
Freehand region		You use the Freehand tool to select a freehand portion of the rendering in 3D views. • While holding down LEFT CTRL, drag to define the required contour. Release the mouse and keyboard key to create the region.

Tool/Operation	Icon	Description
Cut from volume/Create new volume		Lets you cut data from the current sculpted volume or to create a new volume. **Cut current volume…** Cuts data from the current sculpted volume. In this case, you will need to save the loaded data if you want to keep your changes. **Create new volume…** Creates a new volume in which the only the sculpted data is retained. **NOTE** In both cases, data is excluded from the volume by overwriting data values in the masked region with the minimum data value available.
Clear		Clears all labeled voxels in the mask.
Invert		If clicked, all labeled voxels in the mask will be inverted. This means that very voxel that is not labeled in the selected region of interest will be labeled, while every voxel that was previously labeled will be unlabeled.
Undo		Undoes the last labeling operation that was performed.

7 Effect Splitter

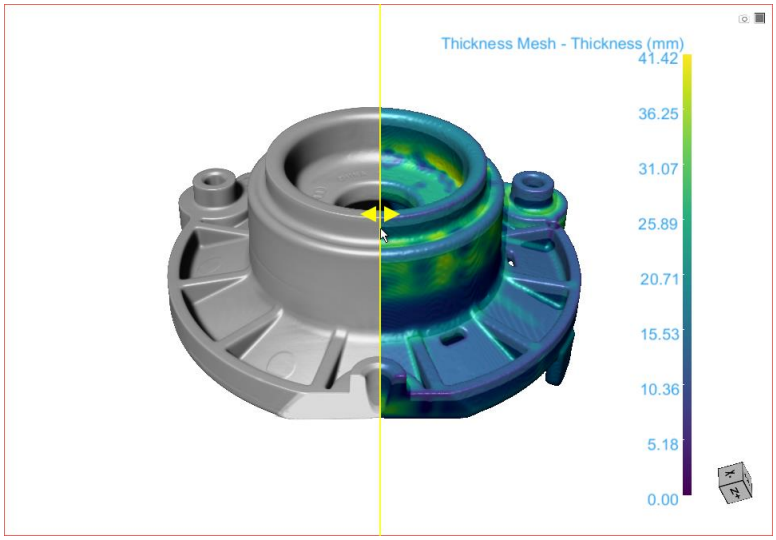
This software release includes an ‘effect splitter’ that lets you split the currently selected 3D view into two horizontal windows with an adjustable slider. You can then apply different 3D effects to objects in each half of the view, such as edge contrast and opacity, or you can clip objects to reveal an original input and a processed output.

As shown below, a split 3D view can show the original rendering (on the left) and with edge contrast applied to the same data to reveal the interior of the object (on the right).



Split 3D view with edge contrast applied on the right

A split view can also contain multiple objects, as shown below. In this case, an original rendering can be clipped on one side to let you show a processed output on the other side.



Split 3D view of 3D rendering (left) and thickness mesh (right)

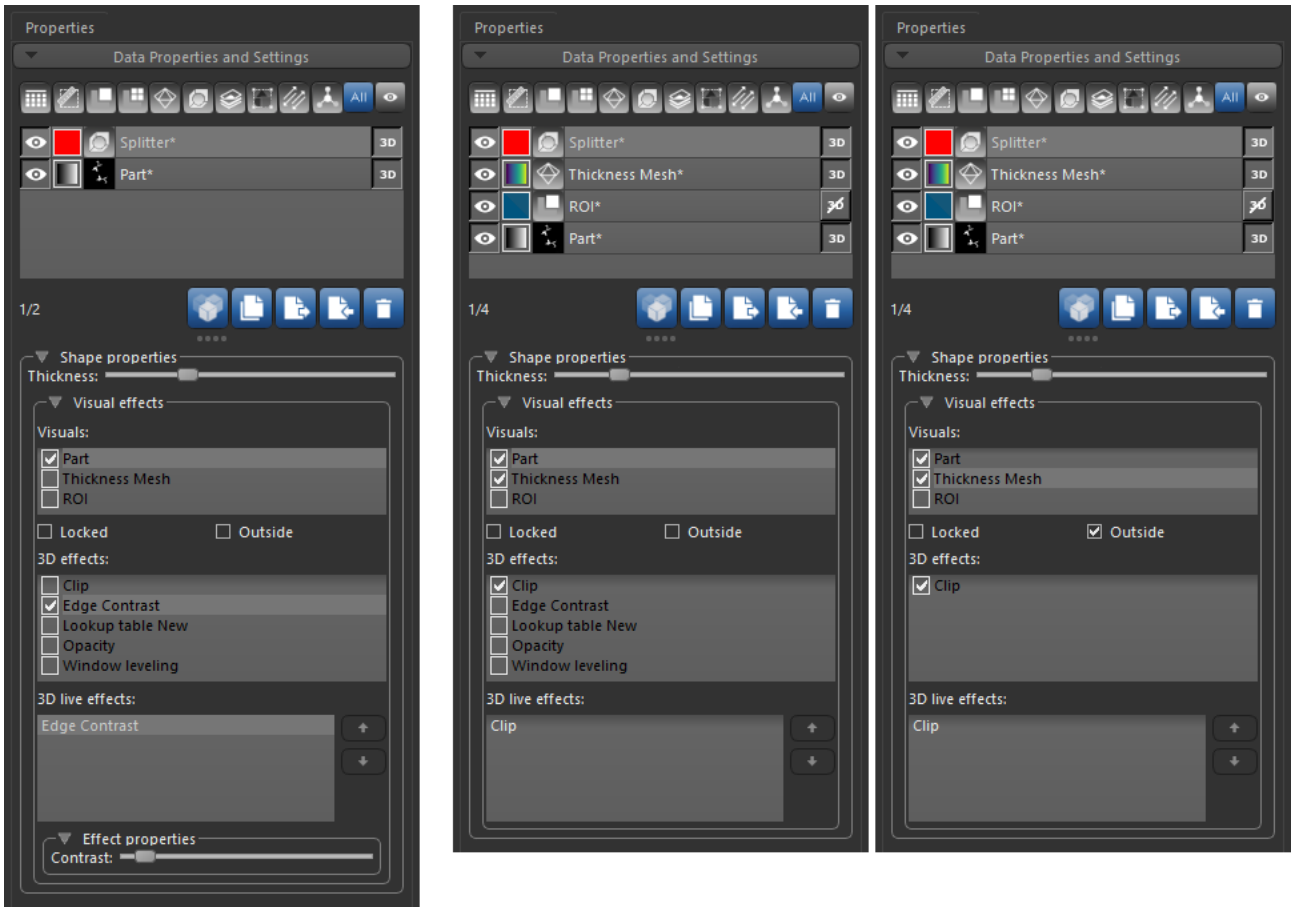
Sweeps of split views can be included in animated sequences to show the transition from one 3D effect to another over the whole view.

Click the **Splitter** button on the Shapes panel, as shown below, to split the selected 3D view and add ‘splitter’ shape to the Data Properties and Settings panel.



Shapes panel

You can select the effect(s) that will be applied on each half of the split view in the Shape properties box, as shown below.



Shape properties for splitters

7.1 Configurable Actions for the Splitter

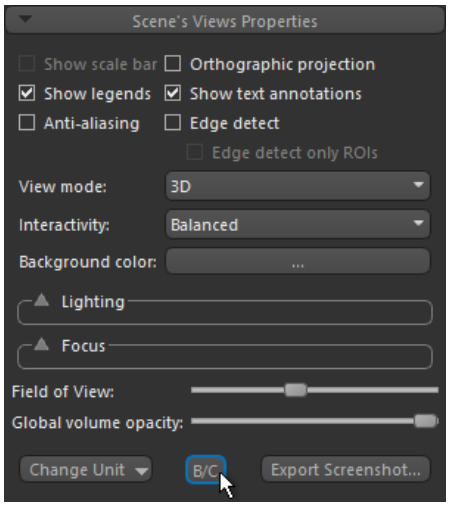
The following actions can be configured for splitters.

Action	Key	Mouse
Move the view splitter		Left mouse

Configurable actions for the splitter

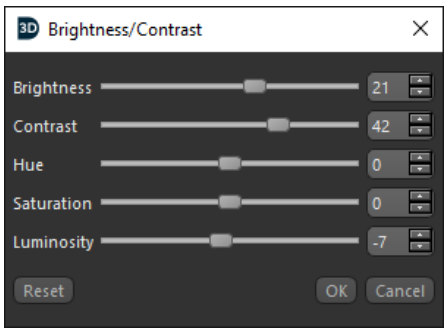
8 Brightness, Contrast, and HSL Settings

This software release includes a new dialog — Brightness/Contrast — that lets you adjust the brightness and contrast of rendered objects in 3D views, as well as set hue, saturation, and luminosity settings. Click the **B/C** button on the Scene's Views Properties panel, as shown below, to open the Brightness/Contrast dialog.



Scene's Views Properties panel

You can use the sliders in the Brightness/Contrast dialog to adjust the brightness, contrast, hue, saturation, and luminosity of rendered objects in the current 3D view, as well as set values in the text boxes or with the up-down controls. You should note that all objects in the 3D view, except for the background, will be affected by the selected Brightness/Contrast settings.



Brightness/Contrast dialog

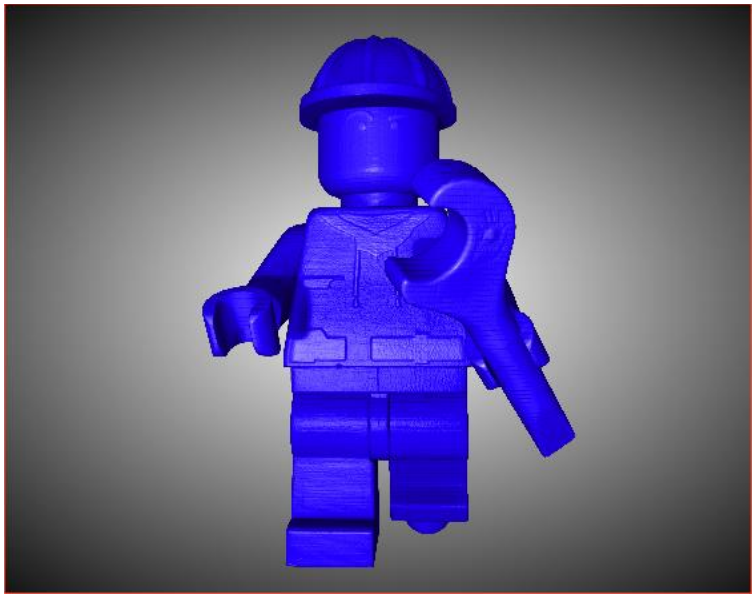
Brightness… Makes rendered objects appear lighter or darker. You should note that increasing brightness can help reveal hidden details but may also make images look washed out. In most cases, you can bring back the details and depth of renderings by adjusting contrast. Values can range from -100 to +100.

Contrast… Alters the difference between light and dark tones. Higher contrast makes details stand out by emphasizing dark areas and highlights, while lowering contrast can create a more uniform, muted look. Values can range from -100 to +100.

Hue… Shifts the tones of objects by changing the overall color palette. The values displayed reflect the number of degrees of rotation around a color wheel. A positive value indicates clockwise rotation, while a negative value indicates counterclockwise rotation. Values can range from -180 to +180.

Saturation… Controls the intensity of color tones. Increasing saturation will make colors more vivid and vibrant, while decreasing saturation will move tones toward grayscale to create an appearance that is more subdued or desaturated. Values can range from -100 to +100.

As shown below, selecting hue and saturation settings can fully change the visualization of grayscale images.

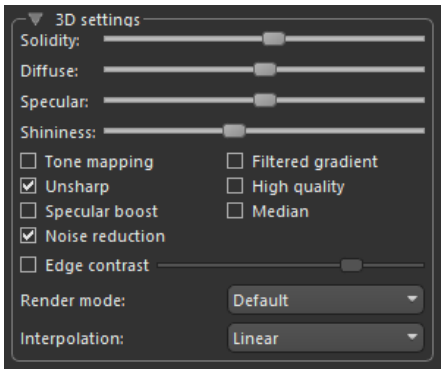


Lego man with hue and saturation settings applied

Luminosity… Affects the perceived brightness of grayscale/color tones, independent of their hue or saturation. Adjusting luminosity can make objects appear lighter or darker without significantly altering their vibrancy. Values can range from -100 to +100.

9 3D Settings for Images

Updated 3D settings for images — **Unsharp**, **Noise reduction**, and **Edge Contrast** — were incorporated in Dragonfly 3D World 2025.1. These settings are available in the 3D settings box on the Data Properties and Settings panel.

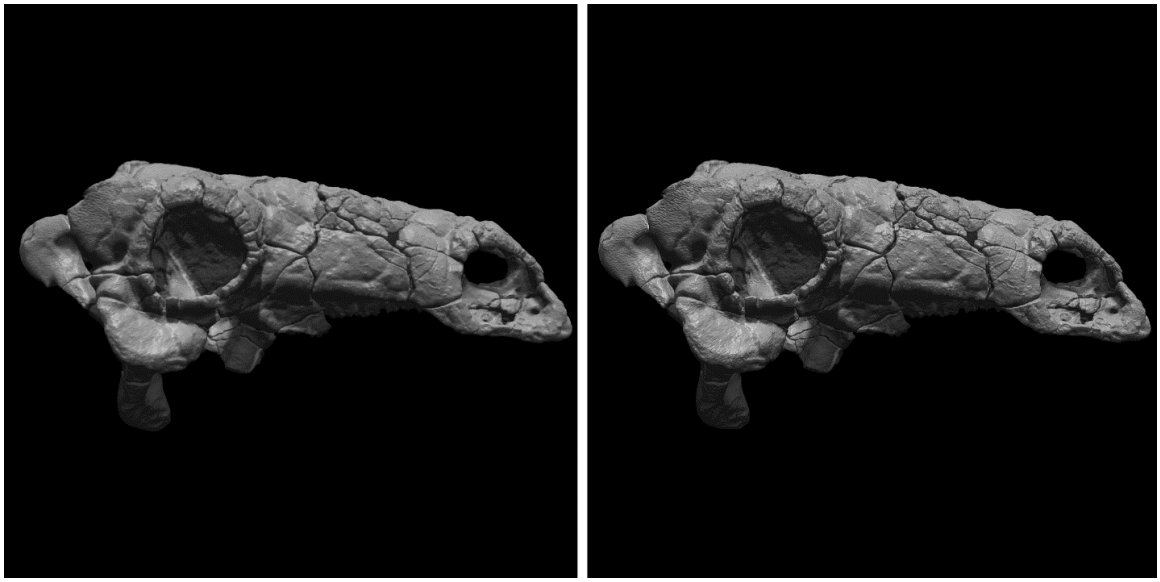


3D settings box

9.1 Unsharp

Providing better sharpening and more surface details, the Unsharp option available in this software release adjusts the amount of sharpening per voxel to target an even level of sharpness across images. Areas that are already sharp are sharpened less, while areas that lack detail are sharpened more. This allows for higher overall natural visual sharpness with fewer artifacts.

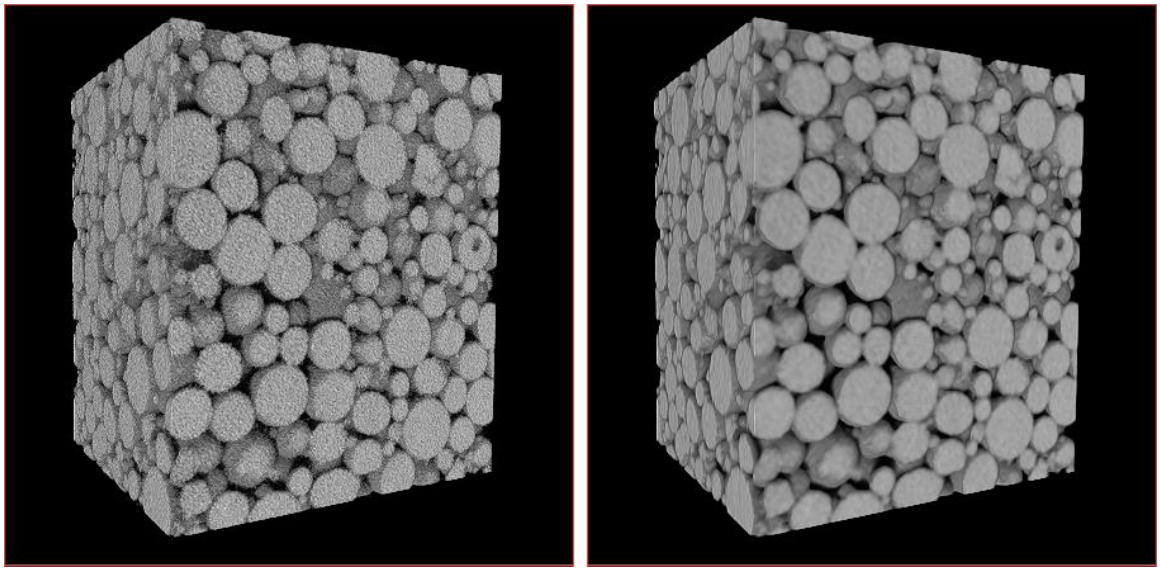
Check the '*Unsharp*' option in the 3D settings box on the Data Properties and Settings panel to apply this filter to your 3D renderings. The effect of sharpening, which needs to be used with lighting, is shown in the following example.



Before (left) and with unsharp applied (right)

9.2 Noise Reduction

This software release provides improved denoising of 3D textures with the application on non-local means filtering in 3D that maintains details and edge sharpness. As shown in the following screenshots, the result is a smoother and more visually appealing rendering.

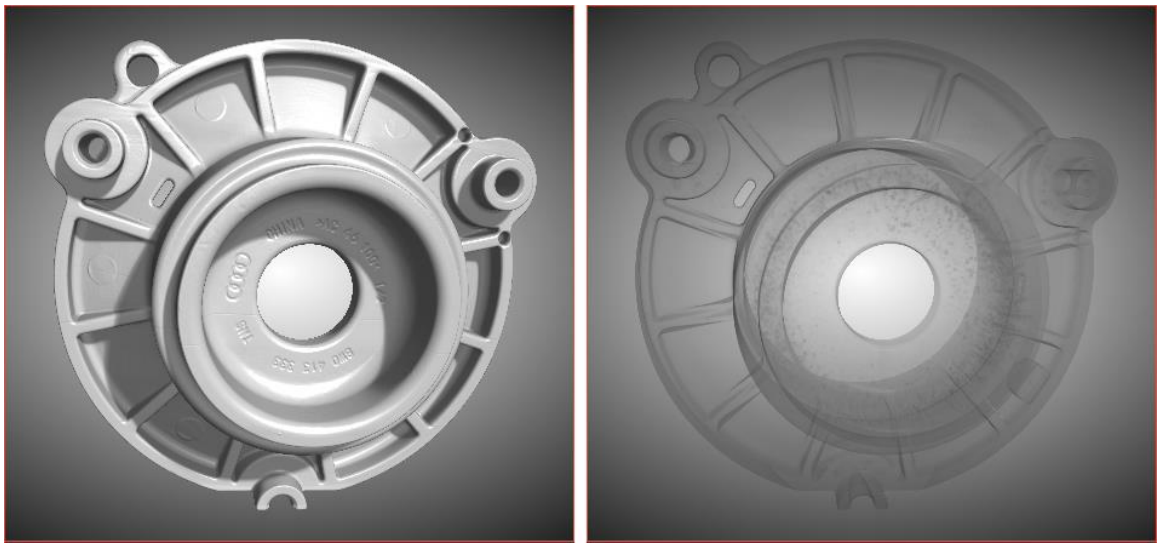


Before (left) and with noise reduction applied (right) to a powder dataset

This setting filters the 3D texture, but does not impact original data, does not need extra RAM or VRAM, and can be applied in less than 1 second for dataset of 1024 × 1024 ×1024 pixels.

9.3 Edge Contrast

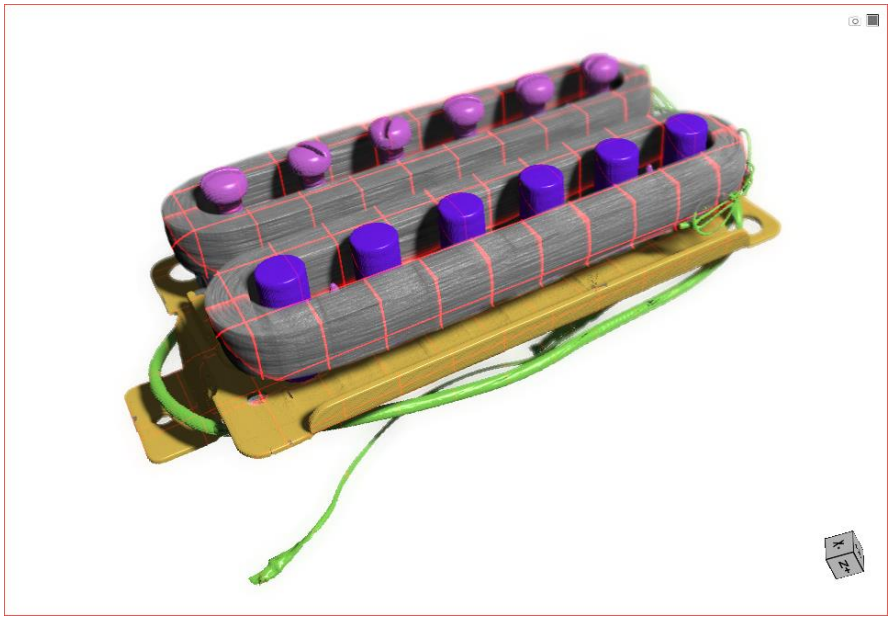
You should note that visualizations produced with the ‘Edge contrast’ applied are improved in this software release.



Before (left) and with edge contrast applied (right) to an automotive part

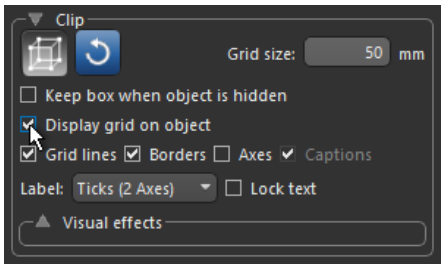
10 Projected Grids

The option to display a projected grid of the clip box is available in the Clip box on the Data Properties and Settings panel. Projected grids can provide a good representation of the size and dimensions of objects within a volume and can also help you to quickly identify spatial relationships within the data. You should note that you can display the grid when the clip box is hidden, as shown below.



Grid displayed on segmented dataset

Set the clip box as required and then check the '**Display grid on object**' option in the clip box, as shown below, to project the grid lines of the clip box on objects in the 3D view. You should not that you can adjust the grid size, as well as display the grid even when the clip box is hidden.



Display grid on object option

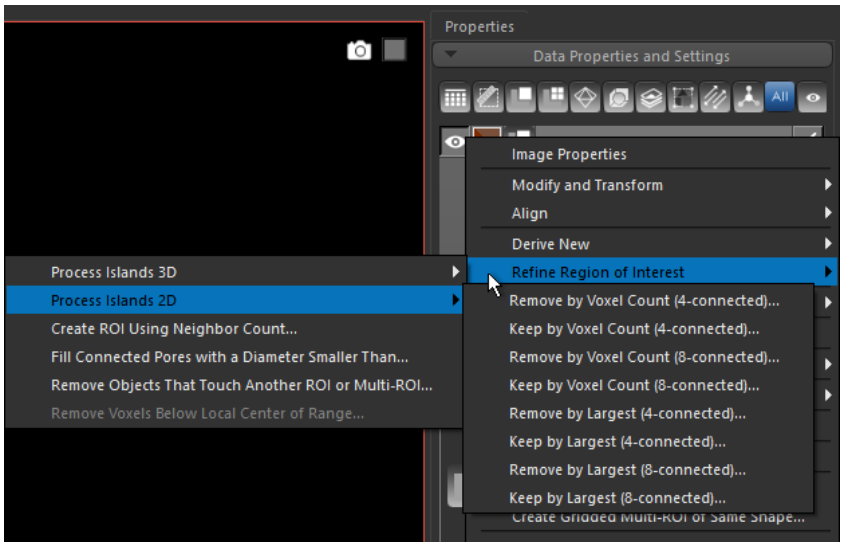
NOTE Projected grids are only available for images. This option is not available for regions of interests, multi-ROIs, meshes, and other objects.

11 2D Processing of ROIs and Multi-ROIs

In cases in which you work with disconnected stacks of images instead of volumetric data or need to work strictly slice-by-slice, this software release provides a number of tools for processing and analyzing your data in 2D. This includes processing islands in 2D, creating new multi-ROIs of connected components based on 4 and 8 connectivity, applying 2D watershed transforms, skeletonization, and computing distance maps in 2D.

11.1 Process Islands in 2D

You can now choose to refine a region of interest by processing islands slice-by-slice in the Z axis. Right-click a region of interest and then choose **Process Islands 2D** in the pop-up menu, as shown below, to access the options for removing or keeping islands.



Process Islands 2D pop-up menu options for refining regions of interest

You should note that connectivity is the way in which a set of pixels are connected to each other and is selectable for processing islands, as explained below.

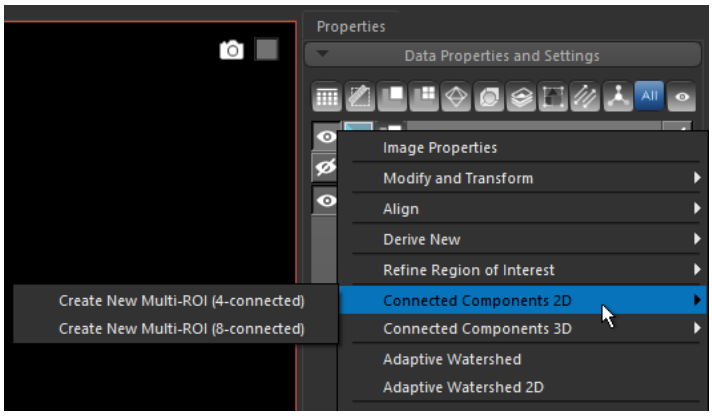
4-connected… Labeled pixels are considered to be connected if any of their edges are adjacent to the current seed. This results in the maximum number of connected components.

8-connected… Labeled pixels are considered to be connect if any of their edges or corners are adjacent to the current seed. This results in the fewest number of connected components.

11.2 Connected Components 2D

This software version lets you create new multi-ROIs of connected components on a slice-by-slice basis in the Z axis. This enables the computation of 2D measurements from multi-slice datasets as each label will be on a different slice.

Right-click the required region of interest or multi-ROI and then choose **Connected Components 2D** in the pop-up menu to see the options for creating new multi-ROIs with 2D connected components.



Connected Components 2D sub-menu for regions of interest

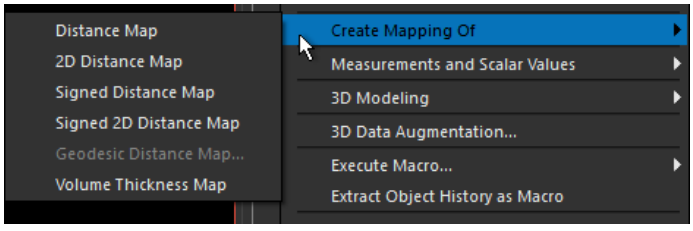
Create New Multi-ROI (4-connected)… Creates a new multi-ROI in which groups of connected voxels are labeled as distinct objects on a slice-by-slice basis along the Z-axis. Propagation is done using the 4 edges adjacent to the current seed and will result in the maximum number of connected components.

Create New Multi-ROI (8-connected)… Creates a new multi-ROI in which groups of connected voxels are labeled as distinct objects on a slice-by-slice basis along the Z-axis. Propagation is done using the 4 edges and 4 corners adjacent to the current seed and will result in the minimum number of connected components.

11.3 2D Distance Maps

Distance maps (also called *distance transforms*), which are powerful tools for image segmentation and analysis tasks, are typically used for watershed transforms and for estimating local thickness. This software release includes the option to compute 2D distance maps, which are computed on a slice-by-slice basis in the Z-axis.

Right-click the required region of interest and then choose **Create Mapping Of** to access the options for computing distance maps, as shown below.

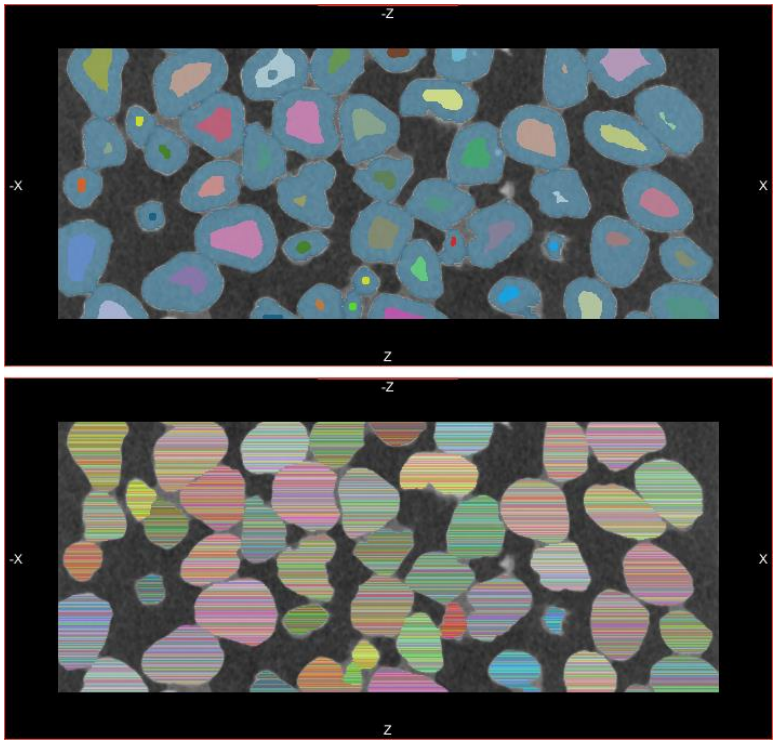


Region of interest contextual menu options for creating mappings

11.4 2D Watersheds

Watersheds, which are primarily used for image segmentation, are particularly useful for dividing touching or overlapping objects. In previous Dragonfly 3D World versions, watersheds could only be applied in 3D. This release provides the additional option of applying watersheds in 2D, in which case the selected algorithm will be applied on a slice-by-slice basis along the Z-axis. It is also possible to apply the '*Compute Watershed 2D with Plane'* algorithm to a single slice in any selected orientation.

As shown below, the typical inputs for a watershed are mask regions of interest (in blue) and seeds multi-ROIs (multi-colored). The output of applying watersheds in 2D are labels created on each Z-axis slice (as shown on the middle screenshot) or on a single slice with applied with a plane (as shown on the bottom screenshot).



Mask region of interest and seeds multi-ROI (top) and resulting 2D watershed (bottom)

11.4.1 Adaptive Watershed 2D

The Adaptive Watershed segmentation technique is an image segmentation method that utilizes the principles of watershed transformation. The '*adaptive*' aspect refers to the recognition of overlapping elliptical objects in the image being segmented, which allows for more accurate segmentations of various particles.

Right-click the required region of interest and then choose **Adaptive Watershed 2D** in the pop-up menu to apply the Adaptive Watershed algorithm on a slice-by-slice basis along the Z-axis.

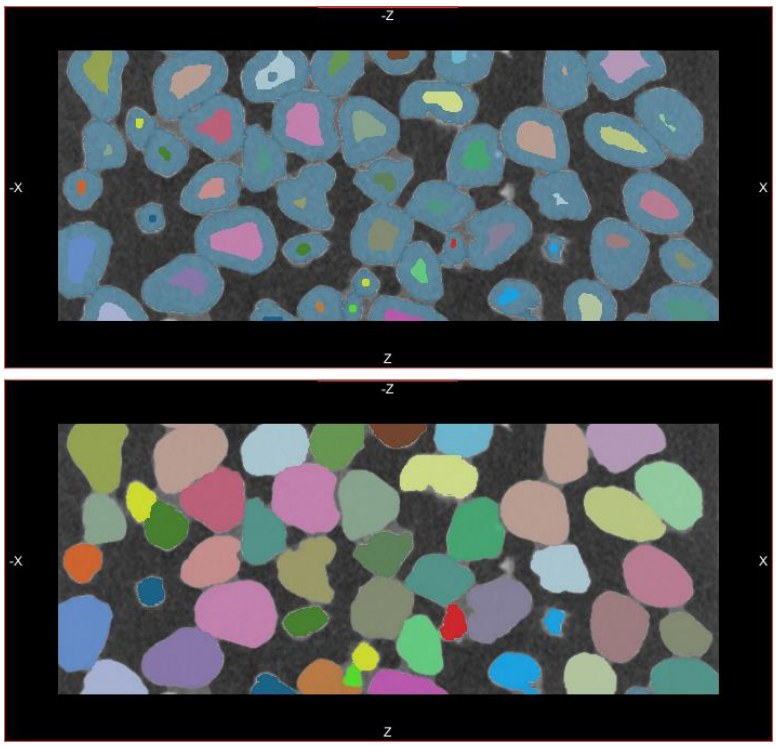
11.4.2 Compute Watershed 2D and Watershed Transform 2D

In addition to providing the Adaptive Watershed method in 2D, Dragonfly 3D World also includes 2D versions of the Compute Watershed and Watershed Transform algorithms. Right-click the required multi-ROI and then choose **Compute Watershed 2D** or **Watershed Transform 2D** in the pop-up menu to apply the algorithms on a slice-by-slice basis along the Z-axis. The difference between the two implementations is that a Sobel is

computed automatically for the selected landscape image when the Watershed Compute 2D algorithm is applied. Both options also include a mask to define the working space for the transformation.

11.4.3 Compute Watershed 2D with Plane

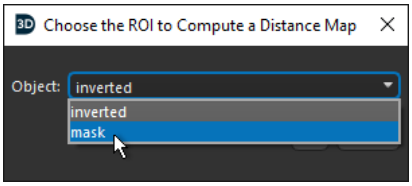
As an alternative to computing watersheds in 2D along the Z-axis, this additional option lets you choose an orientation, or '*plane*', to apply the watershed. The result is a watershed applied to a single slice in the selected orientation.



Region of interest for computing the distance map (blue) and seeds multi-ROI (top) and resulting 2D watershed computed with a plane (bottom)

Do the following to compute this watershed:

- Select the required 2D view and scroll to the required image slice.
- Right-click the multi-ROI that defines the seeds for the watershed.
- Chose **Compute Watershed 2D with Plane** in the pop-up menu.
- Choose the ROI to compute a distance that defines the regions of interest in the Choose the ROI to Compute a Distance Map dialog, as shown below.

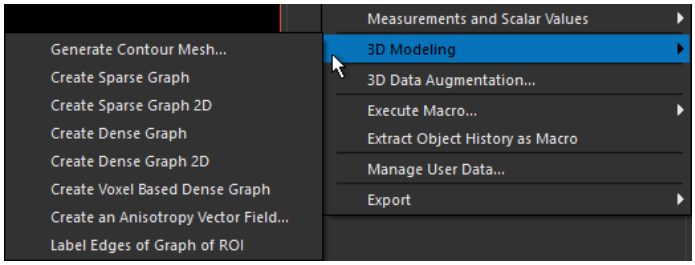


- Click **OK** to compute the watershed.

11.5 2D Graphs

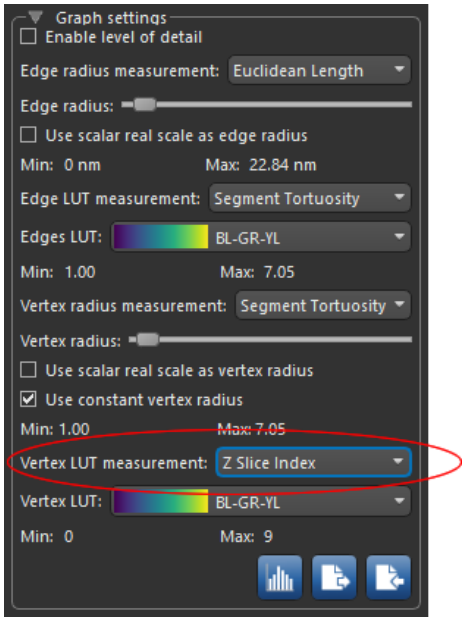
Graphs computed from regions of interest typically provide an opportunity to characterize and model a set of connected areas in 3D, such as tortuous pore space, with spheres and lines representing those areas and their connections. Associated scalar values, such as Euclidean length, and segment tortuosity, length, and Euclidean, can be colored mapped to edges and vertices for sparse and dense graphs.

In this software release, you can also compute graphs on a slice-by-slice basis. Right-click the required region of interest and then choose **3D Modeling** to access the options for computing graphs in 2D, as shown below.



Region of interest contextual menu options

You should note that graphs computed in 2D have the additional parameter ‘Z Slice Index’ for edges and vertices. This parameter, circled below, can help you identify each section of the graph.

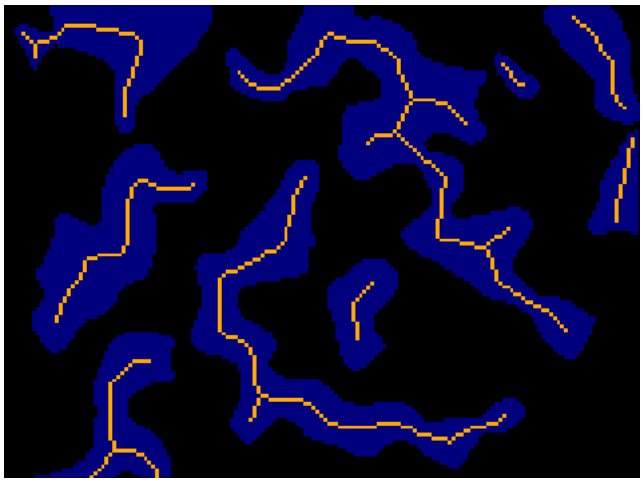


Graph settings

11.6 Skeletonize ROI 2D

A 2D implementation of skeletonization, which reduces regions to a skeletal remnant that preserves the extent and connectivity of the original region, is available in this software release for feature extraction, representing an object's topology, or for other functions.

Right-click the required region of interest and then choose **Skeletonize ROI 2D** in the pop-up menu to apply skeletonization on a slice-by-slice basis computed in the *Z*-axis.



Input region of interest (blue) and ROI skeletonized in 2D (orange)

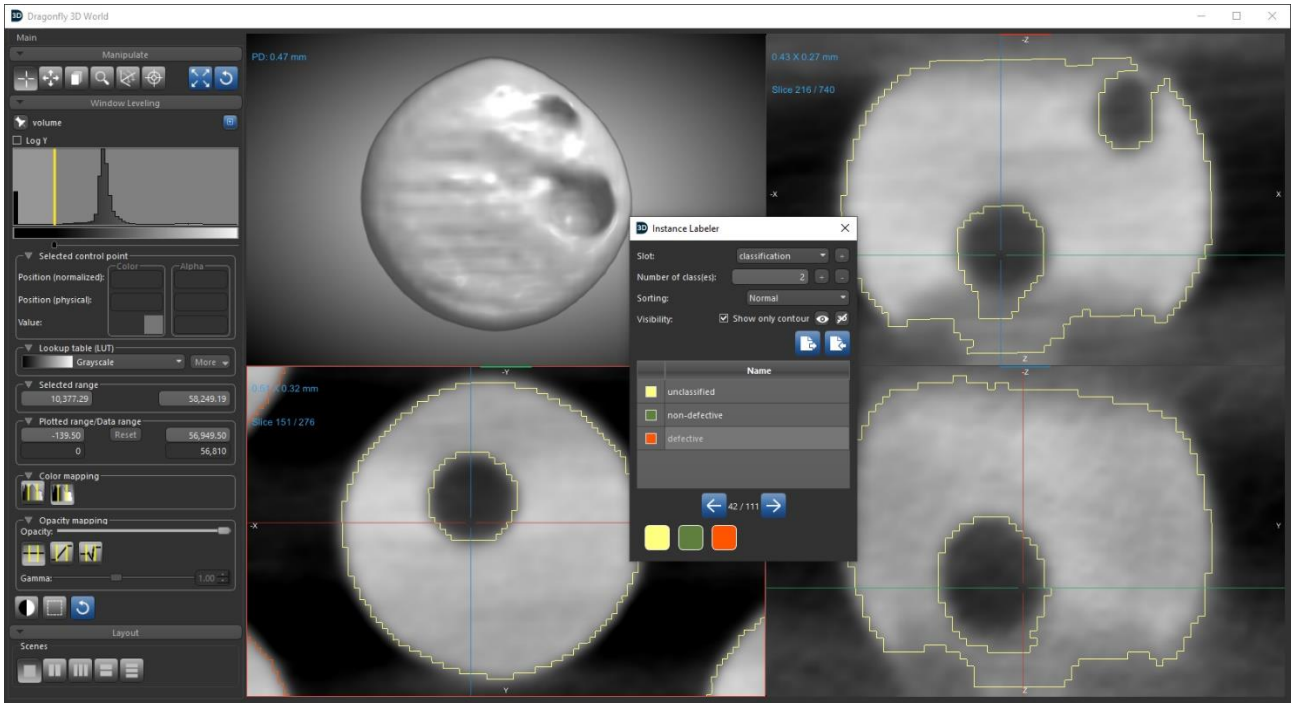
12 Multi-ROIs

A number of new features — an Instance Labeler, conversion of color images to multi-ROIs, width measurements, and other updates — are available for multi-ROIs in version 2025.1.

12.1 Instance Labeler

This new utility for labeling the objects in multi-ROIs lets you define new scalar value slots and then assign labels to instances within that slot. For example, you could create a new slot called '*classification*' and then assign classes such as '*defective*' and '*non-defective*' to instances of the distinct objects.

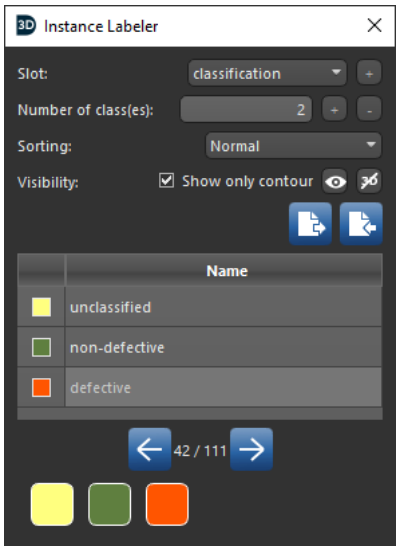
Select the required input image and output multi-ROI, right-click, and then choose **Open Instance Labeler** to open the Instance Labeler context, as shown below.



Instance Labeler contextual window and Instance Labeler panel

The Instance Labeler can be used to prepare training sets for classification models (see Deep Model(s) for Image Classification).

The Instance Labeler panel is shown below.

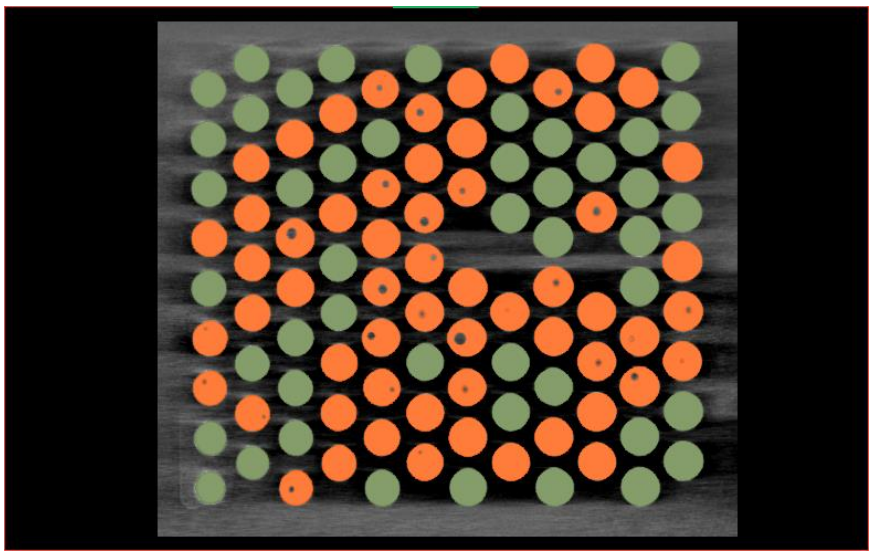


Instance Labeler panel

Item	Description
Slot	Lets you choose a scalar values slot for labeling instances. You can also create a new slot, if required.
Number of class(es)	Lets you set the number of classes that can be applied to instances. For example, you would select 2 classes if you plan to train a classification model to identify instances as ‘defective’ or ‘non-defective’.
Sorting	Lets you choose the sorting method — Normal, Random, Spatial X, or Spatial Y — that will be applied when you advance through the instances within the multi-ROI.
Visibility	Determines how the multi-ROI will be shown in the workspace. **Show only contour…** If checked, only the contours of each instance in the multi-ROI will appear in the 2D views. **Eye icon…** Lets you toggle the visibility of the multi-ROI in all views. **3D…** Lets you toggle the visibility of the multi-ROI in the 3D view.
Import/Export	Lets you export and import the selected labeling settings selected for the Instance Labeler in the Pickle (*.pkl extension) file format. Pickle is a Python-specific binary file format.
Previous/Next	Automatically selects and fits each instance in the views. You can simply label the selected instance by clicking color swatches at the bottom of the panel. **Previous…** Click the **Previous** button to select and fit the previous instance in the views, as determined by the selected sorting method. **Next…** Click the **Next** button to select and fit the next instance in the views, as determined by the selected sorting method.
Color swatches	You can click any of the color swatches to label the selected instance.

Instance Labeler settings and options

Whenever all required instances are labeler, you can close the Instance Labeler and generate a multi-ROI from the labels. A generated multi-ROI from a labeling workflow is shown below.

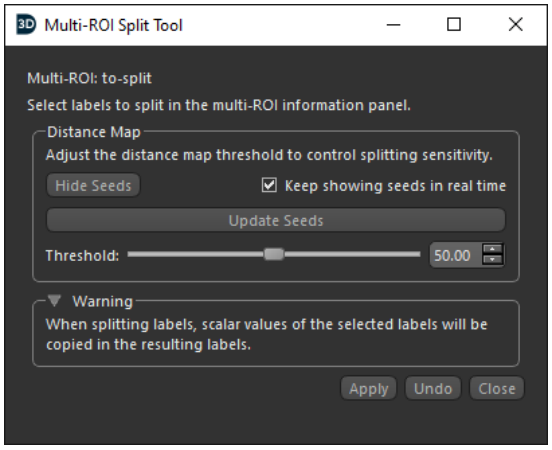


Multi-ROI with labels for ‘defective’ (red) and ‘non-defective (green)

12.2 Split Tool

Previous versions of Dragonfly 3D World ZEISS edition included a split tool in the Object Analysis dialog to split clustered objects. This functionality is now available in a dedicated Multi-ROI Split Tool dialog.

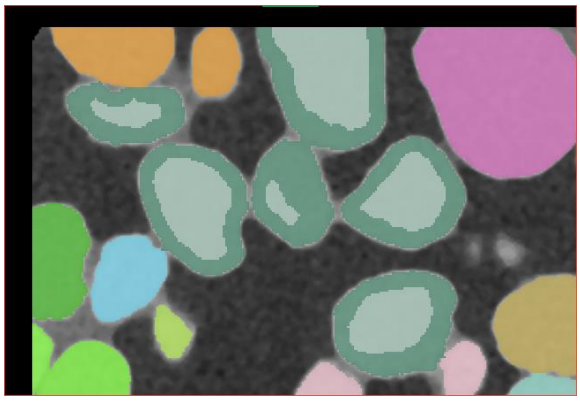
Right-click a clustered object in the Classes and scalar information box and then choose **Launch Split Tool** in the pop-up menu to open the Multi-ROI Split Tool dialog, shown below.



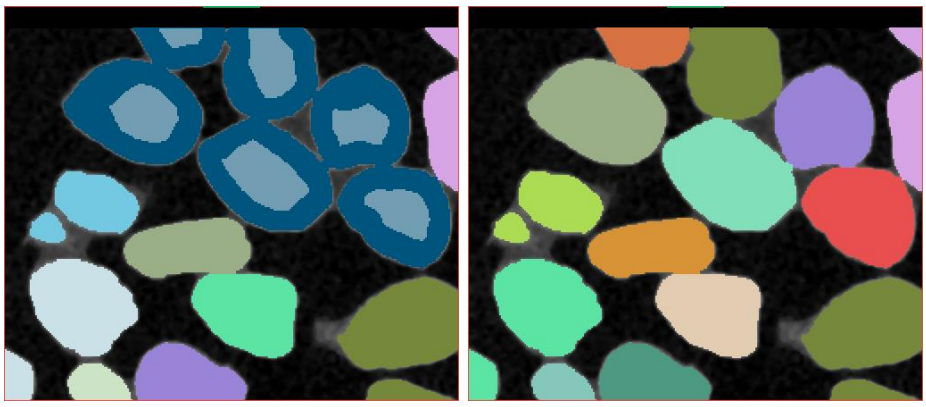
Multi-ROI Split Tool dialog

NOTE The Multi-ROI Split tool is only available for the ZEISS edition of Dragonfly 3D World. Contact sales.dragonfly@comet.tech for information about the availability of this version of Dragonfly.

The following controls and settings are available in the dialog.

Setting	Description
Show Seeds	Click the **Show Seeds** button to compute the distance map that will be used to enable the segmentation of clustered objects. The proposed split with the selected threshold will appear as an overlay, as shown below.  **Keep showing seeds in real time…** If checked, seeds will be shown automatically whenever you select another clustered object, either when you select it with the Pick tool or in the Classes and scalar information box. **Update Seeds…** Lets you update the visibility of seeds whenever another clustered object is selected and the option '*Keep showing seeds in real time*' is not checked.
Threshold	Lets you adjust the threshold of the distance map that is used to separate clustered objects.
Apply	Applies the split operation to the selected clustered object. The separated objects will appear in the Classes and scalar information box.
Undo	Undoes the last applied operation.
Close	Closes the Multi-ROI Split Tool dialog.

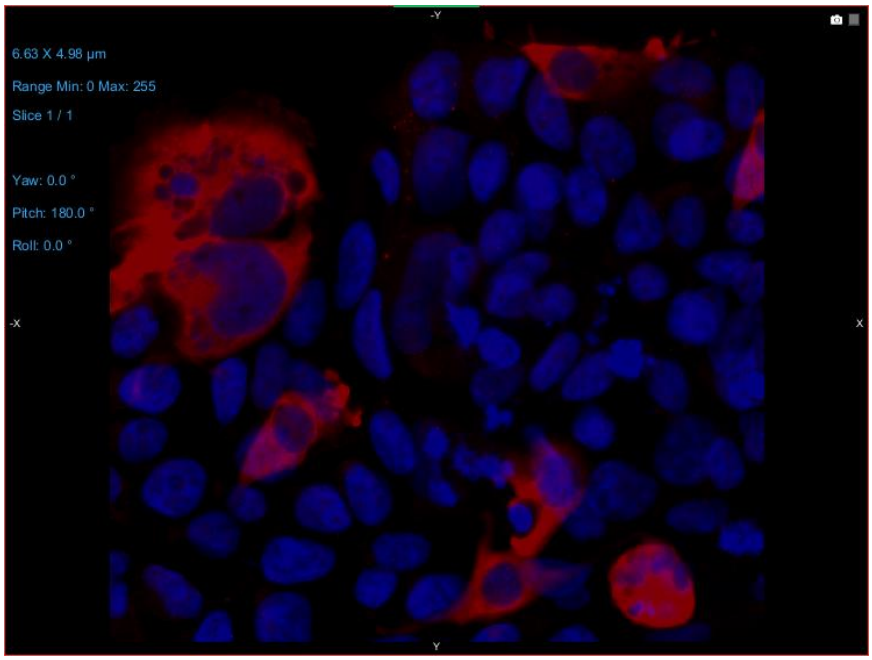
Screenshots of a multi-ROI with clustered objects and after the objects were split are shown below.



Original multi-ROI (on left) and multi-ROI after clustered objects were split (on right)

12.3 Create Colored Multi-ROI From RGB Channels

You can convert the red-green-blue channels of imported color images to multi-ROIs in which each voxel is assigned a unique color that matches the color image. As shown below, the red, green, and blue channels of an RGB image were converted to a new multi-ROI with a color palette that mimics the colors in the original image.



Colored multi-ROI from RGB image channels of a color image of HEK293 cells

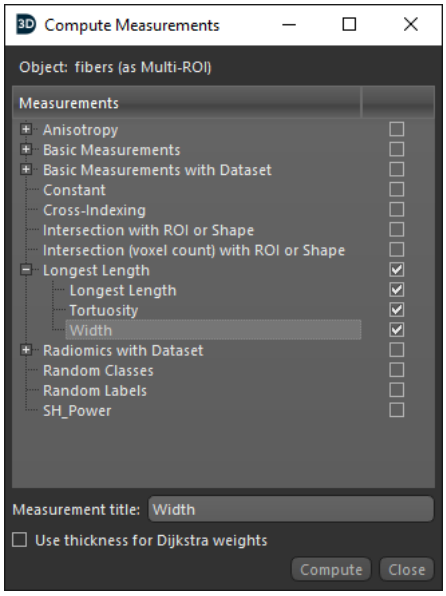
Do the following to create a colored multi-ROI from RGB image channels:

- Load the selected color image as three separate channels.
- Select the loaded image channels, right-click, and then choose **Create Colored Multi-ROI From RGB Datasets** in the pop-up menu.
- Choose the red, green, and blue channels in the Choose RGB Datasets dialog.

12.4 Longest Length Measurements

Width, which represents the maximum thickness or diameter of a structure at its thickest point, is now available for longest length computations. This measurement is particularly useful for analyzing pores, fibers, or any tubular structures for which you need to know the largest cross-sectional dimension.

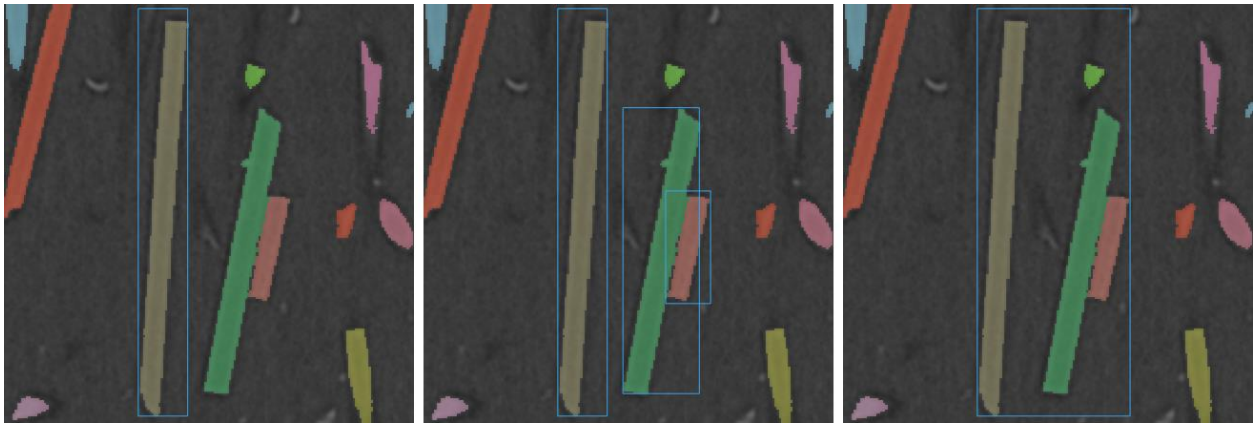
Right-click a multi-ROI and then choose **Measurements and Scalar Values > Compute Measurements** to open the Compute Measurements dialog. As shown on the following screenshot, you can expand the Longest Length category to view available measurements for longest length.



Longest length measurements

12.5 Create Boxes From Classes

You can now create single and multiple boxes for the selected classes of a multi-ROI.



Single bounding box created for a selected class (left), multiple boxes created for selected classes (middle), single box created for multiple classes (right)

The options for creating boxes from a selected multi-ROI class or classes are available in the Classes and Scalar Information pop-up menu, as described below.

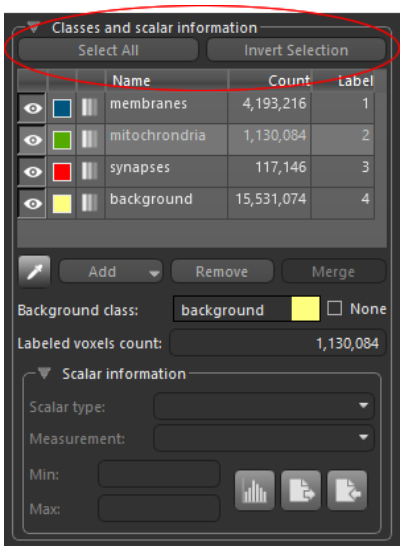
Create Bounding Box of Class… Automatically creates a box that encloses the labeled voxels of the selected class. Available when a single class is selected.

Create Individual Boxes From Classes… Automatically creates a series of boxes that enclose the labeled voxels of each selected class. Available when multiple classes are selected.

Create Bounding Box for all Classes… Automatically creates a box that encloses the labeled voxels of all selected classes. Available when multiple classes are selected.

12.6 Class Selection Options

Two new buttons — **Select All** and **Invert Selection** — are now available in the Classes and scalar information' box for selecting all classes in the list or for inverting the current selection, respectively.



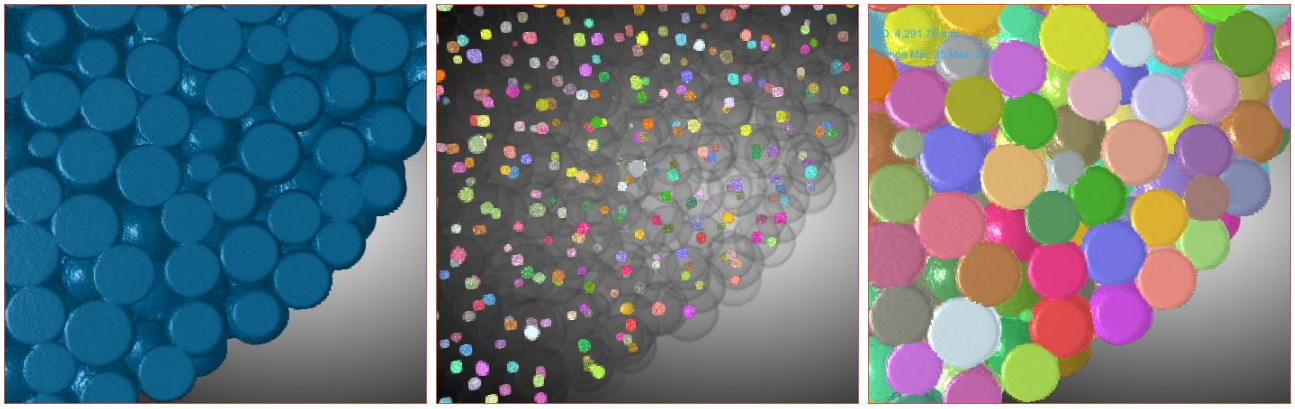
Classes and scalar information box

13 Regions of Interest

New features and settings for regions of interest are described in this topic.

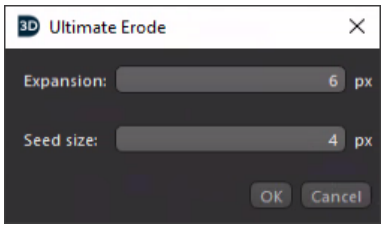
13.1 Create Seeds for Watersheds (Ultimate Erode)

One of the challenges of computing watersheds is creating the seeds to initialize the operation. To help overcome this challenge, this software release includes the option to create seeds from an ultimate erode. Ultimate erodes automatically find the centers of mass of objects within a region of interest that would be separated by segmentation and create seed multi-ROIs as a result. The seeds, as shown below, can be used as an input for watershed segmentations.



Original region of interest (left), computed seeds for watershed (center), and the regions expanded with a watershed transform (right)

Right-click a region of interest and then choose **Create Seeds for Watersheds (Ultimate Erode)** in the pop-up menu to open the Ultimate Erode dialog, shown below. You can set the extent of seed expansion, as well as the size of the resulting seeds, in the Ultimate Erode dialog.

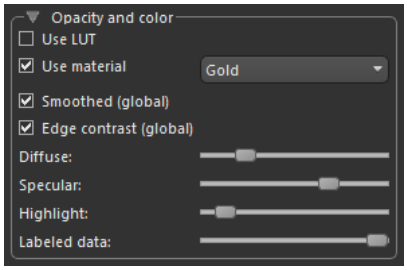


Ultimate Erode dialog

NOTE In most cases, watershed segmentations work best for smooth convex objects that do not overlap extensively.

13.2 Opacity and Color Settings

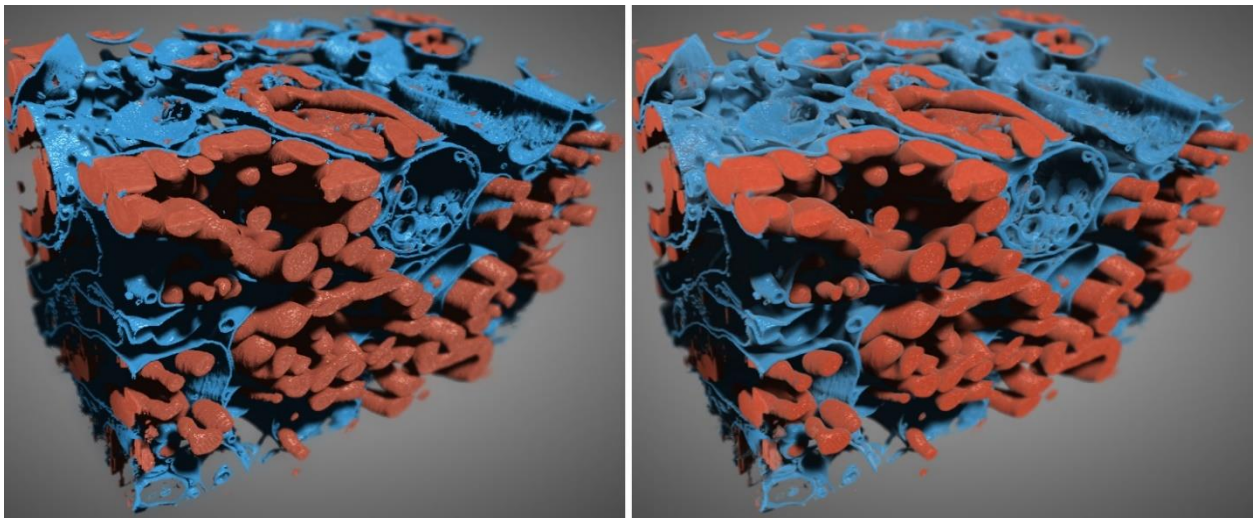
Updates are available in this software release for applying smoothing and edge contrast to adjust the visualization of regions of interests. These options are available in the *Opacity and color* box on the Data Properties and Settings panel.



Opacity and color settings for regions of interest

13.2.1 Smoothing

Implemented improvements for smoothing regions of interest result in cleaner visualizations in which staircasing effects are minimized, as shown below. Selecting the '**Smoothed (global)**' setting in the Opacity and color box applies Gaussian filtering to the alpha channel of the ROIs to improve visualizations.

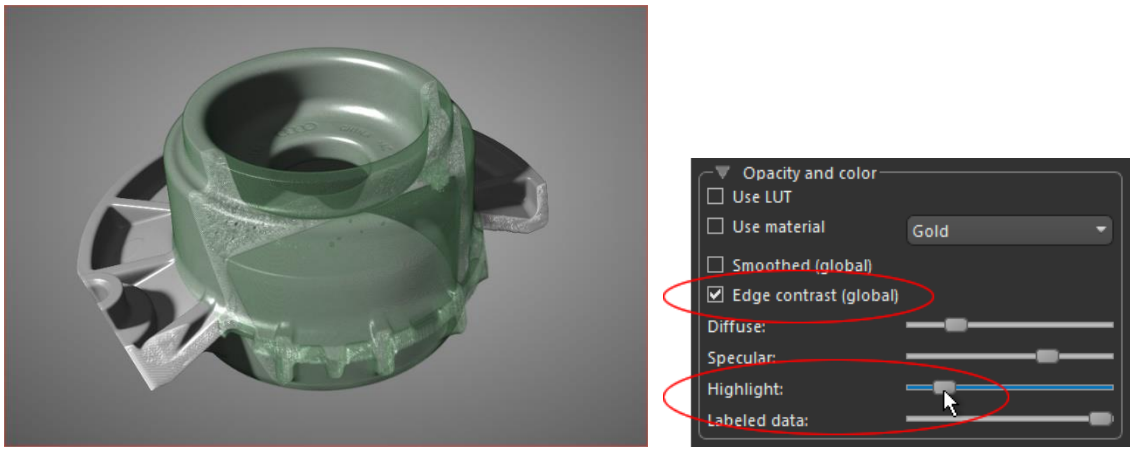


Before (left) and after smoothing applied to a region of interest (right)

13.2.2 Edge Contrast

In some cases, you may want to produce images in which edges of a region of interest are emphasized and other features are semi-transparent. As shown below, the '**Edge contrast (global)**' setting now offers better modulation and control for fine-tuning visualizations that include regions of interest.

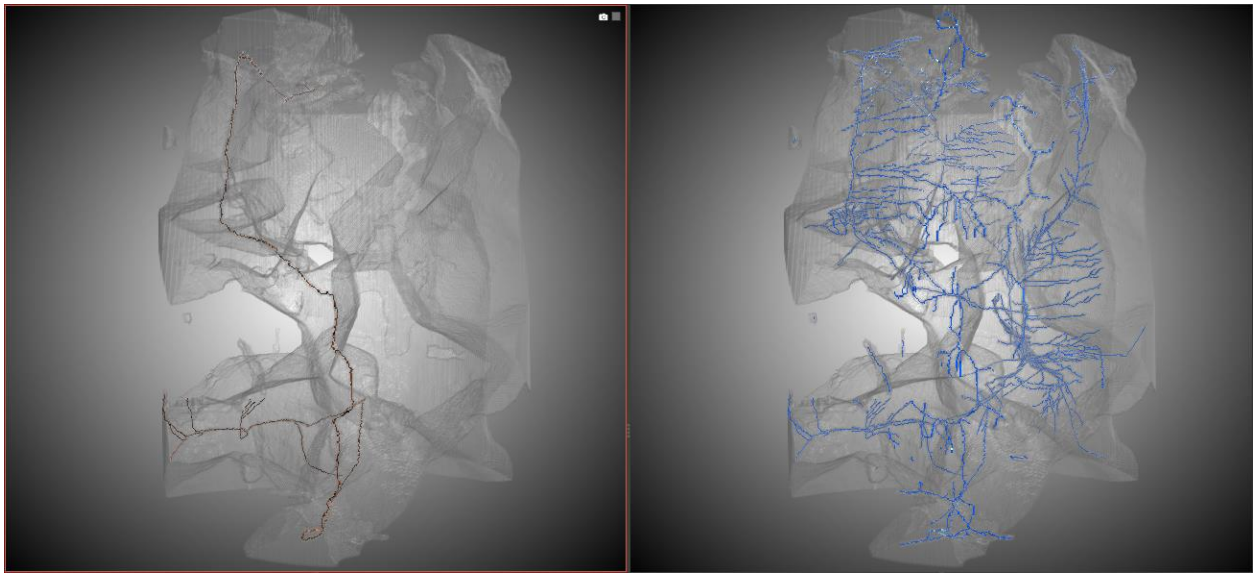
You can adjust the degree of edge contrast with the Highlight slider, as shown on the following screenshot.



Edge contrast applied to a region of interest (with green highlight)

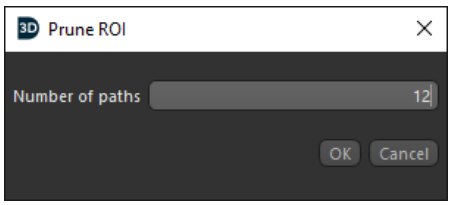
13.3 Skeletonize and Prune ROI

A new item for 3D modeling — **Skeletonize and Prune ROI** — lets you extract a selected number of paths that will be included in a graph generated from a skeletonized region of interest. You should note that skeletonization includes repeatably removes pixels from the edges of regions of interest until they are reduced to single pixel wide skeletons that retain the original shape of the ROI.



Skeletonized ROI with 12 paths (left) and fully skeletonized ROI (right)

Right-click the required region of interest and then choose **Skeletonize and Prune ROI** in the pop-up menu. You can then choose the number of paths that will be retained in the Prune ROI dialog, shown below.

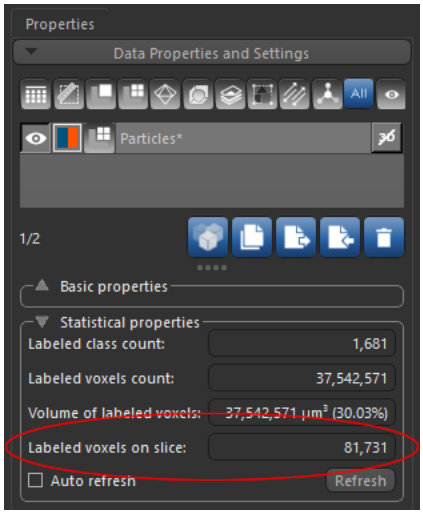


Prune ROI dialog

You should note that the algorithm measures the distance from all end nodes and then selects the longest path to prune. The number of branches of that path that will be included is determined by the number of paths entered in the Prune ROI dialog.

14 Statistical Properties for ROIs and Multi-ROIs

A new statistical property, called '*Labeled voxels on slice*', is available in the Statistical properties box for ROIs and multi-ROIs. This new parameter indicates the total number of labeled voxels on the current slice in the selected 2D view.



Statistical properties for a multi-ROI

The labeled voxels on slice count will be updated automatically each time that the slice is changed, the view is modified, or if another 2D view is selected. You can also click the **Refresh** button or update the count if you modify the current labeling.

15 Analyze and Classify Measurements

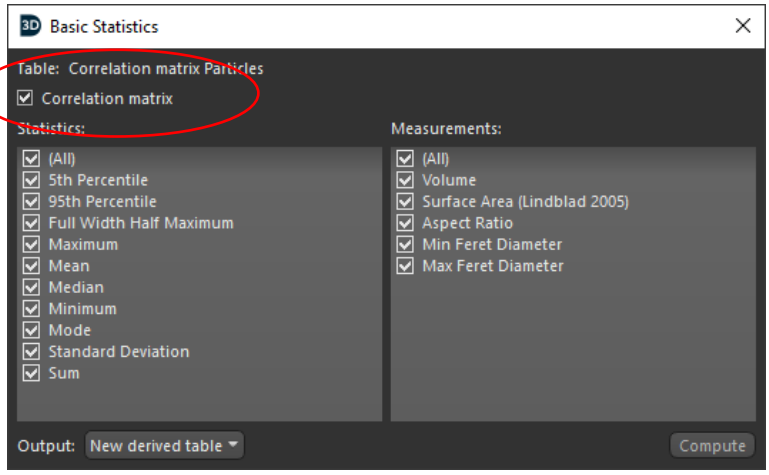
Correlation matrices, opacity controls, a Pick tool, and other additions are available for analyzing and classifying measurements in the Dragonfly 3D World version 2025.1 release.

IMPORTANT Please note that the Object Analysis plugin is no longer available for Dragonfly 3D World as of version 2025.1. You should find all of the same features in the Analyze and Classify Measurements dialog, as well as a number of additional functions. For ZEISS edition users, the split functionality is now available in a dedicated plugin (see Split Tool).

15.1 Compute Correlation Matrix

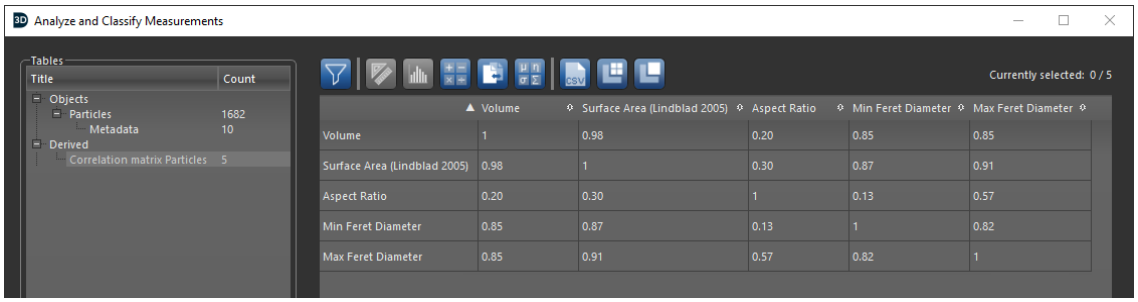
This software release provides the opportunity to compute correlation coefficients between pairs of measurements in the Analyze and Classify Measurements table. These coefficients quantify the strength and direction of the linear relationship between two variables, ranging from -1 (a perfect negative correlation) to +1 (a perfect positive correlation), with 0 indicating no correlation.

Select the required table in the Analyze and Classify Measurements dialog and then click the **Statistics** button. Check the '**Correlation matrix**' option in the Basic Statistics dialog, as shown below, to compute the correlation coefficients for the selected measurements.



Basic Statistics dialog

As shown below, each cell in the derived table of the correlation matrix contains the correlation coefficient of all pairs of values.



Correlation matrix

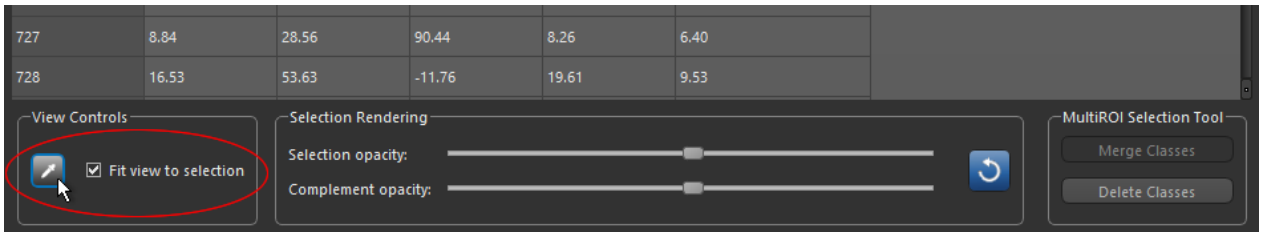
The calculated Pearson correlation coefficients measure the strength and direction of the linear relationship between two variables, X and Y by normalizing the covariance by the product of their standard deviations as follows: `correlation(X, Y) = covariance(X, Y) / (std(X) * std(Y))`

Covariance(X, Y)… Measures how much two variables, X and Y, vary together. A positive covariance indicates that as X increases, Y tends to increase, and vice versa. A negative covariance suggests that as X increases, Y tends to decrease, and vice versa.

std(X) and std(Y)… Represent the standard deviations of variables X and Y, respectively, which measure the spread or dispersion of data points around their respective means.

15.2 Pick Tool

The Pick tool added to the Analyze and Classify Measurements dialog, circled below, lets you make selections directly in views. You can pick the distinct objects of multi-ROIs in 2D and 3D views, or the faces and vertices of meshes and the edges and vertices of graphs in 3D views. The selected item will be highlighted and automatically scrolled to in the table. In addition, you can check the '*Fit view to selection*' item, in which case the selection will be centered and maximized automatically in the workspace views.



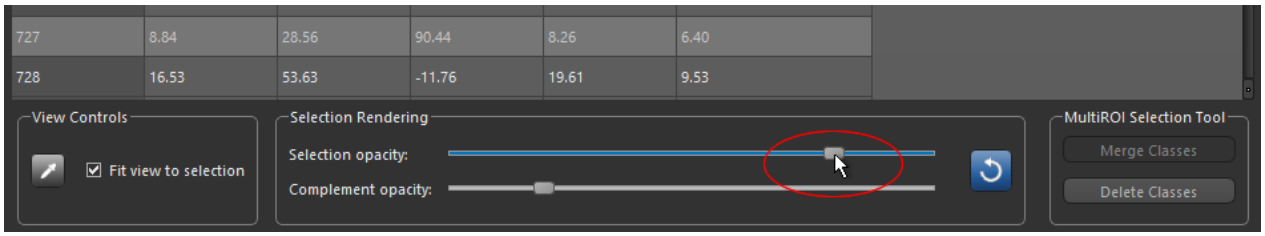
Pick tool in the Analyze and Classify Measurements dialog

The following configured actions are available for the Pick tool.

Action	Key	Mouse
Activate the Pick Tool	-	Left mouse

15.3 Opacity Controls for Multi-ROIs

The opacity controls for multi-ROIs, circled below, let you set the opacity of the selected and unselected (complement) objects in the current scene views.



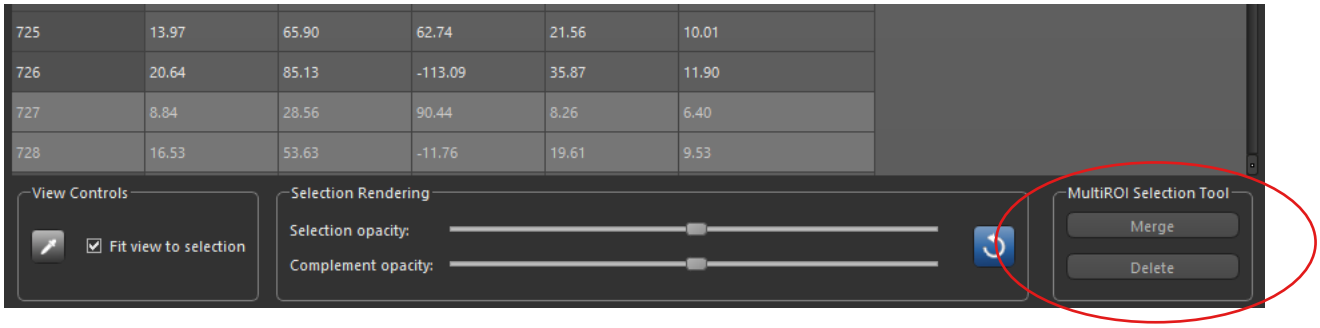
Opacity controls in the Analyze and Classify Measurements dialog

Selection opacity… This slider lets you set the opacity of all indexed objects that are selected — from not visible to fully opaque.

Complement opacity… This slider lets you set the opacity of all indexed objects that are not selected — from not visible to fully opaque.

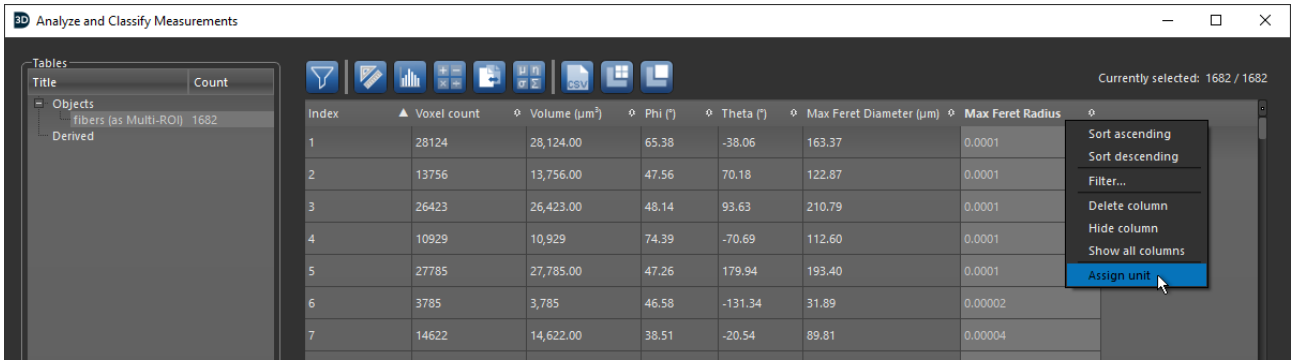
15.4 Multi-ROI Tools

A couple of new tools for modifying the objects in multi-ROIs are now available in the Analyze and Classify Measurements dialog. These new options — **Merge** and **Delete** — let you merge selected labels and delete selected labels respectively and are circled below.



15.5 Assign Unit

Sometimes you may need to assign a unit to specific values. For example, the results of arithmetic operations are always set to ‘generic continuous’, which means that no measurement units are assigned. However, you can assign a unit to computed or other values as shown in the screenshot below.

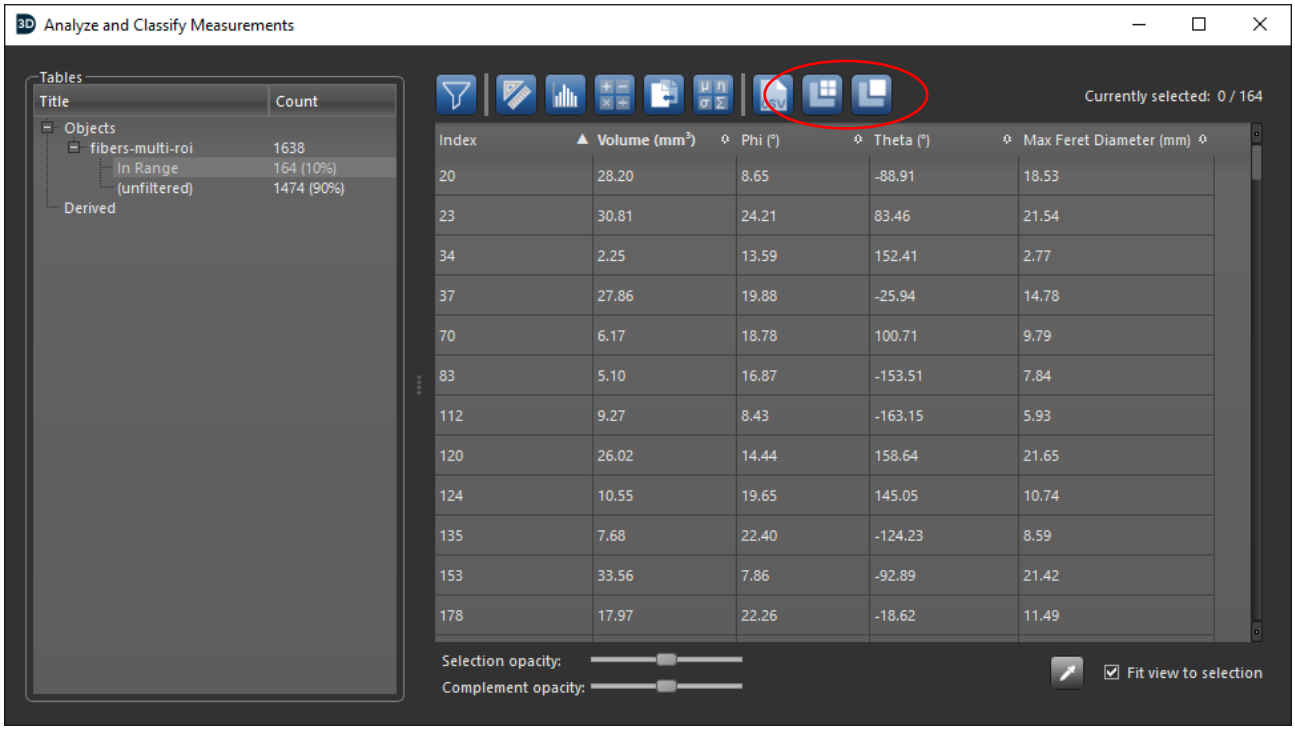


Analyze and Classify Measurements dialog

You should note that the default units of lengths, areas, and volumes is meters, meters^2, and meters^3 respectively, while the default unit of angles is radians. Whenever you assign a unit to scalar values, the default unit of the scalar values will be change, but the scalar values will not be changed. The value will only be updated to the units used to display the values. For example, if the stored scalar value is 0.0125 and you assign meters as the unit for the unit type ‘length’, then the values that appear will be 12.5 mm if the selected screen units are millimeters.

15.6 Export Table

Two new options are available in this software release to export the labeled objects and their associated scalar values to a region of interest or multi-ROI. These options are circled on the following screenshot and explained below.

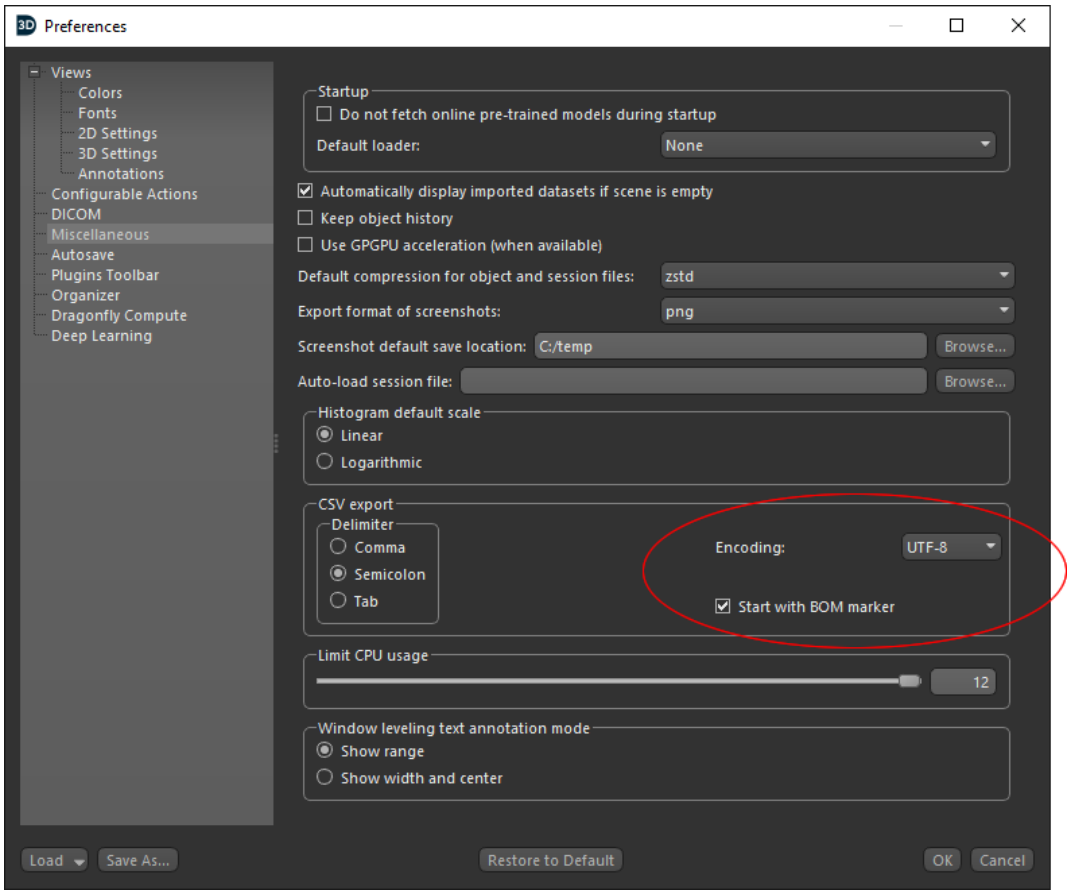


Create multi-ROI from table… Click the **Create Multi-ROI from Table** button to create a multi-ROI that only includes the labeled objects in the current table and their scalar values. In this case, the multi-ROI will have the same shape as the original object from which its scalar values were imported.

Create ROI from table… Click the **Create ROI from Table** button to create a region of interest that only includes the labeled voxels of all objects in the current table. In this case, the region of interest will have the same shape as the original objects from which its scalar values were imported.

16 CSV Export Preferences

This software release includes new settings for exporting data in the CSV file format. You can now choose a character encoding system, as well as the option to include a byte-order mark (BOM) in the exported file. These options are available in the Miscellaneous preferences, as shown below.



CSV export preferences

The following options are now available for exporting data in the CSV file format.

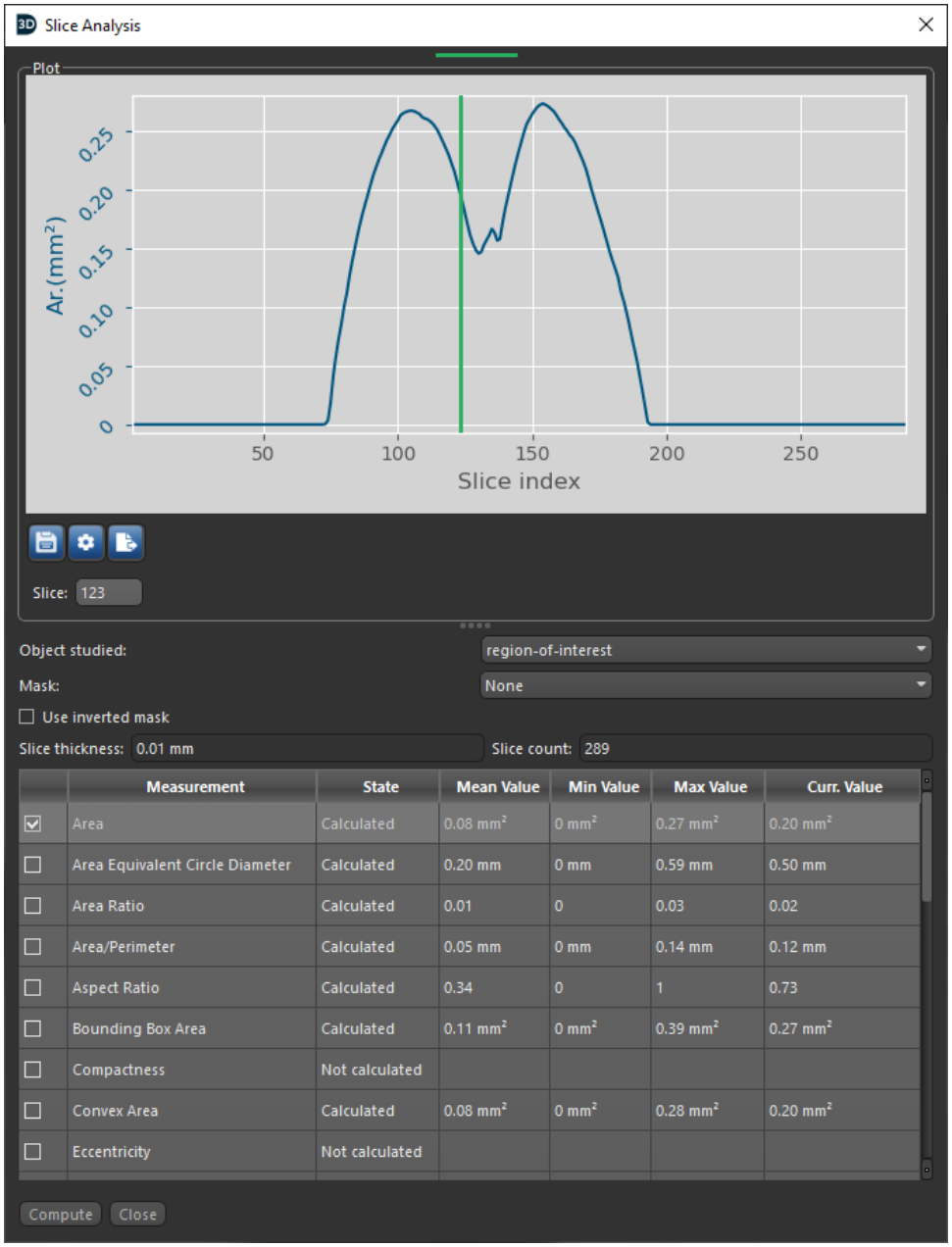
Setting	Description
Encoding	Lets you choose the character encoding system — UTF-8, UTF-16, UTF-16BE, UTF-16LE, UTF-32, UTF-32BE, UTF-LE, or ISO-8859-1 — in which the data will be exported. **NOTE** UTF-8 is the standard encoding for most text files.
Start with BOM marker	If checked, a byte-order mark (BOM) will be added at the beginning of the text content in the exported file. A BOM is a sequence of 2 to 4 bytes at the start of a text file that serves as a header to indicate the file's Unicode encoding. **NOTE** Although it is usually not required, some applications still use the BOM header to explicitly specify when files are encoded in UTF-8. **NOTE** Refer to the Wikipedia topic Byte-order mark for additional information about the definition and usages of byte-order marks.

CSV export options

17 Slice Analysis

You should note that all 2D measurements available for multi-ROIs in the Compute Measurements dialog are now also available in the Slice Analysis panel for regions of interest. This lets you track and measure the characteristics of an object or objects in any orientation and over a number of slices.

Right-click a 2D view and then choose **Start Slice Analysis** in the pop-up menu to open the Slice Analysis dialog, shown below. You can then choose the region of interest that you need to study, as well as the measurements that you need to compute, such as Area, Aspect Ratio, Feret Angle, Major Axis Length, and others.



Slice Analysis panel

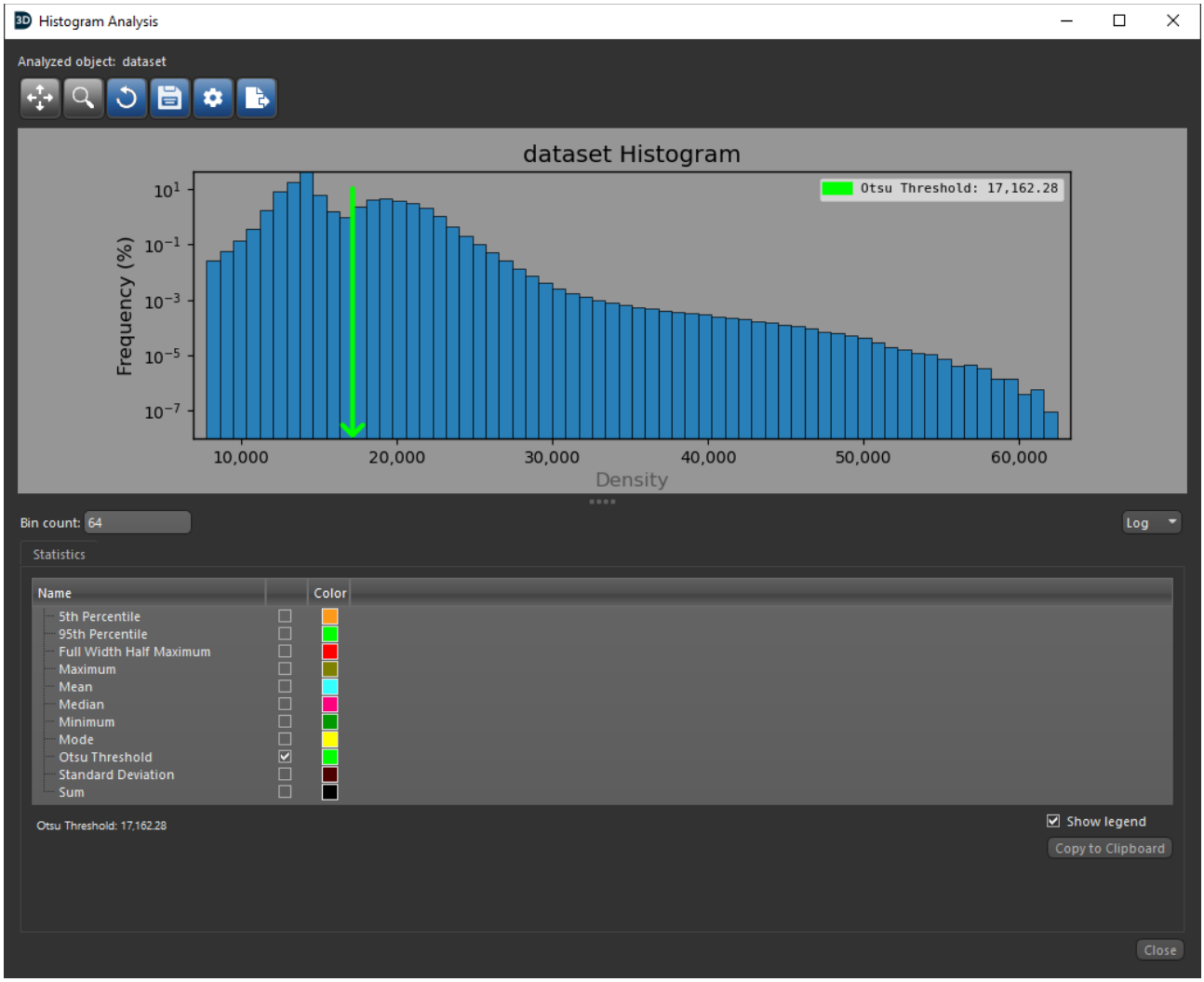
18 Histogram Analysis

This software release includes the addition of the Otsu threshold as a statistic that can be computed and a modification for creating classes.

18.1 Otsu Threshold

The Otsu threshold separates pixels into two classes — foreground and background — and is determined by minimizing intra-class intensity variance, or equivalently, by maximizing inter-class variance. Applicable applications include generating contour meshes, applying threshold segmentations in single-material samples, painting with the brush tools, and filtering.

For reference, this software release lets you compute the Otsu threshold value of your image data, as computed with the selected bin count. Open the Histogram Analysis dialog and then choose **Otsu Threshold** in the Statistics box to compute the value, as shown in the following screenshot.

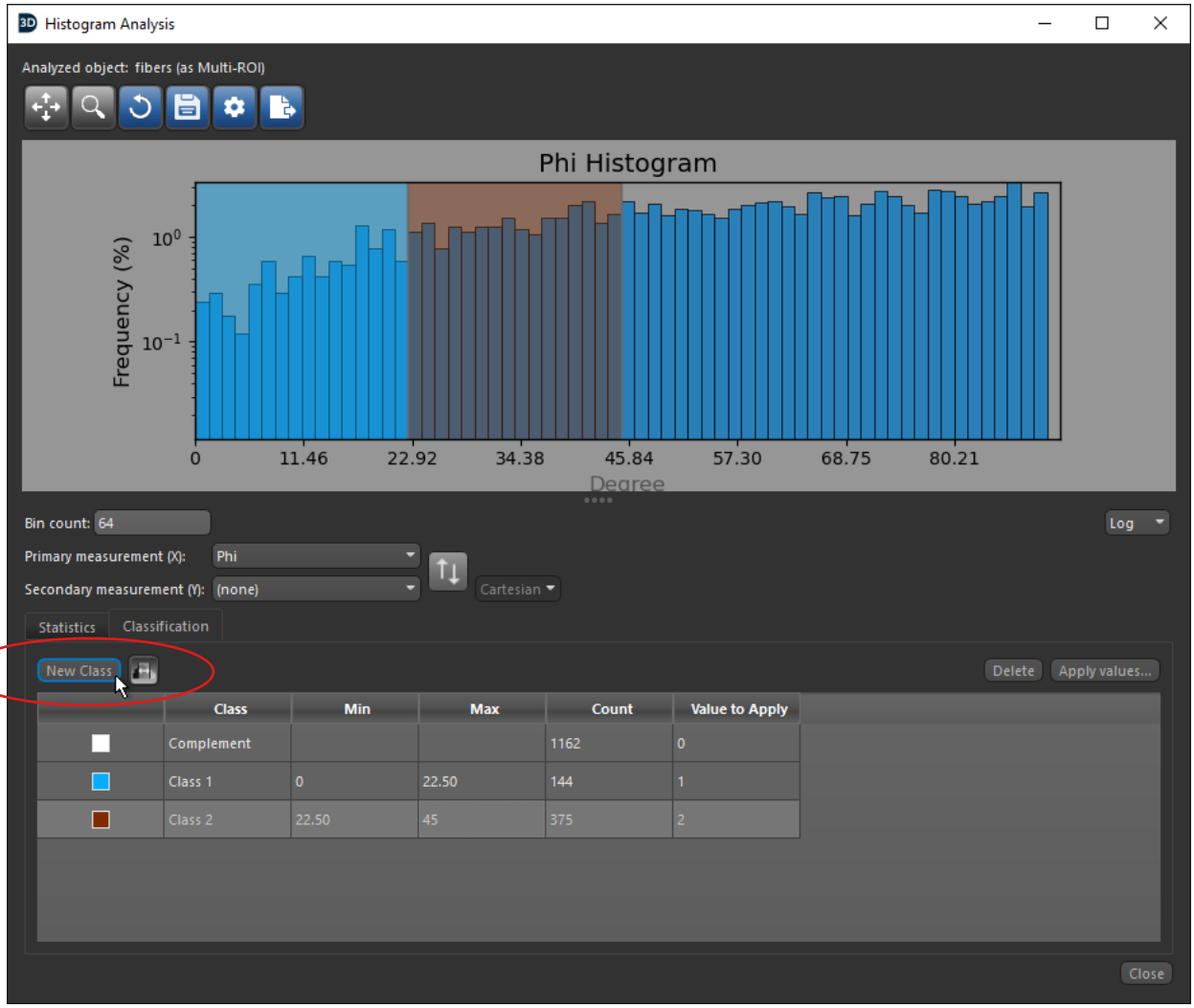


Histogram Analysis dialog

18.2 Class Creation

In previous versions of Dragonfly 3D World, you could create classes by sequentially drawing ranges on 1D histograms in the Histogram Analysis dialog. In this software release, the workflow for creating classes on 1D and 2D histograms has been standardized and now requires you to create a new class for drawing ranges on 1D histograms.

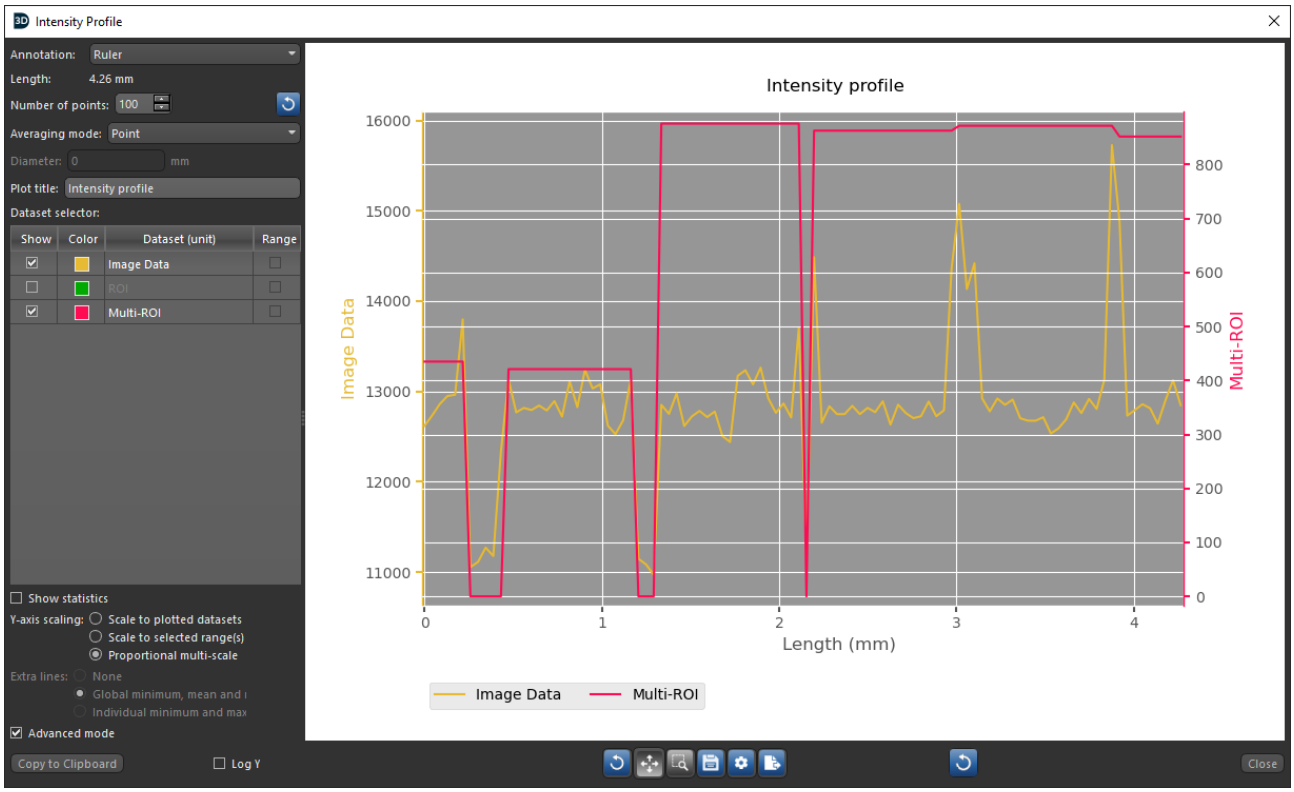
The option for adding classes when defining ranges on 1D histograms is circled in the following screenshot.



Histogram Analysis dialog

19 Intensity Profiles

As an update for version 2025.1, you can now plot the intensity profiles of regions of interest and multi-ROIs from rulers and paths. This can be used in cases in which you need to correlate the labeled voxels of a region of interest or multi-ROI with the intensity values of an image. As shown in the example below, the plotted profile shows the intensity values of a segmented image that correspond to the indexed labels of a multi-ROI.



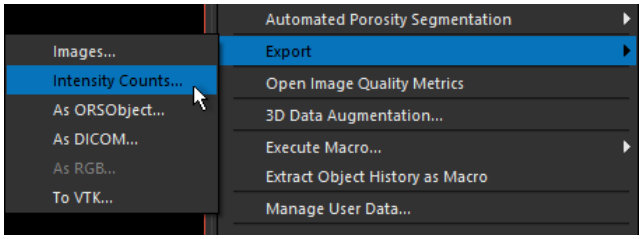
Intensity Profile dialog

NOTE In most cases, you should choose '**Proportional multi-scale**' for Y-axis scaling when plotting intensity profiles of image data along with regions of interest/multi-ROIs.

20 Exporting Intensity Counts

In this software release you can export the raw intensity counts of your image data in the comma-separated values (*.CSV extension) file format instead of exporting binned values from a histogram. This option is available for all data types, including float.

Right-click the required image data and then choose **Export > Intensity Counts** in the pop-up menu to export all intensity counts or to export all intensity counts within a mask.

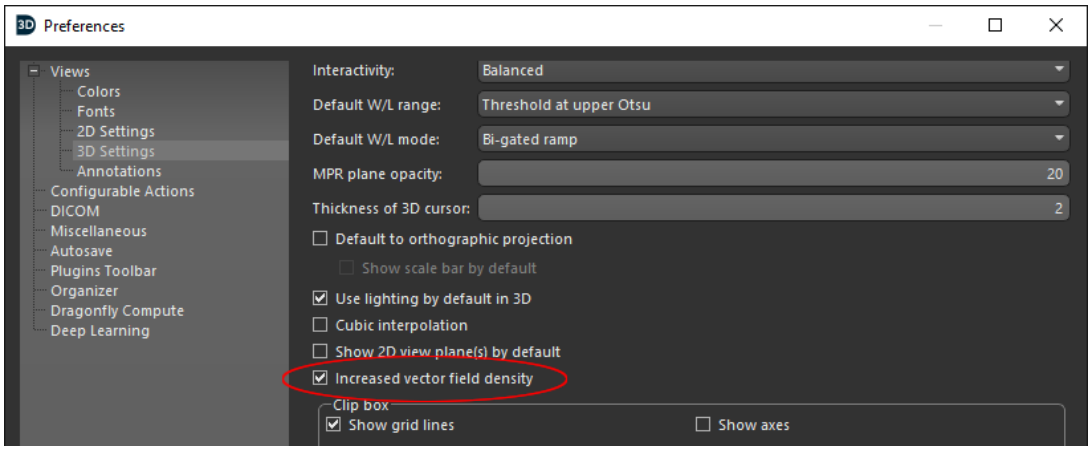


Export options

NOTE You can select a mask in the Choose an ROI as Mask dialog if you only want to export the intensity counts of voxels within a specific area.

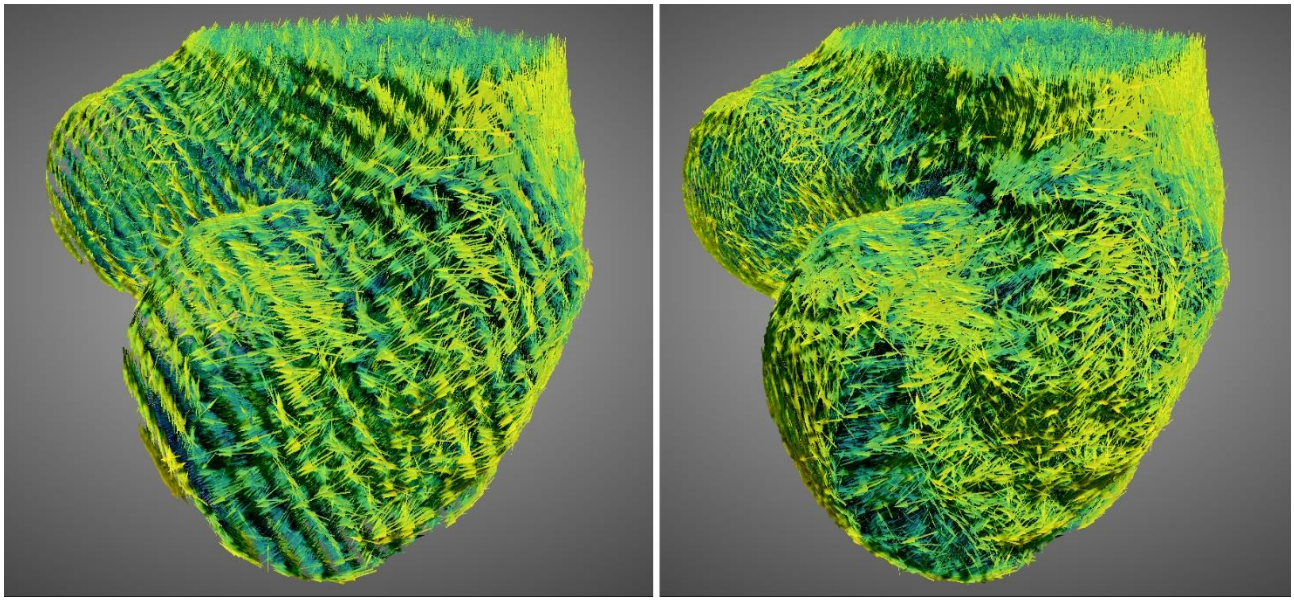
21 Vector Fields

A new 3D Settings preference is available for vector fields to maximize the density of vectors that are rendered in 3D views. The preference '**Increased vector field density**' is available in the Preferences dialog as shown and circled below.



Preferences dialog

The effect of applying the new preference compared to the previous implementation is shown in the following screenshots. You should notice that the distinct 'row' pattern is no longer evident in version 2025.1 whenever the vector field density is increased.



Vectors fields in previous version (left) and with increased density in version 2025.1 (right)

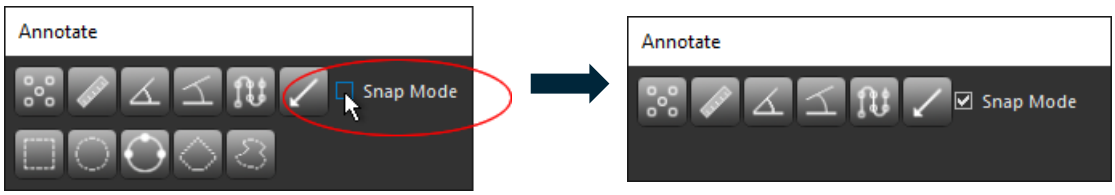
22 Annotations

A new snapping behaviour and other updates are available for annotations in this software release.

22.1 Use Snapping

This new option for the Points, Ruler, Angle, Path, and Arrow annotation tools lets you automatically snap control points to a mesh. This enables precise placement of control points that determine measurements with minimal effort.

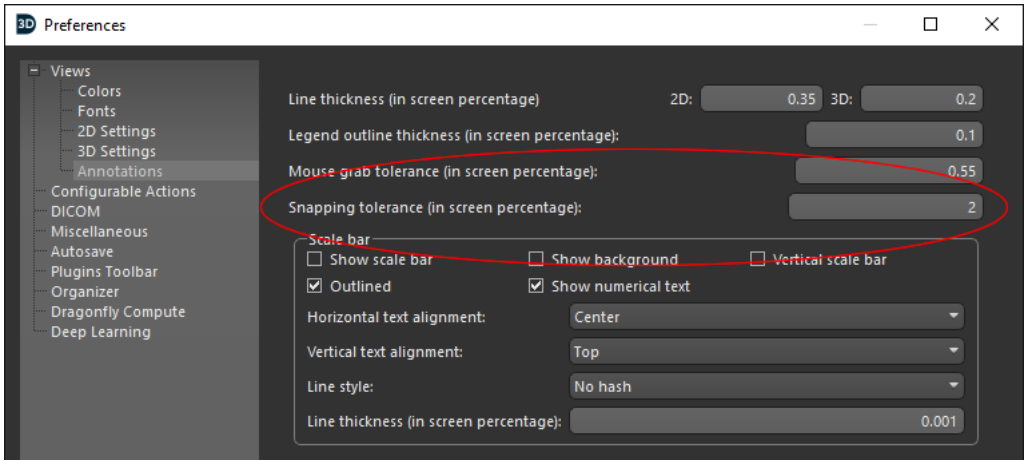
Check the **Snap Mode** option on the Annotate panel to enable snapping behaviour and to update the tools available for snapping.



Annotate panel

22.1.1 Snapping Preferences

You can customize the snapping behaviour for the Annotate tools in the Preferences dialog. The preference '*Snapping tolerance (in screen percentage)*' lets you set a tolerance for snapping.



Annotations preferences

22.2 Create Rulers Between Spheres

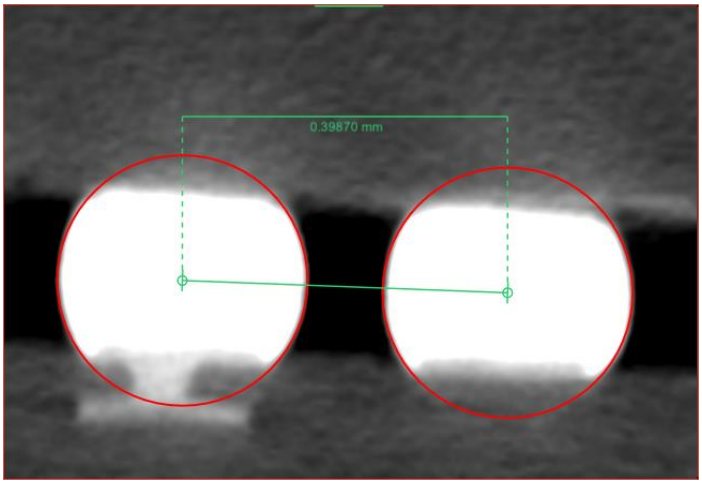
For users who need to measure the distance between the centers of two spherical objects, such as ruby ball bars or ball forests used for CT calibration, this software release provides the option to create rulers that automatically span from the center of one sphere to the center of another. Do the following to create a ruler between spheres:

- Create the required spheres.

  NOTE You can fit spheres to points that broadly define a spherical object.

- Select the two spheres in the Data Properties and Settings panel, right-click, and then choose **Create Ruler Between Spheres** in the pop-up menu.

  A ruler is create automatically that starts at the center of the first sphere and ends at the center of the second sphere, as shown below.



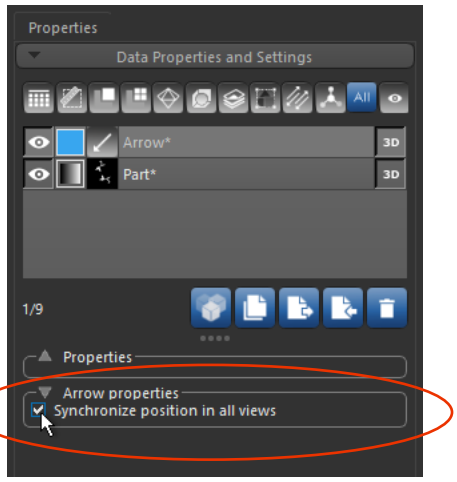
22.3 Arrows

This software release includes the option to synchronize the position of arrows in all 2D views in a scene. As shown in the following screenshot, moving the head of an arrow will update the other 2D views automatically to the new location of the arrow if the setting '**Synchronize position in all views**' is selected.



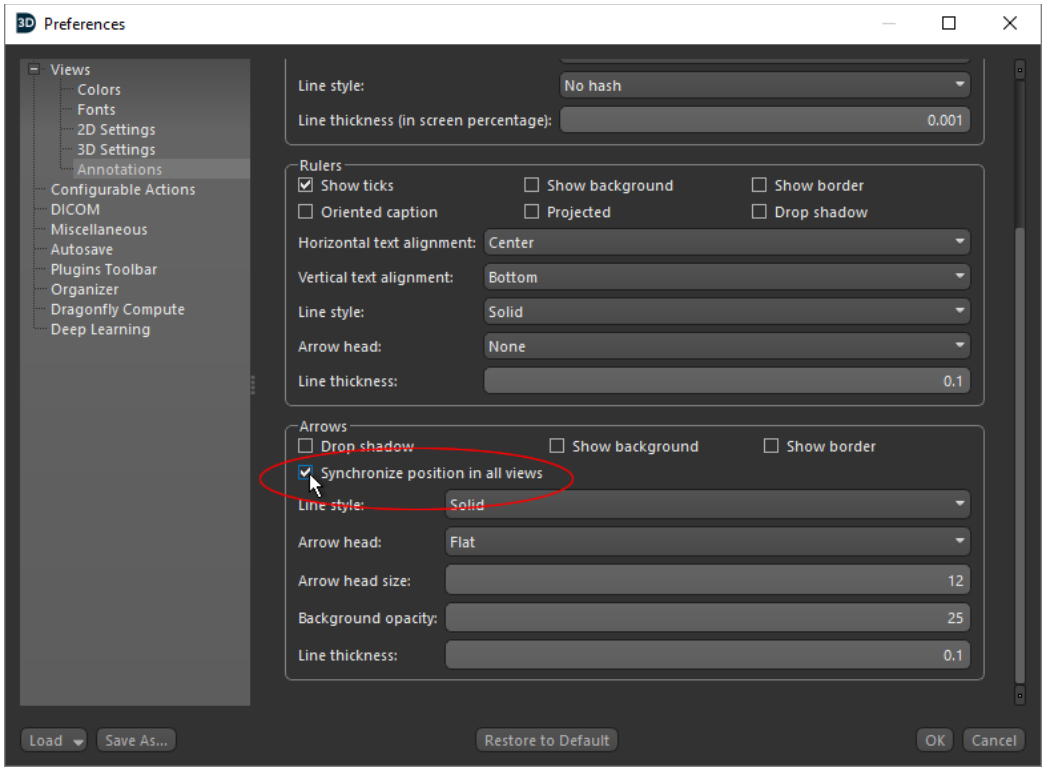
Arrow position synchronized in all views

This new setting, circled on the following screenshot, is available on the Data Properties and Settings panel.



Arrow properties

You can set synchronization in all views as the default setting in the Annotations preferences. This setting — Sync position in all views — is available in the Annotations preferences as shown below.



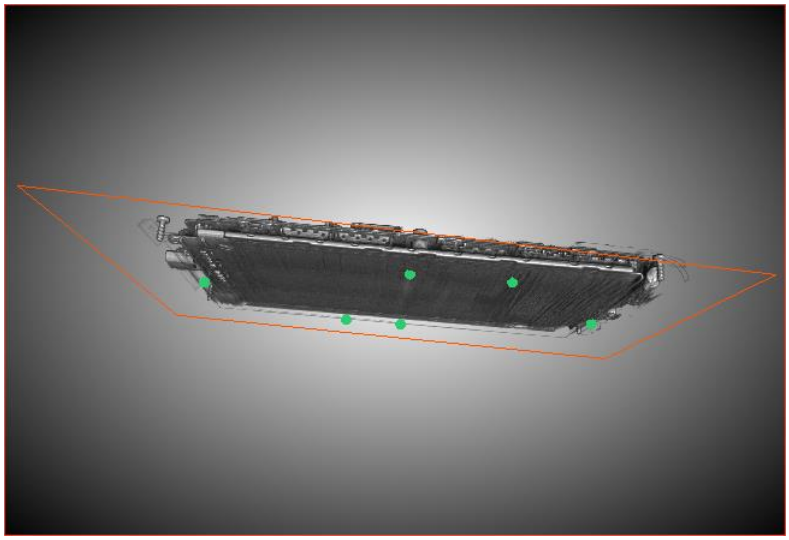
Annotations preferences

22.4 Points Series

Updates for Points series include creating planes from points, as well as applying floating captions.

22.4.1 Create Planes From Points

The option to create a plane from any points set that contains a minimum of three points is available in this software release. An example of a plane created from a series of points is shown below.

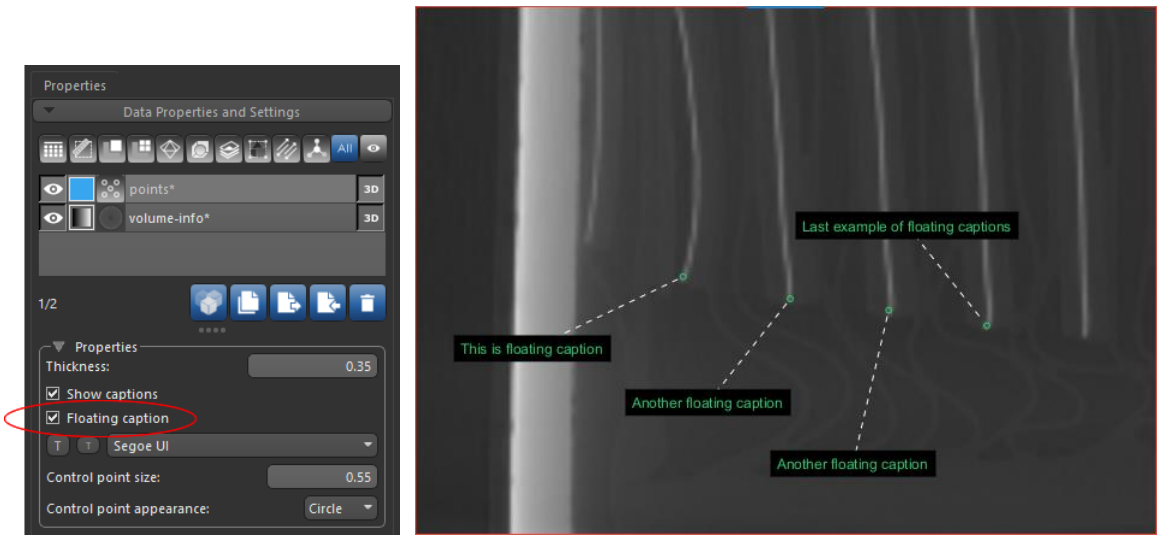


Right-click a points set and then choose '**Create a Plane from Points**' in the pop-up menu. The plane will be created from the '*best fit*' of the points in the series.

NOTE You will need to add a minimum of three points to the set to create a plane.

22.4.2 Floating Captions

You should note that floating captions are now available for points series. This option is available on the Data Properties and Settings panel, as shown below.



Floating caption option for points

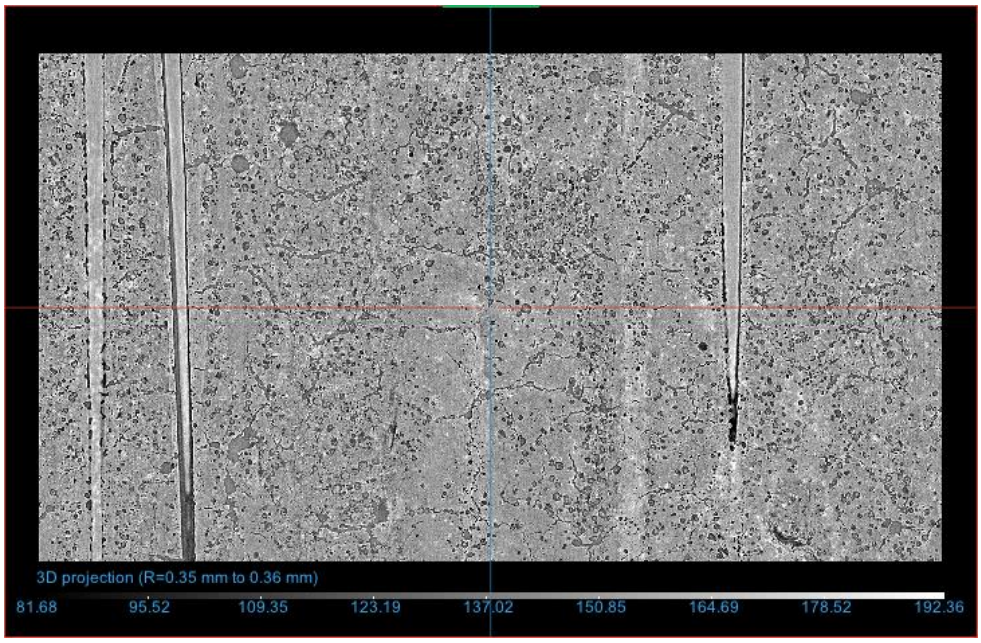
23 Shapes

Updates for shapes included in this software release include extracting 3D projections from cylinders and spheres, as well as attaching a plane to a dataset.

23.1 Extract 3D Projections from Cylinders and Spheres

This software release provides the option to extract 3D projections of datasets from cylinders and spheres. This lets you inspect surfaces or sub-surfaces within a lower and upper radii that are translated from a cylindrical or spherical coordinate system to a rectangular coordinate system. In previous versions, only 2D projections could be extracted to examine surfaces extracted from cylinders and spheres.

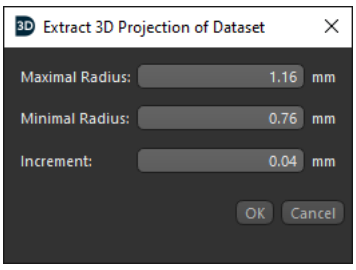
An example of a 3D projection extracted from a cylinder within a radius of 0.1 mm is shown below.



3D projection extracted from a cylinder

Do the following to extract a 3D projection from a cylinder or sphere:

- Right-click the required sphere or cylinder and then choose **Extract 3D Projection of Dataset** in the pop-up menu.
- Select a dataset in the Choose a Dataset to Unwrap dialog.
- Select the required settings for the maximal and minimal radii and the step size in the Extract 3D Projection of Dataset dialog, as shown below.

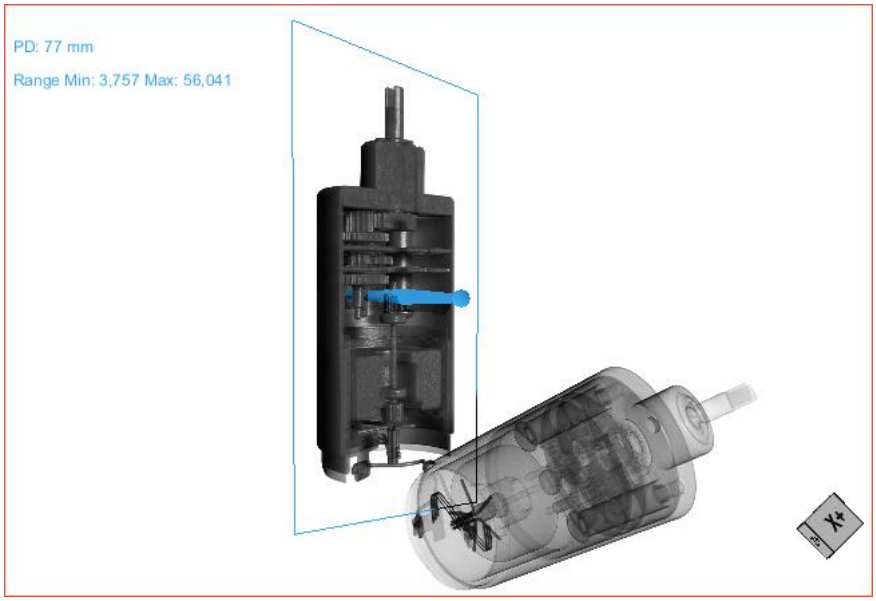


- Click **OK** to extract the 3D projection.

> **NOTE** You can perform segmentations on extracted projections and then re-wrap the projection into its original shape.

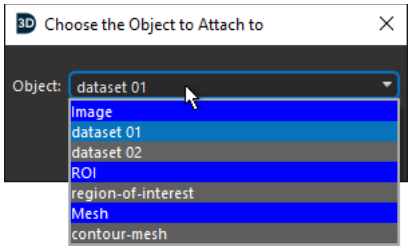
23.2 Attach Plane

Whenever you work with multiple objects, it can be difficult to manipulate planes. This software release provides the option to attach a visual plane to a selected object. In this case, the plane will be resized to the selected object, as shown below.



Visual plane attached to an object

Right-click the required plane and then choose **Attach Visual Plane To** in the pop-up menu. You can choose the object that want to attach the visual plane to in the 'Choose the Object to Attach To' dialog, as shown below.



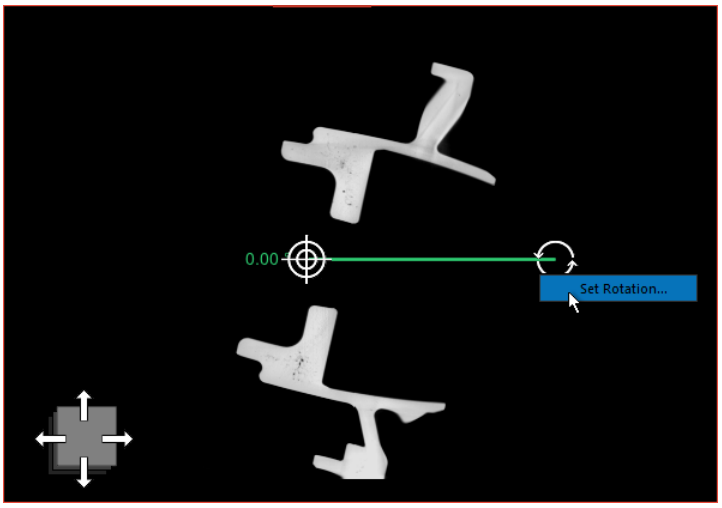
Choose the Object to Attach To dialog

24 Translate/Rotate Tools

For image registration and other purposes, this software release provides an update for the Translate/Rotate tools. You can now choose an angle of rotation that will be applied to rotate selected objects, as well as the step size that will be applied to translate selected objects.

Do the following to rotate selected objects by a set angle:

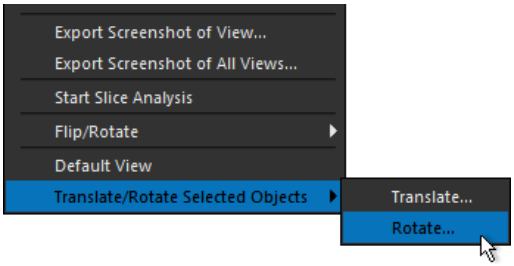
- Click the **Displace** tool on the Translate/Rotate panel and then right-click the Rotate tool handle. Choose '**Set Rotation**' in the pop-up menu, as shown below.



NOTE In this case, the rotation will be applied from the pivot point.

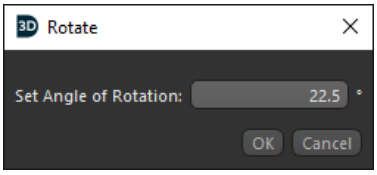
or

Right-click the required 2D view and then choose **Translate/Rotate Selected Objects > Rotate** in the pop-up menu, as shown below.



NOTE In this case, the rotation will be applied from the center of the view.

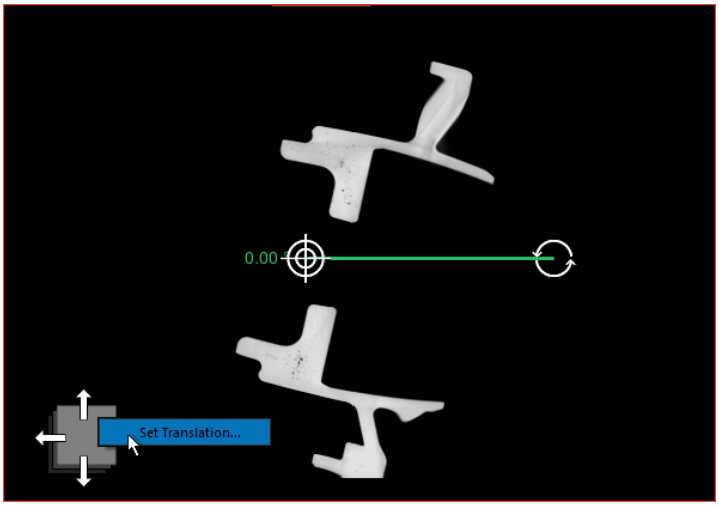
- Choose the required angle of rotation, which can be negative or positive, in the Rotate dialog.



- Click **OK** to rotate the selected object(s).

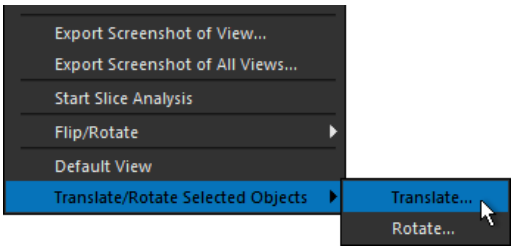
Do the following to translate selected objects by a set step:

- Click the **Displace** tool on the Translate/Rotate panel and then right-click the Rotate tool handle. Choose '**Set Translation**' in the pop-up menu, as shown below.

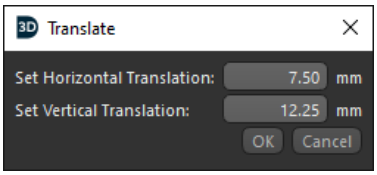


or

Right-click the required 2D view and then choose **Translate/Rotate Selected Objects > Translate** in the pop-up menu, as shown below.



- Choose the required horizontal and/or vertical translation steps, which can be negative or positive, in the Translate dialog.



- Click **OK** to translate the selected object(s) by the set amount(s).

25 Views

A number of updates for the workspace views are available in this software release.

25.1 View at 100%

A new setting for 2D views — **View at 100% (1:1 Pixel Ratio)** — is available in this software release to provide the most accurate view. In this mode, each image pixel will be displayed by one monitor pixel. At other zoom settings, image pixels may be interpolated to a different number of monitor pixels.

The 100% zoom setting is available in the 2D view drop-down menu. You can set any 2D view to 100% zoom in the Dragonfly 3D World workspace and in the Image Filtering context, as shown below.

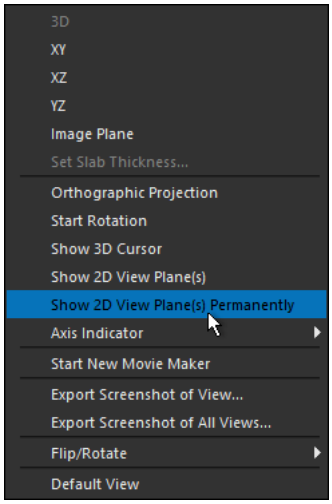


2D view set at 100% in Image Filtering (on right)

NOTE Viewing an image at 100% zoom without interpolation can be important for image processing because it lets you accurately analyze individual pixels and identify potential issues like noise, sharpness, pixelation, or artifacts. This can help ensure that you are making precise adjustments based on the actual pixel data without any smoothing effects.

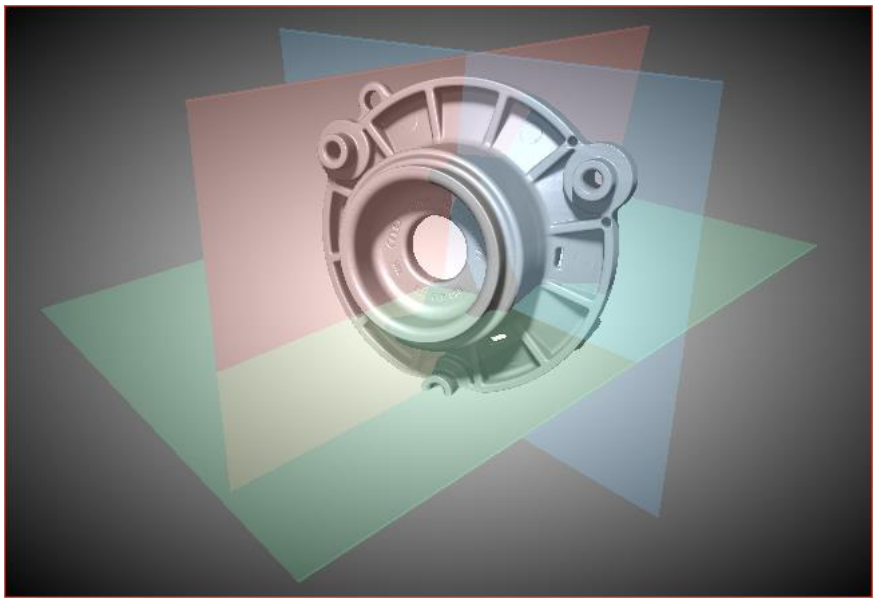
25.2 Show 2D View Planes Permanently

For inspection workflows or to simply examine your image data, you may want to show the 2D view planes permanently in 3D views. This option — **Show 2D View Plane(s) Permanently** — is available in the 3D view pop-up menu as shown below.



3D view pop-up menu

As shown below, the 2D view planes will remain visible in the 3D view after the 3D cursor is manipulated in any of the 2D views contained in the scene or if a 2D view is scrolled or rotated with the Yaw or Pitch text annotations.

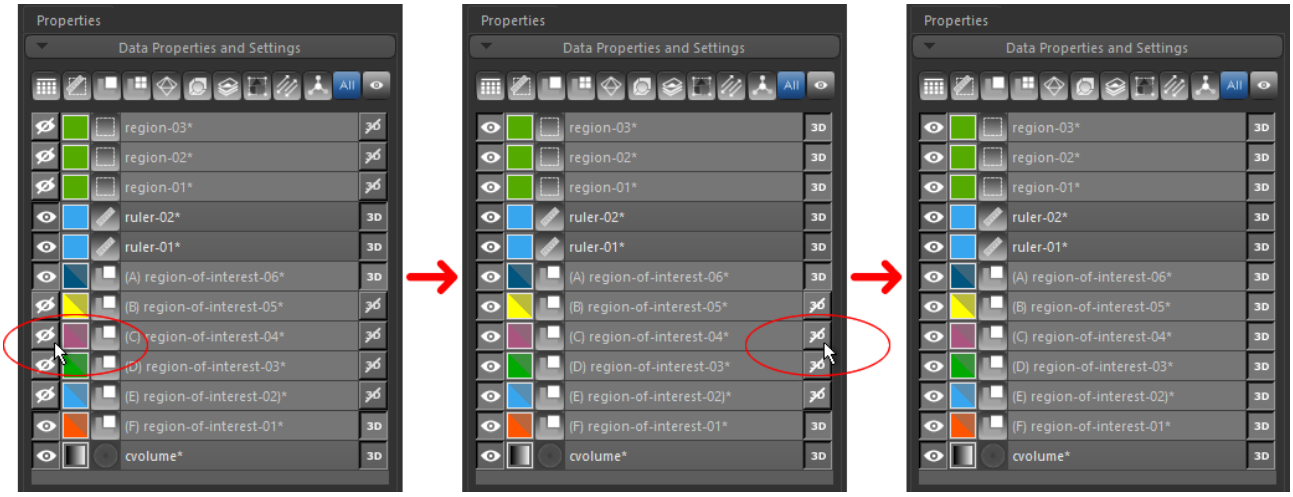


Planes shown permanently in a 3D view

25.3 Setting the Visibility of Multiple Objects

Whenever you work with a large number of objects, you may want to synchronize the visibility of selections so that objects are either visible or hidden.

As shown below, clicking the **Eye** icon for any object within a selected group on the Data Properties and Settings panel will synchronize the visibility of all objects in the group to the setting applied to the clicked object. In addition, clicking the **3D** icon will synchronize the visibility of all objects in the group in the 3D view to the setting applied to the clicked object.



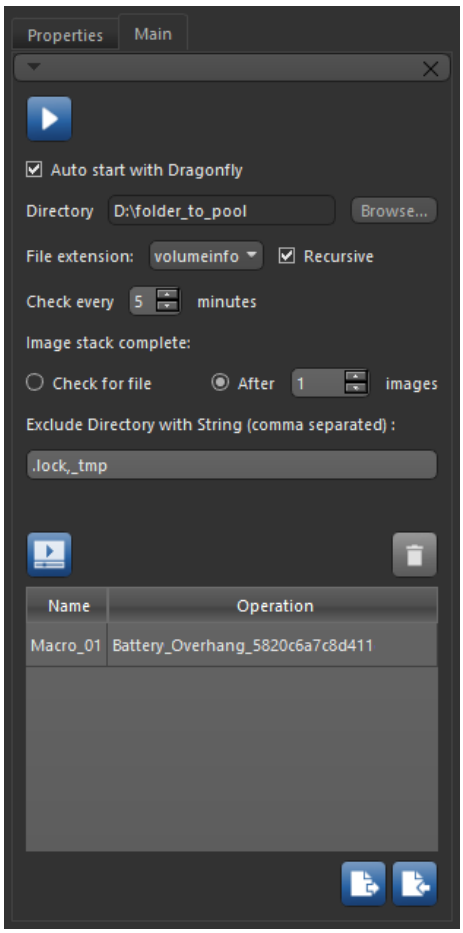
Setting the visibility of multiple objects

NOTE The visibility of the selected classes of multi-ROIs is also synchronized in the Classes and scalar information box in this software release.

26 Auto Executor

This software release includes the production release of Dragonfly 3D World's **Auto Executor**, which can be configured to automatically process data sent to a polled directory with a selected macro. The settings that need to be configured are available on the Auto Executor panel. These settings include the directory to poll for new scan data, the type of data to process, the required monitoring period, and the macro that will be executed within the workflow.

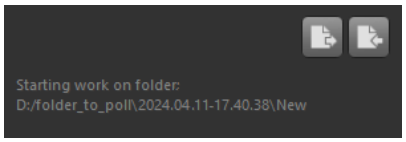
Choose **Utilities > Auto Executor** on the menu bar to open the Auto Executor panel, shown below.



Auto Executor panel

NOTE The Auto Executor is separately licensed feature for Dragonfly 3D World. Commercial and non-commercial users will need an additional license to run the AE. Contact sales.dragonfly@comet.tech for more information and pricing.

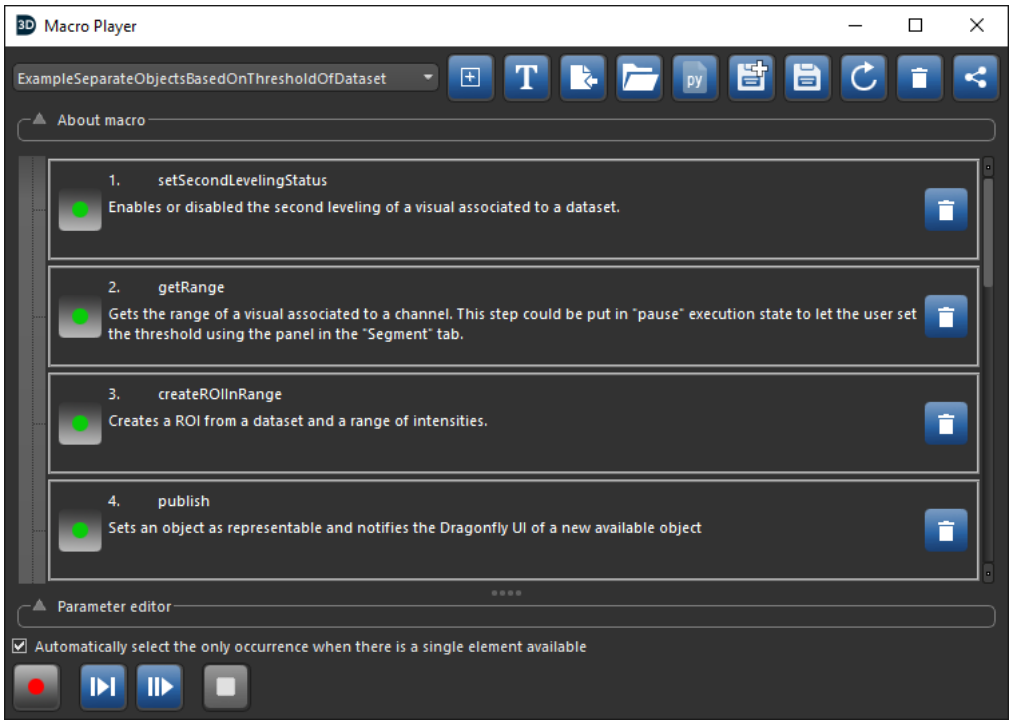
The following settings and options are available on the Auto Executor panel.

Setting	Icon	Description
Start		Click to start processing new data sent to the polled directory. **NOTE** The status of the macro is shown at the bottom of the Auto Macro Executor panel, as shown in the example below. 
Auto start with Dragonfly	--	If checked, the macro will start automatically whenever Dragonfly is launched. **NOTE** All other operations will not be available when the macro is running.
Directory	--	Lets you select the directory that will be polled for new data to process. For example, D:/folder_to_poll. Images sent to new folders within this directory will be processed. For example, D:/folder_to_poll/yyyy.mm.dd-hh.mm.ss.
File extension	--	Lets you select the type of file or files that will be searched for in the polled directory. **Recursive…** If checked, the application will search deeper and deeper into folders until it finds the selected data type to process.
Check every xx minutes	--	Determines the frequency, in minutes, at which the selected directory will be polled.
Image stack complete	--	Lets you select the criteria that indicates when all image data has been received. **Check for file…** If selected, the image stack will be considered complete when a file with the designated file name is pushed to the polled directory. For example, ‘ready.txt’. You should note that the ‘Check for file’ option is usually selected when the number of image files is unknown. For example, in cases in which data is saved as single TIFF or PNG files that are part of an image stack. **After xx images…** If selected, the image stack will be considered complete when a set number of image files are available in the polled directory.
Exclude directory with string (comma separated)	--	Lets you exclude a directory or directories automatically. For example, ‘.lock’ and ‘_tmp’.
Add macro operation		Lets you add macro files to the current processing operation.
Delete selected operation		Lets you delete the selected operation.
Export operation stack		Lets you export the current operation stack in the JSON file format (*.json extension).
Import operation stack		Lets you import an exported operation stack.

Auto Executor settings

27 Macro Recorder

Updates available for Dragonfly's Macro Recorder include added items for managing and sharing macros. Choose **Utilities > Macro Player** on the menu bar to open the Macro Player, shown below.



Macro Player dialog

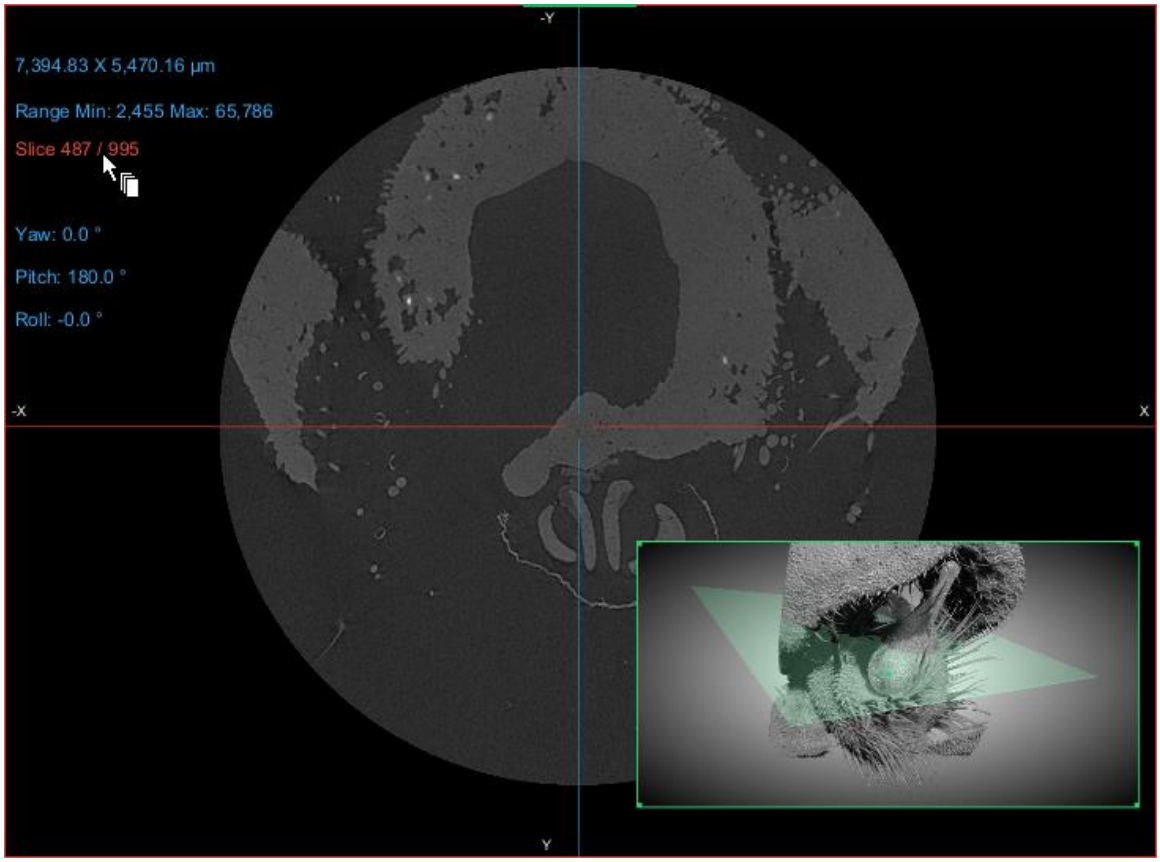
The following added items are available for managing macros:

Setting		Description
Rename macro		Opens the Rename Macro dialog, in which you can rename the currently selected macro.
Import macro to current user's folder		Lets you import a saved macro into the default macro folder for the current user or all users.
Open folder		Opens the folder that contains the currently selected macro.
Share		Lets you share the currently selected macro on Dragonfly Social.

Macro Player controls

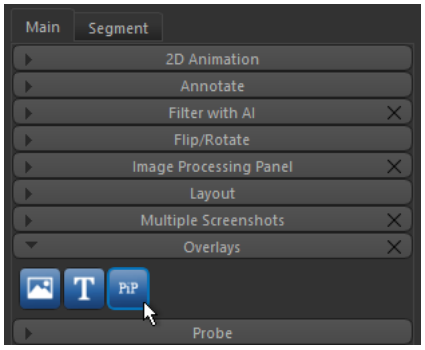
28 Picture-In-Picture Mode

For 2D animations and screenshots, this software release provides a '*Picture-in-Picture*' mode in which an overlay of the 3D view can be added to any 2D view. The overlay can include the 2D view plane(s) and can be repositioned and resized in the 2D view. Lighting and other effects applied to the 3D view will also appear in the added overlay, as shown in the following screenshot.



2D view in Picture-in-Picture mode

Adjust the 3D view as required and then click the **PiP** button on the Overlays panel, as shown below, to add a 3D view overlay to the current 2D view.



Overlays panel

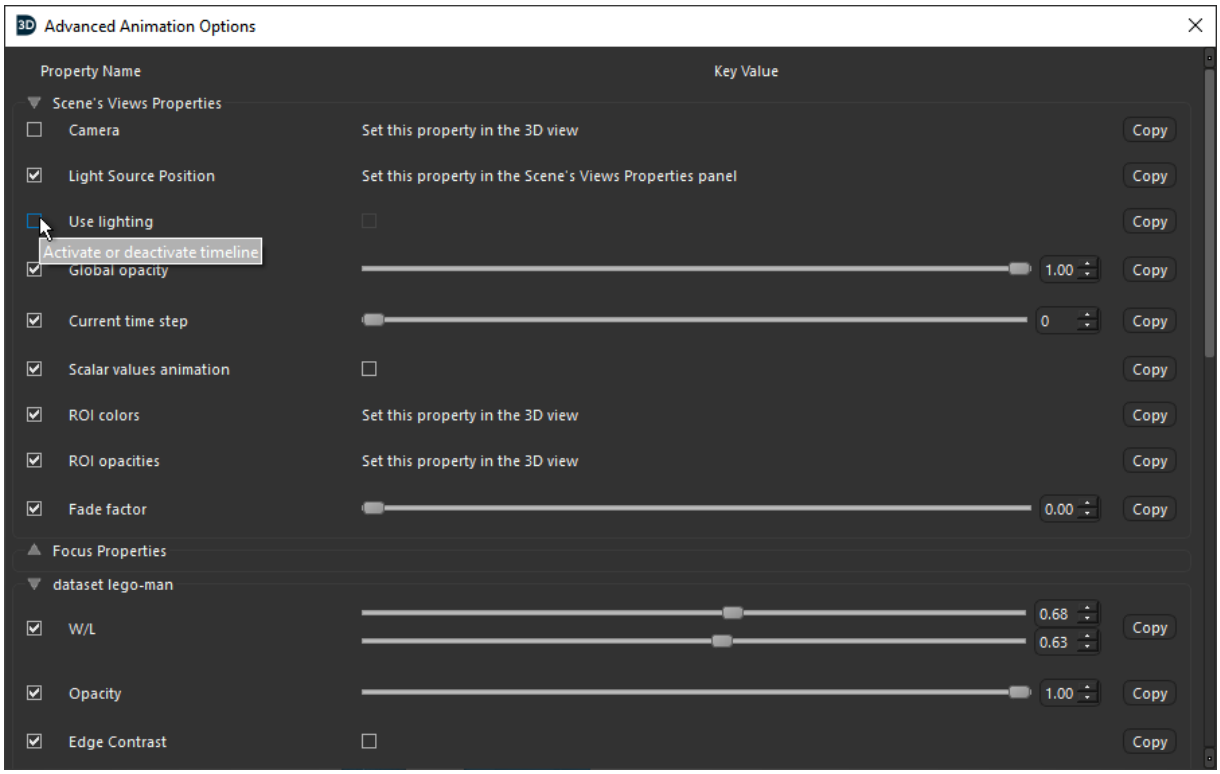
29 Movie Maker

Advanced animation options for all key frames, starting the Movie Maker with or without a saved timeline, and saving videos in the MP4 file format are available in this software release for animated sequences.

29.1 Advanced Animation Options

For advanced users, this software release provides the option to activate or deactivate the key value of any selected property, such as the camera, lighting, opacities, and others, for all key frames on the timeline. This option is available for applicable properties in the Advance Animation Options dialog.

As shown below, you can activate or deactivate the key value for properties by checking or unchecking the Property Name checkboxes, as shown below.



Advanced Animation Options dialog

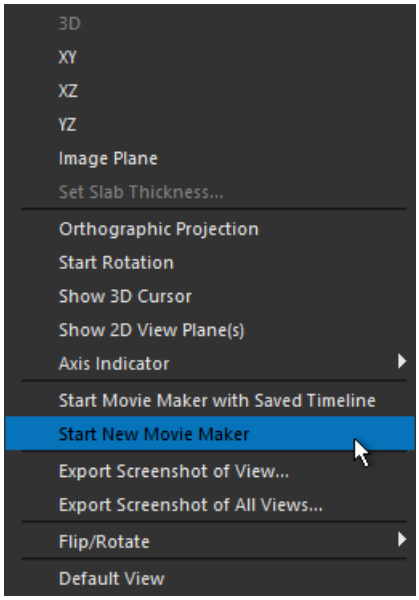
The effect of checking or unchecking the activation checkboxes on the left side of the Advanced Animation Options dialog is as follows:

If checked… The selected property, such as lighting, global opacity, edge contrast, or other, will be applied as per the key value set for each key frame. This means that the property's key value for each key frame on the timeline will be applied when the animation is played and recorded. You should note that key values can be set in the Advanced Animation Options dialog, as well as in the Scene's Views Properties and the Data Properties and Settings panels.

If unchecked… The selected property, such as lighting, global opacity, edge contrast, or other, will be deactivated as per the key value of the current key frame. This means that the property's key value for each key frame on the timeline will not be applied when the animation is played and recorded.

29.2 Starting the Movie Maker

In cases in which you load a session with a saved timeline, you can choose to start the Movie Maker with the timeline saved in the session file or you can choose to start a new Movie Maker without the saved timeline. These options are available in the 3D view pop-up menu, as shown below.



3D view pop-up menu

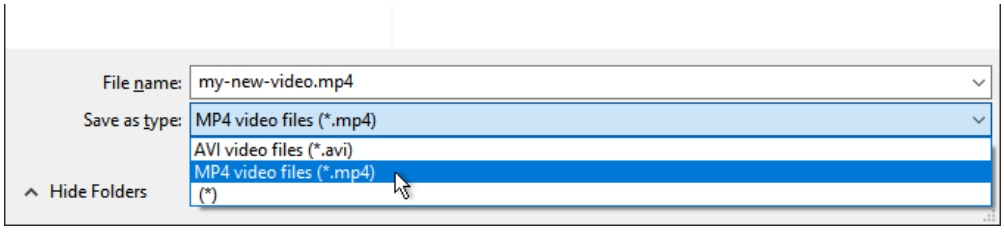
Start Movie Maker With Saved Timeline… Starts the Movie Maker with the timeline saved in the currently open session file. In this case, the keyframes you created in the saved session will appear on the timeline.

Start New Movie Maker… Starts a new Movie Maker with a blank timeline. In this case, any keyframes you created in the saved session will not appear in the Movie Maker.

29.3 Save as MP4

This software release includes the option to save the animated sequences you create in the MP4 (*.mp4 extension) file format. MP4 is an international standard that works with a vast range of devices and, when compared to other video file types, MP4 files are typically more compressed. However, this file format has a high post-compression video quality, which means that any loss in video quality during playback is usually minimal.

The option to choose a file format for exporting animations is available in the Export as Video File dialog, as shown below.

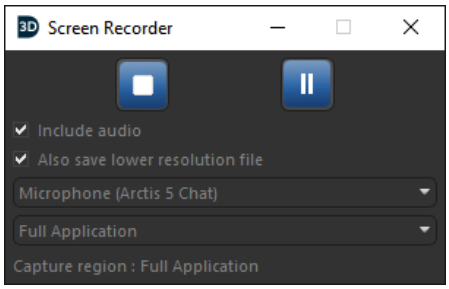


Save options in the Export as Video File dialog

30 Screen Recorder

A number of updates are available in this software release for Dragonfly's Screen Recorder, which can be used to make videos that illustrate findings, new workflows, and analysis techniques.

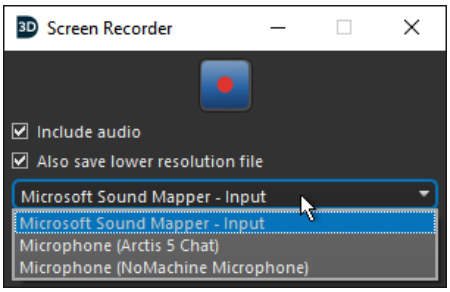
Choose **Utilities > Screen Recorder** on the menu bar to open the Screen Recorder dialog, shown below.



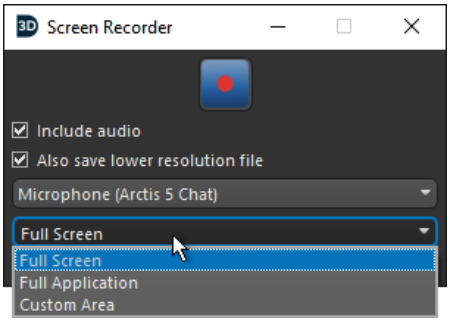
Screen Recorder

Updates for the Screen Recorder include:

- The option to automatically pause a recording whenever a Progress dialog appears onscreen and to then resume recording when processing is complete.
- The option to choose the microphone that will be used for recording audio.



- The option to select the region to record — **Full Screen**, **Full Application**, or **Custom Area**.

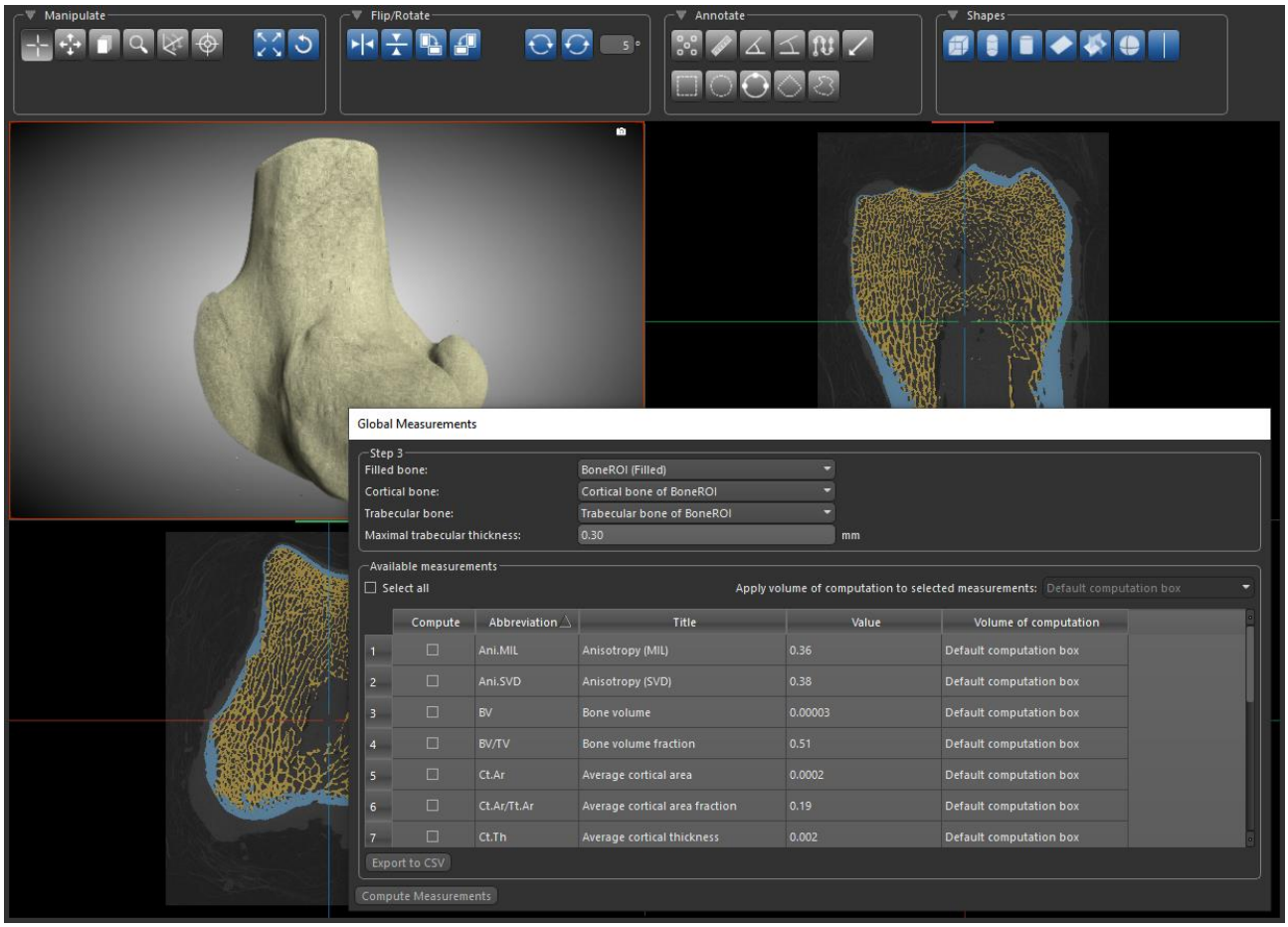


31 Bone Analysis Wizard

Updates in this software release for the Bone Analysis wizard include a refreshed workspace, an additional opacity control for the Kohler segmentation method, and new options for computing global measurements.

31.1 Workspace Update

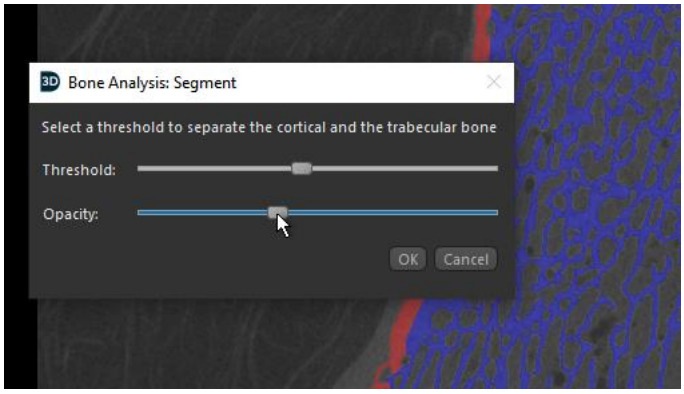
As part of the updates for Dragonfly 3D World's Bone Analysis wizard, the tools at the top of the workspace were grouped within boxes according to the function. As shown below, all of the manipulate, flip/rotate, annotate, and shape tools are now grouped within collapsible boxes.



Bone Analysis workspace

31.2 Opacity Control for Kohler Segmentation Method

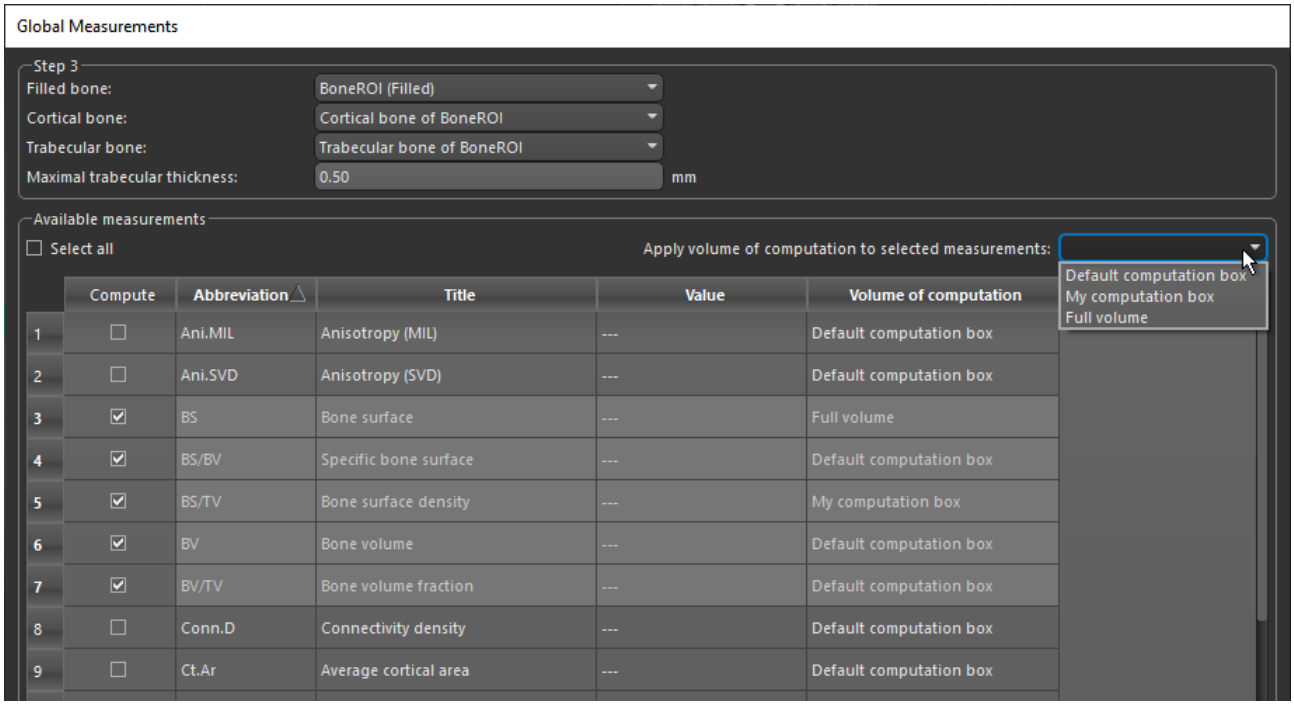
The Bone Analysis wizard provides two methods to segment cortical and trabecular bone — Buie and Kohler. As an update for the Kohler method, you can now adjust the opacity of highlight that defines the threshold for separating cortical and trabecular bone.



Threshold and Opacity sliders for Kohler method

31.3 Updates for Global Measurements

To help accelerate measurement workflows, this software release includes the option to update the volume of computation for multiple indices at the same time. As shown below, you can apply a volume of computation — the default computation box, full volume, or any custom box — to all selected items in the drop-menu, as shown below.



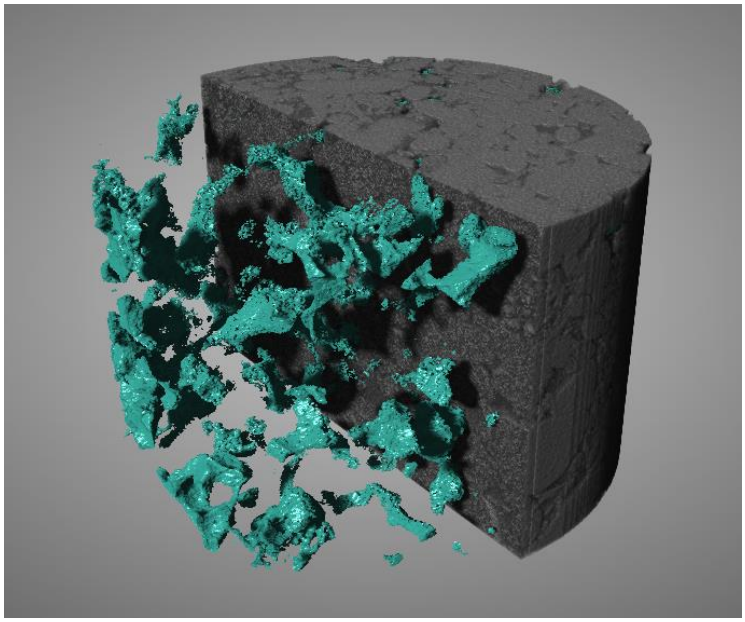
Global Measurements dialog

32 Automated Porosity Segmentations

A new option for segmenting pores and cavities, as well as an update for automated porosity segmentations using the Otsu threshold and Sobel filtering, are available in this software release.

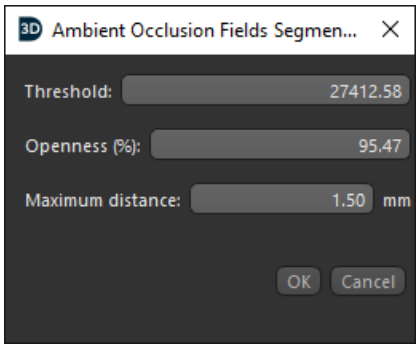
32.1 Ambient Occlusion (AO) Fields

Used for segmenting pores and cavities, the newly added ambient occlusion (AO) algorithm calculates a scalar value for each voxel of a dataset, which represents the degree to which it is '*occluded*' from ambient light, to distinguish pores and cavities from the surrounding material and background. An example of a pore network segmentation done with the AO algorithm is shown below.



Pore network segmented with AO fields

Right-click a 3D image or region of interest and then choose **Porosity Segmentation with AO Fields** to open the Ambient Occlusion Fields Segmentation dialog. You can then enter the required settings in the dialog to segment the pores and cavities in the selected object.

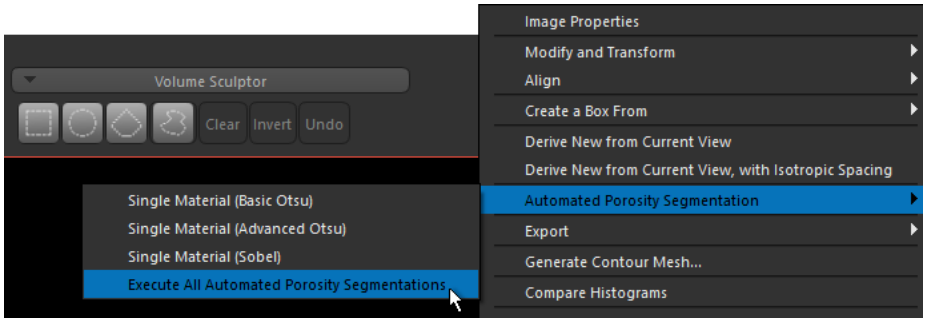


Ambient Occlusion Fields Segmentation dialog

NOTE If you are applying the AO algorithm to a region of interest, you must label the material within the image. You should also note that the setting '*Threshold*' is not available for regions of interest.

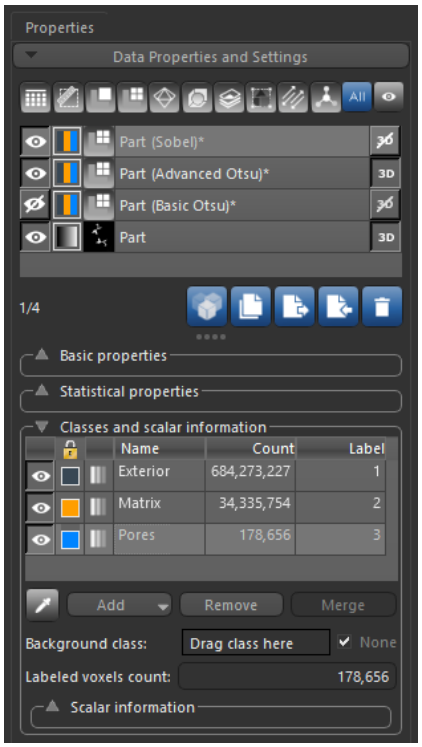
32.2 Automated Porosity Segmentation Methods

Dragonfly 3D World provides automated porosity segmentation methods to analyze closed pores quickly and accurately in single-material samples, such as castings. You can now execute all methods in a single click, as shown in the screenshot below.



Pop-up menu items for automated porosity segmentations

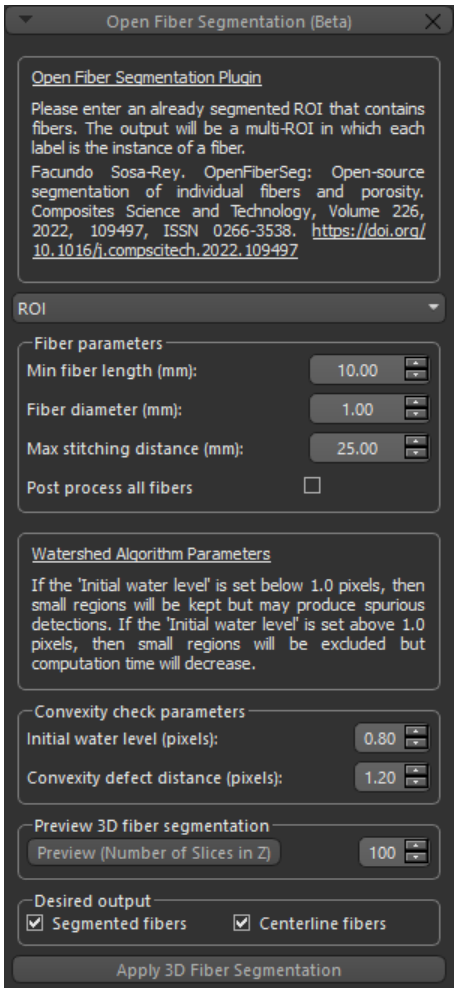
The output of all automated porosity segmentations is a series of multi-ROIs, as shown below, with labels for the *Exterior*, *Matrix*, and *Pores*. Any measurements related to the labels of the generated multi-ROIs can be viewed in the 'Classes and scalar information' box.



Generated automated porosity segmentation outputs

33 Open Fiber Segmentation

Updates for the Open Fiber Segmentation module, which lets you extract individual fibers from datasets of short fiber reinforced composites, are available in this software release. Choose **Workflows > Open Fiber Segmentation** on the menu bar to open the module, shown below.



Open Fiber Segmentation panel

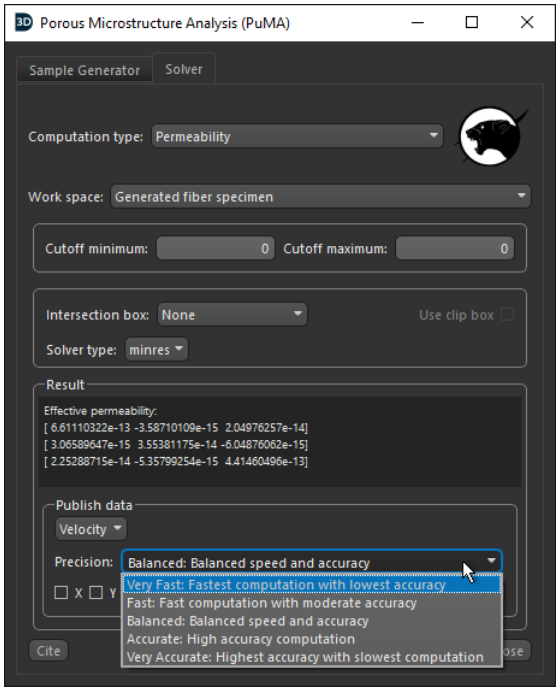
Changes include the following:

Min fiber length… This parameter, which is the minimum value that the algorithm will accept as a fiber, now uses the default length units instead of pixels.

Desired output… Two options — **Segmented fibers** and **Centerline fibers** — can be selected either separately or in combination as the desired output. The output multi-ROI can be the extracted individual fibers and/or a multi-ROI of extracted centerlines of the individual fibers.

33.1 PuMA (Porous Microstructure Analysis)

To help support different workflow needs, this software release includes '*Precision*' settings for computing outputs in the PuMA (Porous Microstructure Analysis) dialog. As shown in the following screenshot, you can choose from the fastest computation with lowest accuracy to highest accuracy with slowest computation.



33.2 Pore Network Modeling

You should note that the version of OpenPNM implemented in Dragonfly 3D World was updated to 3.0 for this software release. Choose **Workflows > Pore Network Modeling** on the menu bar to open the OpenPNM tab on the left sidebar. This extension provides porous media researchers with a ready-made framework for performing a wide range of pore network simulations.

NOTE Refer to https://pmeal.com/posts/2022-10-10/ for information about the updates available in version 3.0 of OpenPNM.

34 Additional File Support

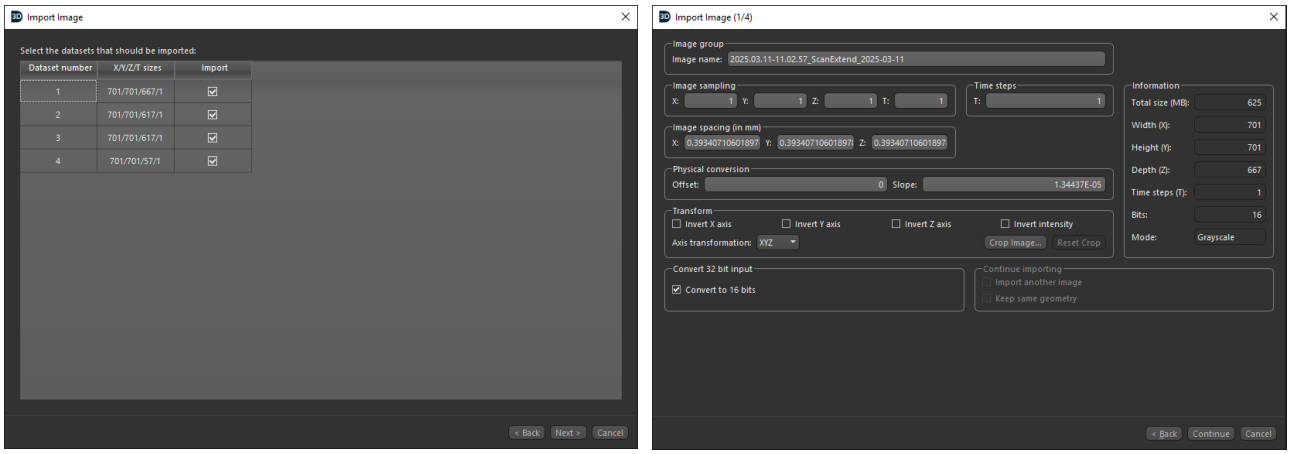
To make Dragonfly 3D World more accessible to a wider range of data types, this software release includes support for additional proprietary file formats exported from leading hardware manufacturers.

34.1 Support for XRV Files

This software release includes support for seamlessly integrating volume and multi-volume scans with metadata handling from Yxlon Geminy systems directly into Dragonfly 3D World. This allows users to directly compare the resulting volumes from different X-ray acquisition setups side-by-side in 3D World. Multiple sub-scan volumes exported in the XRV (*.xrv extension) file format can be loaded as a single stitched volume or as separate volumes.

Stitch files… You can automatically load and stitch multi-volume scans from the Command Prompt dialog using ‘load’ or ‘load_data’. You can also right-click the required XRV file and then choose to open the file with the ‘Dragonfly.exe’ for version 2025.1.

Load as single files… You can load the scans in XRV files separately with Dragonfly’s Image Loader. In this case, you can choose which files will be loaded (as shown below on the left), as well as the image settings, such as sampling and convert to 16 bits, for each scan (as shown below on the right).



Import Image dialog

34.2 Support for Bruker Files

This software release includes support for loading image files exported from Bruker microCT and 3D X-ray microscopy systems. This includes extracting image pixel sizes from log files (*.log file extension) when loading image stacks.

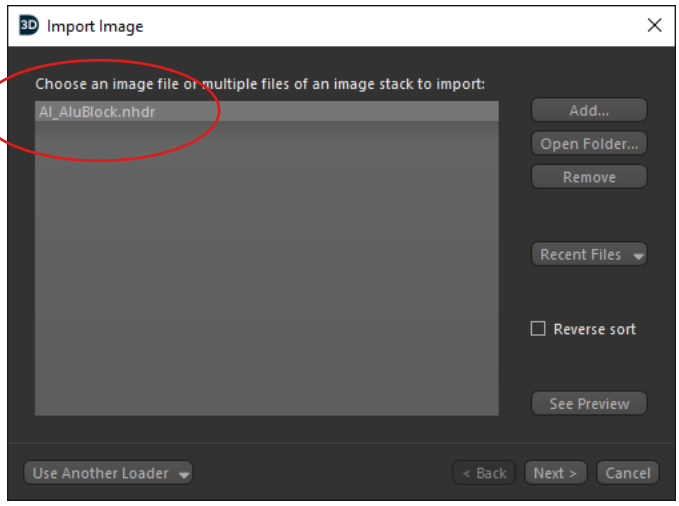
Choose **File > Import Image Files** to open the Image Loader and then do one of the following.

- Add the BMP, PNG, or TIFF files that you want to load.
- Choose the folder containing the files that you want to load.
- Add the .log file that is in the same directory as the BMP, PNG, or TIFF files that you want to load.

34.3 Support for Nikon Files

This software release includes support for opening reconstructed CT volume files exported from Nikon imaging systems as *.vol or *.raw files.

Choose **File > Import Image Files** to open the Image Loader and then add the *.nhdr file that is in the same directory as the *.vol or *.raw file that you want to load. This header file contains all of the information required to open the CT volume files correctly.



NOTE Nikon header files with a *.nhdr file extension were previously only written whenever files were converted from floating point to 16-bit and 8-bit data. This file is now written for all volumes.

34.4 Support for North Star Imaging Files

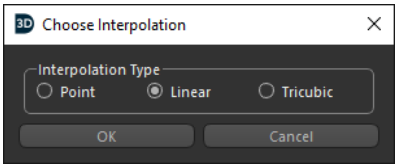
This software release includes support for opening reconstructed datasets exported from North Star Imaging (NSI) systems with the *.nsihdr and *.nsivol file extensions.

Choose **File > Import Image Files** to open the Image Loader and then add the *.nsihdr or *nsivol file that you want to load.

NOTE Support for loading NSI files is only available for the Windows version of Dragonfly 3D World.

35 Deriving, Resampling, and Extracting Datasets

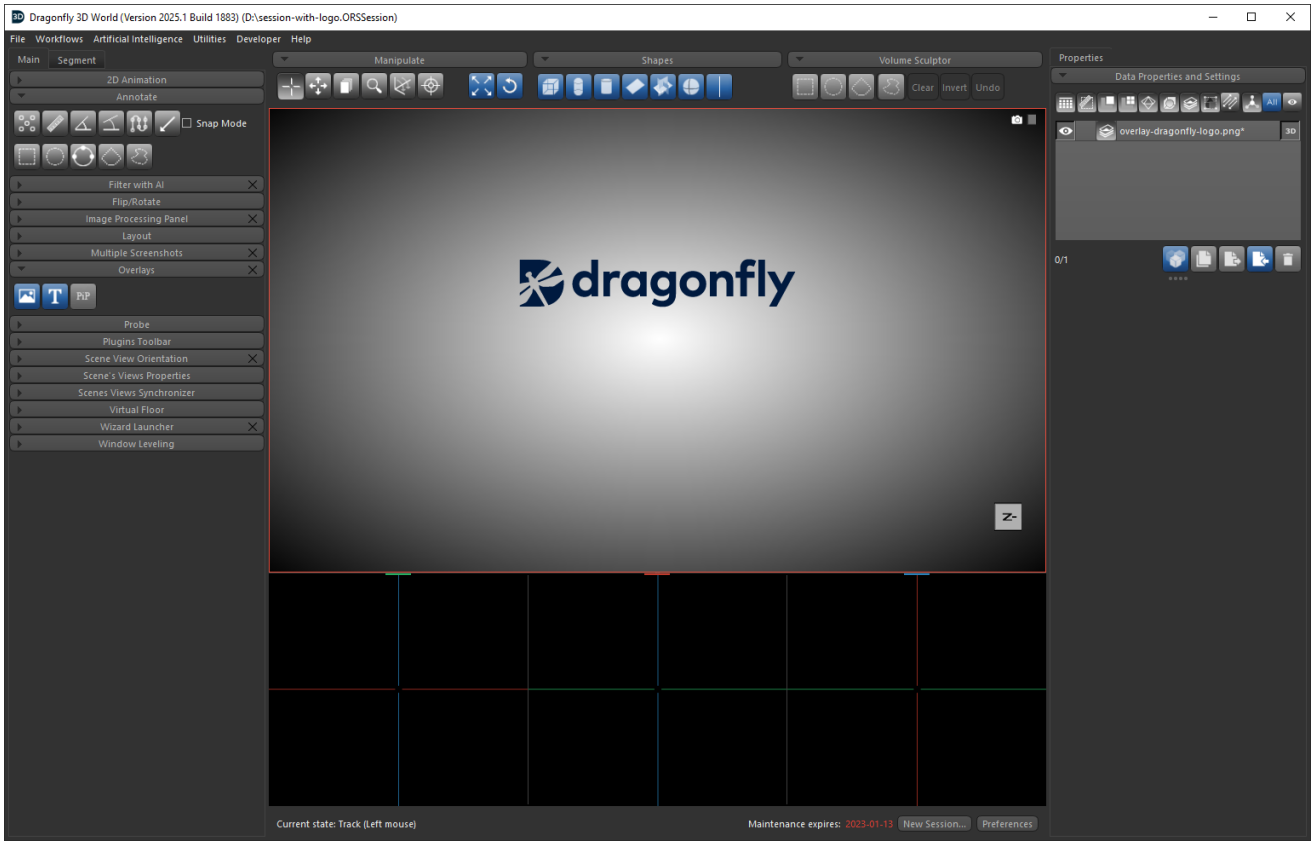
This software release provides interpolation options — Point, Linear, and Tricubic — for creating datasets derived from a view, extracted from a shape, or whose geometry was resampled from another dataset. These interpolation options are also available for datasets extracted from a shape.



Choose Interpolation dialog

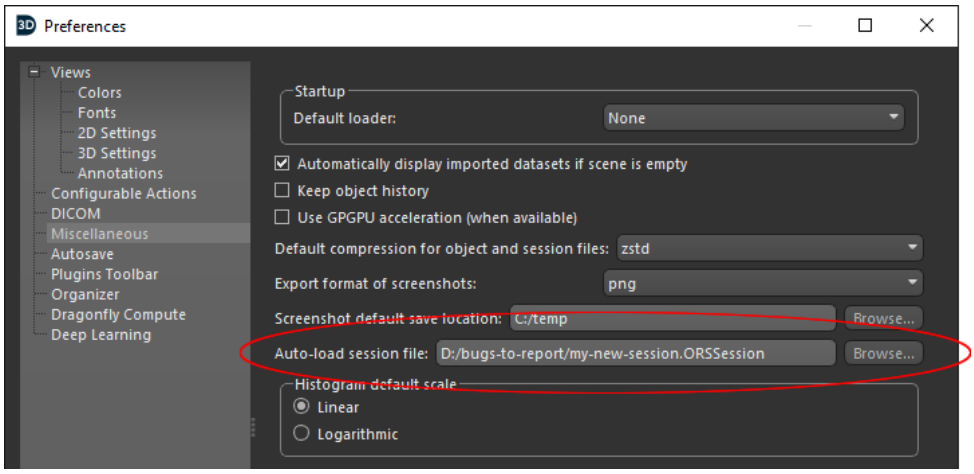
36 Auto Load Session Files

This software release includes the option to automatically load a session file whenever Dragonfly 3D World is launched or whenever a new session is created. As shown below, creating a session file with only an image overlay lets you display a company or institutional logo in the workspace without having to import it repeatedly.



3D World workspace with an image overlay

The option to auto load a session file is available in the Miscellaneous preferences, as shown below.



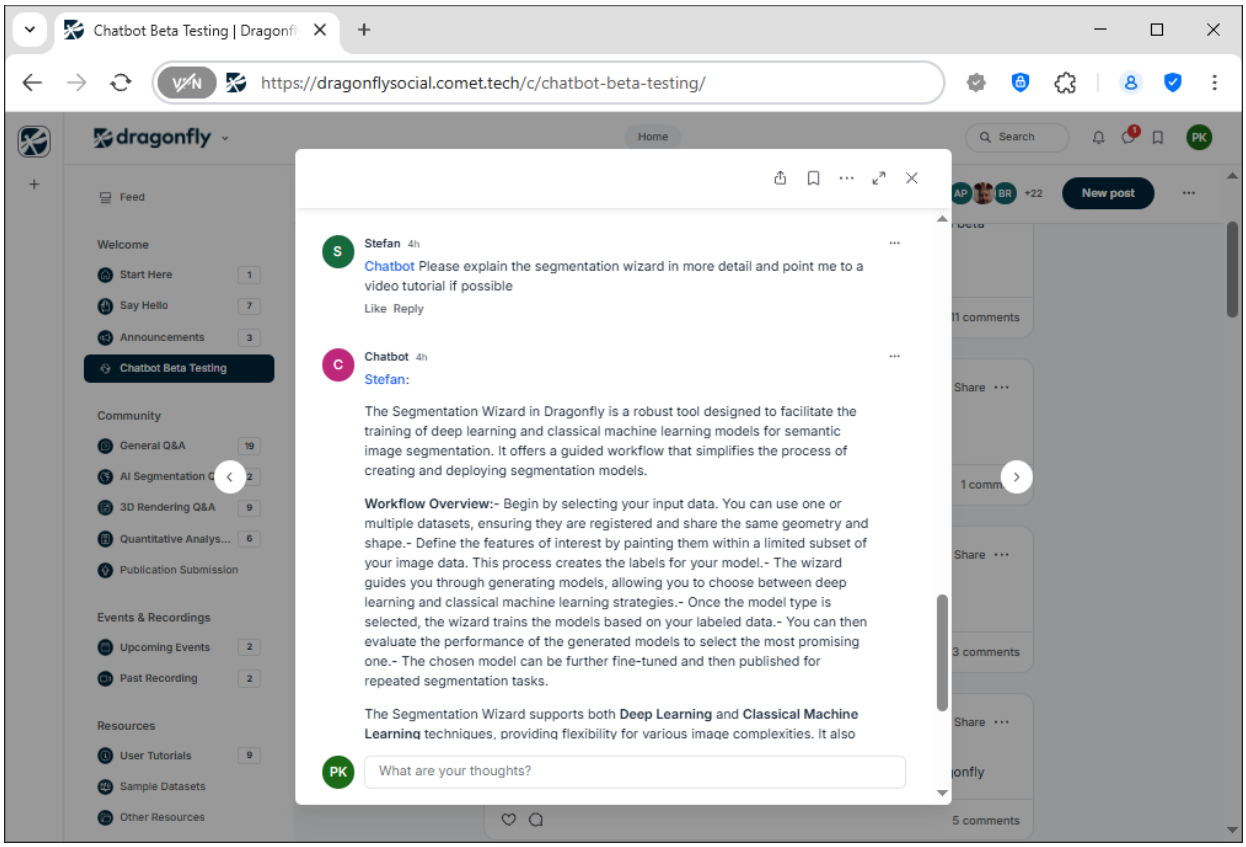
Miscellaneous preferences

37 Dragonfly Social

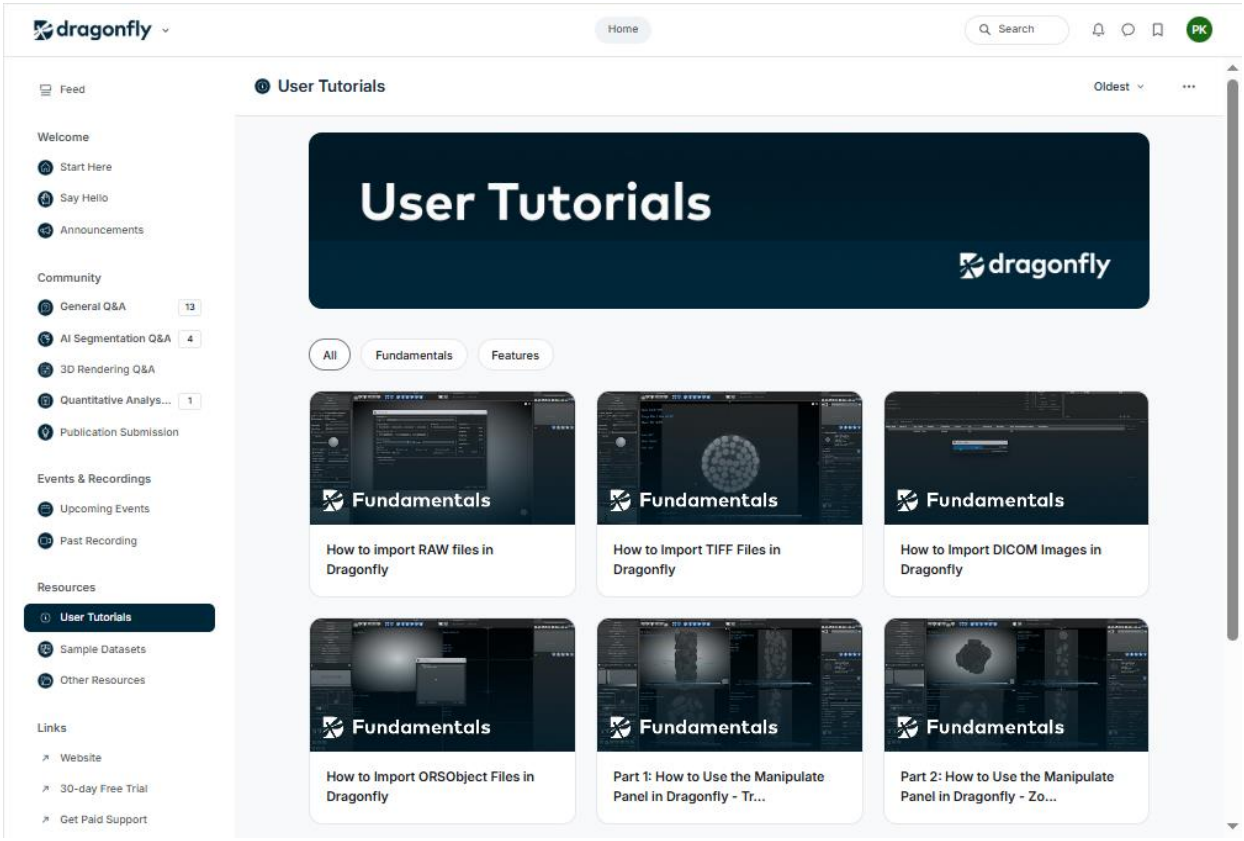
You should notice improvements for Dragonfly Social that makes it more user-friendly, engaging, and resourceful — which should help you to get the most out of your interactions, discussions, and shared resources. You should also note that Dragonfly Social will now appear in your default browser instead of the custom Chromium browser used previously when accessed from Dragonfly 3D World.

Changes for Dragonfly Social include:

- A refreshed interface for easier navigation.
- Enhanced spaces to help you connect, learn, and collaborate.
- Easy sharing of deep models (see Sharing Deep Models).
- A first implementation of a chatbot, which is designed to answer questions about Dragonfly using our product knowledge base. To start a post, click the **Chatbot Beta Testing** link on the navigation panel and then enter your message in the Create a post box. When processing your request is done, you can review the information generated by the chatbot, as shown below.



- Improved resources for better access to tutorials, datasets, and discussions. A new tutorial series is now available with videos covering fundamental topics to get you started. And that is just the beginning. We will be adding more tutorials regularly to support your journey.



38 Checking for Updates

All Dragonfly customers receive notification of new software releases, which contain new features, performance improvements, bug fixes, and other changes. You can also check for new releases on a regular basis to ensure that your version of Dragonfly has the latest updates. Updates can be downloaded and installed as described below for systems running online, as well as for offline systems.

NOTE Commercial users must have a valid Maintenance and Support plan to be eligible for an updated version. Non-commercial users must have a current non-commercial license.

38.1 Updating Online Systems

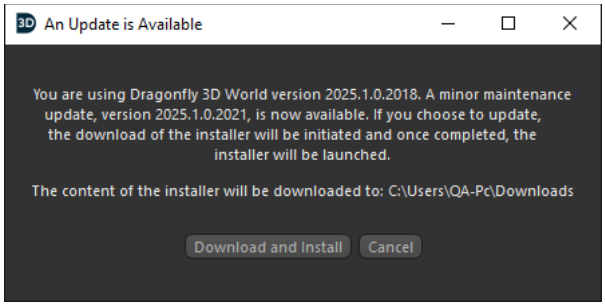
Do the following to check for and install an update for a system connected to the internet:

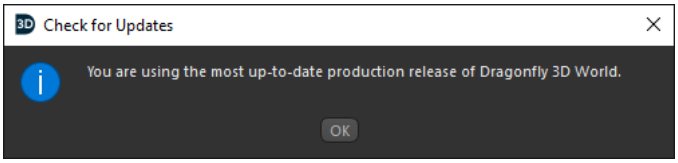
- Save your work and create a new session, recommended.

  NOTE Dragonfly 3D World cannot be updated if it is running. It will close automatically during the installation process.

- Choose **Help > Check for Updates** on the menu bar.

  A message appears with the results of comparing the version installed on your system with the current version that is available.





- Do one of the following if an update is available:
  - Click the **Download and Install** button if you want to update your system.

    If you chose to update your system, a Zip file with the installer will be downloaded and then unzipped automatically. Click **Yes** if the User Account Control dialog appears. Dragonfly will close and the Setup Wizard will appear. Follow the onscreen instructions to install the update.

  - Click **Cancel** if you want to update your system at another time or not at all.

38.2 Offline Updates

Do the following to check for and install an update for an offline system:

- Choose **Help > Check for Updates** on the menu bar.
  The Check for Updates dialog appears onscreen with a QR code.

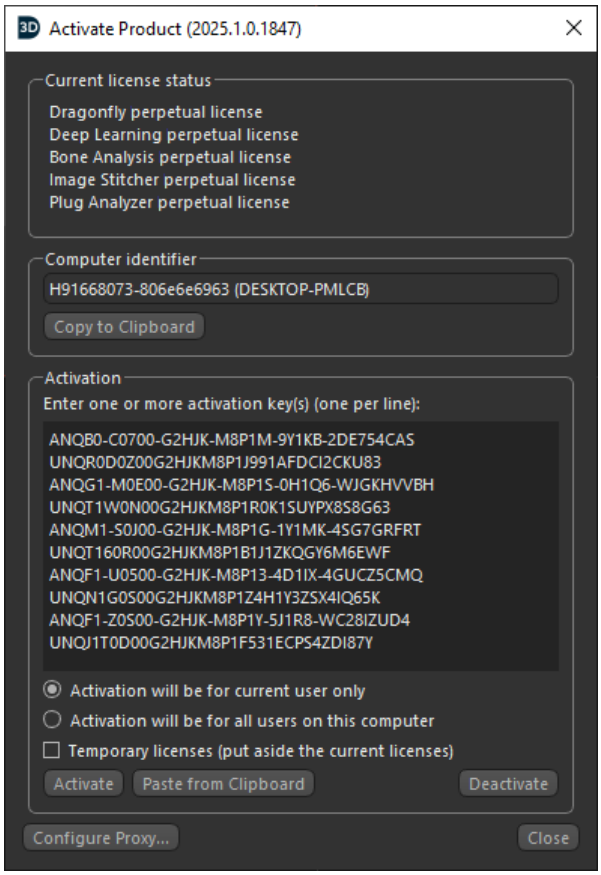


- Open the Camera app or Code Scanner on your smart phone.
- Hold your device so that the QR code appears in the viewfinder. A link will be shown when the device recognizes the QR code.
- Tap the link to open the notification associated with the QR code.
- Do the following if an update is available:
  - Enter and send your email. You will then receive an email with a download link.
  - Download the Zip file with the installer to a portable device, such as a USB key.
  - Unzip the file you downloaded on your Dragonfly workstation and then run the installer.

38.3 License Keys

You should note that license keys are in pairs — activation keys that you receive to activate licensed features and computer-bound keys that are activated for each licensed feature. The main advantage of this arrangement is to allow seamless offline activations.

Choose **Help > Activate Product** on the menu bar to view your activation and computer-bound keys in the Activate Product dialog, shown below.



Activate Product dialog

39 Location of Python Distribution and Code

The location of the extracted Python distribution and Python code was changed for this software release as follows:

Location of Python distribution… Is now copied to '%installation_folder%\Python_env'. It was previously available in the directory '%ProgramData%\ORS\Dragonflyxxxx.x\Anaconda3'.

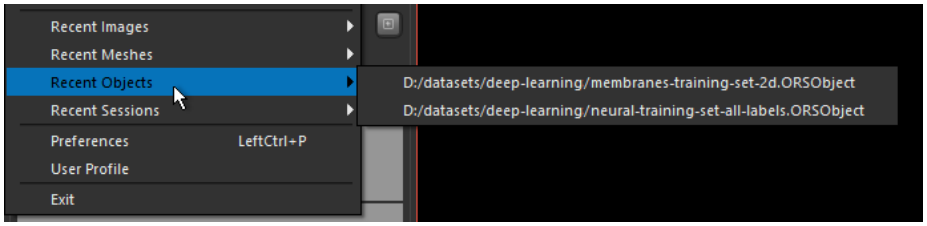
Location of Python code… Is now copied to '%installation_folder%\python'. It was previously available in the directory '%ProgramData%\ORS\Dragonflyxxxx.x\python'.

40 Menu Bar Changes

The following new items are available on the menu bar in Dragonfly 3D World 2025.1. Other changes are also listed here.

40.1 File Menu

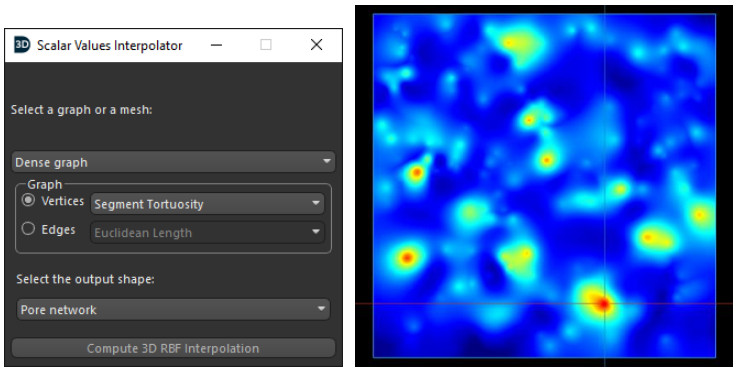
The following changes, listed below, were implemented in the File menu.

Item	Description
Import Points from CSV	Lets you import a points set that was exported from Dragonfly 3D World in the comma-separated values (*.CSV extension) file format.
Reset to Recommended Workspace	Resets the workspace to the arrangement recommended by the Dragonfly team. You can save the recommended workspace as the default one by choosing **File > Save as Default Workspace** on the menu bar.
Reset to Pre-Configured Workspace	Resets the workspace without any configured arrangement of the panels.
Recent Objects	Displays a list of recently imported object files (*.ORSObject extension). You can select an item from the list to import it. 

File menu

40.2 Workflows Menu

The following changes, listed below, were implemented in the Workflows menu.

Item	Description
Scalar Values Interpolator	Opens the Scalar Values Interpolator dialog, shown below, in which you can produce smooth surfaces from the scalar values in graphs and meshes. 

Workflows menu

40.3 Artificial Intelligence Menu

The following changes, listed below, were implemented in the Artificial Intelligence menu.

Item	Description
Custom Deep Model Architectures	This software release includes a new custom deep model architecture for object classification as well as updates for the Noise2Void and YOLO custom deep model architectures. **Noise2Void…** Opens the Noise2Void dialog, which provides a custom deep model architecture for denoising (see Noise2Void for Denoising). **Classification…** Opens the Classification dialog, which provides access to the custom deep model architecture EfficientNet for unparalleled efficiency and accuracy for image classification tasks (see Deep Model(s) for Image Classification). **YOLOv7…** Opens the YOLOv7 dialog, which provides a custom deep model architecture for object detection (see YOLO (You Only Look Once) for Object Detection).
AI Visual Assistant	Opens the AI Visual Assistant dialog, in which you can enter prompts to locate, identify, and count distinct objects in a 2D view (see AI Visual Assistant).

Artificial Intelligence menu

40.4 Utilities Menu

The following changes, listed below, were implemented in the Utilities menu.

Item	Description
Auto Executor	Opens the Auto Executor panel on the right sidebar, which can be configured to automatically process data sent to a polled directory with a selected macro (see Auto Executor).

Utilities menu

41 Changes to Contextual Menus

The following changes for the contextual menus available in the Data Properties and Settings panel and for the 2D and 3D views contextual menus are implemented in Dragonfly 3D World 2025.1.

41.1 Dataset Contextual Menu

The items listed below are now available in the Dataset pop-up menu.

Item	Description
With World Axis	Available in the Align sub-menu, this new item lets you align images orthogonally to world axis coordinates. For cases in which an image was extracted from a shape that was not orthogonal to the imaging plane.
Automated Porosity Segmentation	The original items from version 2024.1 were renamed and a new item was added that executes all automated porosity segmentations sequentially (see Automated Porosity Segmentation Methods).
Porosity Segmentation with AO Fields	Lets you segment pores and cavities from the surrounding material and background (see Ambient Occlusion (AO) Fields).
Surface Determination	Opens the Surface Determination panel, in which you can generate high precision meshes (see Surface Determination Tool).
Anatomical Structures Segmentation	Opens the Anatomical Structures Segmentation dialog, in which you can fully segment anatomical structures in both CT and MRI images (see Anatomical Structures Segmentation).
Intensity Counts	Available in the Export sub-menu, this new item lets you export the raw intensity counts of image data in the comma-separated values (*.CSV extension) file format instead of exporting binned values from a histogram (see Exporting Intensity Counts).

Dataset pop-up menu

41.2 ROI Contextual Menu

The items listed below are now available in the ROI pop-up menu. You should note that some refactoring was applied to streamline the ROI contextual menu.

Item	Description
Process Islands 2D	Available in the Refine Region of Interest sub-menu, this new item lets you process islands slice-by-slice in the Z axis (see Process Islands in 2D).
Connected Components 2D	Lets you create new multi-ROIs of connected components on a slice-by-slice basis in the Z axis (see Connected Components 2D).
Adaptive Watershed 2D	Lets you apply the Adaptive Watershed algorithm on a slice-by-slice basis in the Z-axis (see Adaptive Watershed 2D).
Skeletonize ROI 2D	Lets you skeletonize a region of interest on a slice-by-slice basis in the Z-axis (see Skeletonize ROI 2D).

Item	Description
Skeletonize and Prune ROI	Lets you extract a selected number of paths that will be included in the graph generated from a skeletonized region of interest (see Skeletonize and Prune ROI).
2D Distance Map Signed 2D Distance Map	Available in the Create Mapping Of sub-menu, these new items let you compute distance maps on a slice-by-slice basis in the Z-axis (see 2D Distance Maps).
Create Sparse Graph 2D Create Dense Graph 2D	Available in the 3D Modeling sub-menu, these new items let you create graphs on a slice-by-slice basis in the Z-axis (see 2D Graphs).
Create Voxel Based Dense Graph	This new item in the 3D Modeling sub-menu lets you create a graph in which every single voxel of the skeletonized and pruned region of interest has a corresponding vertex. In contrast, a dense graph does not necessarily put a vertex at every voxel position.

ROI pop-up menu

41.3 Multi-ROI Contextual Menus

The items listed below are now available in the multi-ROI pop-up menu. You should note that some refactoring was applied to streamline the multi-ROI contextual menu.

Item	Description
Connected Components 2D	Lets you create new multi-ROIs of connected components on a slice-by-slice basis in the Z axis (see Connected Components 2D).
Compute Watershed 2D Watershed Transform 2D	Are 2D versions of the Compute Watershed and Watershed Transform that are applied on a slice-by-slice basis in the Z-axis (see Compute Watershed 2D and Watershed Transform 2D).
Compute Watershed 2D with Plane	Lets you choose an orientation, or ‘plane’, to apply the Compute Watershed 2D algorithm. The result is a watershed applied to a single slice in the selected orientation (see Compute Watershed 2D with Plane).
Create Dense Graph from Multi-ROI	Lets you create a dense graph from multi-ROIs.
Create Colored Multi-ROI from RGB Channels	Lets you convert the red-green-blue channels of imported color images to multi-ROIs in which each voxel is assigned a unique color that matches the color image (see Create Colored Multi-ROI From RGB Channels).

Multi-ROI pop-up menu

The items listed below are now available in the Classes and Scalar Information pop-up menu.

Item	Description
Launch Split Tool	Opens the Multi-ROI Split Tool dialog, in which you can separate clustered objects (see Split Tool).
Create a Bounding Box from Class	Automatically creates a box that encloses the labeled voxels of the selected class (see Create Boxes From Classes).
Create Bounding Boxes for Each Class	Automatically creates a series of boxes that enclose the labeled voxels of each selected class (see Create Boxes From Classes).
Create a Bounding Box from Classes	Automatically creates a box that encloses the labeled voxels of all selected classes (see Create Boxes From Classes).
Export Class as an Optimized Thickness Mesh	Exports the selected class as an optimized thickness mesh (see Optimal Meshes).

Classes and scalar information pop-up menu

41.4 Meshes Contextual Menu

The items listed below are now available in the Meshes pop-up menu.

Item	Description
Fit Shape from Vertices	Lets you create a cylinder, plane, or sphere that is fitted to the vertices of the selected mesh.

Meshes pop-up menu

41.5 Shapes Contextual Menu

The items listed below are now available in the Shapes pop-up menu.

Item	Description
Tools	The new tools let you cut meshes within or outside of boxes (see Mesh Tools). **NOTE** Available for boxes only.
Extract 3D Projection of Dataset	Lets you extract 3D projections of datasets from cylinders and spheres (see Extract 3D Projections from Cylinders and Spheres). **NOTE** Available for spheres and cylinders only.
Create Ruler Between Spheres	Lets you create a ruler between the centers of two selected spheres (see Create Rulers Between Spheres).

Shapes pop-up menu

41.6 Annotations Contextual Menu

The items listed below are now available in the annotations pop-up menu.

Item	Description
Look at Annotation in All Views	Automatically scrolls each 2D view in the current scene to the location of the selected arrow or the first point in the selected points set without changing the orientation of the views. This means that if the default MPR views are available in the scene, then the annotation will be shown in the XY, XZ, and YZ orientations.
Create a Plane from Points	Lets you create planes from any points set that contains a minimum of three points (see Create Planes From Points). **NOTE** Available for points only.
Create an ROI from an Annotation	Lets you create a region of interest from annotations, as described below. **Points…** The region of interest will be a series of connected lines. **Regions…** The region of interest will the filled. **Rulers, angles, paths…** The region of interest will be a single line.

Annotations pop-up menu

41.7 2D Views Contextual Menu

The items listed below are now available in the 2D views pop-up menu.

Item	Description
View at 100% (1:1 Pixel Ratio)	If selected, each image pixel will be displayed by one monitor pixel (see View at 100%).
Translate/Rotate Selected Objects	Lets you translate or rotate selected objects by set step sizes (see Translate/Rotate Tools).

2D views pop-up menu

41.8 3D Views Contextual Menu

The items listed below are now available in the 3D view pop-up menu.

Item	Description
Show 2D View Plane(s) Permanently	If selected, 2D view planes will remain visible in the 3D view after the 3D cursor is manipulated in any of the 2D views or if a 2D view is scrolled or rotated with the Yaw or Pitch text annotations (see Show 2D View Planes Permanently).
Start Movie Maker With Saved Timeline	Starts the Movie Maker with the timeline saved in the currently loaded session file. In this case, the keyframes you created in the saved session will appear on the timeline.
Start New Movie Maker	Starts a new Movie Maker with a blank timeline. In this case, any keyframes you created in the loaded saved session will not appear in the Movie Maker.

3D views pop-up menu

42 Preferences Changes

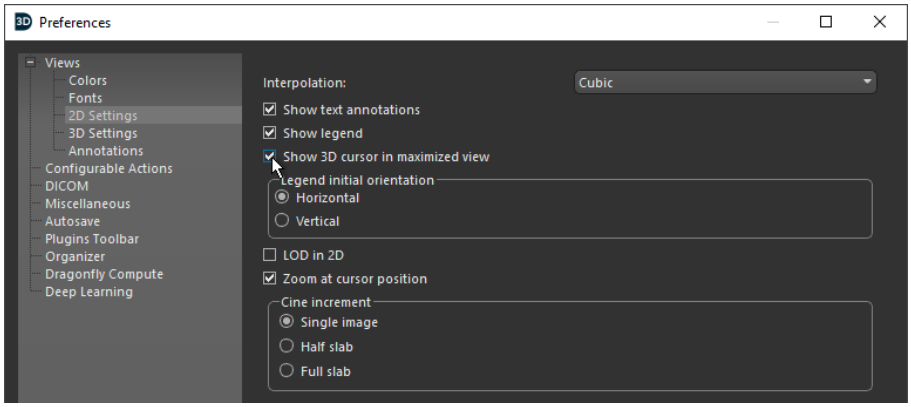
Changes implemented for setting the application preferences are listed in this topic. Click Preferences on the Status bar or choose **File > Preferences** on the Menu bar to open the Preferences dialog.

42.1 Views Preferences

The following changes were implemented for the Views preferences.

42.1.1 2D Settings

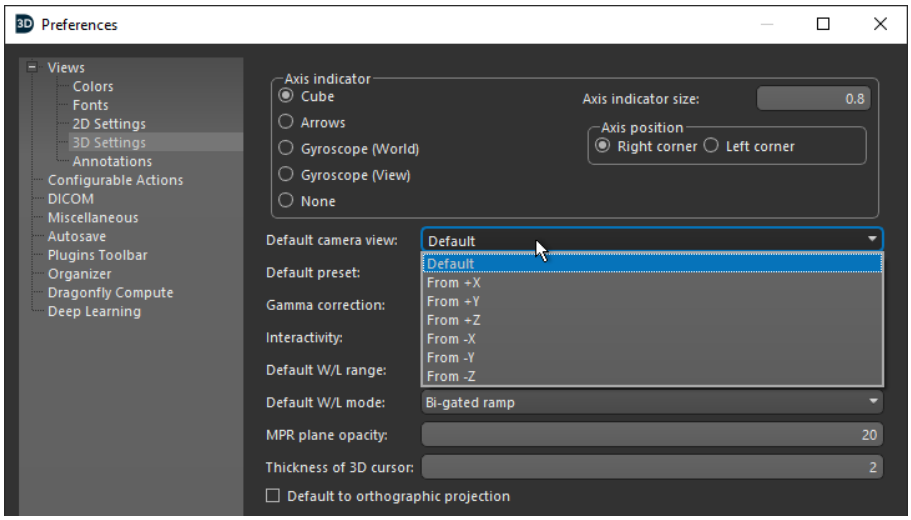
Changes to the 2D Settings preferences are indicated in the following table.

Item	Description
Show 3D cursor in maximized view	This new 2D Settings preference lets you choose to keep the crosshairs of the 3D cursor visible in maximized 2D views. 

2D Settings preferences

42.1.2 3D Settings

Changes to the 3D Settings preferences are indicated in the following table.

Item	Description
Default camera view	This new 3D Settings preference lets you choose a default camera view — From +/-X, From +/-Y, or From +-/Z — for 3D views. The camera view options are available in the Default camera view drop-menu, as shown below. 
Increased vector field density	Maximizes the density of vectors that are rendered in 3D views (see Vector Fields).

3D Settings preferences

42.1.3 Annotations

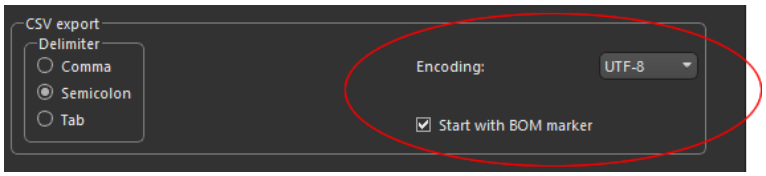
Changes to the Annotations preferences are indicated in the following table.

Item	Description
Snapping tolerance (in screen percentage)	Lets you set a tolerance, in screen percentage, for the snapping behaviour of applicable Annotate tools (see Use Snapping).
Synchronize position in all views	This new Annotations preference for arrows lets you choose to automatically synchronize the position of the arrows on all views of the current scene (see Arrows).

Annotations preferences

42.2 Miscellaneous Preferences

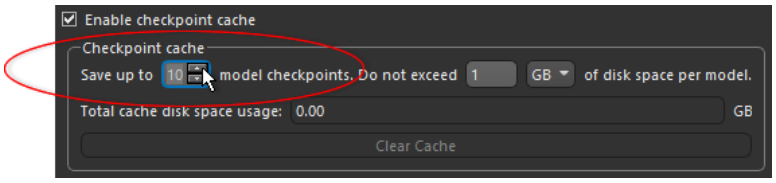
Changes for the Miscellaneous preferences are indicated in the following table.

Item	Description
Use GPGPU acceleration (when available)	If selected, applicable operations will run within the GPGPU framework (see GPGPU Acceleration).
Auto-load session file	Lets you choose a session file that will be loaded automatically each time that Dragonfly 3D World is launched or whenever a new session is created (see Auto Load Session Files).
CSV Export	Lets you choose a character encoding system, as well as the option to include a byte-order mark (BOM) in exported CSV files. Refer to the topic CSV Export Preferences for additional information about these settings. 

Miscellaneous preferences

42.3 Deep Learning Preferences

Changes for the Deep Learning preferences, including removed items, are described in the following table.

Item	Description
Checkpoint cache	Now includes the option to set the number of model checkpoints that will be saved when the option 'Enable checkpoint cache' is selected. 
Compile deep models for faster inference	This item for compiling deep models with TensorFlow-TensorRT (TF-TRT) was removed with the migration to PyTorch for deep learning applications.
Execute Deep Learning tasks in an external process	This preference for executing deep learning tasks in an external process was removed for this version since PyTorch releases GPU memory at the end of training or inference.

Deep Learning preferences

43 System Requirements

This software release supports the base system requirements for Windows and Linux. However, if you want to run PyTorch with the latest CUDA version, you might need to update your installed graphics driver before installing Dragonfly 3D World 2025.1. See Deep Learning Requirements for 2025.1 for information about checking the installed graphics driver and CUDA version on your system.

NOTE Go to https://dragonfly.comet.tech/en/getting-started for system recommendations to fully experience all the benefits and capabilities of Dragonfly 3D World.

44 Third-Party Packages

You should note the changes for the third-party packages listed below.

Item	Version 2025.1	Previous Version (2024.1)
PyTorch	2.7.1	Not applicable
Qt	6.7.3	6.4.2
Python	3.10.13	3.10.12
PuMA	3.2.0	3.2.0
Netgen/NGSolve	6.2.2301	6.2.2202

Third-party packages

45 Publicly Available Source Code

Users can freely download and examine the source code of the following.

45.1 PyTorch

PyTorch is a machine learning library based on the Torch library, which was originally developed by Meta AI and is now part of the Linux Foundation umbrella. It is recognized as one of the two most popular machine learning libraries alongside TensorFlow and is distributed as open-source software released under the modified BSD license. PyTorch offers a comprehensive collection of building blocks for neural networks, including various layers and activation functions, enabling the construction of complex models.

You can freely download and examine the PyTorch source code from: https://pytorch.org/.

45.2 Qt

Dragonfly is designed and developed with Qt, which is a free and open-source toolkit for creating graphical user interfaces and cross-platform applications. Qt is developed by The Qt Company, a publicly listed company, and is available under both commercial licenses and open-source GPL 2.0, GPL 3.0, and LGPL 3.0 licenses.

Users can freely download and examine the Qt source code from: https://download.qt.io/official_releases/qt/.

45.3 Porous Microstructure Analysis (PuMA)

The Porous Microstructure Analysis (PuMA) software integrated in Dragonfly was developed by researchers at NASA to compute effective material properties and perform material response simulations on digitized microstructures of porous media. PuMA can generate artificial microstructures that mimic real materials and to compute morphological properties such as porosity, volume fraction, pore diameter, and specific surface area. Additional capabilities include the determination of effective thermal and electrical conductivity (both radiative and solid conduction — including the ability to simulate local anisotropy for the latter); effective diffusivity and tortuosity from the continuum to the rarefied regime; techniques to determine the local material orientation, as well as the mechanical properties (elasticity coefficient), and the permeability of a material.

PuMA is available under the terms of the NASA Open Source Agreement (NOSA) and is a copyright of the United States Government as represented by the Administrator of the National Aeronautics and Space Administration.

Stable releases of PuMA can be found on the official NASA GitHub repository at: https://github.com/nasa/puma.

The latest development code can be found on the development GitLab repository at: https://gitlab.com/jcfergus/puma-dev.

45.4 Netgen/NGSolve

Netgen/NGSolve is a high-performance multi-physics finite element software. It is widely used to analyze models from solid mechanics, fluid dynamics, and electromagnetics. Users can freely download and examine the NGSolve source code from: https://github.com/NGSolve/ngsolve/releases.

46 Learning Dragonfly

You will find our latest user tutorials on Dragonfly Social at: https://dragonflysocial.comet.tech/c/user-tutorials/.

In addition, you can start discussions, chat, access material, post announcements, as well as upload and download deep models for the application on the Dragonfly Social online community platform. You can also take advantage of the course offerings listed below to further benefit from our training team's in-depth product knowledge.

46.1 Dragonfly Workshops

Our hands-on training workshops are a terrific 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.

Contact sales.dragonfly@comet.tech for more information and availability.

46.2 Online Training

Get connected with an online training session and follow along with a Dragonfly product specialist as they demonstrate the features and benefits of Dragonfly and walk you through specialized modules. Web-based training, which can be adapted to individual needs and interests, offers an interactive approach that lets you practice new techniques on real world case studies.

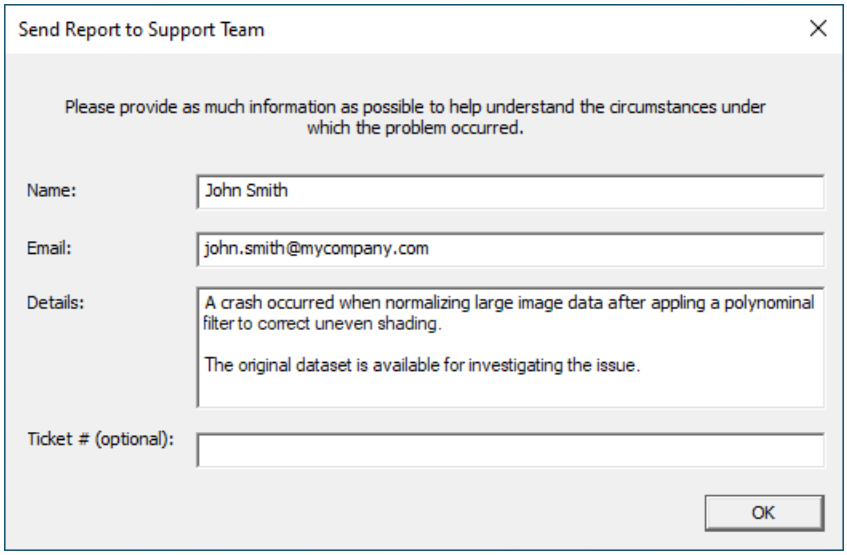
Contact sales.dragonfly@comet.tech for more information and availability.

47 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.

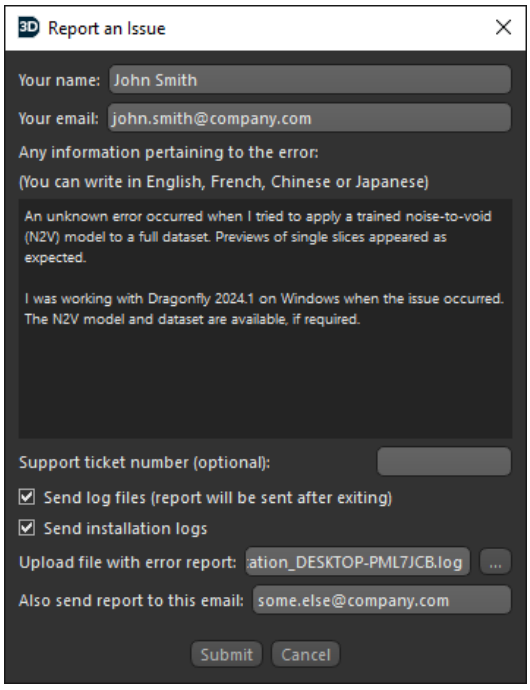
48 Reporting Issues

Dragonfly 3D World includes an integrated reporting module that lets you report any issue that results in a crash. Whenever you choose to send a report, try to include as much information as possible to help the support team to understand why the issue occurred. You can enter details about the issue, such as how to reproduce the problem, in the Send Report to Support Team dialog.



Send Report to Support Team dialog

You should note that you can also report an issue at any time by choosing **Help > Report an Issue** on the menu bar. For example, when an unknown error occurs, or an unexpected result is generated.



Report an Issue dialog

If you decide to report an anomaly, please try to include the following information:

- A description of the issue and when it first occurred.
- The full error message and the steps required to reproduce the problem.
- The installed version of Dragonfly 3D World.
- The operating system of any affected machine.
- If the problem affects a particular dataset or image, you may be asked to provide a copy of the dataset.