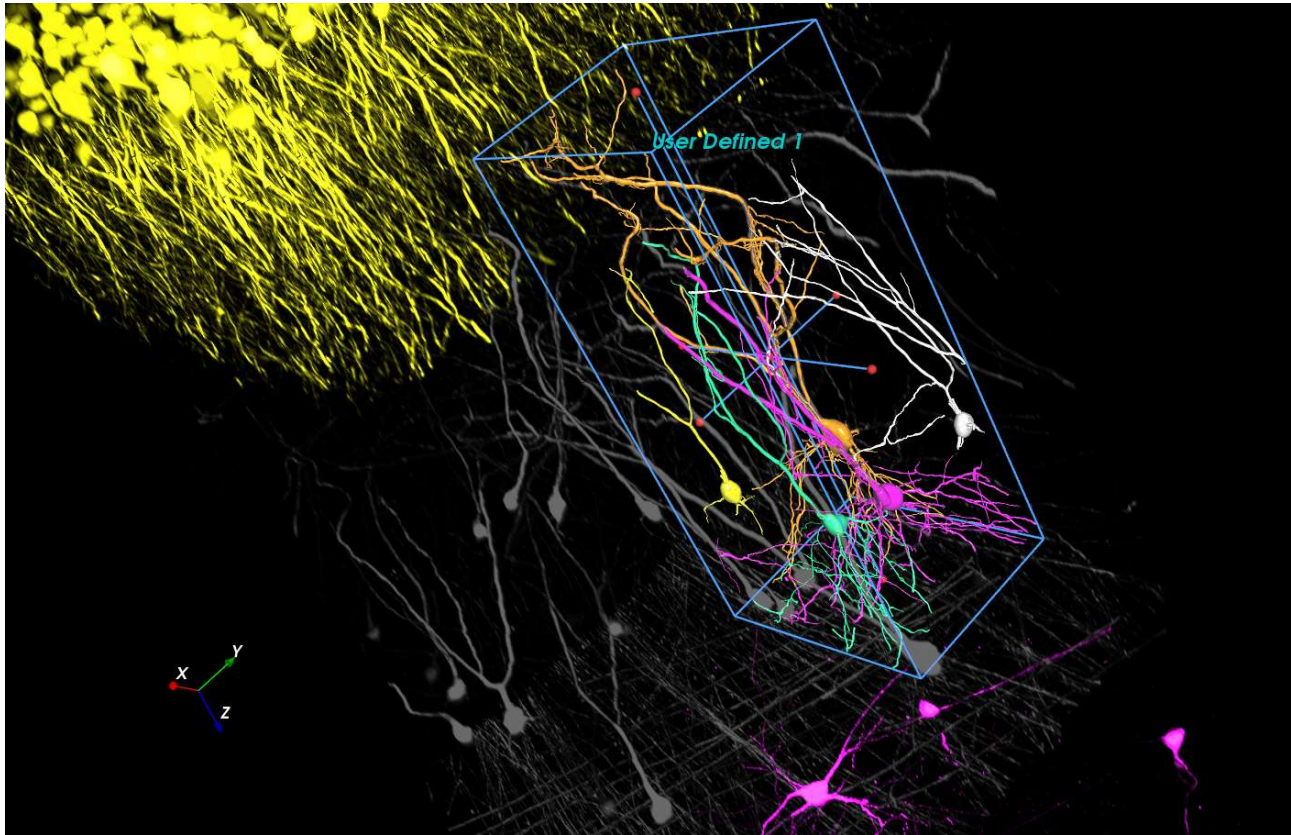


DRVISION TECHNOLOGIES

AIVIA 8.5

May 24th, 2019, Bellevue, WA, USA



OVERVIEW

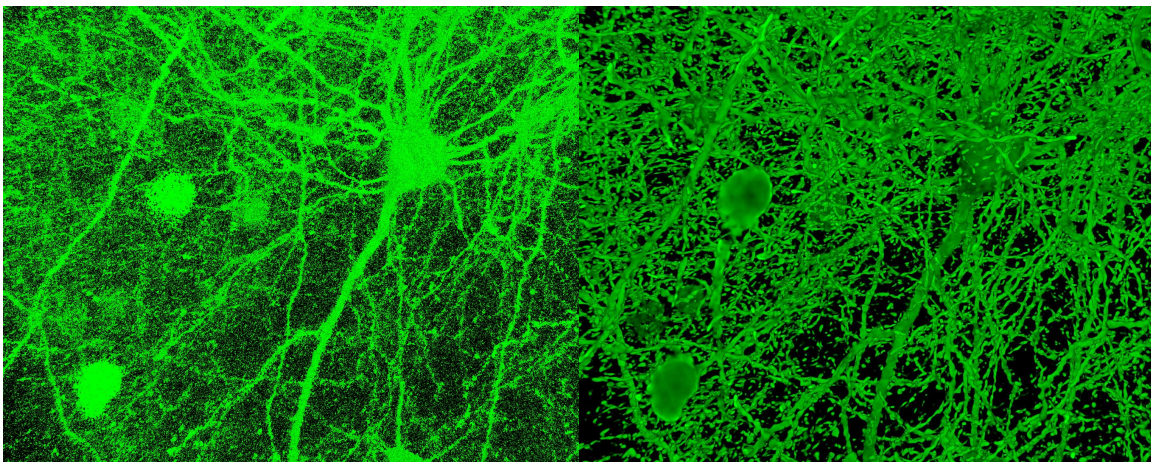
One of the core missions of neuroscience is to map neural circuits across the entire brain and understand how different cells contribute to a specific behavior. New sample preparation (i.e. tissue clearing) and imaging (i.e. light sheet microscopy) techniques enable visualization of the whole brain in 3D space with high spatiotemporal resolution. However, these datasets can often be hundreds of gigabytes to terabytes in size and take hours to days to acquire; this hampers the ability of researchers to investigate the data and formulate new hypothesis to test. Aivia 8.5 brings numerous improvements to acquisition, visualization and analysis of ultra-large high-resolution images: 1) AI deconvolution takes low SNR images and output high SNR result that reduces acquisition time and light exposure; 2) optimized rendering pipeline visualizes large, teravoxel datasets in seconds, and can be analyzed quickly using ROI processing that focuses analysis on the areas crucial to your work; 3) predictive neuron reconstruction provides fast and accurate tracing of dense neural circuits. Aivia 8.5 provides efficient, AI-enabled solutions to boost research productivity and help extract the dynamics hidden in the data.

Summary of Aivia 8.5 developments:

- *AI Deconvolution – 8 new features*
- *Teravoxel data handling – 23 new features*
- *Predictive neuron reconstruction – 26 new features*
- *Volume transformer – 13 new features*
- *2D stitching – 21 new features*
- Live recipe apply and general improvements – 12 new features
- ?? bugs fixed

AI deconvolution

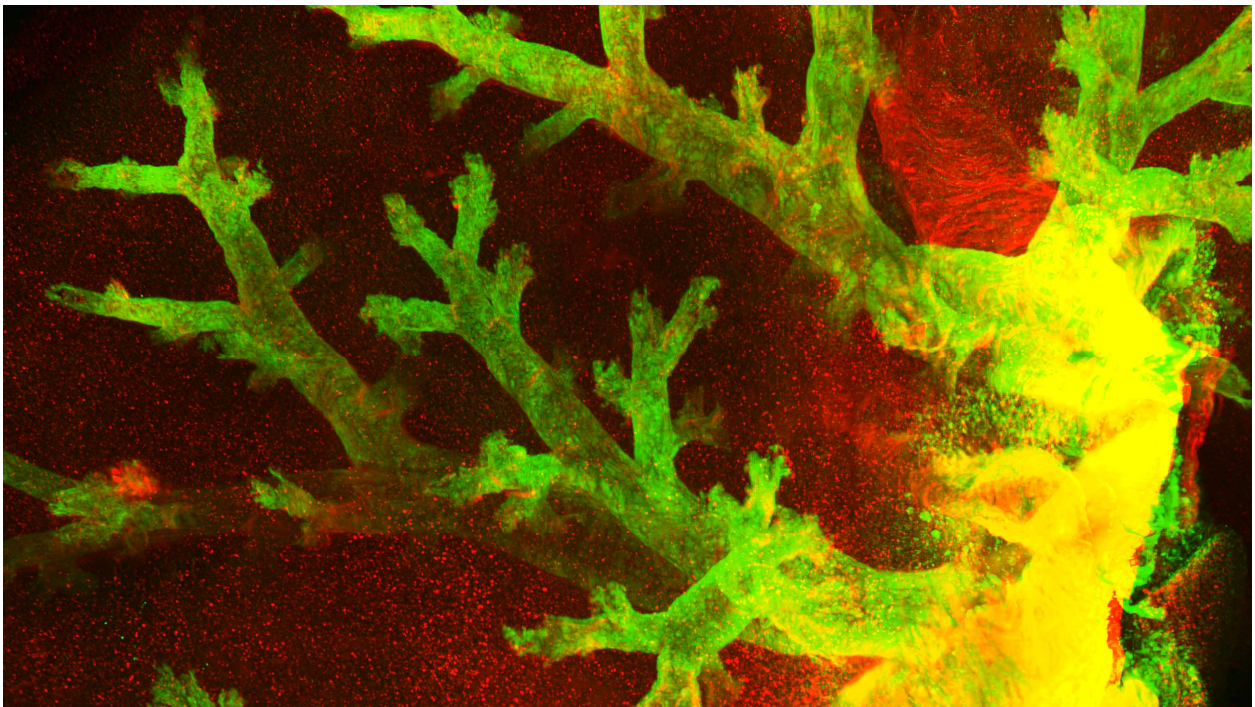
- Two new, pre-trained deep learning model for restoring noisy confocal images at two different objective magnifications
 - AI deconvolution (20x confocal)
 - AI deconvolution (40x confocal)
- Restore noisy image to quality on par with 48-line average resonant scanning confocal image that has been deconvolved using classical computational method
- Works both on Aivia desktop and Aivia Cloud
 - GPU-accelerated for faster deconvolution performance with less processing overhead
 - Leverage state-of-the-art hardware powered by Google Cloud Platform for even faster apply and batch processing with Aivia Cloud
- Upgrade, customize and augment our existing model using Transfer Learning with your own data to improve deconvolution quality



Left: original raw data imaged with a 40x 1.3 NA objective Leica SP8 confocal microscope with a resonant scanner set up with single-line average ; right: image restored using the 40x objective confocal AI deconvolution model

Teravoxel data handling

- Further optimization of the multi-block volume rendering pipeline to support up to 3,000 blocks per image max (up from 81 blocks) that enables rendering of single timepoint teravoxel data (> 1 TB) in seconds
- Volume rendering quality displayed at the bottom of the Aivia window to provide user feedback of 3D display
- New ROI processing tool for applying recipes to small crops of data in 3D
 - Define cube-shaped ROI manually with intuitive ROI tool
 - Import drawn meshes in PLY or OBJ formats into current image
- Use ROIs in the Recipe Console to analyze subset of large datasets
 - Apply a recipe (using a single setting) to multiple ROIs at the same time
 - Preview analysis results in ROIs before extending analysis to whole image
 - Save and load recipe settings to specific ROIs



Rendering of a large one-terabyte 3D volume of lung tissues in Aivia (Image courtesy: LightSpeed Microscopy Inc.)

Predictive neuron reconstruction

- New semi-automatic tool for dendrite tracing in the Neuron Composer (formerly Neuron Editor)
- Two modes of predictive operations: predict segment, end-to-end
 - Predict segment generates potential tracing paths with one-click validation
 - Point-to-point traces paths between two user-defined points
- Advanced view options for precise display control to navigate dense datasets during tracing with ease
 - Three camera modes for controlling viewport camera position and direction to maximize trace visibility: follow, pan-only and manual

- Four clipping modes for controlling the amount of voxel data being displayed to focus display on the traced dendrite: latest, grow, object set and manual
- Build dendrite segment from all validated segments automatically, with automatic trace termination when reaching an existing path
- General improvements to the other Neuron Composer tools
 - New dendrite diameter parameter in Add Soma tool for smoothing soma surface

Volume transformer

- Transform 3D imaging data to align with an arbitrary reference plane
- Interactive on-screen multi-directional widget for transforming reference plane
 - Directional arrows for translation along X, Y and Z axes
 - Bi-directional arrows for rotation about X, Y and Z axes
 - Flat plate for translation along XY, XZ and YZ planes
 - Extra alignment points provide three additional default location for positioning the reference plane widget
- Preview transformation before apply
- Apply transform to create new image aligned to the reference plane (with pixel clipping and padding)

Volume transformation of a CVT transmission cap (left: original image with alignment plane; right: aligned image using the Volume Transformer)

Live recipe apply and additional improvements

- Live recipe apply: Apply the current recipe in the Recipe Console during Live Import of 2-to-4D datasets
- Display settings and analysis tool sections in the right panel can be collapsed or docked independently to the right of the Image Viewer
- New VR interactions
 - Toggle object lock to disable object interactions with the controller (left controller menu button)
 - Toggle object centering mode to scale scene from 1) object center; or 2) center of the VR space (right controller menu button)
- We have fixed 66 bugs to make Aivia more stable and user-friendly (less workarounds needed).

Demo license and testing

Download Aivia from <https://www.drivetechnologies.com/demo> – it includes all the features listed above plus all the functionality previously introduced. See more details here <https://www.drivetechnologies.com/aivia>.

Resources

Video tutorials - <https://www.drivetechnologies.com/tutorials> and via our YouTube channel, <https://www.youtube.com/channel/UCSZnnDkQItndrBfCmfkxyfw>

How to tutorials (text) – scroll to the “How To Guides” section on the tutorials page:

<https://www.drivetechnologies.com/tutorials>

Sample data sets – under the heading of each recipe in the “Recipes” sections in the Aivia Wiki homepage:

<https://drvision.atlassian.net/wiki/spaces/AW/overview>

Aivia Wiki (reference manual) - <https://drvision.atlassian.net/wiki/spaces/AW/overview>

Get Aivia for your lab

Please contact us (quyent@drivetechnologies.com) for pricing and licensing options.