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DRVISION

## About DRVISION

### **Our History**

Started in 1999 by Dr. James Lee, Ph.D., and a core group of machine learning and pattern recognition experts, DRVISION holds 50 patents and has received over 10 M USD from US science funding agencies.

### **Our Vision**

We enable scientific advancement by creating and deploying state of the art teachable image analysis tools, immersive image visualization and interactions.

### **Our Technology**

DRVISION is a pioneer and world leader in image based decision technology which enables a new generation of intelligent, learning-enabled analytical tools for a wide range of applications.

#### **Image Credits:**

- Margaret I. Davis, Ph.D., NIAAA/NIH, Bethesda, MD
- Alleninstitute.org/bigneuron, Allen Institute for Brain Science, Seattle, WA
- Gabriel Martins, Ph.D., Instituto Gulbenkian de Ciencia, Lisbon, Portugal

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### Aivia

A complete image visualization and analysis platform packed with 15 preset applications. Aivia uses the latest generation of object detection algorithms which offer researchers a quick route to their results. Aivia is highly reliable, fully featured and supported. Ideal for analysis of 2D, 3D, and 2D+time microscopy data.

# Image Analysis as a Service (IAaaS)

IAaaS enables research groups, pharmaceutical, and biotech companies to leverage the accumulated expertise of DRVISION's image data analysts. Contact us to set up a project discovery and scope meeting.

## **Contract Software Development**

We deliver ground breaking capabilities to enable new, highend products in high precision manufacturing, inspection, life sciences, digital pathology and biotechnology. Our contract clients push the boundaries of science and technology to create a new generation of products for semiconductor inspection, high-precision lithography, x-ray inspection, microscopy and many more. They come to us for breakthroughs in imagebased decision capabilities. Contact us to learn more about our contract software development offerings and set up a meeting for project discovery and scope.



# 3D Object Reconstruction, Analysis and Editing

Fast and automated detection in 3D datasets can now be accomplished with Aivia. You can use Aivia to automatically detect fluorescently labeled 3D objects using the latest image segmentation technology. Aivia automatically calculates a wide range of measurements, ensuring you extract all the information from your images and delve into the data more effectively. We provide two fully-automatic analysis recipes for 3D object reconstruction: Neuron Analysis and Cell Count.

### **Neuron Analysis**

Aivia detects all somas and traces their dendrites within a 3D dataset in less than 25 seconds (for a  $2k \times 2k \times 500$ , 1 GB data set) with only a few key parameters. The recipe supports a wide range of common neuron imaging use cases (e.g. whole neuron, dendritic network without soma and spine analysis). We offer over 70 statistical measurements (shapes, intensity, etc.) on neurons, dendrites and spines. You can further enhance the detection outcome using our Neuron Editor tools to create soma and spines, and trace dendrites in 3D semi-automatically.

### **Cell Count**

Aivia uses intensity, size and shape input to detect and count objects in 3D. Its advanced algorithms work well in both sparsely-populated samples and in samples where objects are touching each other. The software automatically discerns the boundary between adjacent objects by carefully examining the dataset for object-object transition features. Morphological (e.g. surface area, volume) and intensity measurements are automatically calculated for further analysis. Immersive Microscopy Image Visualization

The advent of 3D light microscopy enabled a wave of new groundbreaking discoveries in biology and medicine. Today, virtual, augmented, and mixed reality tools are poised to help researchers and physicians push the boundaries of knowledge and improve healthcare respectively. In Aivia 5, we are pioneering the latest 3D computer graphics and virtual reality (VR) technologies to bring you the benefits of immersive image visualization and analysis.

Since the launch of Aivia 5, we have made significant progress to improve the rendering and viewing experience in 3D datasets. You will discover significant speed boost when rendering your data sets with millions of 3D objects already created. You can navigate across the entire 3D scene with minimal frame rate loss. With the keyframe animations tool, you can export an immersive flythrough of the 3D dataset as a movie to share with your collaborators and others.

View and interact with your 3D and 4D data in virtual reality (VR). Aivia 5 coupled with HTC Vive system provides a seamless experience. Combined with Aivia 5 detection, you can now directly interact with your data. Segmented objects can be relocated to view how potential physical changes affect the network. Objects can be closely examined and compared side-by-side. The speed boost allows scenes in VR to be rendered more smoothly - reducing the risk of motion sickness while you explore the analysis results in the immersive VR environment.

## **Machine Learning Phenotyping**

Assessing the frequency, spatial distribution and morphological parameters of 3D reconstructed objects allow you to generate blueprints for particular phenotypes. In Aivia, our machine learning approach for object classification harnesses the full wealth of information contained in each and every measurement.

The machine learning-enabled classifier is trained to look for specific phenotypes (e.g. developmental stages, disease states and cell types) present in your data. There are two ways to take advantage of the fast and robust machine learning classification algorithm in Aivia.

For neuron classification, you can use the free and open-source DRVISION-taught classifiers (Mouse, Rat and Human) to identify 8 major types of neurons in your sample (Chandelier, Granule, Motorneuron, Purkinje, Pyramidal, Stellate, Tripolar, and Spindle). These classifiers were taught using a sample of neuron reconstructions from the reference repository, NeuroMorpho.Org<sup>#</sup>.

Aivia 5 also provides you with the flexibility to build your own classifier from individual dendrite segments, dendrite branches, spines and whole cells/nuclei detected with Aivia. It is also possible to import SWC, VRML, and IV object reconstructions from other analysis software into Aivia's machine learning classifier. This way, you can create new classifiers or augment an existing one with reconstructions done previously.

# Ascoli, Giorgio A. "Mobilizing the base of neuroscience data: the case of neuronal morphologies." Nature Reviews Neuroscience 7.4 (2006); 318-324.