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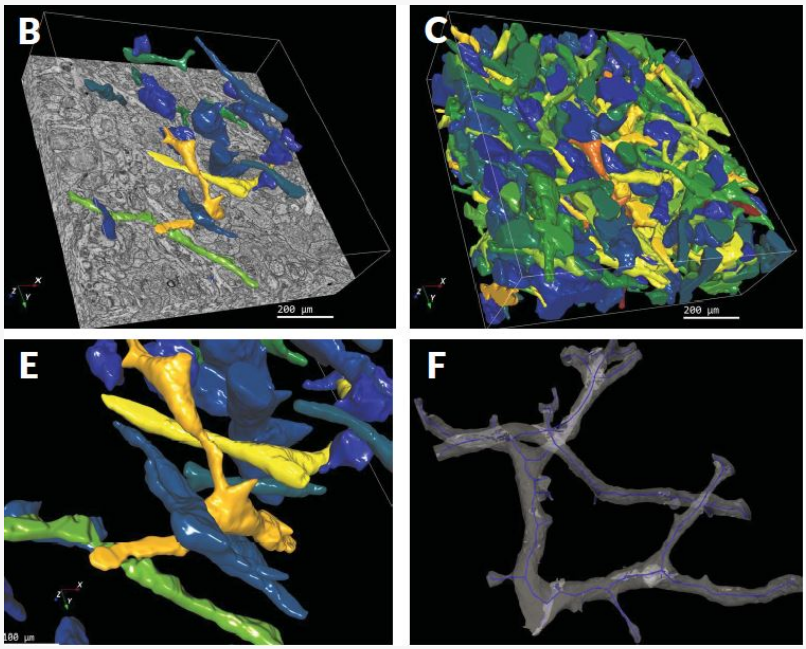
BELLEVUE, WA, UNITED STATES, July 8, 2019 /EINPresswire.com/ -- DRVISION Technologies, a pioneer in computer vision and the world's leading AI microscopy software company has been awarded up to 3.27 million USD from the National Institute of Mental Health (NIMH) to develop the Intelligent Connectomics Analysis (ICA) platform. The R&D funded by this Small Business Innovation Research Fast-Track grant (# R44 MH121167) will further augment the machine learning enabled solutions currently available in Aivia and Aivia Cloud.



Neuron reconstruction and circuit detection based on 3D EM data. (B and C) Example of automatically detected neuron segments using Aivia and the raw data (grey). (E) Close up of segments near each other. (F) Example of partial neuron circuits created in our pilot work.

ICA will greatly automate the labor-intensive task of manual neuron reconstruction, synapse detection and circuit inference based on Electron Microscopy (EM) and Correlative Electron and Light Microscopy (CLEM) images by creating and deploying innovative AI assisted tools. ICA tools will handle multi-terabyte data sets, be usable by neuroscientists with no machine learning expertise and will cover all major aspects of the connectomics analysis pipeline: ground truth creation; training of deep learning models for neuron boundary detection; applying said models, neuron tracing, synapse detection, circuit determination, editing of neurons, synapses and circuits; interactive visualization of raw and processed data; and downstream data driven analysis such as functional inference from structure and phenotypic discoveries. Moreover, ICA will pilot the use of "bi-directional active learning", a groundbreaking AI powered method which guides users to areas that likely need human corrections, makes use of the updated annotations to further improve the initial AI module and incrementally offers additional high confidence neuron reconstructions until the full 3D dataset is mapped. ICA tools will be commercially supported and integrated into Aivia to accelerate the rate of knowledge creation in the field of neurosciences.

DRVISION will work closely with Prof. Rachel Wong from the University of Washington in addition to 10 other collaborating sites from across the USA (University of Washington, University of California San Francisco, Northwestern University, University of British Columbia, Washington University, University of Oregon, Stanford University / Howard Hughes Medical Institute and the

University of Chicago). The collaborating sites will provide test data sets, detailed user feedback and validate ICA's tools using different samples from different regions of the nervous system and across key model systems such as mouse, zebrafish, fly and worm.

"The team at DRVISION is grateful for this grant. Using deep learning for automated 3D EM image boundary detection and tracing by pioneering research groups has created a promising new direction for connectomics. To address the significant connectomics data analysis challenges, ICA extends the pioneering work and completely redefines the analysis paradigm required to balance among versatility, usability, time, labor, data, computing and accuracy," stated Dr. James Lee, DRVISION President and CEO and the principal Investigator of the project. "ICA is a technology platform that could integrate different deep learning models. We will continue to survey the fast-evolving machine learning field and are ready to adapt emerging models with proven advantages to achieve the best possible connectomics analysis outcomes for broad brain regions and model systems."

"We are excited to work with DRVISION to develop a widely accessible toolset that will enable labs to more rapidly reconstruct neurons, identify their synapses, and provide quantitative measures of their connectivity in 3D EM volumes. CLEM is very labor-intensive. The ICA platform DRVISION plans to develop will speed up discoveries for many labs using CLEM to link structure with function." mentioned Professor Rachel Wong, the Chair at the Dept. of Biological Structure (University of Washington) and the key academic collaborator on the ICA project.

"The ICA project, which officially starts today, is a welcomed next step for the pilot work we have been doing with Prof. Wong and her lab members. This exciting endeavor will greatly benefit from DRVISION's leading position in the field of AI microscopy as well as the unique and extensive insight Prof. Wong's group have with neuron reconstruction and circuit mapping. ICA will gradually be integrated into Aivia and Aivia Cloud thus making this revolutionary and highly enabling technology available to the wider neurosciences community. The DRVISION team is very happy and proud to be the recipients of this competitive NIMH grant which will give us the unique opportunity to solve a challenge that greatly limits the progress of the field of connectomics." said Dr. Luciano Lucas, DRVISION's Executive Vice President and ICA's project manager.

Motivation and background: As the world's population grows older the number of people affected by neuro-degenerative diseases is sharply increasing. Despite significant advances in the last decades, our understanding of the normal morphology, distribution and connectivity of different neuron types remains sparse making it very challenging to create effective diagnostic tools and/or therapeutic solutions for neurological disorders. Electron microscopy (EM) and correlative electron and light microscopy (CLEM) aided approaches are driving a wave of discovery by systematically mapping critical brain regions at sub-cellular resolution. However, such approaches are often heavily dependent on the manual segmentation and tracing of each neuron which can take several months for a small brain region.

About DRVISION
DRVISION works with scientists and engineers at the technological frontier, and pioneers image based decision technologies that propel major breakthroughs in the life science, electronics and materials industries. DRVISION is a technological innovator with 50 issued US patents, and commercial interests in X-ray inspection, survey, search / alignment, video inspection and life sciences. DRVISION makes and markets Aivia microscopy image analysis software. Aivia development is partially funded by the National Institutes of Health (NIH) under multiple Small Business Innovative Research (SBIR) programs worth over $13 M. For more information, visit www.drvtechnologies.com.

About Prof. Rachel Wong's lab at the University of Washington
Prof. Wong's lab is interested in neuronal circuit assembly in development, circuit disassembly in

degeneration and circuit reassembly upon cellular regeneration. Their studies are based on the vertebrate retina of zebrafish and mice. They apply a diversity of approaches including in vivo and in vitro confocal and multiphoton imaging, electron microscopy, transgenic methods and electrophysiology to investigate neuronal structure, function and connectivity in normal and perturbed retinas. For more information, visit http://wonglab.biostr.washington.edu/research.html.

Luciano Lucas, PhD
DRVision Technologies LLC
452-773-1548
email us here