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# Scalable automated (synapse) detection using the Open Connectome Project

William Gray Roncal<sup>1,2</sup>, Anish K. Simhal<sup>3</sup>, Joshua T. Vogelstein<sup>2</sup>, Forrest Collman<sup>4</sup>, <sup>5</sup>Eva L. Dyer, Mark A. Chevillet<sup>1</sup>, Randal Burns<sup>2</sup>, Guillermo Sapiro<sup>3</sup>, Gregory D. Hager<sup>2</sup>

<sup>1</sup>JHU Applied Physics Laboratory, <sup>2</sup>Johns Hopkins University, <sup>3</sup>Duke University, <sup>4</sup>Allen Institute for Brain Sciences, <sup>5</sup>Northwestern University

Contact: wgr@jhu.edu

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## Background

- ▶ New neuroimaging datasets are large (10GB to 100TB+)
- ▶ Object detection is a canonical problem
- ▶ Many techniques exist to aid in scene parsing

## Challenge

- ▶ Translating algorithms for neuroscience discovery is multi-faceted and complex
- ▶ Solving these issues often requires re-solving common problems
- ▶ A reusable framework would facilitate scientists doing science

## Action

- ▶ We developed a flexible analytics toolbox to enable rapid discovery
- ▶ These tools are built into the NeuroData framework
- ▶ Algorithms include a variety of community-developed and custom tools for common workflows

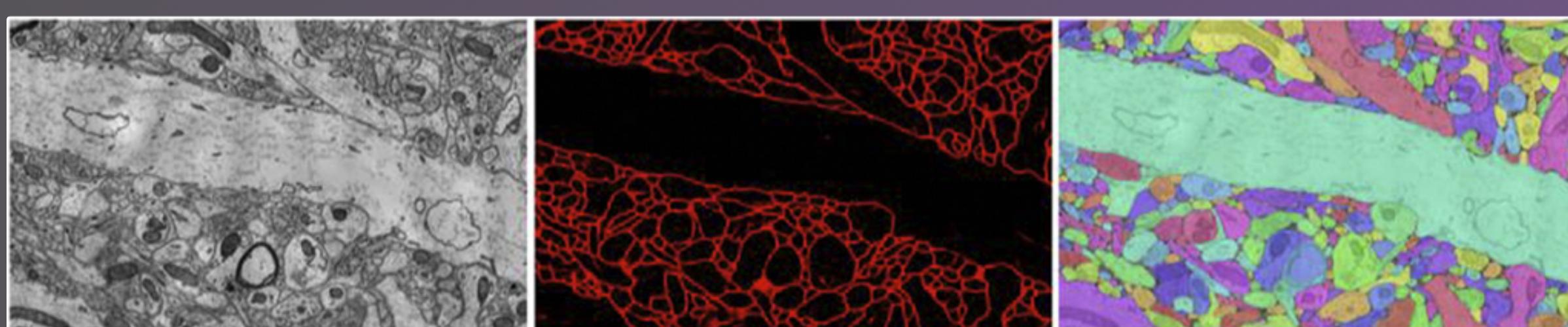
## Resolution

- ▶ Our code was used for object detection tasks across multiple modalities, including Array Tomography, X-Ray Microscopy and Electron Microscopy
- ▶ Code, data, and an analytics stack are available at [neurodata.io](http://neurodata.io)

## Background

NeuroData provides an ecosystem of tools and services to enable data sharing and computation:

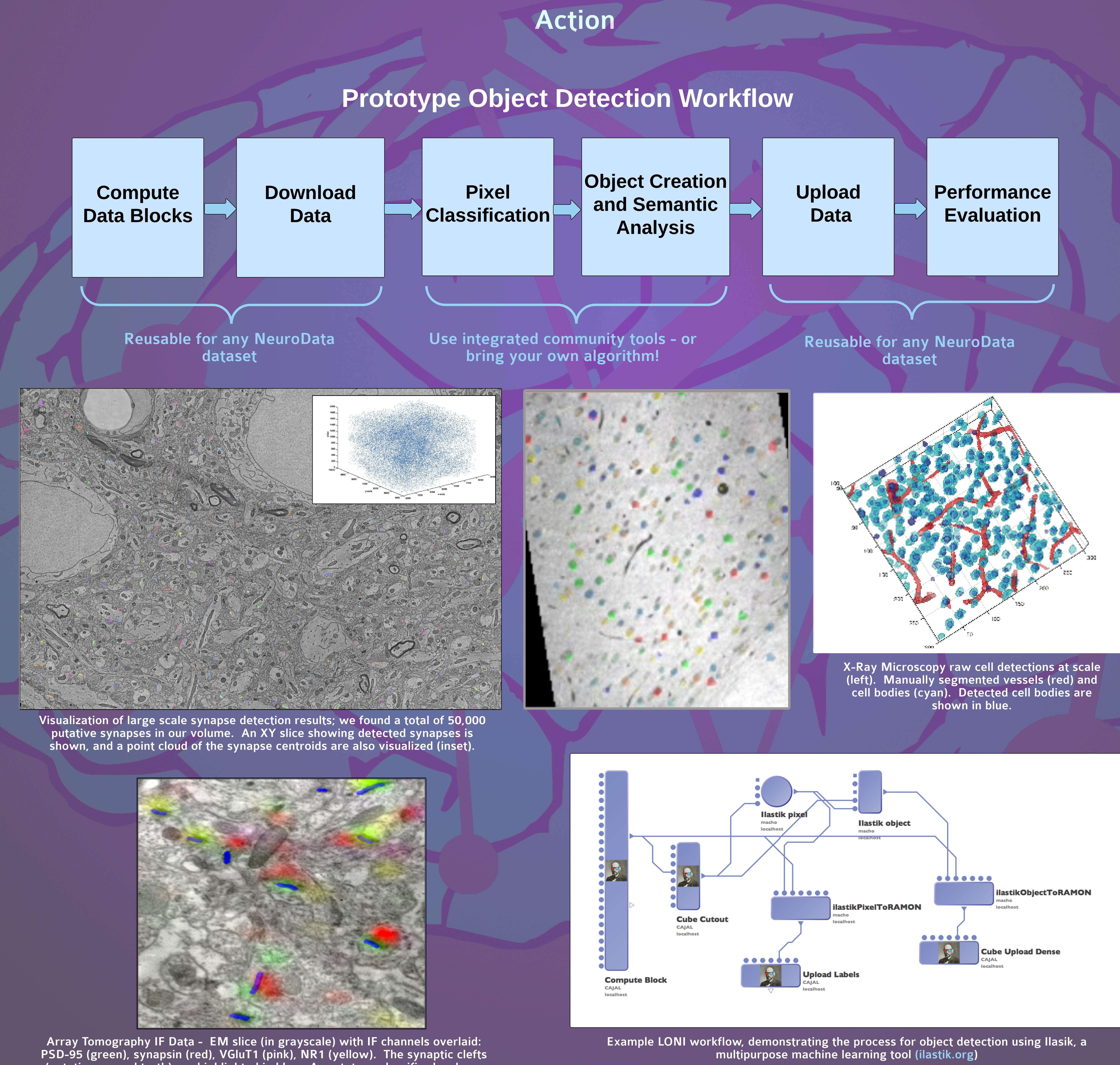
- ▶ High-throughput reads/writes to spatial database to support high performance computing (HPC)
- ▶ Spatially co-registered image and annotation data
- ▶ Flexible, interoperable RAMON data standard to enable both annotations and metadata
- ▶ RESTful endpoints, with MATLAB and Python interfaces for rapid workflow construction



## Challenge

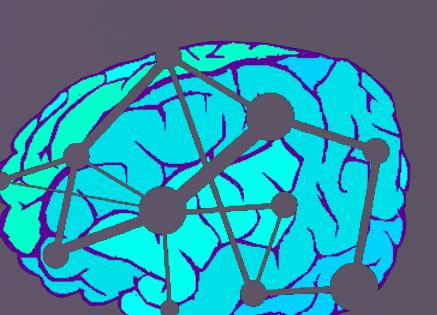
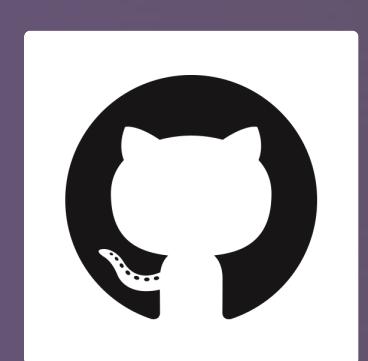
Processing neuroscience data at scale requires addressing a wide range of challenges, including:

- ▶ Data storage
- ▶ Data access
- ▶ Algorithm Implementation
- ▶ Algorithm scaling
- ▶ Utilizing computational resources
- ▶ Enabling reproducible science
- ▶ Multiscale scene understanding
- ▶ Recording object metadata
- ▶ Performance Assessment



## Resolution

- ▶ Code and data are open and available at [neurodata.io](http://neurodata.io)
- ▶ NeuroDataVision exists as an integrated analytics stack in an Amazon Machine Image for mesoscale processing and prototyping
- ▶ Many algorithms have been included for immediate use; the framework can be easily extended
- ▶ More complex workflows (e.g., graph estimation from images) are also available



## References

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