

SuRVoS

Super-Region Volume Segmentation Workbench



diamond



The University of Nottingham

SuRVoS Workshop

4th & 5th May, 2017

SuRVoS Workbench is a new program for the segmentation of 3D image datasets. SuRVoS combines high-level algorithms for feature detection, and super-region building for smarter, quicker segmentation and analysis. A training workshop will be held at Diamond Light Source on May 4th and 5th, 2017. Please bring your own data as time will be provided on the second day for individual, hands-on training.

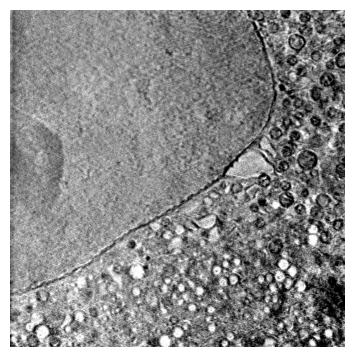
Accommodation: <http://www.stfc.ac.uk/about-us/where-we-work/rutherford-appleton-laboratory/ridgeway-house/>

Registration: <http://bit.ly/2nw1Jkw>

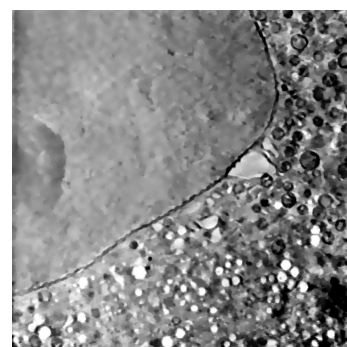
Cost to all participants: £50 (excludes accommodation)

Data Preprocessing & Feature Extraction

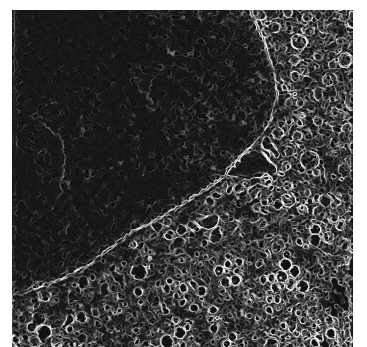
- **Denoising** and **Feature** filters are used to preprocess the volume and enhance different properties.
- These **features** are stored as channels, and can be visually explored at any time to assess their quality.
- **Features** are then used to build region representation (**Supervoxels** and **Megavoxels**) and to train **Machine Learning** models.



Raw Slice

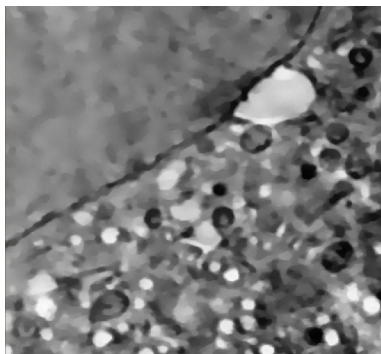


Total Variation

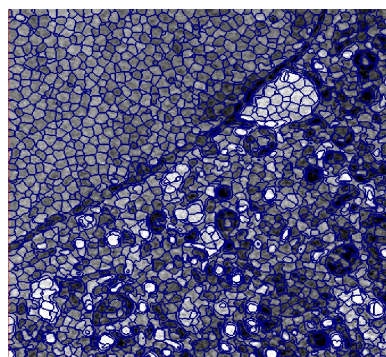


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Data Representation



400x400x100 ROI



10x10x10 Supervoxels

- **Supervoxels** and **Megavoxels** group together similar and nearby voxels into 3D regions that preserve volume boundaries.

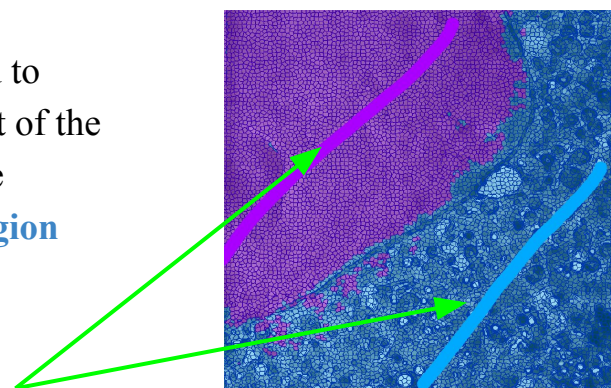
- Reduce the time and complexity of segmentation (both manual and semi-automatic) processing by several orders of magnitude.

Left: ROI with **16M** pixels

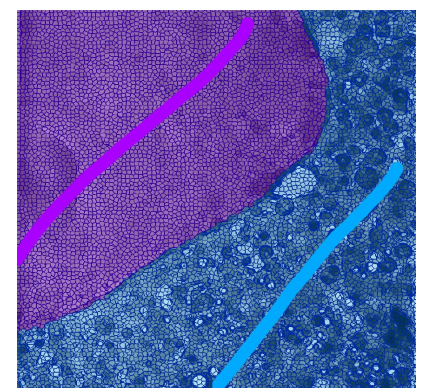
Right: 16M/1000 = **16K** supervoxels

Model Training

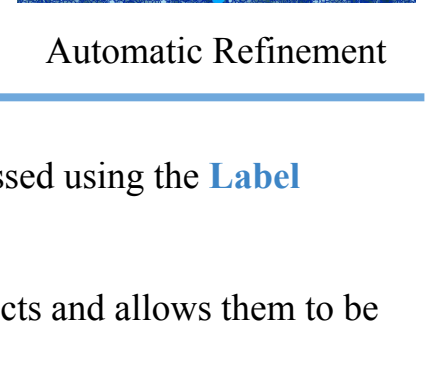
Machine Learning classifiers (e.g Random Forest) are used to learn from user annotations and predict the labels for the rest of the volume. **Markov Random Fields** are then used to refine the prediction of each supervoxel by connecting them into a **Region Adjacency Graph**, improving the overall accuracy.



User Annotations

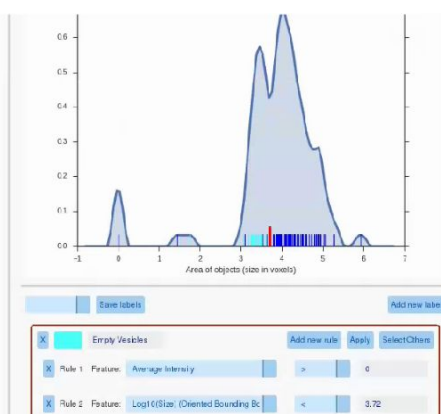
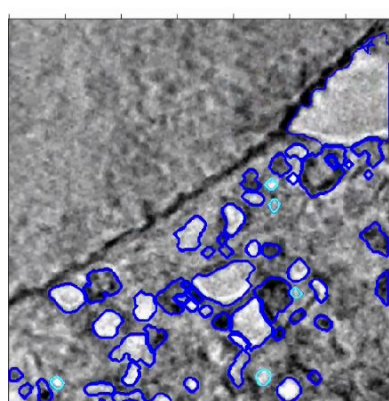


Predictions



Automatic Refinement

Label Postprocessing



Segmented objects can be further processed using the **Label Splitter** and **Label Statistics** tools.

- **Label Splitter**: detects individual objects and allows them to be further categorized.

- **Label Statistics**: outputs quantitative statistics of segmented objects.

<https://diamondlightsource.github.io/SuRVoS/>

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