

# COMP9517 Computer Vision Project, T2 2019

## Project Synopsis

This is a group project that will be executed by a team of 4 or 5 students. The aim of this project is to develop and evaluate methods for image segmentation.

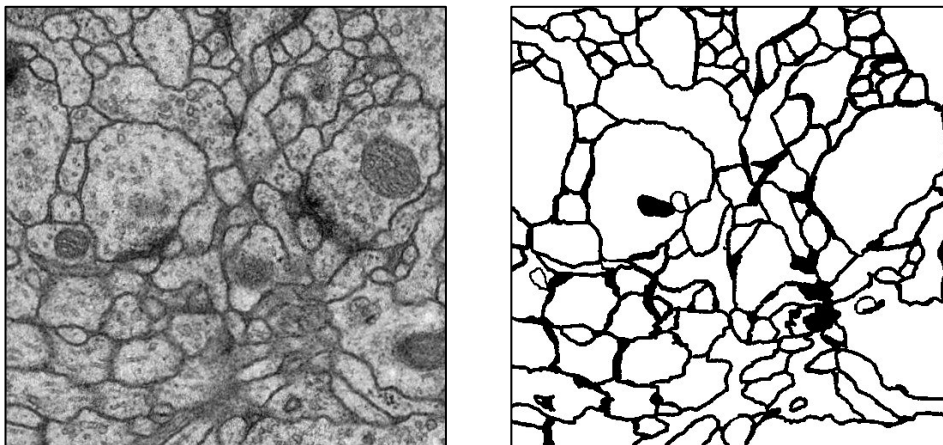
**The project is worth 45% of the total course marks.** Refer to the marking criteria file for detailed information about marking. Submission instructions and demo schedule will be released later.

## Dataset

The dataset for the ISBI 2012 EM Segmentation Challenge ([http://brainiac2.mit.edu/isbi\\_challenge/](http://brainiac2.mit.edu/isbi_challenge/)) is to be used in this project and has been provided on WebCMS3. Please note that these images are subject to copyright and should not be used for any other purpose.

The dataset contains 30 ssTEM (serial section Transmission Electron Microscopy) images taken from the Drosophila larva ventral nerve cord (VNC). The images represent a set of consecutive slices within one 3D volume. Corresponding segmentation ground truths are also provided in this dataset.

The objective is to segment the neuron membranes as indicated in the ground truth masks. The segmentation result can be evaluated using  $V^{\text{Rank}}$  and  $V^{\text{Info}}$  metrics, and the scripts for evaluation can be obtained from [http://brainiac2.mit.edu/isbi\\_challenge/evaluation](http://brainiac2.mit.edu/isbi_challenge/evaluation). If learning-based approaches are developed, a cross-validation training and testing process should be applied.



**Figure 1:** An input ssTEM image for segmentation (left) and the corresponding segmentation ground truth mask (right)

## Project implementation

Each team should develop a minimum of two different methods. Each team member can develop one method individually, or several team members can work together to develop a more complex (e.g. multi-stage) method. You are free to design your own methods, such as morphological processing, feature extraction + classifier training, deep learning, or a combination of these various types of methods. You can use any open-source libraries such as scikit-learn and Keras.

You are expected to fine-tune each method, perform performance comparison, and discuss why one method outperforms the others. You can get some ideas about method design from the

research papers uploaded on WebCMS3. These papers are selected to present a variety of method designs and levels of complexity. The “design and planning” session in week 7 should be used to get feedback from tutors about the method design to enable a successful project outcome.

### Checkpoints

The checkpoints include:

<b><i>Project Milestones</i></b>	<b><i>Format</i></b>	<b><i>Date &amp; time</i></b>
Design and planning	Tutor consultation	July 16 <sup>th</sup> (12-2pm)
Project demo	Group presentation (20 minutes)	August 5 <sup>th</sup> (4-6pm) or 6 <sup>th</sup> (12-2pm)
Project report	Final report (pdf) and code	August 12 <sup>th</sup> (midnight)

### Design and planning

This item will not be assessed. The objective of this session is to present your plan of method development and workload partitioning to the tutors, and the tutors will provide feedback and guidance. This will ensure that the project will contain appropriate scope and complexity.

### Report

The report should contain introduction, methods, experimental setup, results, discussion, and conclusions. It should be 12 – 15 pages, maximum 20 pages (single column, 1.5 line spacing).

A table of individual contribution should also be included in the report. The table should indicate clearly the individual team member’s contribution to the “methods” and “results” sections, which will be evaluated individually. The other sections will be evaluated as the group component.

A brief guideline of the report sections is as follows:

- **Introduction:** introducing the project aim, methods and findings
- **Methods:** presenting the details of all methods developed, including brief description of method theories and design choices
- **Experimental setup:** describing the dataset and evaluation metrics
- **Results:** presenting the evaluation results of each method, and including evaluation of main design choices
- **Discussion:** performing comparisons among the methods developed and if applicable presenting results from combining various methods
- **Conclusions:** summarising the study and findings
- **References:** listing literature and other references
- **Appendix:** including the table of individual contribution

### Demo

Each group is to present a 20 minutes presentation to one tutor and one assessor. This should include a PowerPoint presentation, demo of some results, and Q&A. The tutor and assessor will provide feedback during this session.

### Code Submission

Code files should indicate the individual students’ names. These will be evaluated as part of the individual component.