

## Assignment 2 - Nuclei Segmentation

Dateline for hand-in: 20 JUNE 2019 MIDNIGHT

In this assignment, you would be working with the Kaggle 2018 Data Science Bowl challenge dataset for semantic segmentation and report the results or your reflections. This image data set contains a large number of segmented nuclei images as a testing ground for the application of novel and cutting edge approaches in computer vision and machine learning. The collection of the nuclei images in this dataset comes from a breadth of biological contexts. Your task for this assignment would be as following –

1. Collect the dataset and detailed description of them from the following link <https://data.broadinstitute.org/bbbc/BBBC038/>. For more information and ideas, you may consult the Kaggle competition page from <https://www.kaggle.com/c/data-science-bowl-2018/overview>.
2. Setup the dataset in a form that can be used for deep learning semantic segmentation training and testing.
3. Implement an U-Net architecture for segmentation and train on the 80% of the stage1-train dataset and validate on the rest 20%. Report the results in terms of mean average precision (map), where intersection over union (IOU) is to be more than 0.8 for a correct nuclei segmentation. Please consult <https://www.kaggle.com/c/data-science-bowl-2018/overview/evaluation> for more information.
4. Reflect upon what ideas could be taken to improve the results. Here, <https://www.kaggle.com/c/data-science-bowl-2018/discussion>, you may find inspiration from other successful solutions that topped the leaderboard.
5. Implement a Mask R-CNN network to do the same and discuss your results and findings. you may use the implementation from <https://github.com/louis-she/dsb>.
6. Which method is giving better result and why? (Mask R-CNN or U-Net?)
7. Convert all images to grayscale and redo the training for one of the network. Does it improve the result? What is your interpretation of the found results?
8. Apply some data augmentation during both training and testing and write down the results you found.
9. Try to incorporate your open topic into your assignment solution and discuss the implication.

On Friday, we will provide five new images to segment and we will analyze the results together.

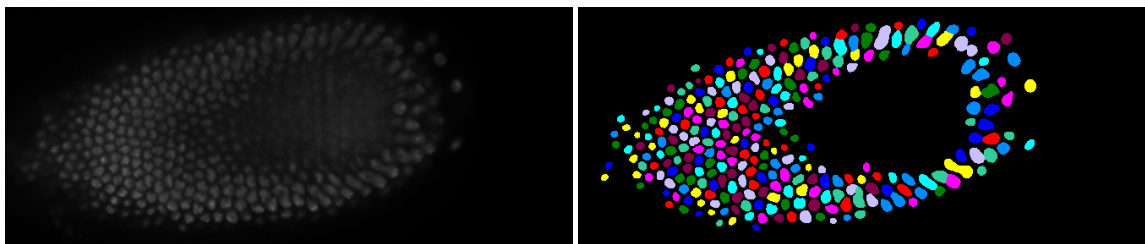


Figure 1: On the left, an original microscopic image and on the right, the semantic segmentation of each nuclei from the winning solution of the competition.