Project 4: Cilia Segmentation

Team Kampf:

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Approaches

- Techniques
  - Beat Frequency
  - Median Filter
  - Optical Flow
  - UNet (from the last project)
  - Fully Convolutional DenseNets (Tiramisu Network)
- Settled on the last approach
  - UNet has its deficiencies, based on the lessons from the last project
  - Want to try something with better performance
  - Didn’t have enough time to get results from other approaches

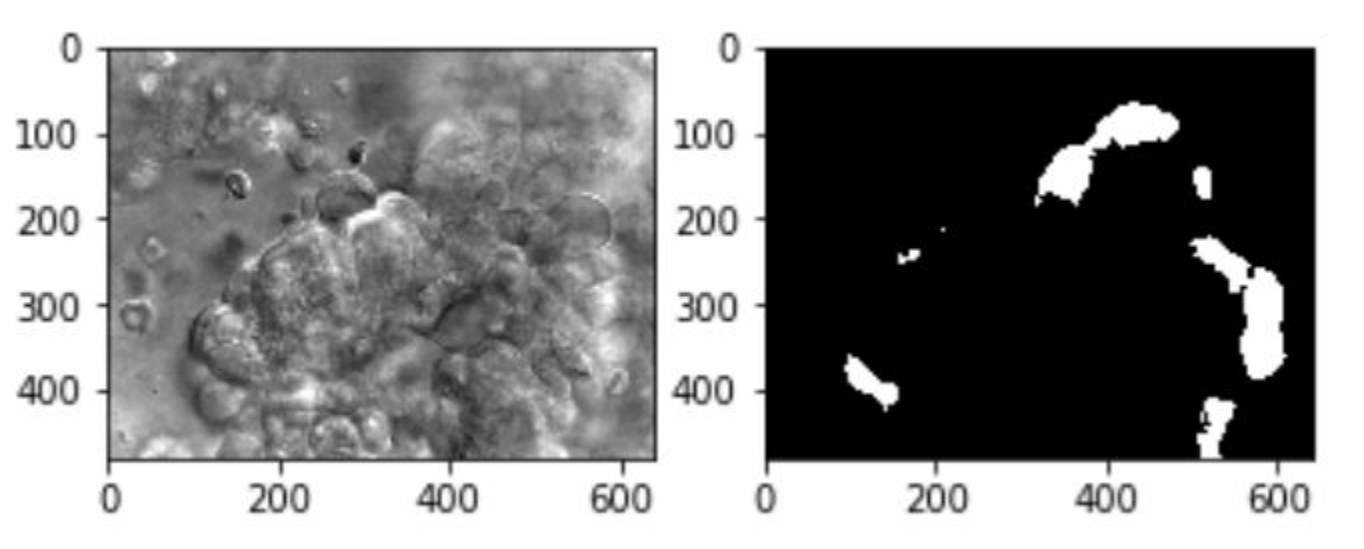
Tiramisu

- Hardware Specs
  - CPU: Intel(R) Core(TM) i7-5960X CPU @ 3.00GHz
  - RAM: 64 GB
  - GPU: Nvidia GeForce GTX 1080 Ti
- To get the inputs for the network (including the images and the mask):
  - Splitting the 211 “videos”/images into the training set and validation set. (ratio is about 9:1).
  - Take the first frame of the 100 frames in training, validation, and testing sets
  - For training sets (both images and masks)
    - Random Clip with the size of (256, 256)
    - Random Horizontal Flip
  - Tried both removing the cell (label 1) and keeping the cell
    - The results doesn’t vary much; removing might be a little better?
- In training processes
  - Only use 1 channel
  - Take a batch size of 1
  - Adam Optimizer (better than its alternatives)
  - Saving model at every step

Tiramisu

- In testing
  - Pick a trained model has the least validation loss
  - Again, choose a batch size of 1
  - Get the results!
    - We also provide the option of getting results from CPU only. (Take a long time).
    - The best single model gives a score of 40.8.
  - Ensembling the results
    - We ended up getting about two dozens of submissions with scores over 37.
    - Put these masks together, and set some threshold to get an ensembled results.
    - Best score: 45.8 after ensembling
- Lessons
  - Instead of taking the first frame, maybe should randomly take a frame?
  - More hyper-parameter tuning
  - More preprocessing
    - We didn't take that many preprocessing steps.
    - But not sure how much improvement it will give us.

Sample Result (for the first one in testing)



THANK YOU!

Questions?