CSCI 8360 Data Science Practicum

Project 2: Ciliary Motion Extraction

Team-Bruce

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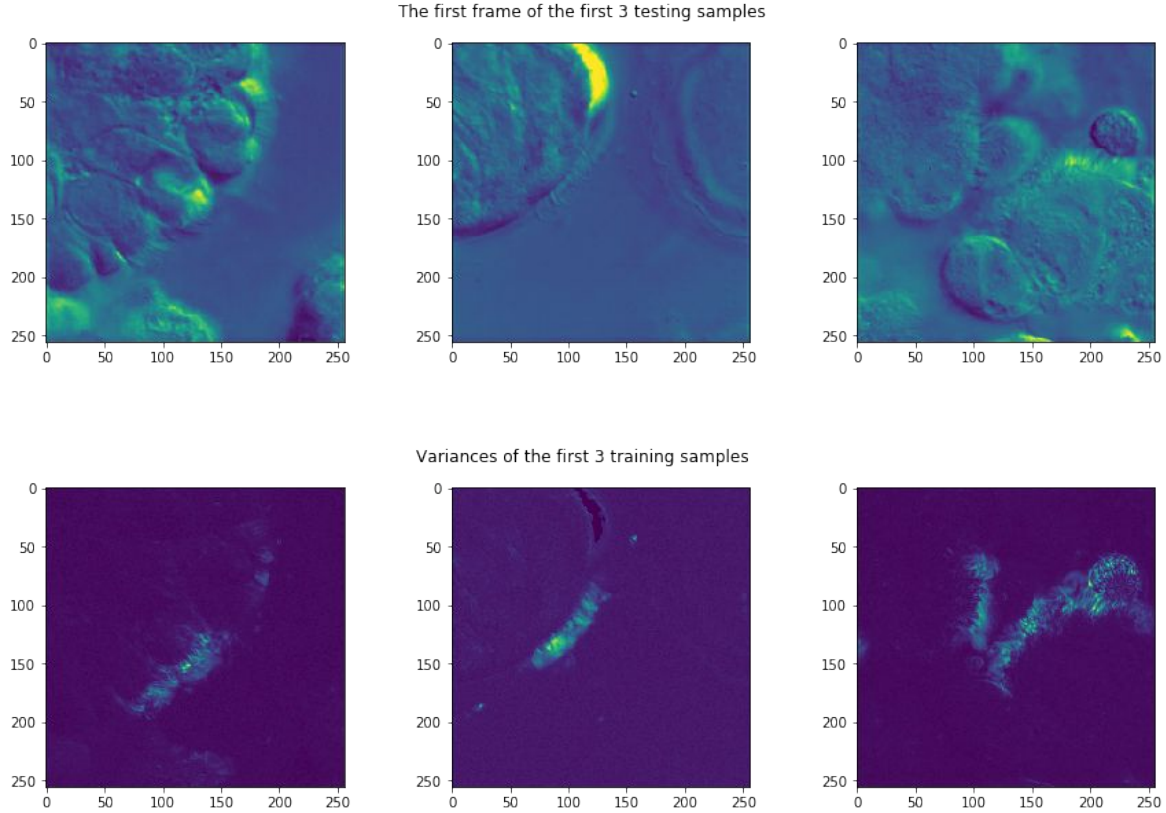
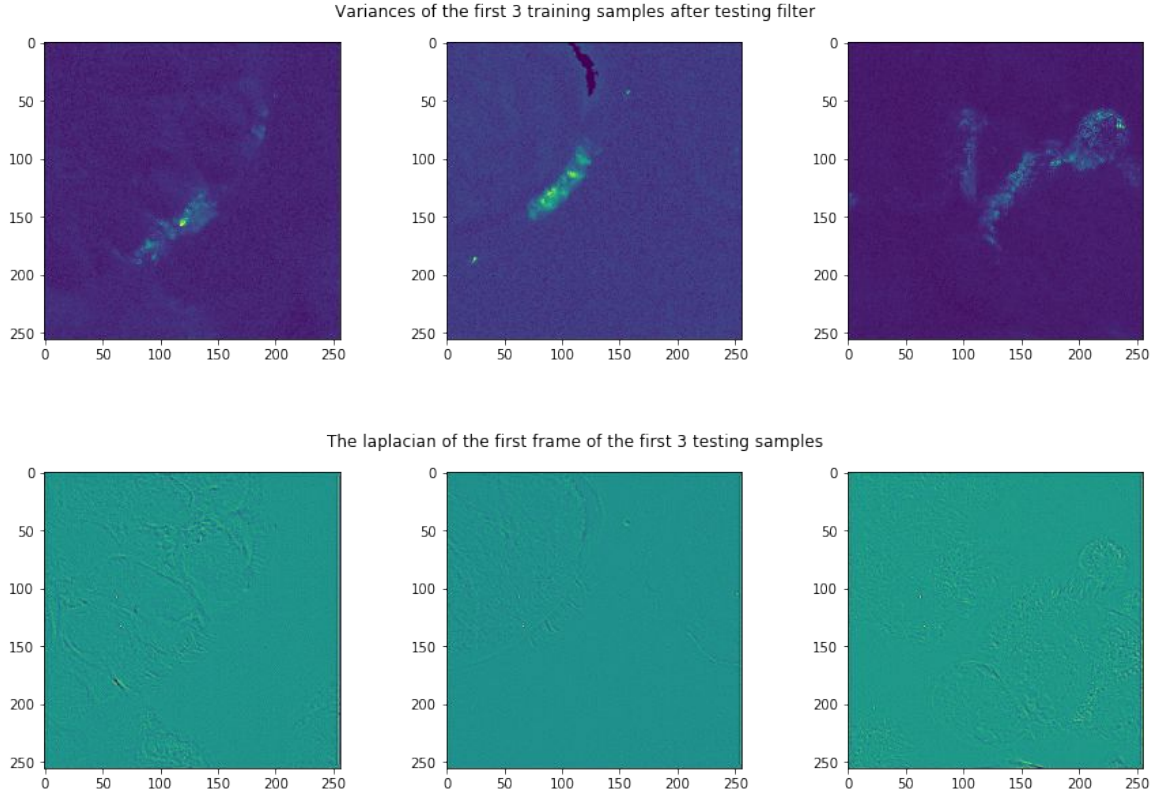
Technologies

- ML instance on Google Cloud Platform
  - Packages: 'OpenCV', 'Tensorflow', 'Keras', 'Matplotlib', 'Sklearn', 'Pandas', 'PIL', 'Numpy'
- Python 3.6

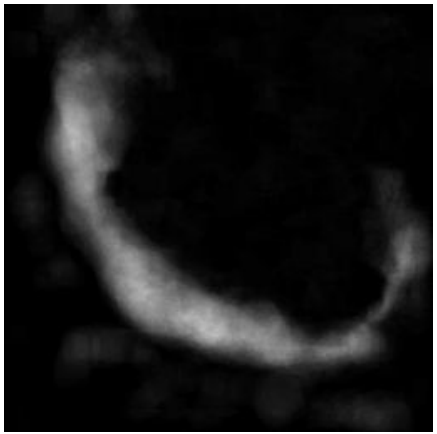
Feature Exploration: Variance

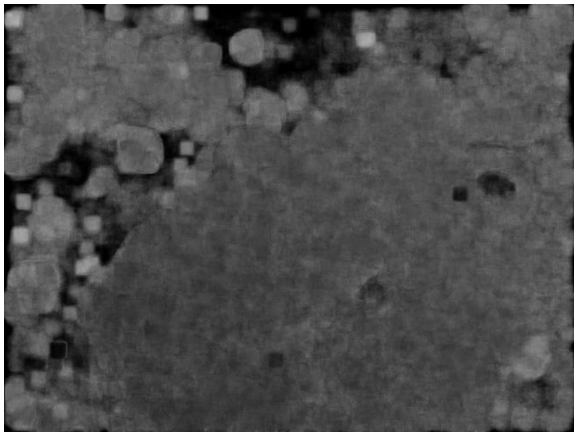


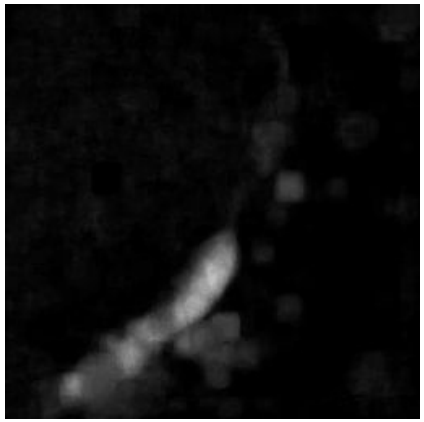
Feature Exploration: Laplacian filter and variance



Feature Exploration: Dense optical flow



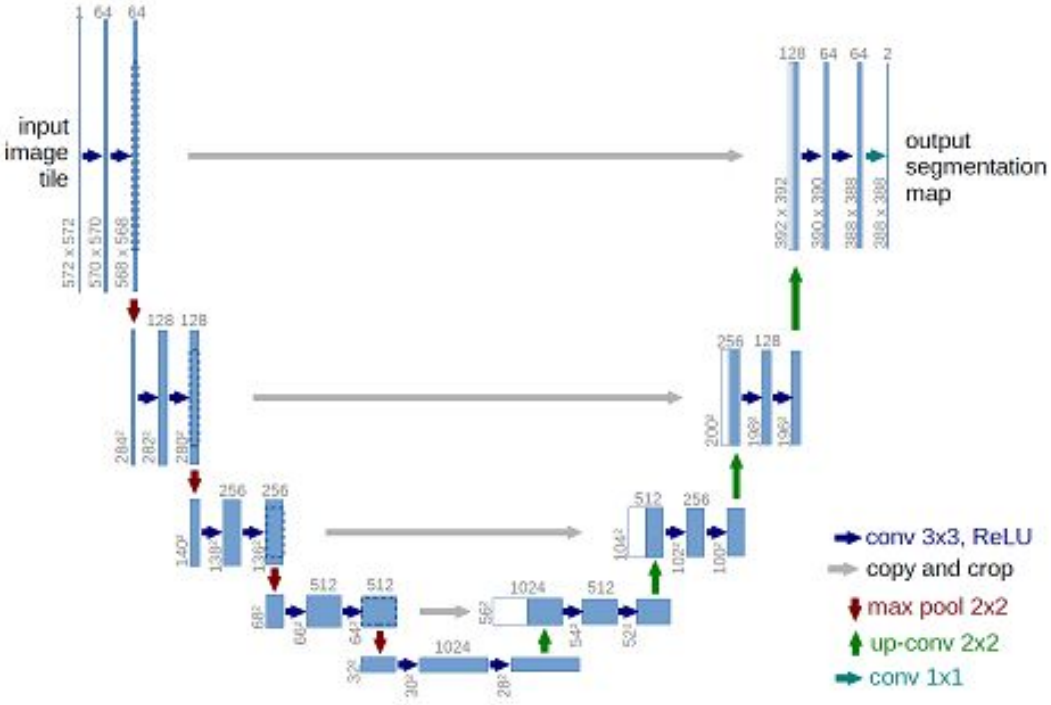




Classifiers

- Simple threshold
- K-means
- Unet

Unet

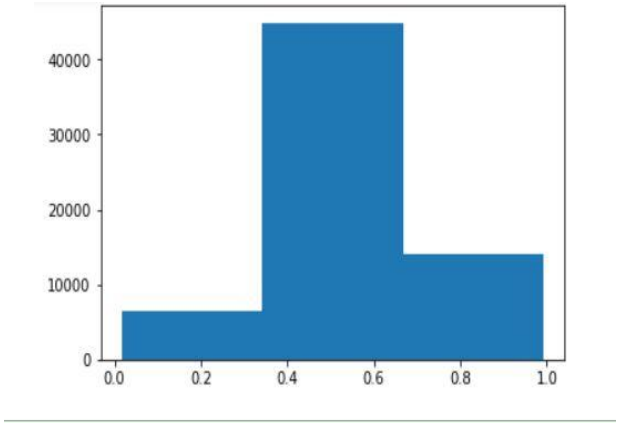

input image tile
output segmentation map
conv 3x3, ReLU
copy and crop
max pool 2x2
up-conv 2x2
conv 1x1

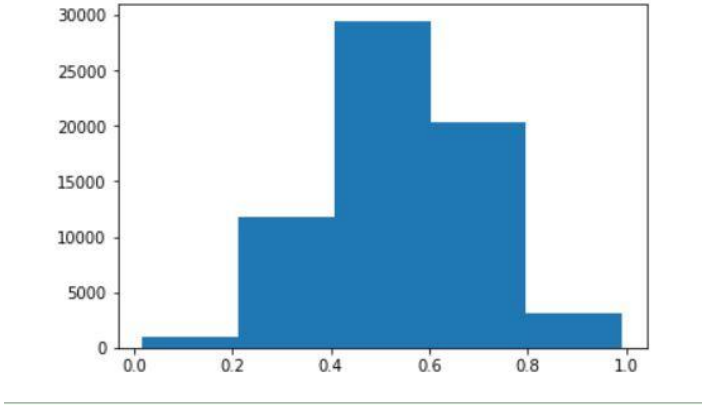
Unet

1. Batch normalization
2. 50 epochs
3. Batch size 32.
4. Tried adding a lstm layer on the input, but no luck here (also no time)

Post Processing

- Histogram Binning
- Histograms of 3,5
-





Classification Results

1. Simple threshold: IoU 17.5
2. UNet with 30 epochs on raw variance: 15.4
3. Laplacian filter + variance + simple threshold: 14.8
4. Optical Flow + hard code threshold: 11.6
5. Others are pretty much around or below 10.

Lessons

Start early on the models , rather than just EDA.

Code engineering is important.

Try different models rather than stuck in the same place.