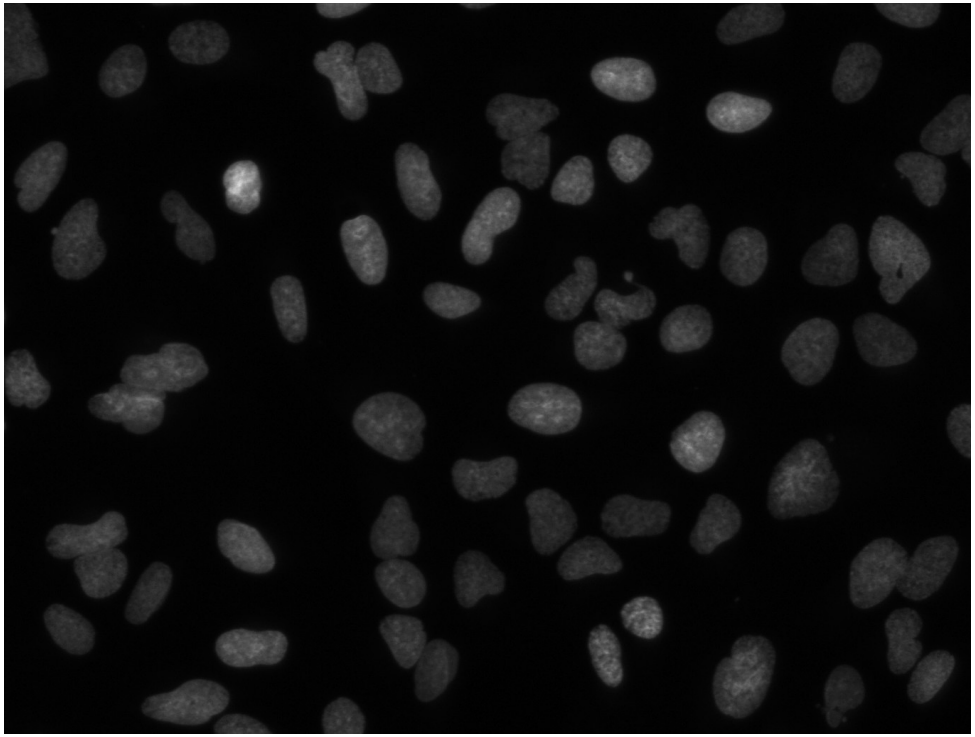
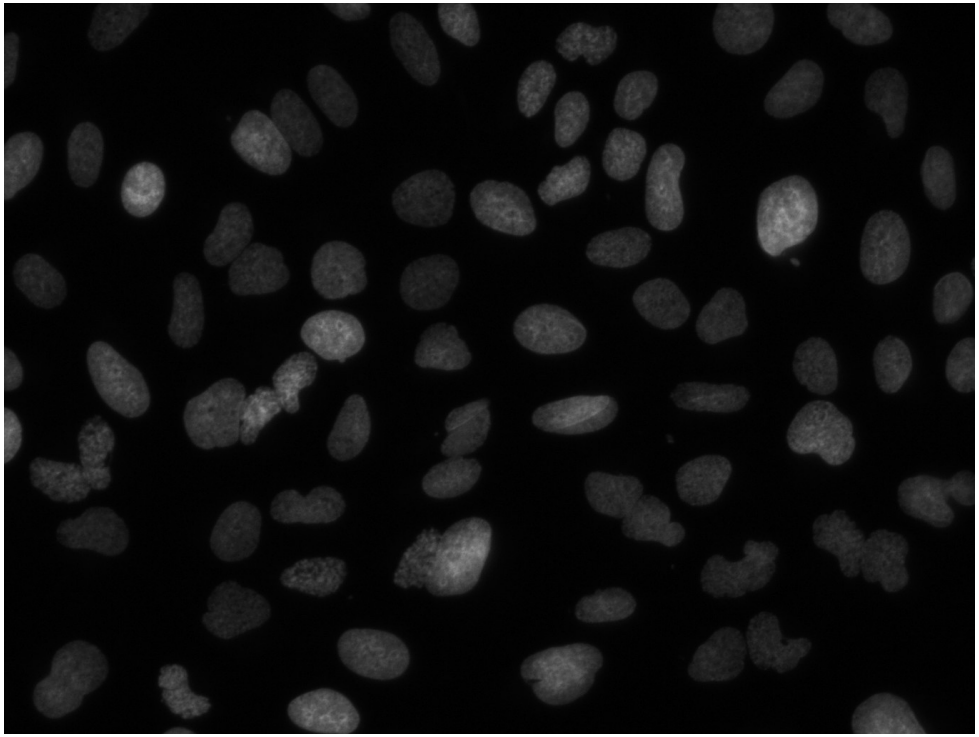
Microscope image segmentation by means of machine learning methods

Jan Nováček

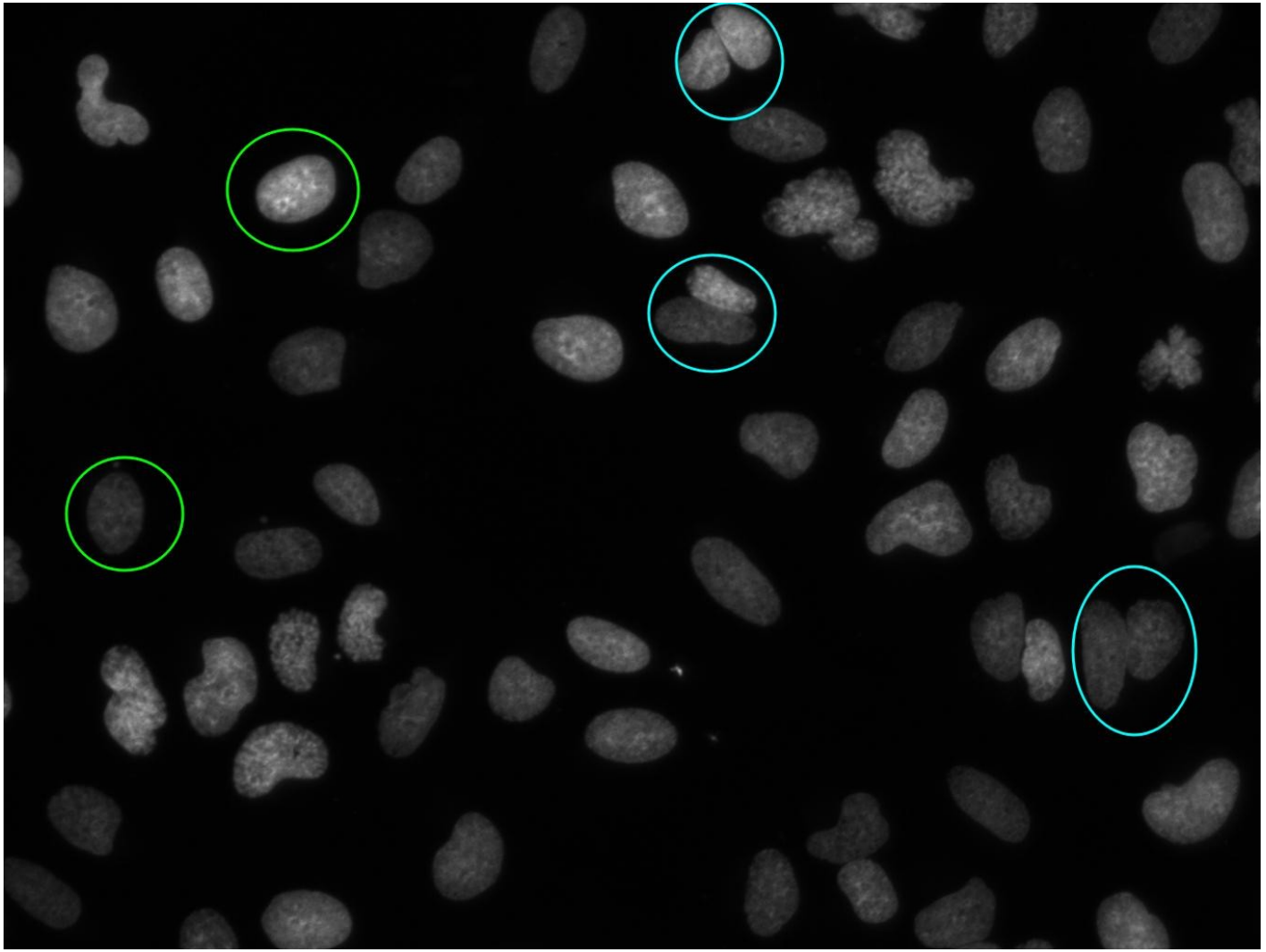
Motivation

- research in area of genotoxicity on IMTM
- scanning colored cell nuclei (DAPI)
- need for getting statistics about cells on image



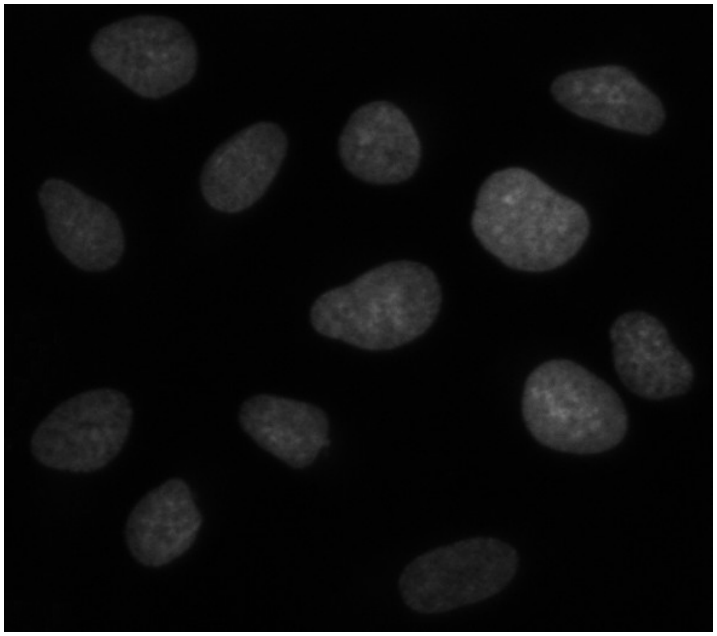


Problems

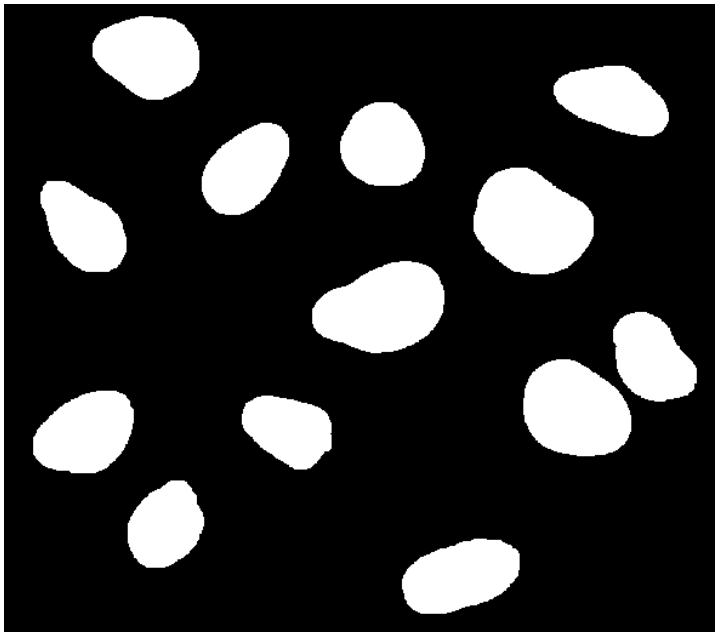


Task

input



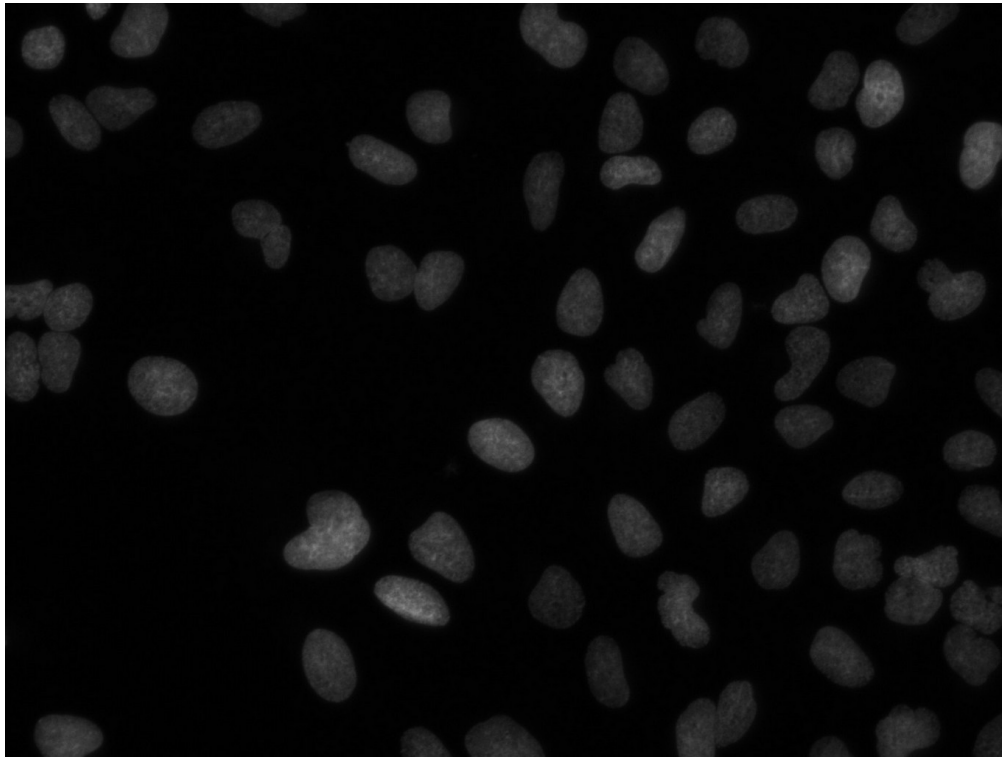
output

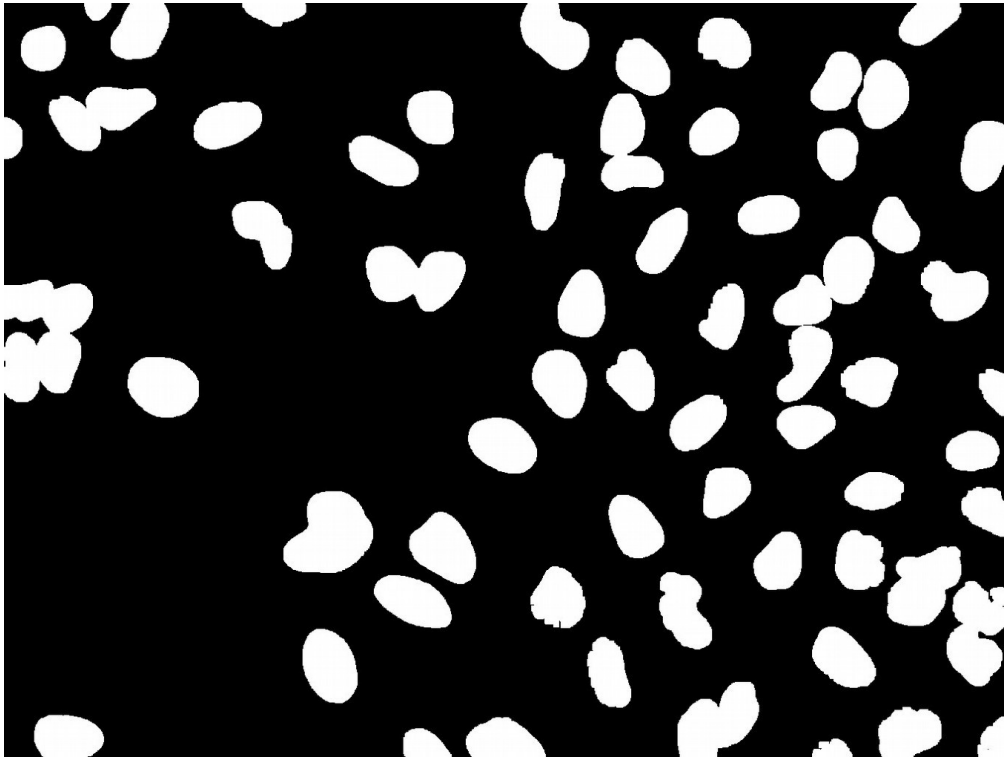


- **solved in two steps:**
  1. segmentation
  2. cluster separation

1. segmentation

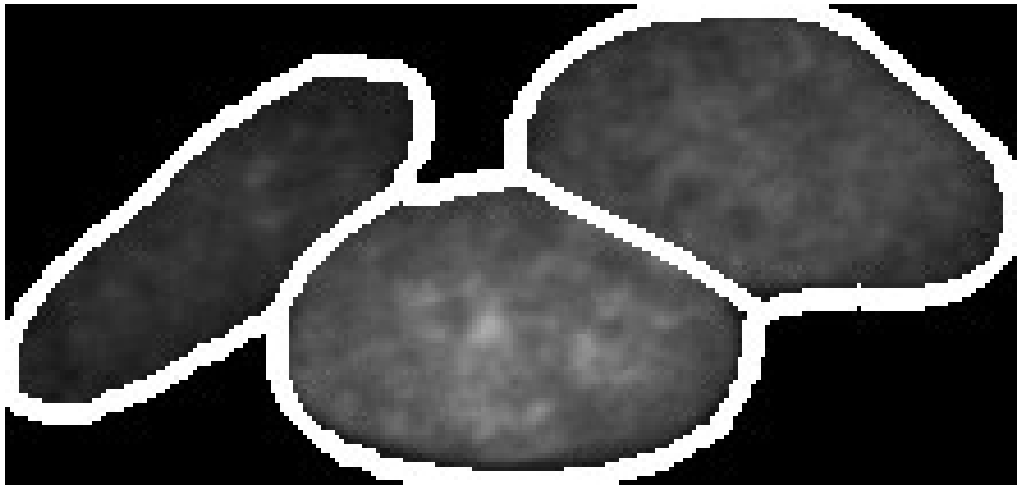
- thresholding
- can be solved better with ANN





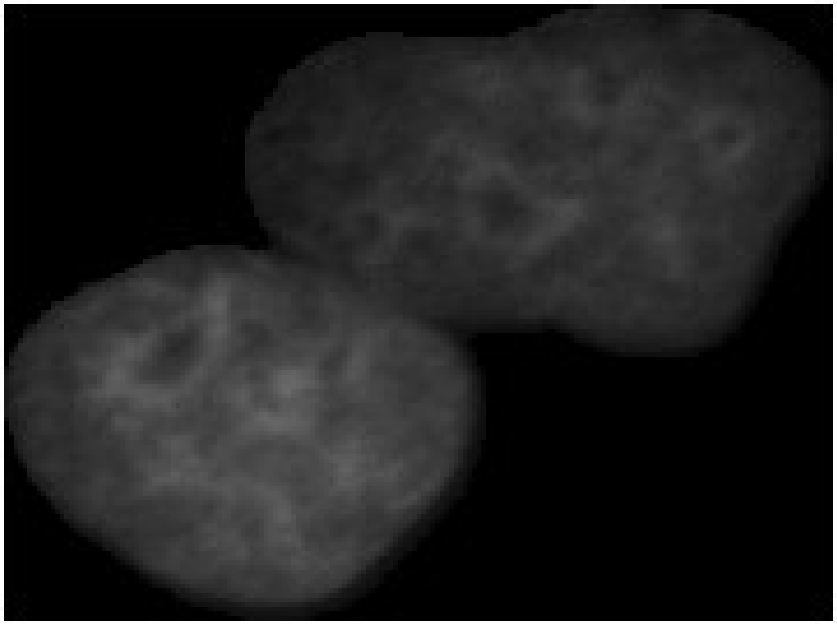
2. cluster separation

- border around every cell in a cluster
- convolutional neural network (CNN)

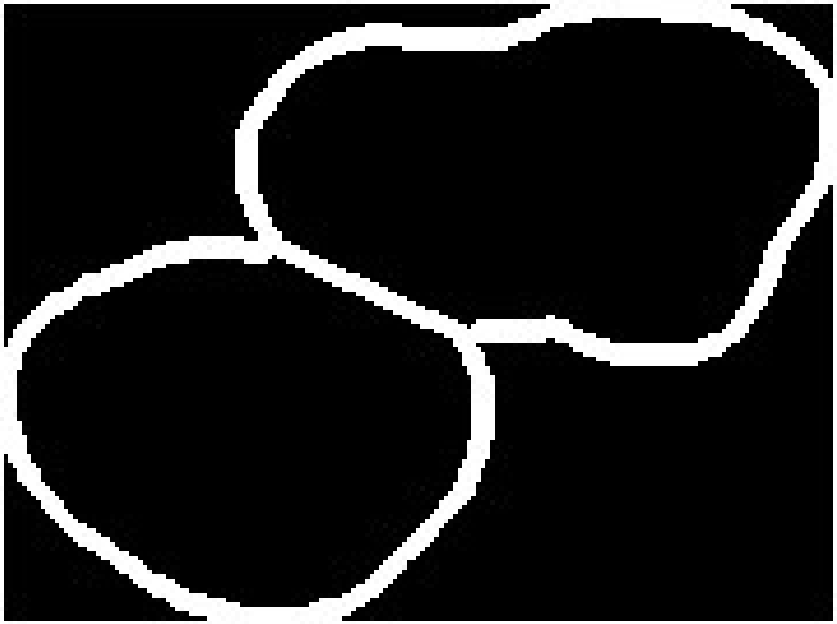


First experiment (unsuccessful)

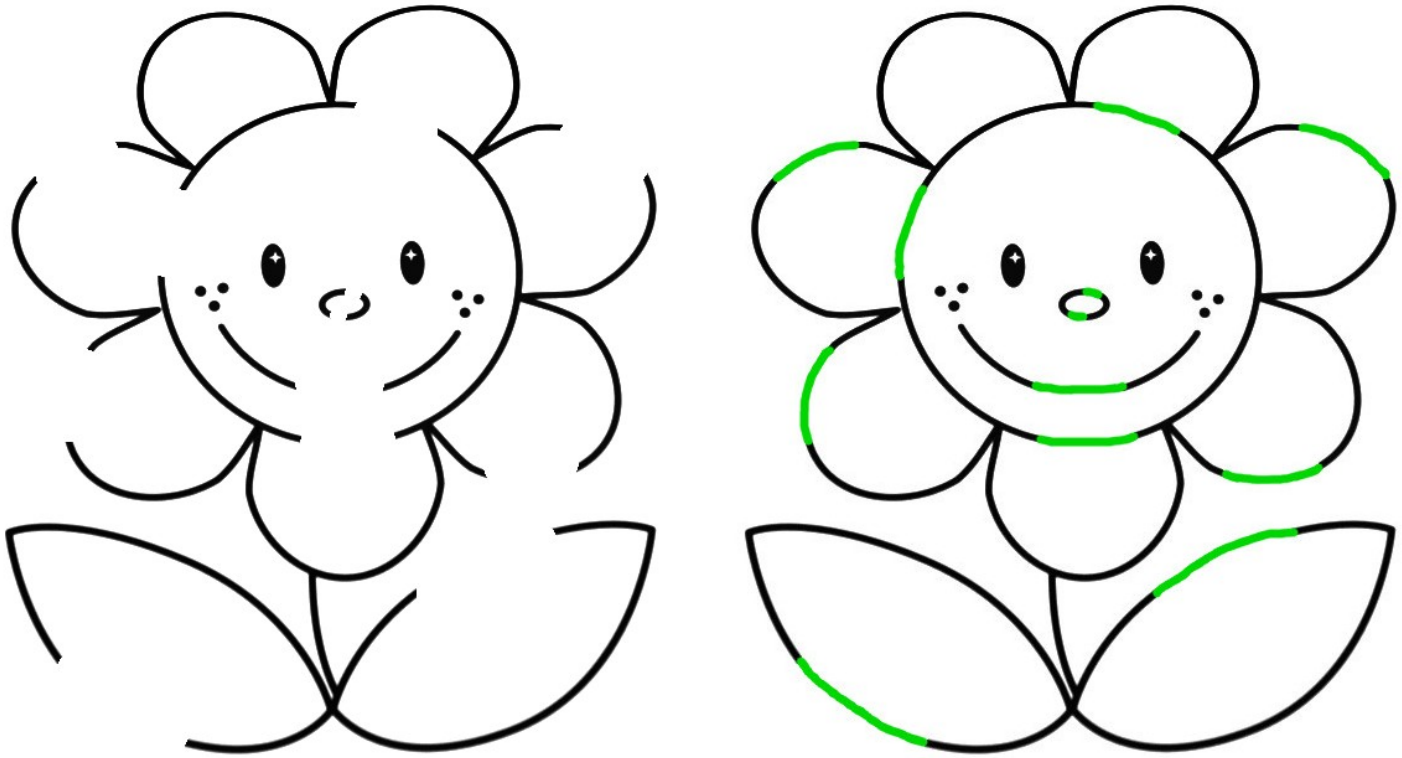
CNN input



CNN output



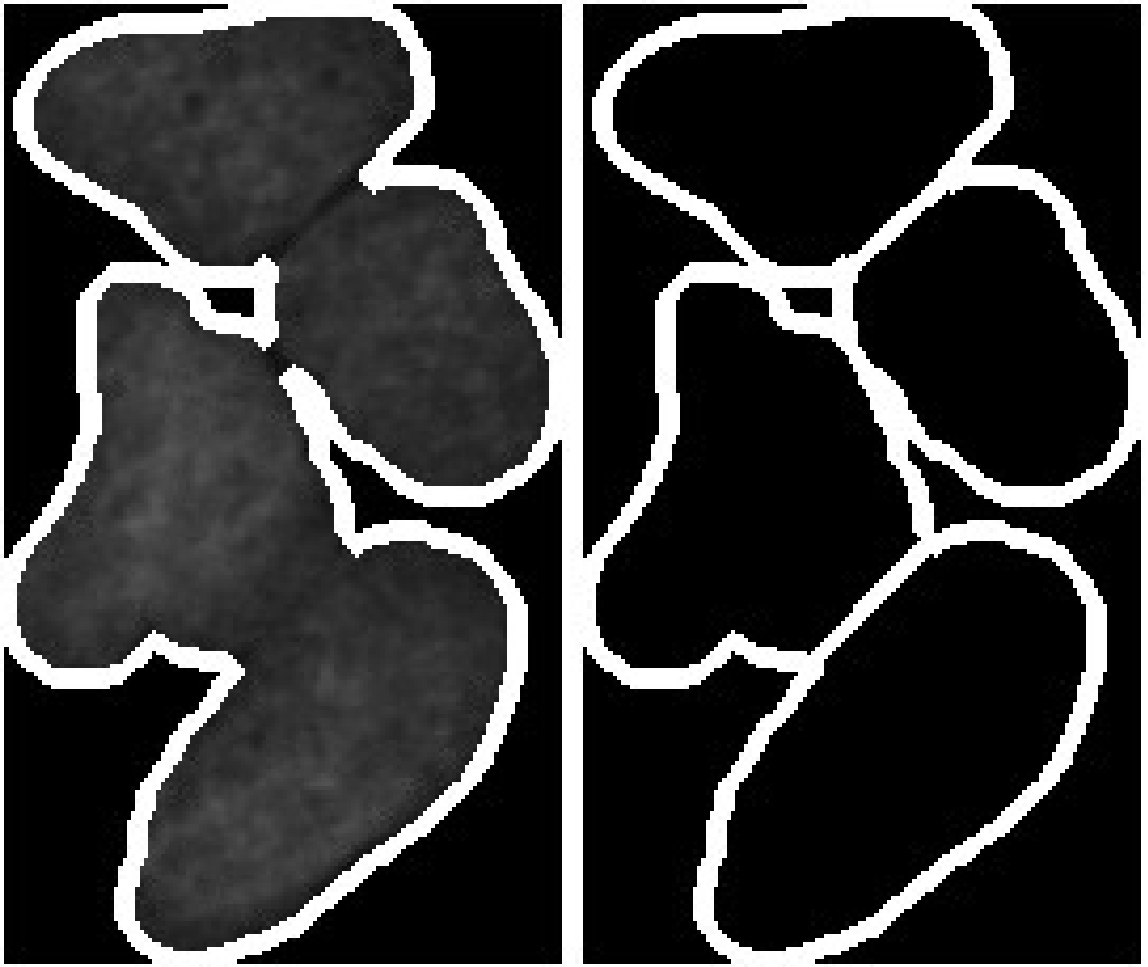
Idea



Second experiment (successful)

CNN input

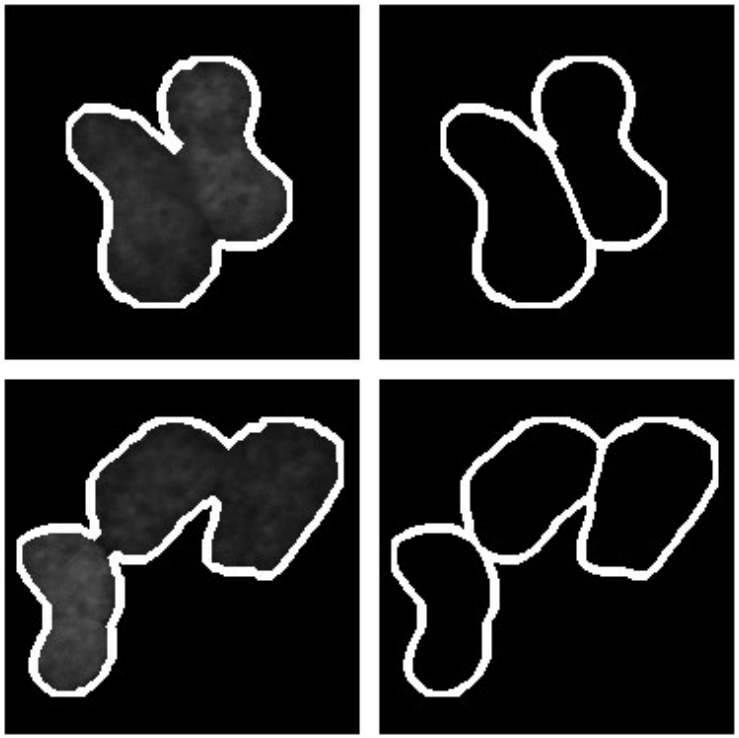
CNN output



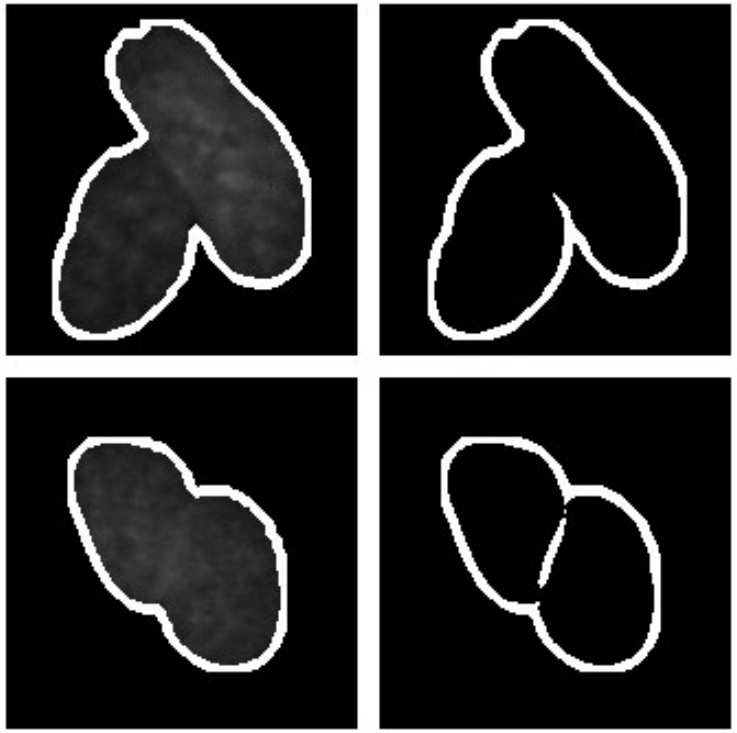
Results

- 99.98 % pixel accuracy
- 39/42 correctly separated clusters

correct

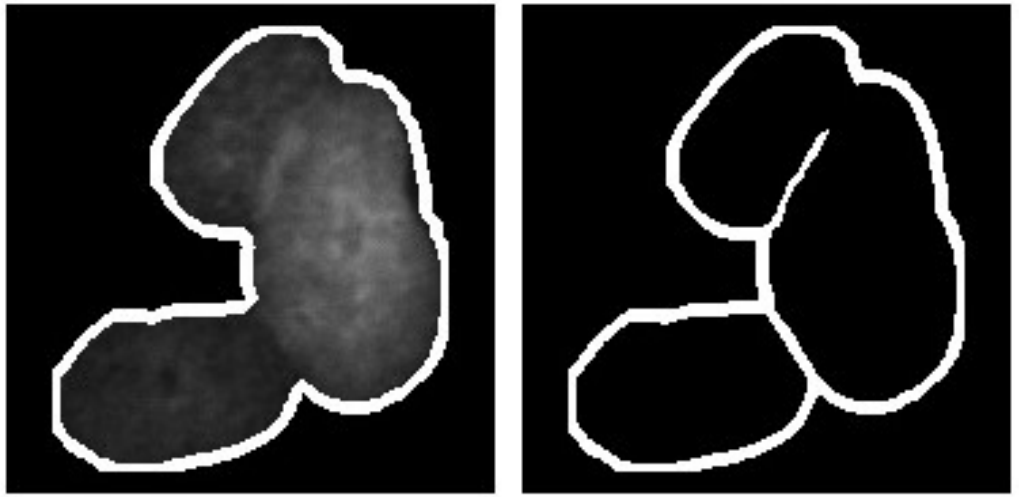


wrong

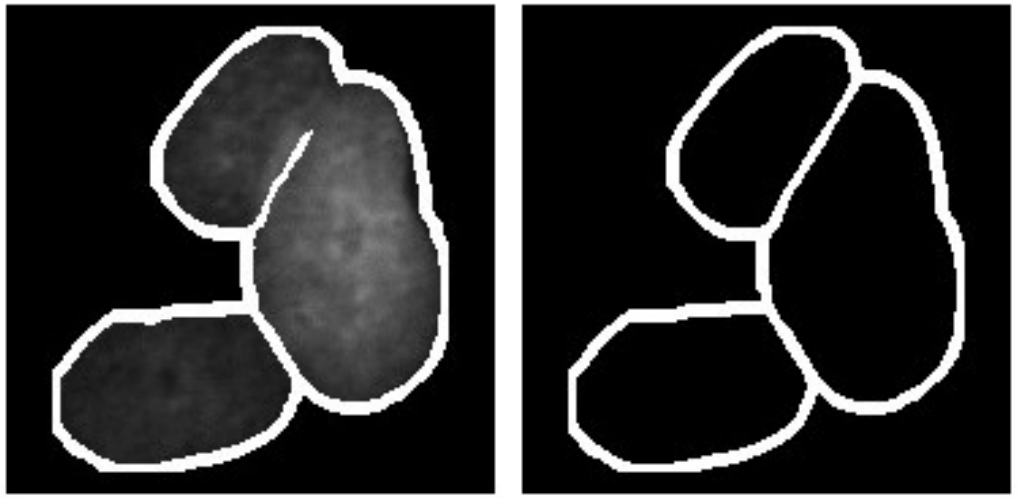


Improvement

1. iteration



2. iteration



Result

- **new method**
  - separation of a same kind objects
  - verified on cell cluster separation task

Technologies

Thanks.

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