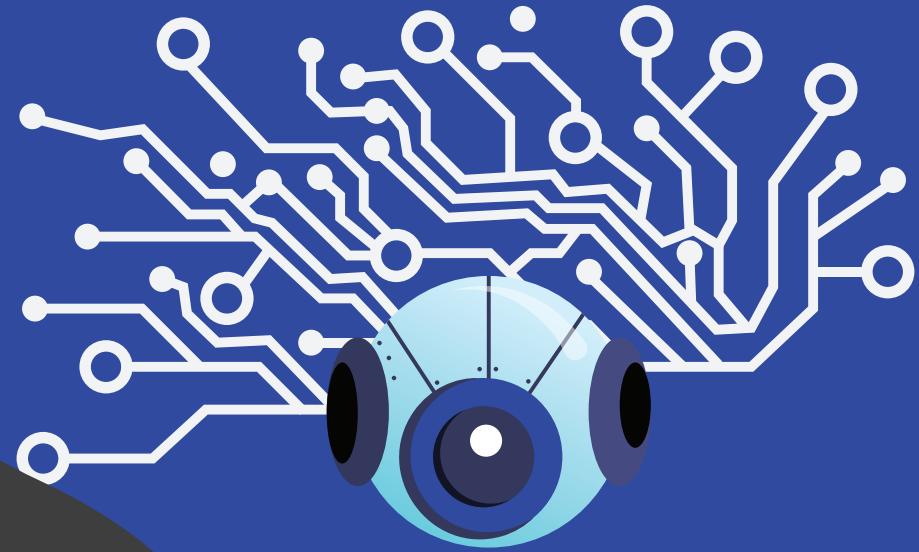
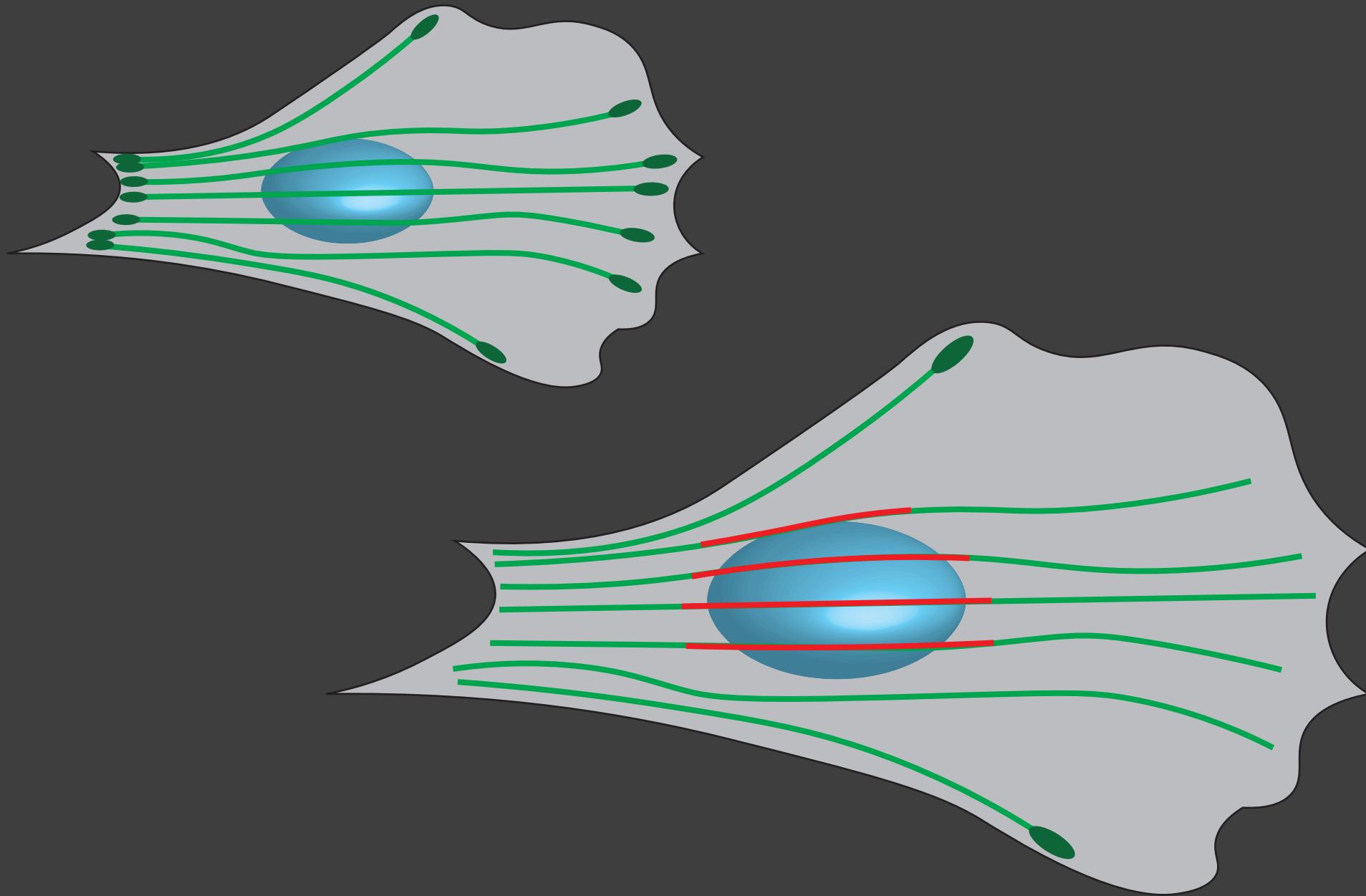


MACHINE LEARNING AND CELL STRUCTURE

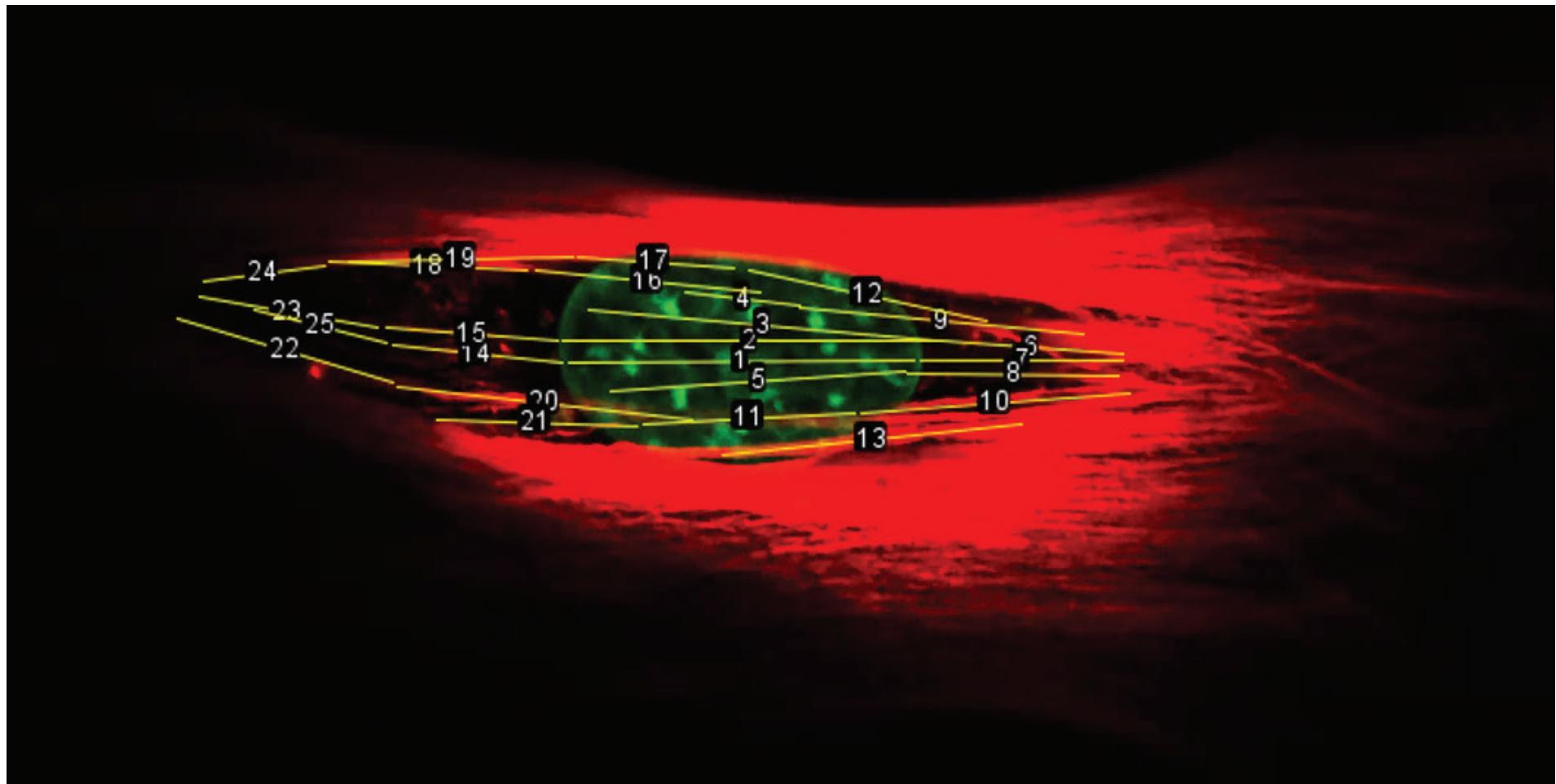
NINA NIKITINA
12/18/2020



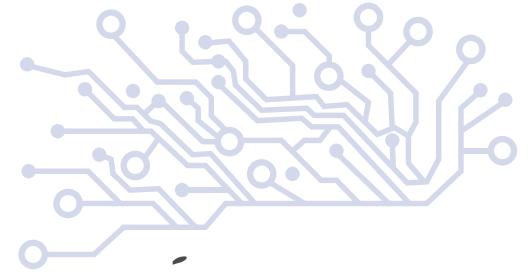
RESEARCH PROJECT



RESEARCH PROJECT

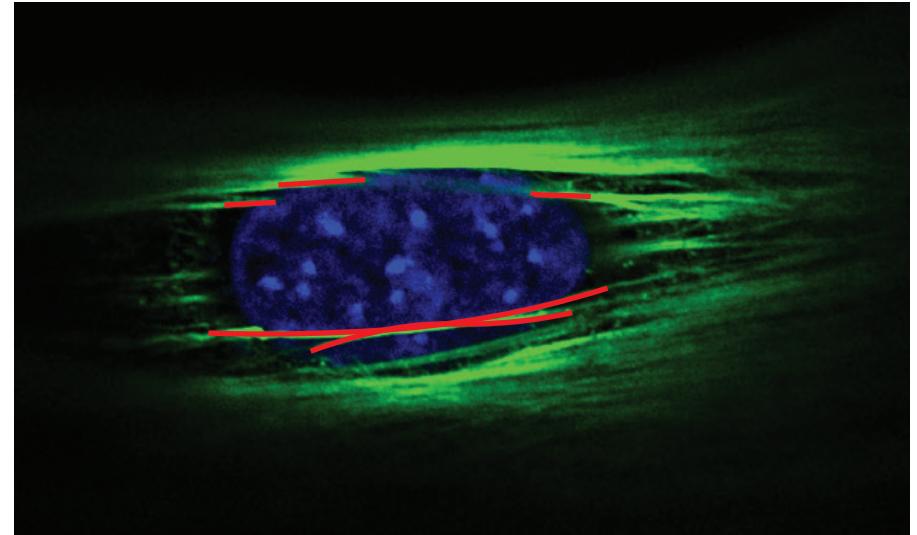
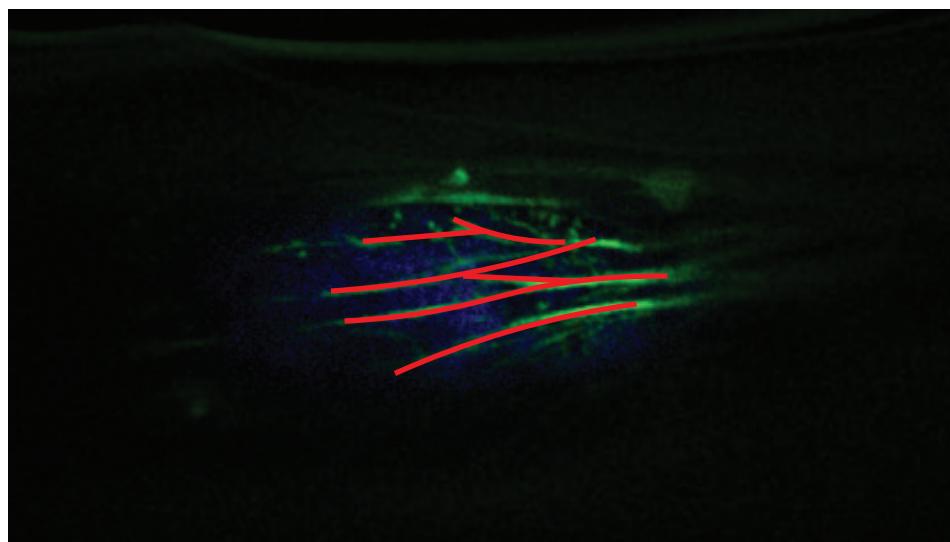
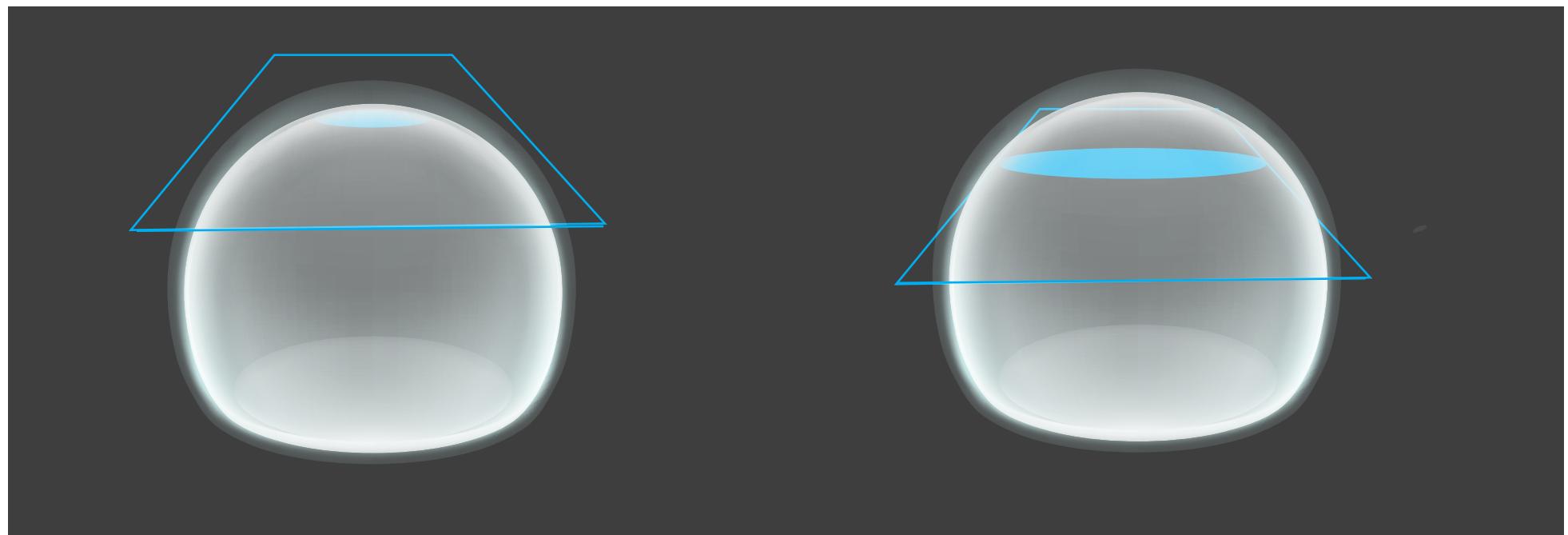


WHY MACHINE LEARNING?

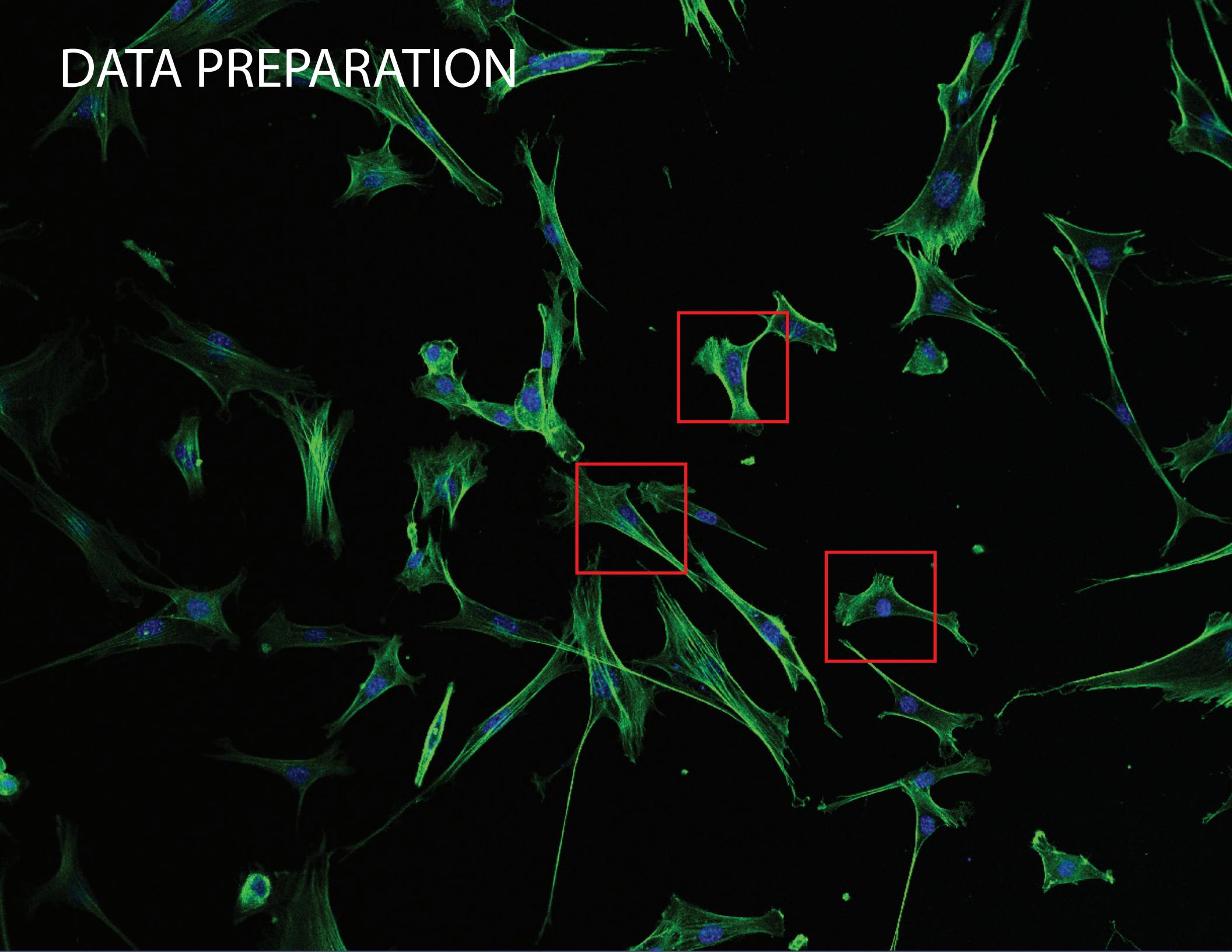


- 1) DETECTING AND MEASURING ARE VERY TIME-CONSUMING FOR HUMAN
- 2) PEOPLE CAN NOT MEASURE EVERYTHING CONSISTENTLY,
AND SOMETIMES RESULTS MAY VARY

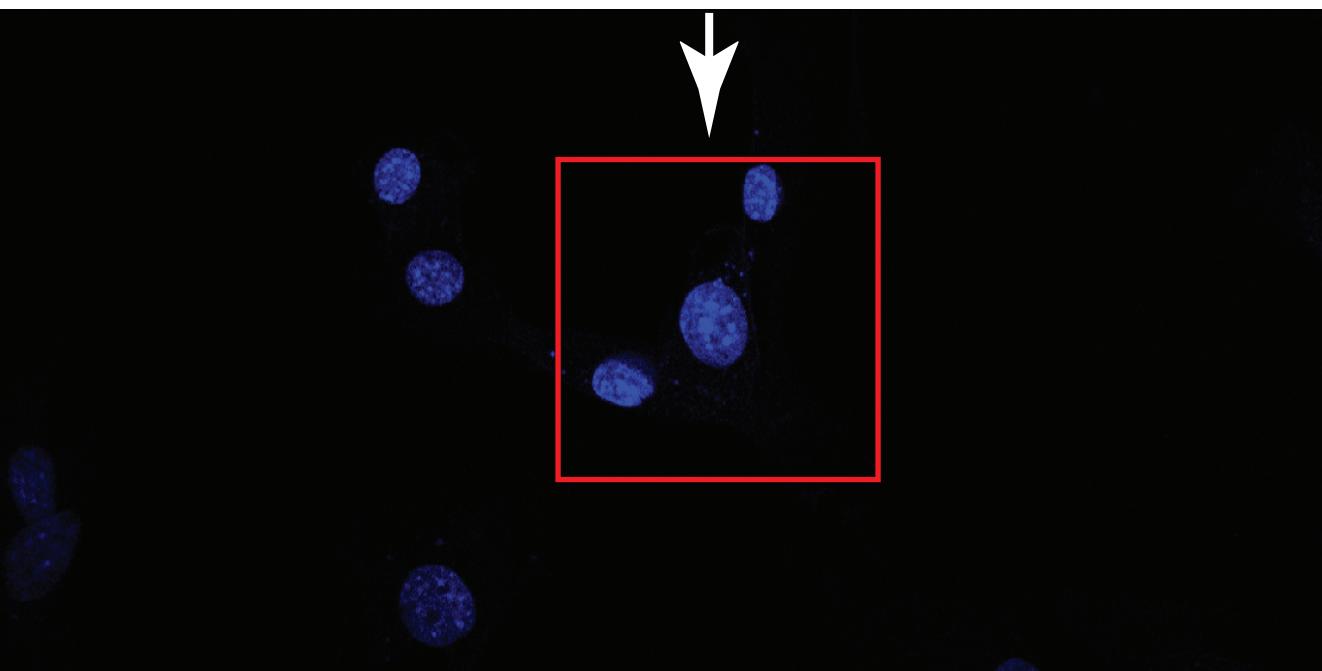
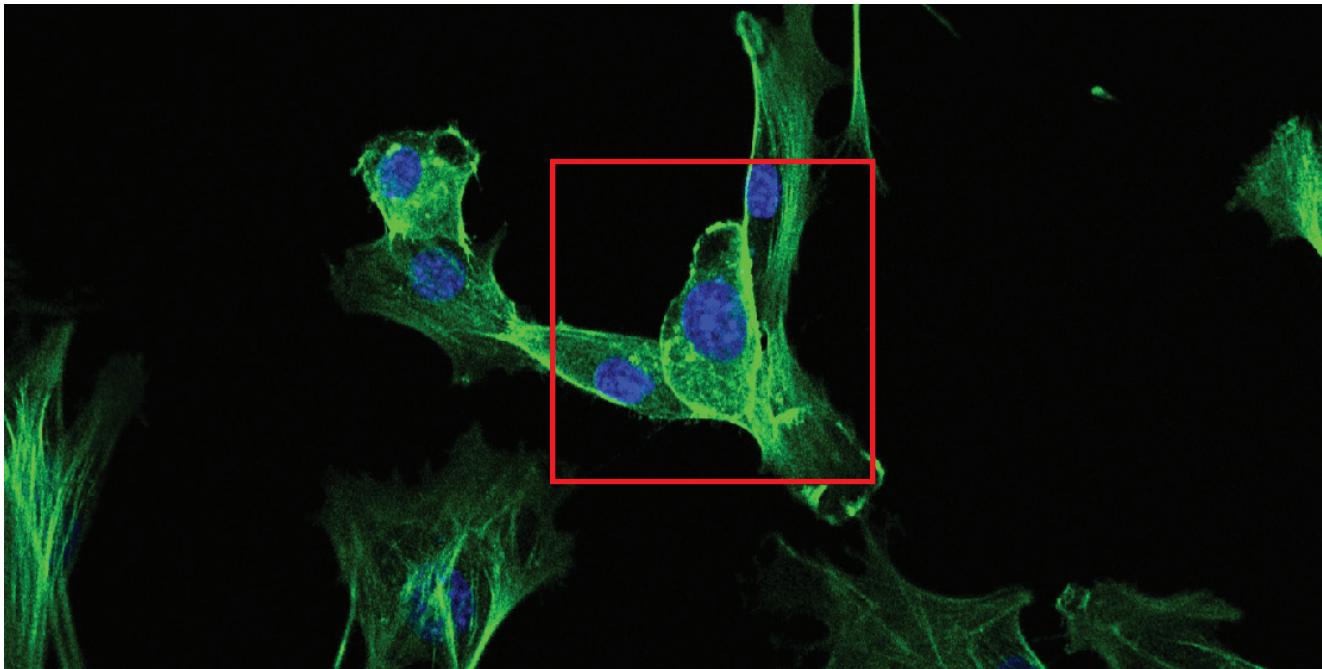
COMPUTERS CAN SPEED UP THE PROCESS
AND MAKE MEASUREMENTS CONSISTENT



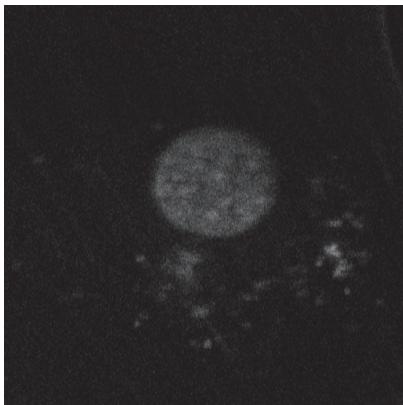
DATA PREPARATION



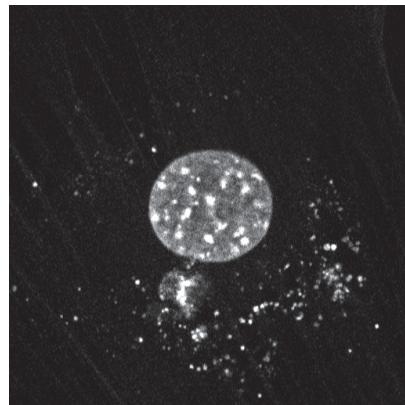
DATA PREPARATION



ALEXNET DATA SET



0

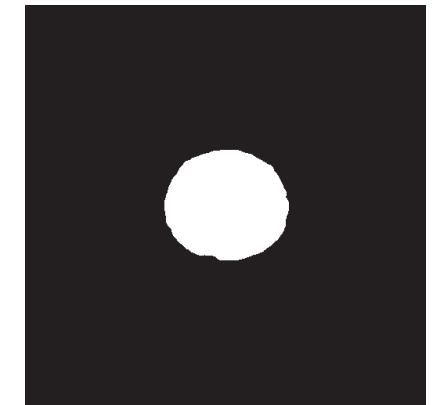
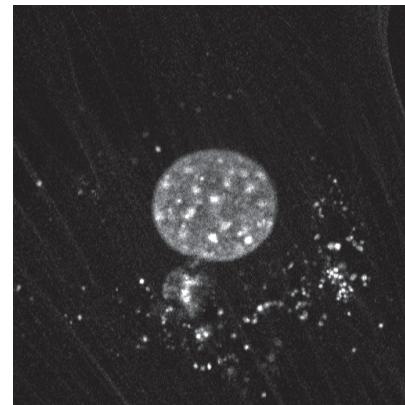


1

Training set for AlexNet consisting of 1600 images, labeled image as 1 if there is a nucleus in the center of image and 0 otherwise

Further augmentation brought it up to 9000 training images

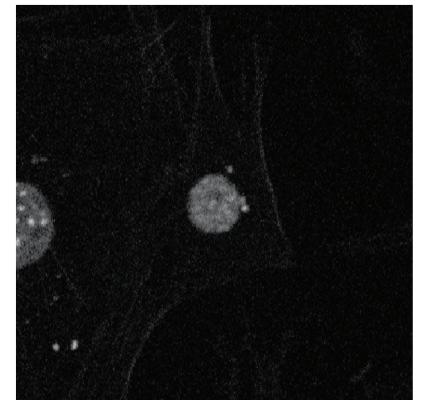
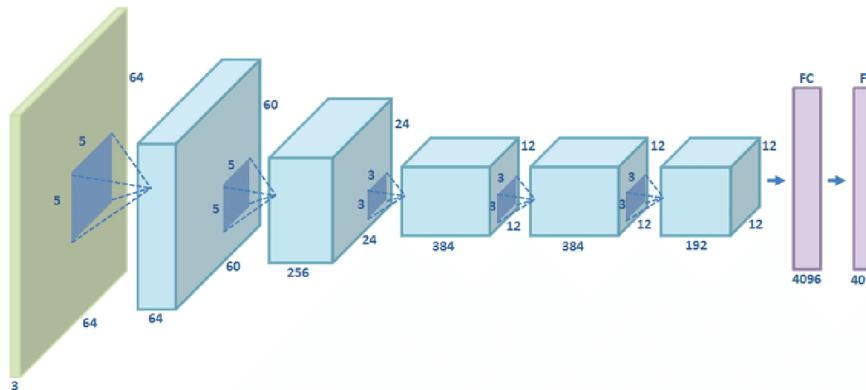
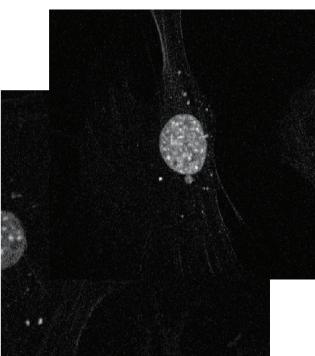
UNET DATA SET



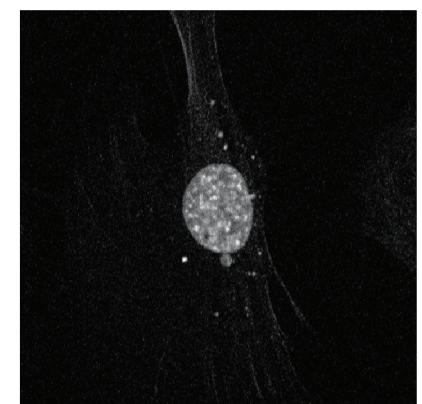
Training set for Unet consisting of 300 images from different slices of 30 nuclei; nuclei pixels were labeled with 1 and background with 0;

No data augmentation

ALEXNET



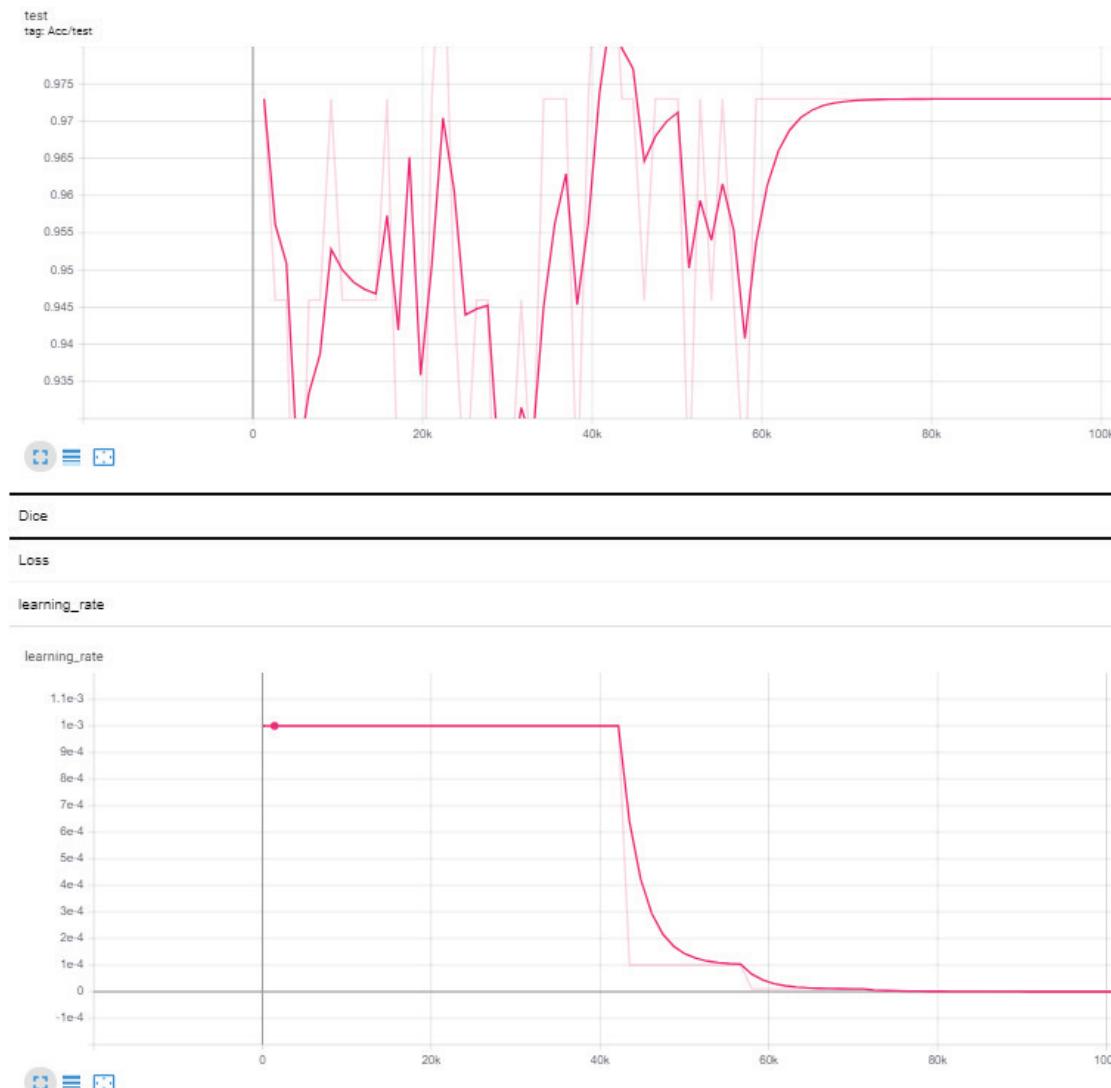
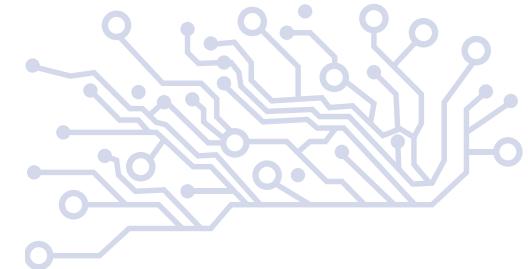
No nucleus
in the center



Nucleus
in the center

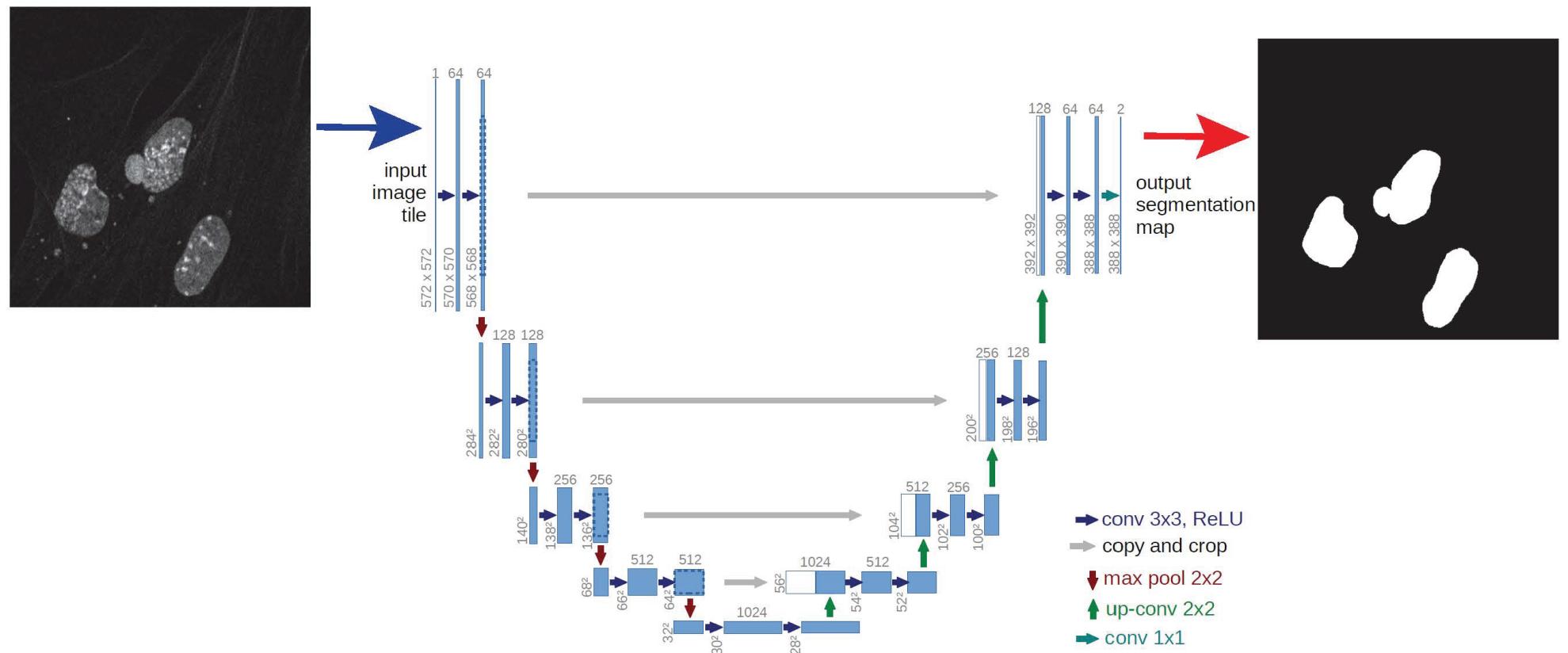
AlexNet Architecture

ALEXNET



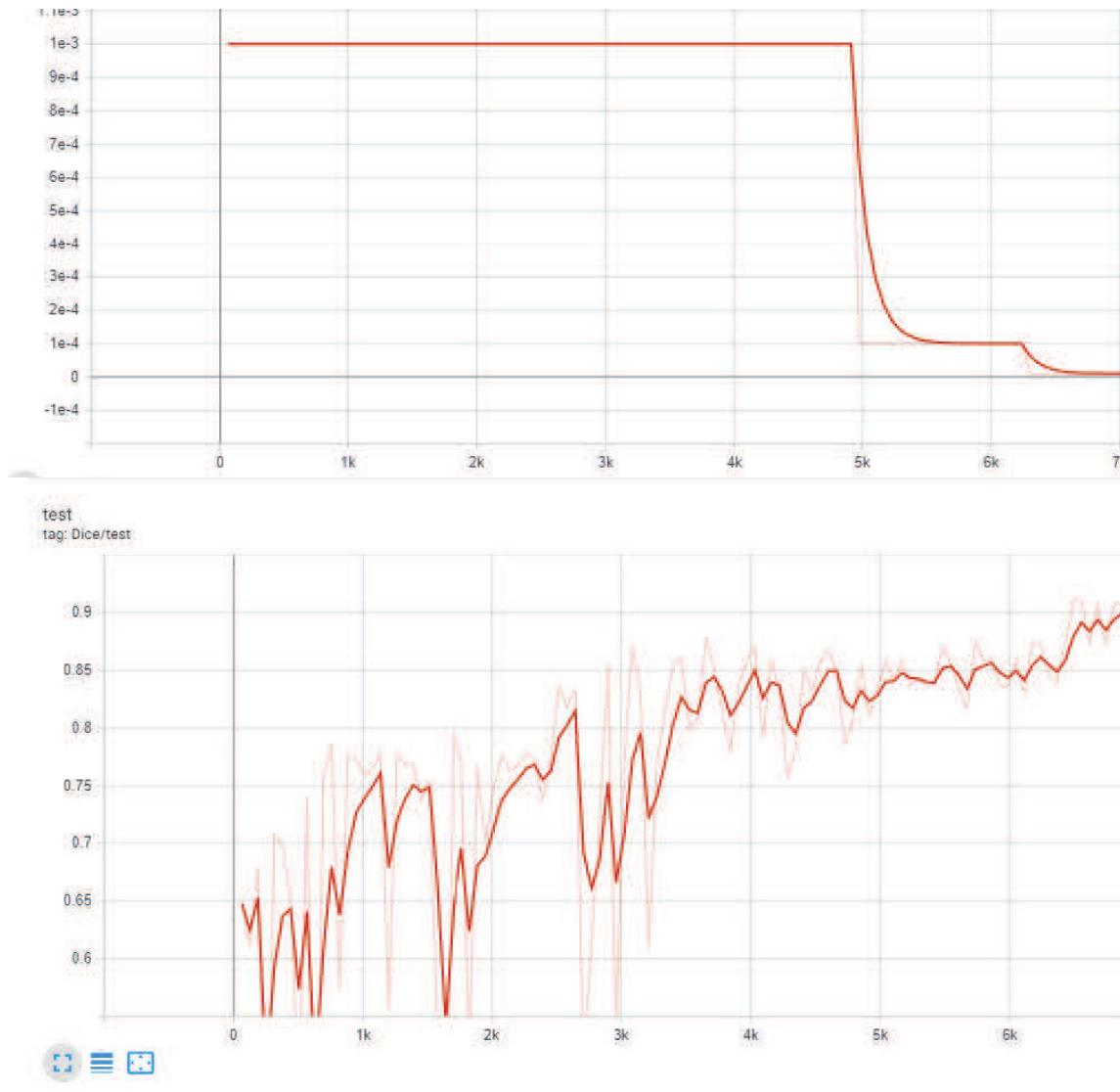
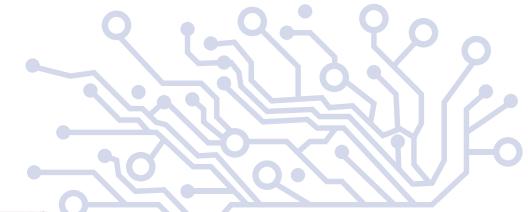
The neural net was able to predict a nucleus in the center of the image with 97% accuracy

UNET



Unet Architecture

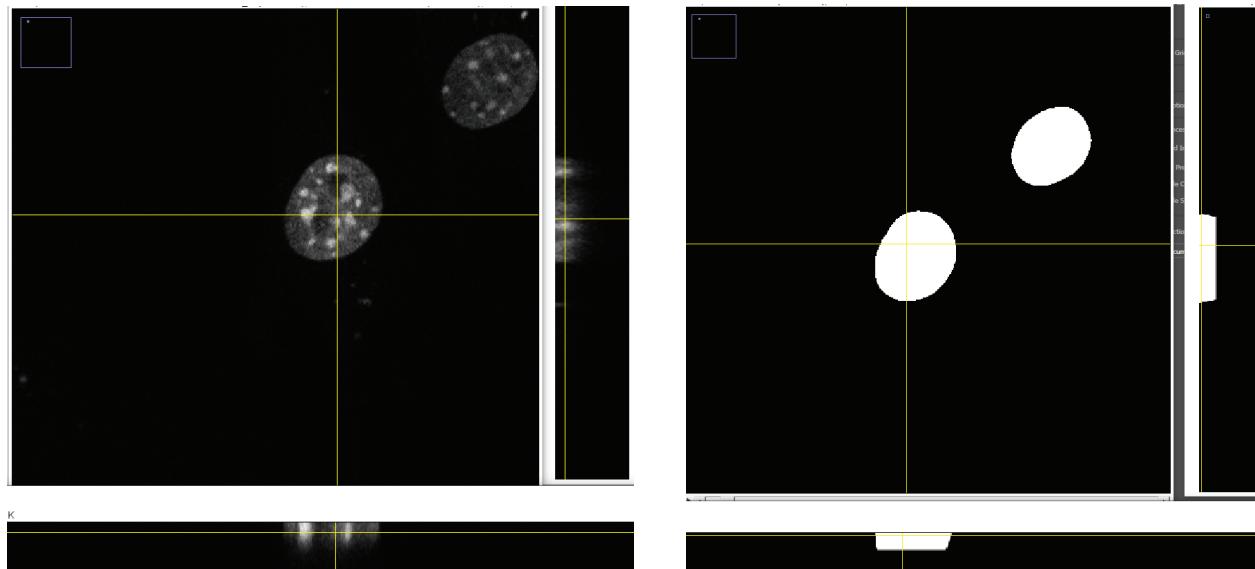
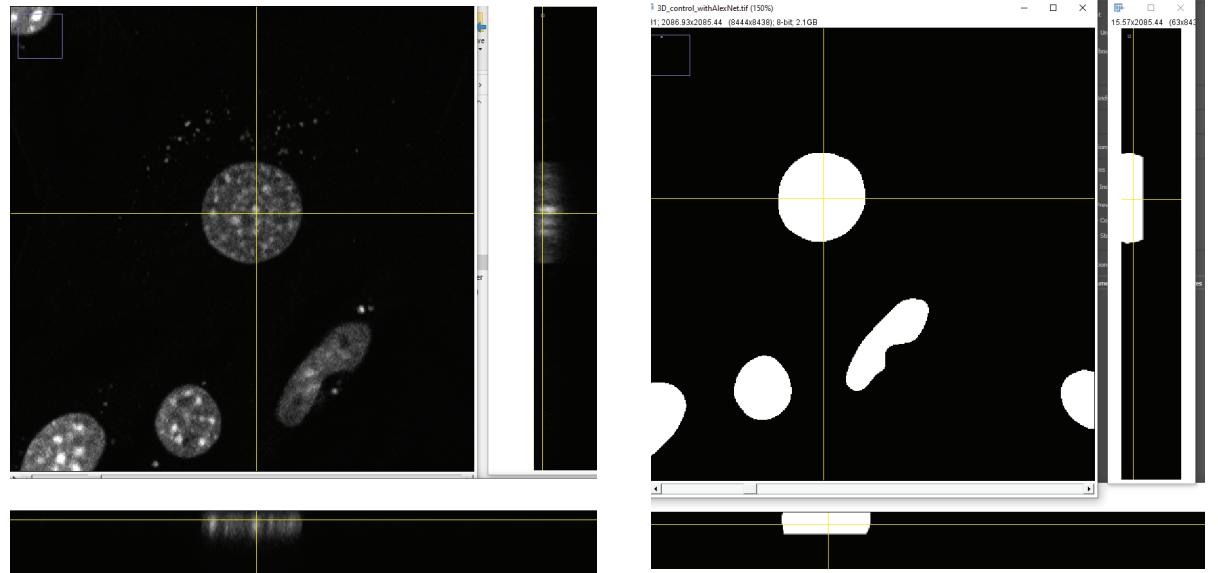
UNET



The neural net was able to segment the nuclei with Dice coefficient around 0.89.

RESULTS VERIFICATION

CONTROL_SIRNA_20X_5X5_15UM_STACK_AIRYSCAN_PROCESSING_STITCH-003

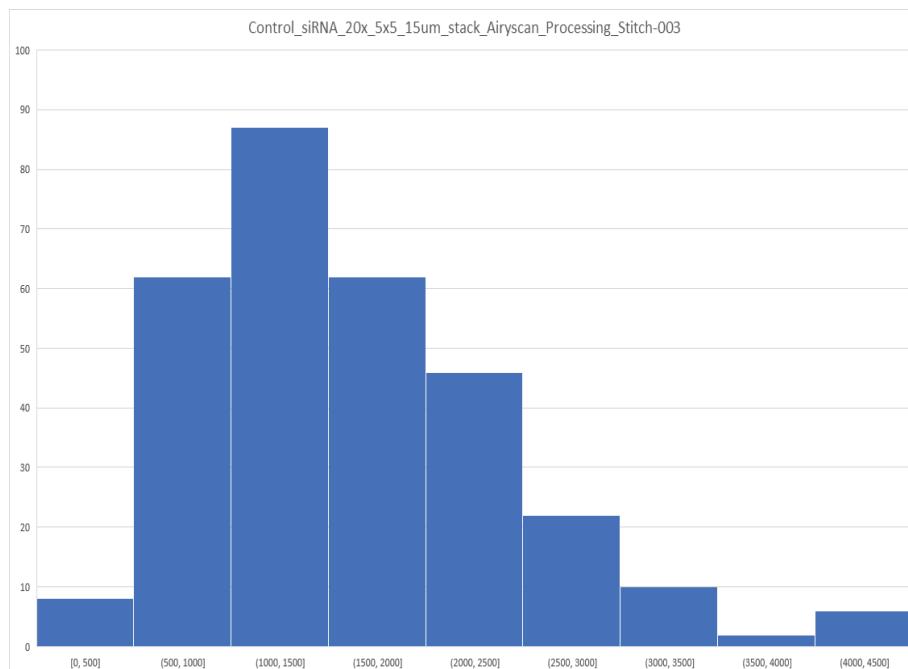


RESULTS VERIFICATION

CONTROL_SIRNA_20X_5X5_15UM_STACK_AIRYSCAN_PROCESSING_STITCH-003

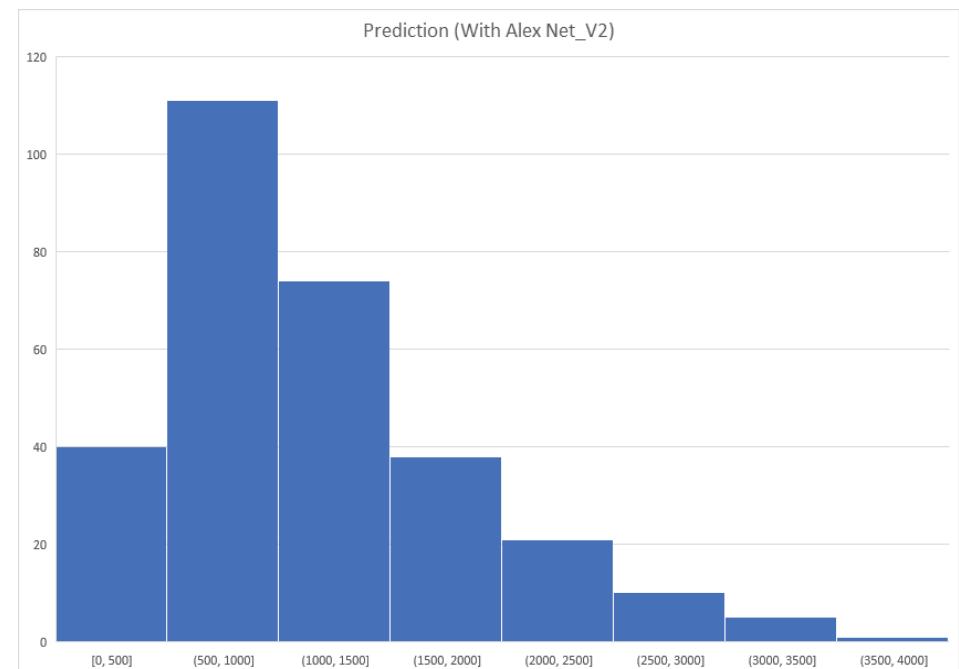
Total volum: 488 408

Number of Nuclei: 304



Total volum: 347 411

Number of Nuclei: 298



IMARIS

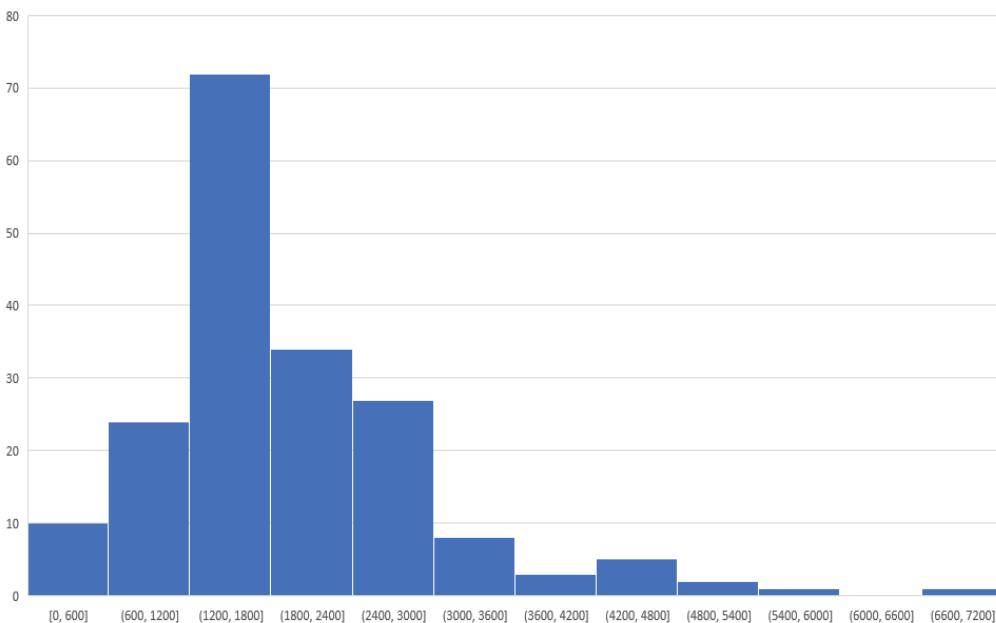
PREDICTION (UNET | ALEX NET)_AUTO_0.01%

RESULTS VERIFICATION

LAMIN_SIRNA_20X_5X5_15_UM_STACK_11_9_AIRYSCAN PROCESSING_STITCH-002IMG

Total volum: 355 371
Number of Nuclei: 186

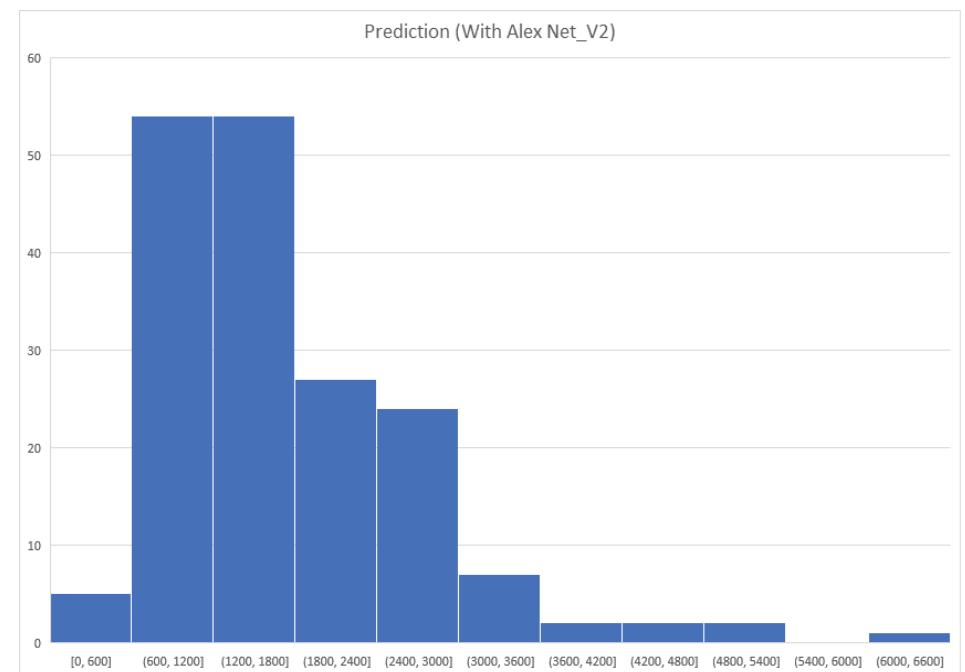
Lamin_siRNA_20x_5x5_15_um_stack_11_9_Airyscan Processing_Stitch-002img



IMARIS

Total volum: 307 576
Number of Nuclei: 173

Prediction (With Alex Net_V2)



PREDICTION (UNET | ALEX NET)_AUTO_0.01%

RESULTS VERIFICATION

