NUDT-CN

Authors: Wei Liao

Email: liaowei_v@nudt.edu.cn

Platform: Linux

Prerequisites: Python 3

NUDT-CN: SUMMARY

We built a transformer-based end-to-end cell segmentation and tracking model based on MaskDino [1], called CellDino. We use a rotated box approach for detection and segmentation, and introduce track and and mitosis queries for cell tracking.

NUDT-CN: PREPROCESSING

For **Fluo-N2DH-GOWT1**, **Fluo-N2DL-HeLa**, and **PhC-C2DH-U373**, intensity normalization by the 1- and 99-percentile was applied to accommodate for differences in the intensity distribution in the datasets.

NUDT-CN: SEGMENTATION

For **Fluo-N2DH-GOWT1**, **Fluo-N2DH-HeLa** and **PhC-C2DH-U373**, we trained with a combination of gold truth and silver truth. Each corresponding dataset uses 90% of the data in its training set as the training data, and the rest as the validation set. Data enhancement methods such as random cutting, flipping and scaling and random Gaussian noise are used in training. We used MaskDino's pre-training weights during training, then froze the weights of the encoder part, and only updated the weights of the decoder part for training. For each image, CellDino can directly obtain an instance segmentation of each cell in the image. We used a rotated box to perform the detection in order to better fit the morphology of the cells.

NUDT-CN: TRACKING

For training we randomly select two consecutive frames at a time. The cells are tracked by adding a track query to MaskDino, and then a mitosis query is used to deal with cell division.

NUDT-CN: POST-PROCESSING

After getting the instance segmentation of each cell, we can get the instance segmentation of the entire image by splicing these instance segmentation together.

REFERENCES

1. Li F, Zhang H, Xu H, Liu S, Zhang L, Ni LM, Shum HY. Mask DINO: Towards a unified transformer-based framework for object detection and segmentation. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 3041-3050 (2023).