

Supplementary Material for IAUNet: Instance-Aware U-Net

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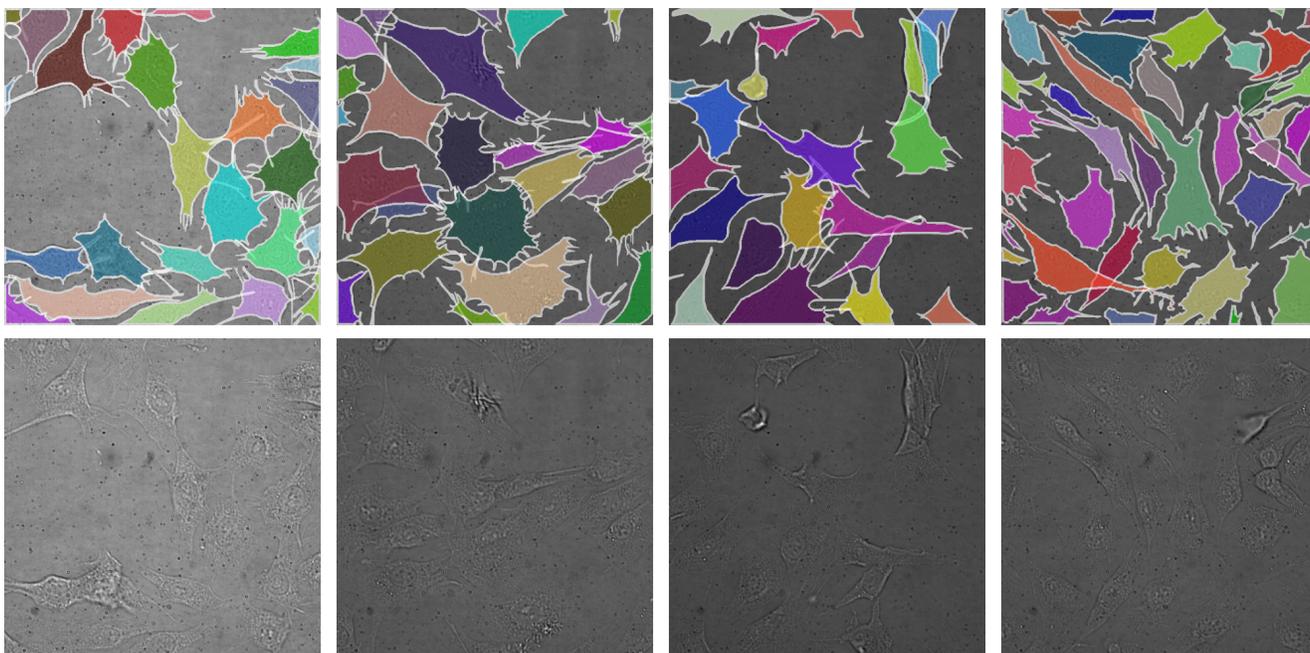
1. Revvity-25

One of our key contributions in the paper is the **2025 Revvity Full Cell Segmentation Dataset (Revvity-25)**. This dataset is designed specifically for cell instance segmentation in brightfield images, capturing diverse cellular morphologies across seven distinct cell lines.

1.1. Data Acquisition

Revvity-25 is a high-resolution, multi-cell line dataset collected to advance cell segmentation research in biomedical imaging. Seven cell lines from human, dog, and mouse origins are included, capturing a wide array of cellular morphologies.

The human cell lines in the dataset include breast cancer (MCF7), fibrosarcoma (HT1080), cervical cancer (HeLa), hepatocellular carcinoma (HepG2), and alveolar basal epithelial cells (A549). Dog kidney tissue cells (MDCK) and mouse embryonic fibroblast cells (NIH3T3) further enhance the dataset's diversity, offering unique structural characteristics for instance segmentation tasks. Cells were seeded into 384-well Collagen Type I-coated CellCarrier Ultra Microplates (Revvity, Waltham, MA; catalog no. 6057700). To improve contrast, cells were stained with 10 $\mu\text{g/ml}$ Hoechst 33342 (Thermo Fisher, Waltham, MA; catalog no. H3570) and then fixed using a 3.7% formaldehyde solution (Sigma Aldrich, St. Louis, MO; catalog no. 252549).



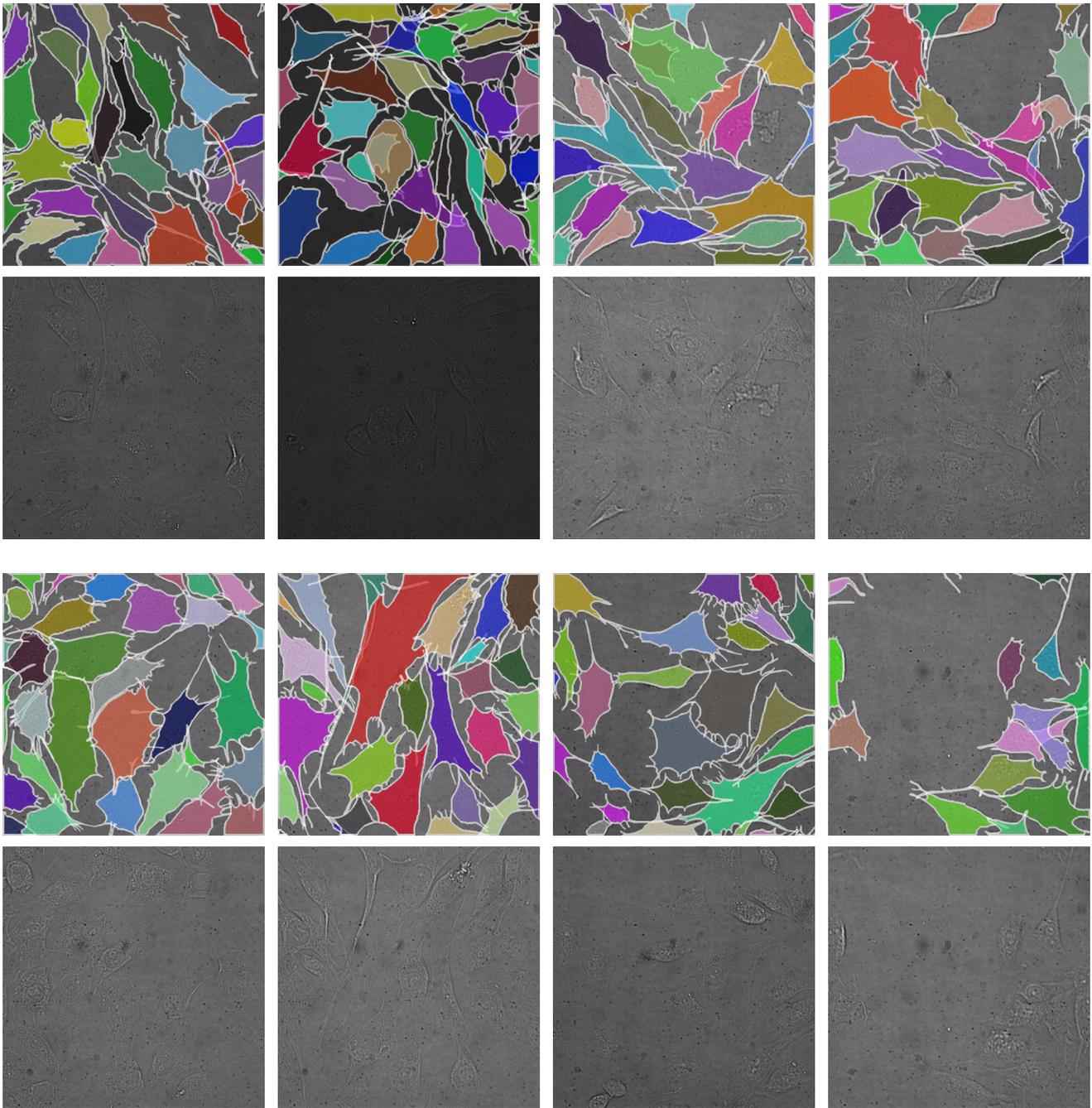


Figure 1. 2025 Revvity Full Cell Segmentation Dataset samples.

High-resolution images were captured using an Opera Phenix high-content screening system in confocal mode with a 20 \times water immersion objective. Each image has a resolution of 1080 \times 1080 pixels, with a pixel size of 0.59 μ m. Images are stored at 16 bits per pixel per channel to preserve quality. For each cell line, 432 fields of view were captured, totaling 3024 images.

1.2. Data Annotation

Revvity-25 includes detailed manual annotations of cell cytoplasm across different cell types, specifically capturing complex cell morphologies and overlaps. Each cell instance was labeled manually, with each image taking up to an hour to annotate carefully. This detailed instance-level labeling provides essential data for segmenting cell bound-

Models	backbones	num_queries	AP	AP ₅₀	AP ₇₅	AP _S	AP _M	AP _L	#params.	FLOPs
<i>YOLO Family</i>										
YOLOv8-M [2]		-	37.5	72.2	35.6	32.8	38.3	46.0	27.2M	110.4G
YOLOv8-L [2]		-	40.5	72.5	42.6	<u>37.4</u>	<u>41.3</u>	46.9	45.9M	220.8G
YOLOv8-X [2]		-	<u>41.1</u>	<u>73.1</u>	<u>43.2</u>	38.2	41.6	<u>47.6</u>	71.8M	344.5G
IAUNet (ours)	Swin-S	100	53.0	85.7	57.0	1.3	29.7	59.1	64M	76G
YOLOv9-E [4]		-	41.2	<u>73.2</u>	43.6	38.9	41.9	46.0	27.8M	159.1G
YOLOv9-C [4]		-	<u>41.4</u>	73.1	<u>43.9</u>	<u>38.6</u>	41.9	<u>47.4</u>	60.5M	248.1G
IAUNet (ours)	Swin-S	100	53.0	85.7	57.0	1.3	<u>29.7</u>	59.1	64M	76G
<i>SAM Family</i>										
SAM-B (points) [1]		-	5.0	12.4	3.3	<u>14.9</u>	5.5	0.1	90M	742G
SAM-B (boxes) [1]		-	<u>24.3</u>	<u>56.9</u>	<u>18.4</u>	29.1	<u>24.0</u>	<u>18.9</u>	90M	742G
IAUNet (ours)	Swin-S	100	53.0	85.7	57.0	1.3	29.7	59.1	64M	76G
SAM-L (points) [1]		-	6.3	13.6	5.5	<u>21.4</u>	7.0	0.3	308M	2.6T
SAM-L (boxes) [1]		-	<u>29.2</u>	<u>65.2</u>	<u>22.8</u>	32.4	<u>29.0</u>	<u>24.8</u>	308M	2.6T
IAUNet (ours)	Swin-B	300	53.7	86.5	59.4	1.0	30.0	60.3	102M	132G

Table 1. **Instance segmentation on our Revvity-25 dataset.** IAUNet outperforms YOLO-family models as well as SAM models with different pretrained encoders.

aries in challenging cases. The dataset consists of 110 high-resolution 1080x1080 images acquired at a 63x magnification level, each containing two brightfield planes. On average, each image includes 27 manually labeled and expert-validated cell instances, totaling 2937 annotated cells. Cell boundaries were outlined with an average of 60 polygon points per instance, with complex shapes requiring up to 400 points to ensure precision. Annotations were performed using LabelStudio [3], with each cell labeled individually to capture fine boundaries. We view Revvity-25 as a valuable resource for training and evaluating models in detailed cell segmentation tasks, enabling applications in modal and amodal semantic and instance segmentation tasks.

2. Results

In Tab. 1, we report additional results on our Revvity-25 dataset across additional models.

References

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