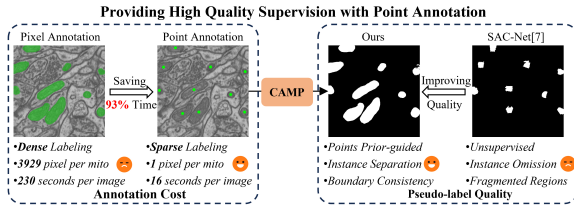


# MILab BOE

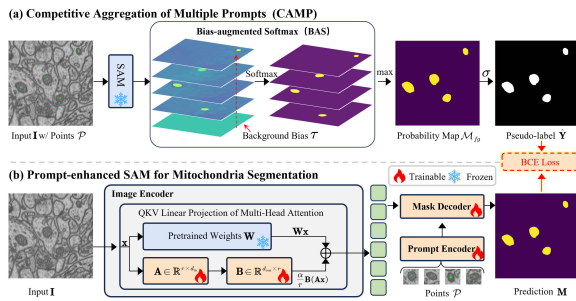
MILab "WeakMitoSAM: competitive prompt aggregation for point-supervised mitochondria segmentation in electron microscopy images" **Biomedical Optics Express**BOE

electron microscopy, EMDense Annotation **230** 200 nm



1 93% 230 16 CAMP

**WeakMitoSAM 16 93%**



2 CAMP SAM BAS LoRA SAM

WeakMitoSAM 2

## 1.CAMP

SAMSegment Anything Model **CAMP**Competitive Aggregation of Multiple Prompts

- SAM logit
- **Softmax**Bias-augmented Softmax, BAS
- 

SAM

## 2. SAM Prompt-enhanced SAM with LoRA

CAMP SAM

- SAM **LoRA** 21.55M 653.17M 3.3%
- 
- 

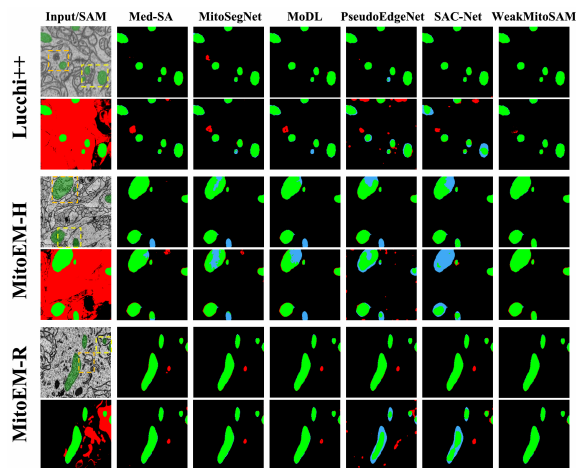
1 IoUDice PQ WeakMitoSAM

Supervision	Methods	Lucchi++			MitoEM-H			MitoEM-R			Average		
		IoU↑	Dice↑	PQ↑	IoU↑	Dice↑	PQ↑	IoU↑	Dice↑	PQ↑	IoU↑	Dice↑	PQ↑
Zero-Shot	SAM [14]	15.44	23.96	2.04	10.74	17.09	3.42	17.88	26.36	0.62	14.69	22.47	2.03
Fully Supervised	U-Net [10]	81.88	89.48	60.59	83.48	89.95	67.40	88.97	93.40	67.21	84.78	90.94	65.07
	UKAN [39]	80.71	88.78	61.75	83.18	89.77	69.11	88.39	93.07	70.83	84.09	90.54	67.23
	AttU-Net [35]	82.02	89.66	68.44	83.93	90.23	65.31	88.45	93.13	65.01	84.80	91.01	66.25
	BCDU-Net [36]	82.23	89.84	64.04	82.83	89.26	59.19	87.10	91.53	64.55	84.05	90.21	62.59
	UCTransNet [37]	78.85	87.59	53.86	83.51	89.94	60.11	88.76	93.22	52.73	83.71	90.25	55.57
	Rolling-Unet [38]	81.92	89.58	66.06	83.06	89.64	67.95	88.79	93.28	66.86	84.59	90.83	66.96
	MitoSegNet [9]	82.35	90.06	63.78	82.91	89.54	62.45	87.52	92.14	68.31	84.26	90.58	64.85
	MoDL [3]	82.87	90.35	67.12	83.02	89.87	65.18	87.96	92.85	71.04	84.62	91.02	67.78
	PseudoEdgeNet [19]	83.83	90.72	76.36	80.97	88.40	70.40	87.60	92.68	75.81	84.13	90.60	74.19
	SAC-Net [7]	83.37	90.64	70.47	81.81	88.95	68.10	87.80	92.73	72.95	84.33	90.77	70.51
	Med-SA [23]	81.34	88.93	62.28	83.12	90.25	68.88	88.41	93.61	74.36	84.29	90.93	68.51
	<b>WeakMitoSAM</b>	<b>88.40</b>	<b>93.54</b>	<b>77.95</b>	<b>86.42</b>	<b>91.95</b>	<b>74.74</b>	<b>91.19</b>	<b>94.98</b>	<b>75.02</b>	<b>88.67</b>	<b>93.49</b>	<b>75.90</b>
Weakly Supervised	MitoSegNet [9]	76.12	86.23	60.15	70.36	79.42	51.64	83.84	90.46	62.75	76.77	85.37	58.18
	MoDL [3]	77.94	87.01	61.34	73.58	82.15	53.07	84.12	90.83	63.51	78.55	86.66	59.31
	PseudoEdgeNet [19]	45.21	61.40	25.14	40.24	54.80	12.48	27.67	40.94	3.08	37.71	52.38	13.57
	SAC-Net [7]	44.91	61.36	33.61	60.98	74.59	50.11	58.01	72.17	45.05	54.63	69.37	42.92
	Med-SA [23]	75.68	85.35	62.15	75.81	85.57	55.11	84.41	91.14	64.39	78.63	87.35	60.55
		<b>WeakMitoSAM</b>	<b>82.24</b>	<b>89.76</b>	<b>68.81</b>	<b>80.34</b>	<b>88.15</b>	<b>61.41</b>	<b>86.27</b>	<b>91.98</b>	<b>69.78</b>	<b>82.95</b>	<b>89.96</b>

Lucchi++MitoEM-HMitoEM-RIoUDicePanoptic Quality, PQ

1

- WeakMitoSAM IoU **82.95%**PseudoEdgeNet 37.71%SAC-Net 54.63%
- PQ **66.67%** MitoSegNet PQ 64.85%
- WeakMitoSAM 88.67% / 93.49% / 75.90%IoU / Dice / PQ MitoSegNet MoDL IoU **4%**



3 Lucchi++MitoEM-HMitoEM-R TPFNFPWeakMitoSAM

1. 93%
- 2.
3. WeakMitoSAM
4. CAMP

MILab MILab625010202026-1-2151(JC2025052025YFA1805700BX20250368  
<https://doi.org/10.1364/BOE.592074>

<https://github.com/WilliamLee30/WeakMitoSAM>