

OmniSAM: Omnidirectional Segment Anything Model for UDA in Panoramic Semantic Segmentation

Ding Zhong*, Xu Zheng*, Chenfei Liao, Yuanhuiyi Lyu, Jialei Chen, Shengyang Wu, Linfeng Zhang, Xuming Hu

Introduction

Motivation:

➤ **Problem:** Panoramic images have severe distortion because of the large Field-of-View (FoV) gap when compared to standard pinhole cameras.

➤ **Existing Methods' Weakness:** Specialized transformers designed for panoramic segmentation do not generalize well to different scenarios.

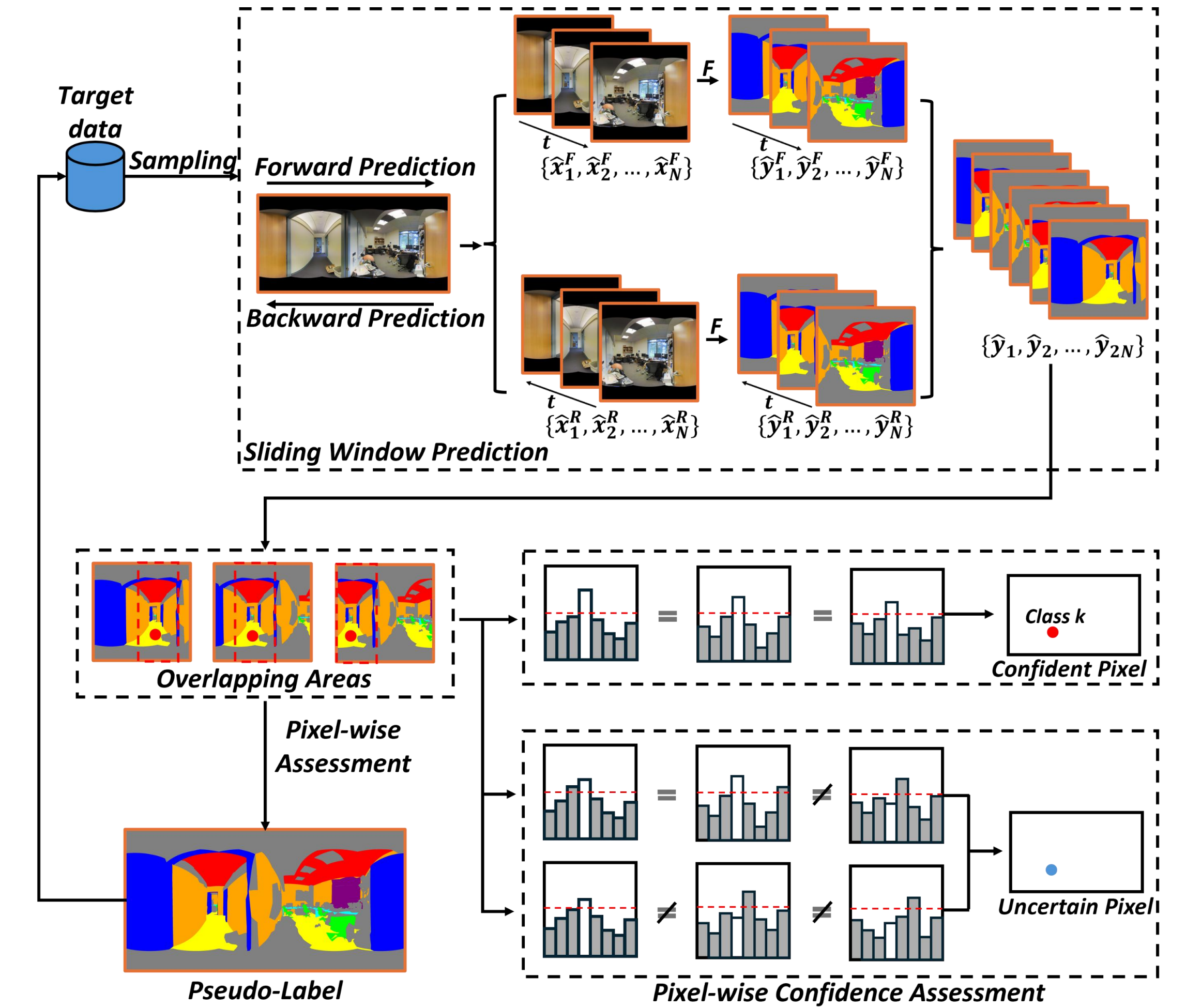
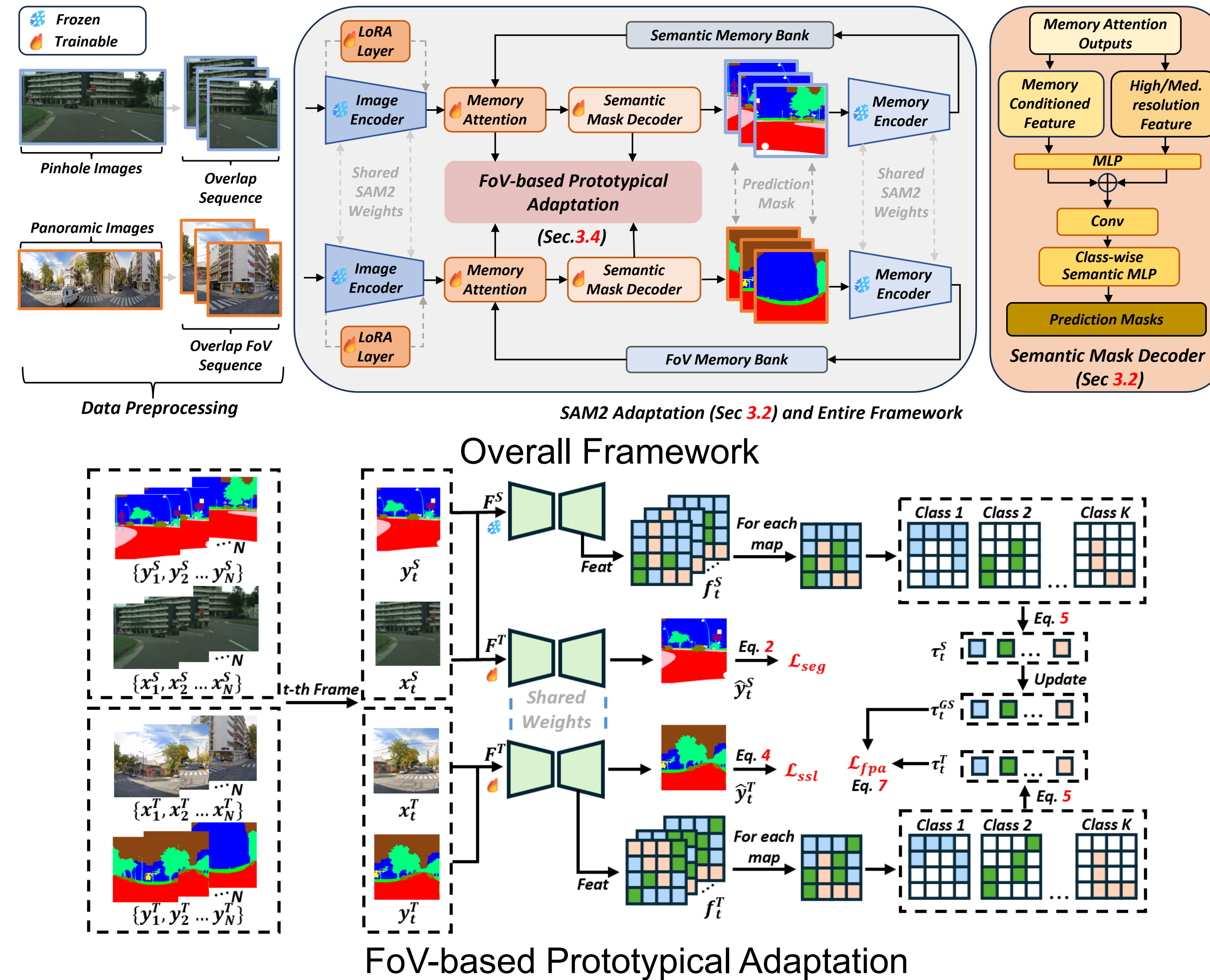
Main Contributions:

➤ **A New Framework:** We introduce **OmniSAM**, which treats panoramic images as a sequence of image patches.

➤ **Dynamic Pseudo-label Updating Mechanism:** A general method that can accelerate the convergence speed of domain adaptation.

➤ **FoV-based Prototypical Adaptation (FPA) Module:** A module ensures reliable patch-wise feature alignment between the source and target domains for our framework.

Methods



Dynamic Pseudo-label Updating Mechanism

Experiments



Indoor pinhole-to-panoramic scenario

Method	Network	mIoU	Ceiling	Chair	Door	Floor	Sofa	Table	Wall	Window	Δ
MPA	PVT-S [30]	57.95	85.85	51.76	18.39	90.78	35.93	65.43	75.00	40.43	-
	Trans4PASS-S [37]	64.52	85.08	58.72	34.97	91.12	46.25	71.72	77.58	50.75	-
	Trans4PASS-S [38]	67.16	90.04	64.04	42.89	91.74	38.34	71.45	81.24	57.54	-
SFUDA	360SFUDA++ w/ b2 [45]	68.84	85.50	57.59	53.15	87.40	53.63	66.49	80.23	66.75	*
	OmniSAM-T w/o MA	68.72	92.12	64.62	35.54	94.21	37.70	74.33	81.70	69.50	-0.12
Ours	OmniSAM-S w/o MA	70.65	91.46	65.41	55.10	94.56	33.88	75.61	84.53	64.66	+1.81
	OmniSAM-B w/o MA	73.09	91.63	69.33	60.43	94.45	36.16	76.22	85.26	71.26	+4.25
	OmniSAM-L w/o MA	78.02	93.79	71.19	78.07	95.17	47.25	81.77	89.85	66.51	+9.18
	OmniSAM-T w/ MA	69.10	92.10	64.60	36.97	94.25	38.86	74.16	81.78	70.09	+0.26
	OmniSAM-S w/ MA	70.81	91.74	66.46	66.74	94.88	12.35	77.43	86.90	69.95	+1.97
	OmniSAM-B w/ MA	74.72	91.06	66.65	69.31	94.57	36.79	76.98	86.58	75.87	+5.88
	OmniSAM-L w/ MA	79.06	93.25	72.12	77.97	95.00	52.08	81.82	89.62	70.58	+10.22

Method	Network	mIoU	Road	S.Walk	Build.	Wall	Fence	Pole	Tr.L	Tr.S	Veget.	Terrain	Sky	Person	Car	Δ
MPA	Trans4PASS-S [38]	55.24	82.25	54.74	85.80	31.55	47.24	31.44	21.95	17.45	79.05	45.07	93.42	50.12	78.04	-
CFA	DATR-S [42]	55.88	80.63	51.77	87.80	44.94	43.73	37.23	25.66	21.00	78.61	26.68	93.77	54.62	80.03	*
MSDA	DTA4PASS [14]	57.16	80.35	53.24	87.93	32.46	48.03	30.97	27.47	19.32	80.40	50.06	94.34	56.31	82.18	-
Ours	OmniSAM-T w/o MA	53.73	79.03	42.19	86.09	28.28	45.95	35.19	10.20	20.53	79.41	35.49	94.40	63.81	77.88	-2.15
	OmniSAM-S w/o MA	57.03	78.99	49.57	88.77	38.48	47.47	38.77	21.84	15.81	81.12	39.32	94.72	65.36	81.22	+1.15
	OmniSAM-B w/o MA	59.34	81.69	53.87	89.33	39.74	50.84	41.98	20.54	21.50	81.71	44.63	95.06	68.13	82.34	+3.46
	OmniSAM-L w/o MA	59.02	83.49	56.14	88.29	34.29	52.39	38.81	23.97	19.83	82.52	44.84	95.26	61.97	85.43	+3.14
	OmniSAM-T w/ MA	59.01	79.95	45.78	88.03	39.74	47.99	42.68	26.69	29.55	78.00	42.98	94.56	68.23	82.98	+3.13
	OmniSAM-S w/ MA	60.23	80.76	46.36	89.79	44.46	48.68	45.32	29.33	25.15	79.51	46.28	94.41	68.90	84.06	+4.35
	OmniSAM-B w/ MA	62.46	84.02	56.23	89.93	44.01	54.54	44.50	25.19	33.42	81.77	49.16	94.69	71.64	82.89	+6.58
	OmniSAM-L w/ MA	61.63	82.45	53.65	90.05	44.00	54.75	43.36	30.99	28.27	80.04	43.59	94.48	70.70	84.88	+5.75

Outdoor pinhole-to-panoramic scenario