

UMT _(k=1, $\mathcal{R}$)						UMT _(k=2, $\mathcal{RS}$)					
UMT ratio	PointNet++	PointNet	PointCNN	DGCNN	AVG	UMT ratio	PointNet++	PointNet	PointCNN	DGCNN	AVG
100%	30.51	29.85	29.46	35.13	31.24	100%	28.08	22.25	21.48	14.10	21.48
80%	47.03	47.14	46.92	48.57	47.42	80%	24.44	20.98	21.65	25.11	23.05
60%	60.35	62.44	63.55	62.89	62.31	60%	41.74	40.51	40.74	40.62	40.90
40%	73.79	66.63	67.40	69.49	69.33	40%	58.48	59.04	58.04	59.04	58.65
20%	84.03	84.14	83.26	85.68	84.28	20%	76.00	75.00	75.78	76.00	75.70

Table 1: Test accuracy (%) results when using different ratios of UMT(k=1, $\mathcal{R}$) and UMT(k=2, $\mathcal{RS}$) training data.

ScanObjectNN	PointNet	PointNet++	DGCNN	PointCNN	PCT	PointConv	CurveNet	SimpleView	RIConv++	3DGCN	PointNN	PointMLP	AVG
Clean	65.20 $\pm$ 1.49	77.38 $\pm$ 2.60	72.66 $\pm$ 2.56	66.96 $\pm$ 6.42	50.75 $\pm$ 15.16	75.42 $\pm$ 2.06	70.92 $\pm$ 1.06	51.93 $\pm$ 2.89	66.34 $\pm$ 1.21	73.84 $\pm$ 2.75	58.17 $\pm$ 0.30	73.32 $\pm$ 1.39	66.91 $\pm$ 0.72
UMT _(k=1)	56.55 $\pm$ 0.11	63.01 $\pm$ 2.38	57.93 $\pm$ 3.11	51.97 $\pm$ 11.99	47.05 $\pm$ 7.12	56.71 $\pm$ 3.61	65.49 $\pm$ 3.15	38.96 $\pm$ 2.08	62.33 $\pm$ 10.68	52.89 $\pm$ 1.13	54.56 $\pm$ 0.17	62.96 $\pm$ 4.19	55.87 $\pm$ 0.95
UMT _(k=2)	14.55 $\pm$ 1.81	49.41 $\pm$ 3.44	20.96 $\pm$ 3.99	13.61 $\pm$ 4.97	15.10 $\pm$ 2.05	20.78 $\pm$ 4.74	21.35 $\pm$ 2.59	20.73 $\pm$ 9.64	10.76 $\pm$ 1.76	52.37 $\pm$ 5.62	48.25 $\pm$ 0.20	16.32 $\pm$ 4.78	25.35 $\pm$ 0.49
UMT _(k=3)	10.92 $\pm$ 3.87	41.96 $\pm$ 3.84	14.62 $\pm$ 5.56	10.62 $\pm$ 2.35	22.02 $\pm$ 7.83	19.96 $\pm$ 3.13	21.43 $\pm$ 8.67	11.79 $\pm$ 3.96	11.69 $\pm$ 1.41	56.32 $\pm$ 0.83	48.94 $\pm$ 0.70	23.05 $\pm$ 16.32	24.44 $\pm$ 2.46
UMT _(k=4)	5.77 $\pm$ 2.10	34.65 $\pm$ 8.31	12.16 $\pm$ 4.84	9.87 $\pm$ 0.95	17.86 $\pm$ 11.63	12.79 $\pm$ 7.46	15.28 $\pm$ 4.86	20.09 $\pm$ 6.26	31.83 $\pm$ 2.20	46.06 $\pm$ 14.07	45.27 $\pm$ 0.17	8.76 $\pm$ 3.18	21.70 $\pm$ 3.61

Table 2: Average test accuracy (%) of classification models trained on the UMT ScanObjectNN datasets with three random seeds.

KITTI	PointNet	PointNet++	DGCNN	PointCNN	PCT	PointConv	CurveNet	SimpleView	RIConv++	3DGCN	PointNN	PointMLP	AVG
Clean	98.04 $\pm$ 2.23	99.49 $\pm$ 0.50	99.33 $\pm$ 0.34	99.23 $\pm$ 0.25	98.93 $\pm$ 0.54	98.04 $\pm$ 1.68	99.10 $\pm$ 1.05	99.38 $\pm$ 0.33	99.64 $\pm$ 0.09	99.67 $\pm$ 0.24	99.49 $\pm$ 0.50	95.72 $\pm$ 5.46	98.84 $\pm$ 0.87
UMT _(k=1)	36.23 $\pm$ 30.18	62.90 $\pm$ 20.51	38.93 $\pm$ 33.08	57.80 $\pm$ 13.99	58.26 $\pm$ 21.66	39.99 $\pm$ 6.82	33.33 $\pm$ 10.75	56.71 $\pm$ 30.96	98.53 $\pm$ 1.19	68.34 $\pm$ 10.46	70.34 $\pm$ 0.98	47.20 $\pm$ 20.79	55.71 $\pm$ 5.54
UMT _(k=2)	31.24 $\pm$ 7.11	51.07 $\pm$ 20.29	27.90 $\pm$ 10.33	49.69 $\pm$ 11.52	51.47 $\pm$ 17.36	25.95 $\pm$ 11.38	20.55 $\pm$ 4.93	51.77 $\pm$ 8.53	99.80 $\pm$ 0.09	70.42 $\pm$ 27.97	47.31 $\pm$ 10.58	39.90 $\pm$ 10.00	47.26 $\pm$ 5.95
UMT _(k=3)	19.13 $\pm$ 6.93	53.73 $\pm$ 12.44	31.26 $\pm$ 21.68	56.08 $\pm$ 17.90	54.45 $\pm$ 11.77	42.54 $\pm$ 21.46	27.38 $\pm$ 19.20	32.62 $\pm$ 11.76	98.48 $\pm$ 1.61	69.51 $\pm$ 8.27	70.14 $\pm$ 1.30	58.44 $\pm$ 6.61	51.15 $\pm$ 4.79
UMT _(k=4)	26.84 $\pm$ 16.26	61.79 $\pm$ 6.65	29.89 $\pm$ 15.72	54.27 $\pm$ 11.99	64.21 $\pm$ 10.76	57.29 $\pm$ 12.05	37.70 $\pm$ 11.60	54.63 $\pm$ 13.07	99.34 $\pm$ 0.23	72.33 $\pm$ 3.47	70.49 $\pm$ 0.76	56.25 $\pm$ 12.33	57.09 $\pm$ 5.97

Table 3: Average test accuracy (%) of classification models trained on the UMT KITTI datasets with three random seeds.