Supporting Information

City Scale Traffic Monitoring Using WorldView Satellite Imagery and Deep Learning: A Case Study of Barcelona

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Figure S1: Total loss, precision and recall plots averaged every 10 epochs for Model 1: YOLOv3, 3class PSM, RGB, XV-anchors, Im 1500, Ep 1000
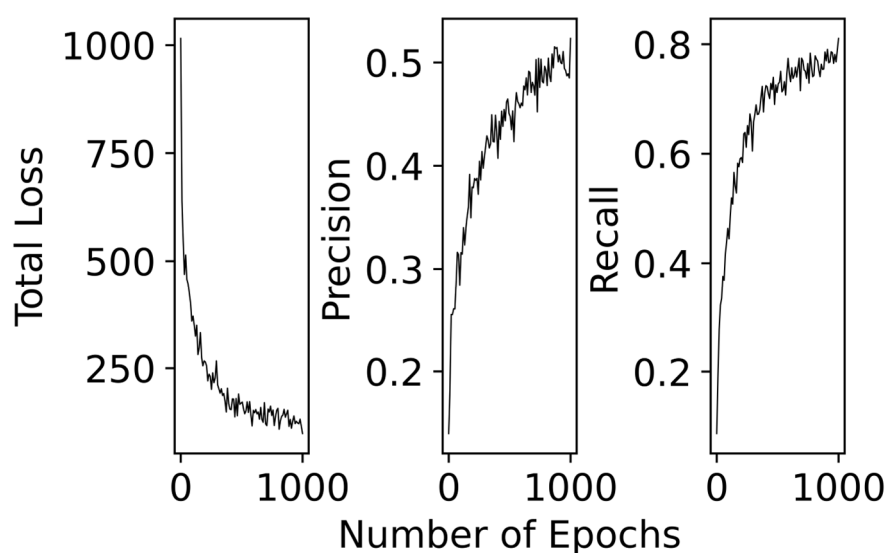

Figure S2: Total loss, precision and recall plots averaged every 10 epochs for Model 2: YOLOv3, PSM, RGB, XV-anchors, Im 1500, Ep 1000
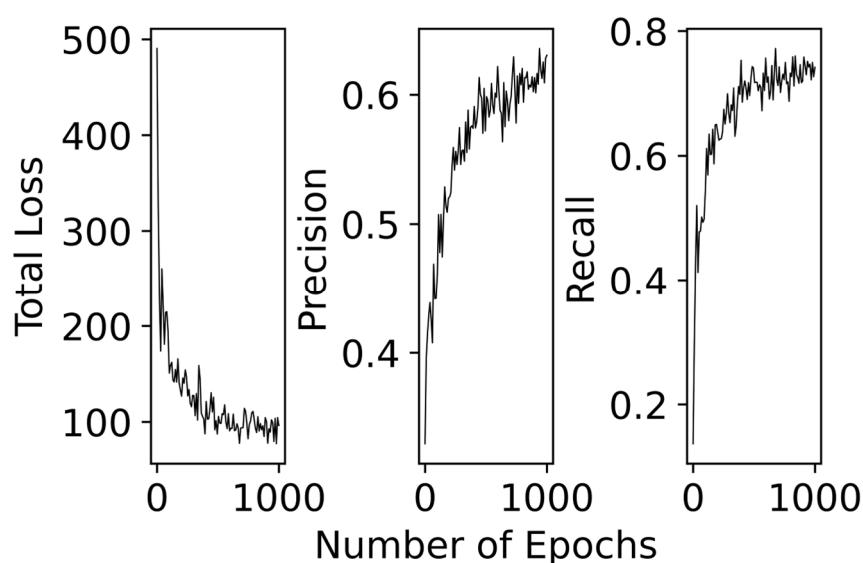
Figure S3: Total loss, precision and recall plots averaged every 10 epochs for Model 3: YOLOv3, SM, RGB, XV-anchors, Im 1500, Ep 1000
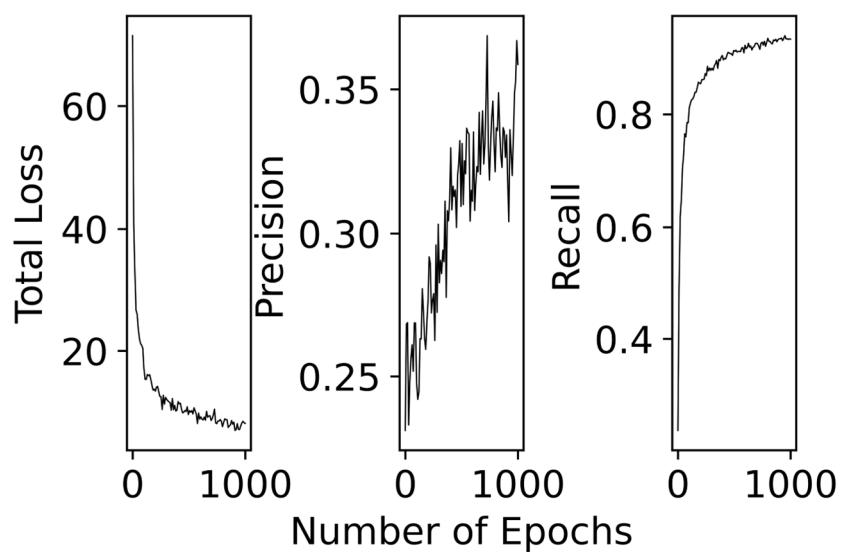

Figure S4: Total loss, precision and recall plots averaged every 10 epochs for Model 4: YOLOv3, PSM, RGB, XV-anchors, NR: 608, Im 1500, Ep 1000
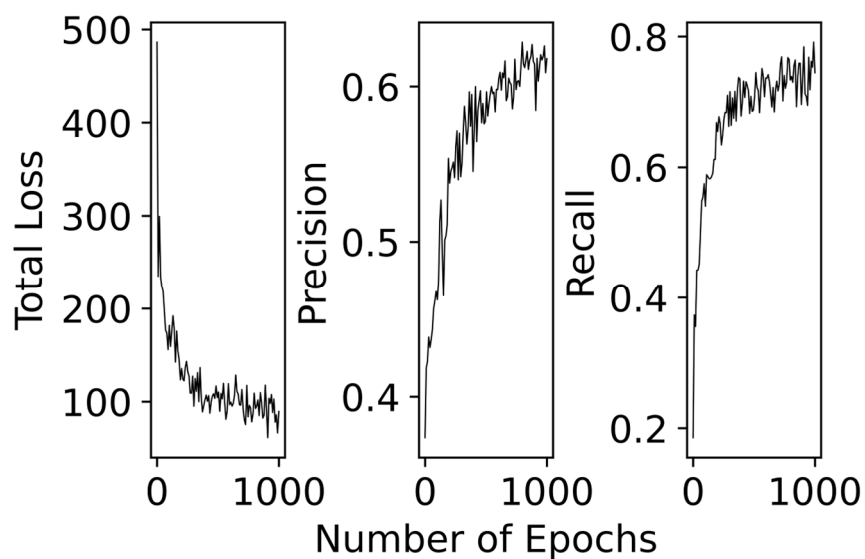
Figure S5: Total loss, precision and recall plots averaged every 10 epochs for Model 5: YOLOv3, PSM, RGC, XV-anchors, Im 1500, Ep 1000
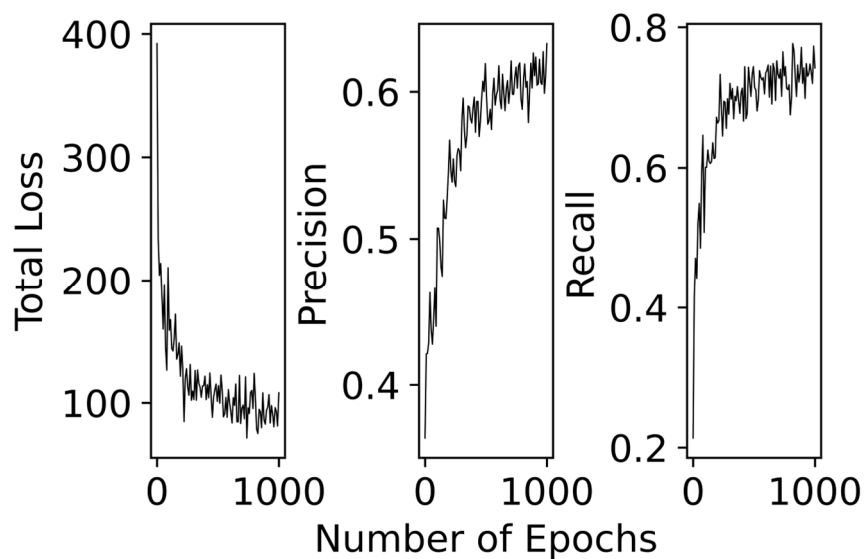

Figure S6: Total loss, precision and recall plots averaged every 10 epochs for Model 8: YOLOv3, SM, RGB, B-anchors, Im 1500, Ep 1000
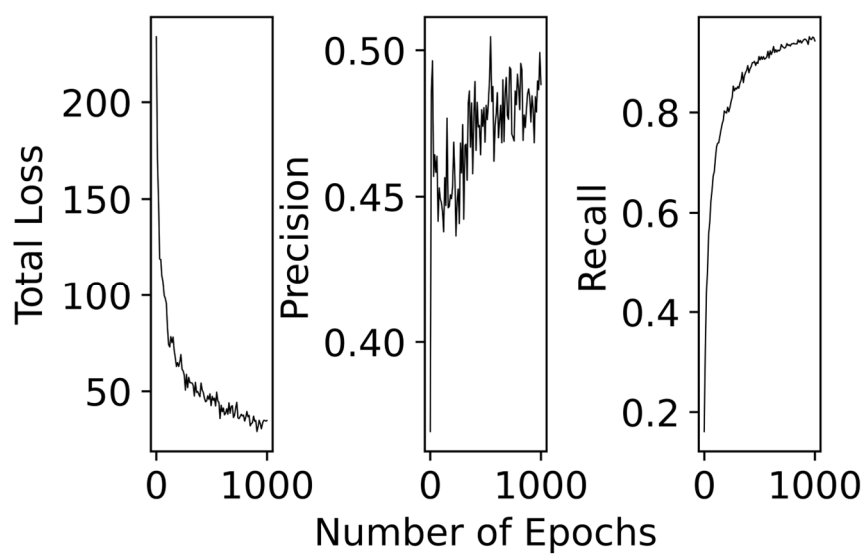
Figure S7: Training data set box loss, precision and recall plots averaged every 10 epochs for Model 9: YOLOv8n, PSM, RGB, Im 416, Ep 300.
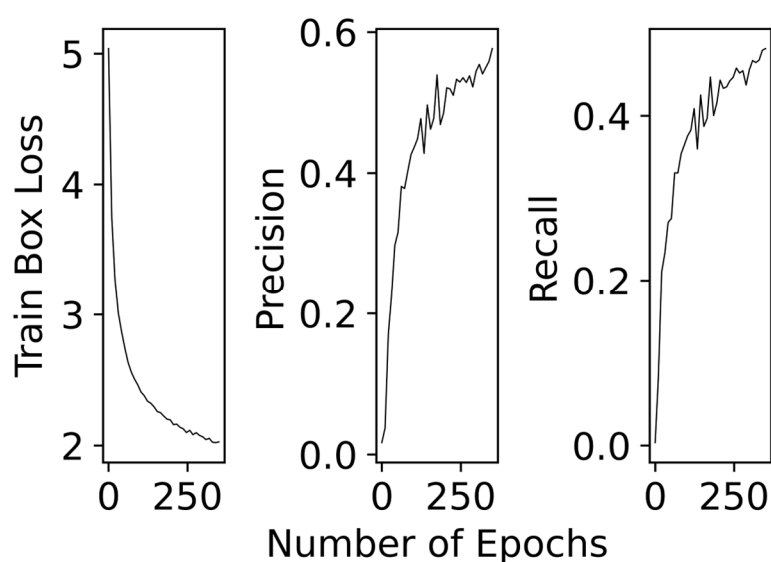

Table S1. Vehicle detection YOLOv3 models validation statistics using the test data set. For each model the Precision, Recall and F1 score accuracy metrics are shown. Two validations were undertaken: PSM and SM where PSM used a validation data set consisting of Parked, Static and Moving vehicles, and SM used a validation data set consisting of Static and Moving vehicles. Model parameters include: PSM (Parked, Static and Moving vehicles in a single class), SM (Static and Moving vehicles in a single class) and 3 class PSM (Parked, Static and Moving vehicle split into three separate classes) training data sets, RGB: Red, Green, Blue spectral band image, RGC: Red, Green, Coastal Blue spectral band image, NR: Network Resolution, B-Anchors: Barcelona training data set 9 anchor boxes, XV-anchors: xView challenge data set 30 anchor boxes, Im: Image size in number of pixel width/height, Ep: epochs.

Model Number	Parameters	Validation type	Precision	Recall	F1 score
1	3class PSM, RGB, XV-anchors, Im 1500, Ep 1000	PSM	0.58	0.79	0.67
		SM	0.12	0.82	0.22
2	PSM, RGB, XV-anchors, Im 1500, Ep 1000	PSM	0.65	0.81	0.72
		SM	0.15	0.91	0.26
3	SM, RGB, XV-anchors, Im 1500, Ep 1000	PSM	0.56	0.43	0.49
		SM	0.25	0.91	0.39
4	PSM, RGB, XV-anchors, NR: 608, Im 1500, Ep 1000	PSM	0.50	0.82	0.62
		SM	0.11	0.91	0.20
5	PSM, RGC, XV-anchors, Im 1500, Ep 1000	PSM	0.58	0.82	0.68
		SM	0.13	0.91	0.23
6	PSM, RGB, B-anchors, Im 1500, Ep 1000	PSM	0.71	0.72	0.71
		SM	0.16	0.79	0.27
7		PSM	0.64	0.77	0.70

	PSM, RGB, B-anchors, Im 416, Ep 300	SM	0.15	0.84	0.26
8	SM, RGB, B-anchors, Im 1500, Ep 1000	PSM	0.62	0.22	0.32
		SM	0.45	0.76	0.57