Supplementary Material

A Visualization

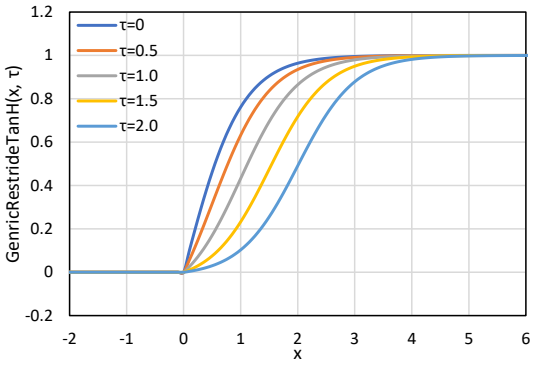

Figure 6: Visualization of the proposed gate activation function. As the coefficient τ increased, the gradient at $0+$ will decrease to alleviate the discontinuity problem.

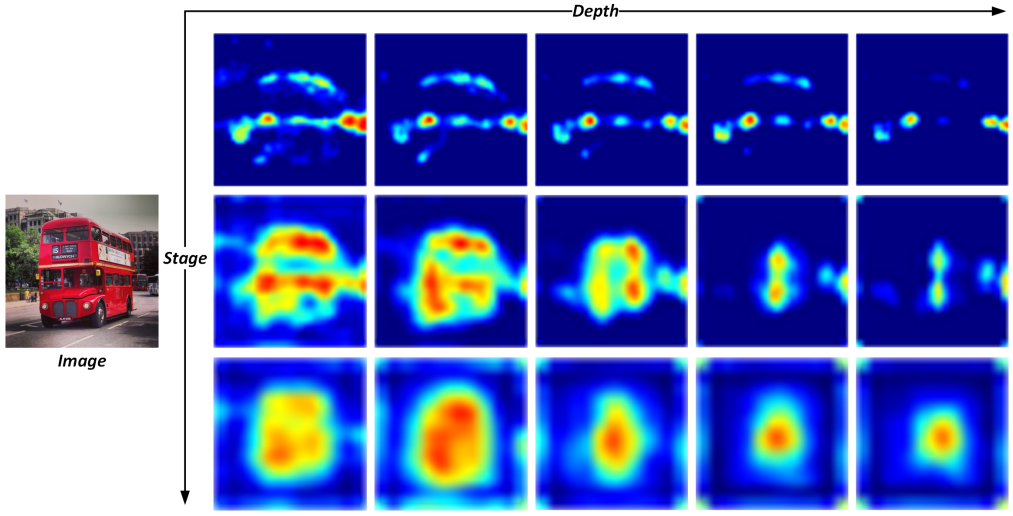

Figure 7: Visualization of the spatial gates in a dynamic head. The response maps are generated from three adjacent FPN scales, *i.e.*, P4, P5 and P6. The row and column of the heatmaps correspond to depth and scale, respectively.

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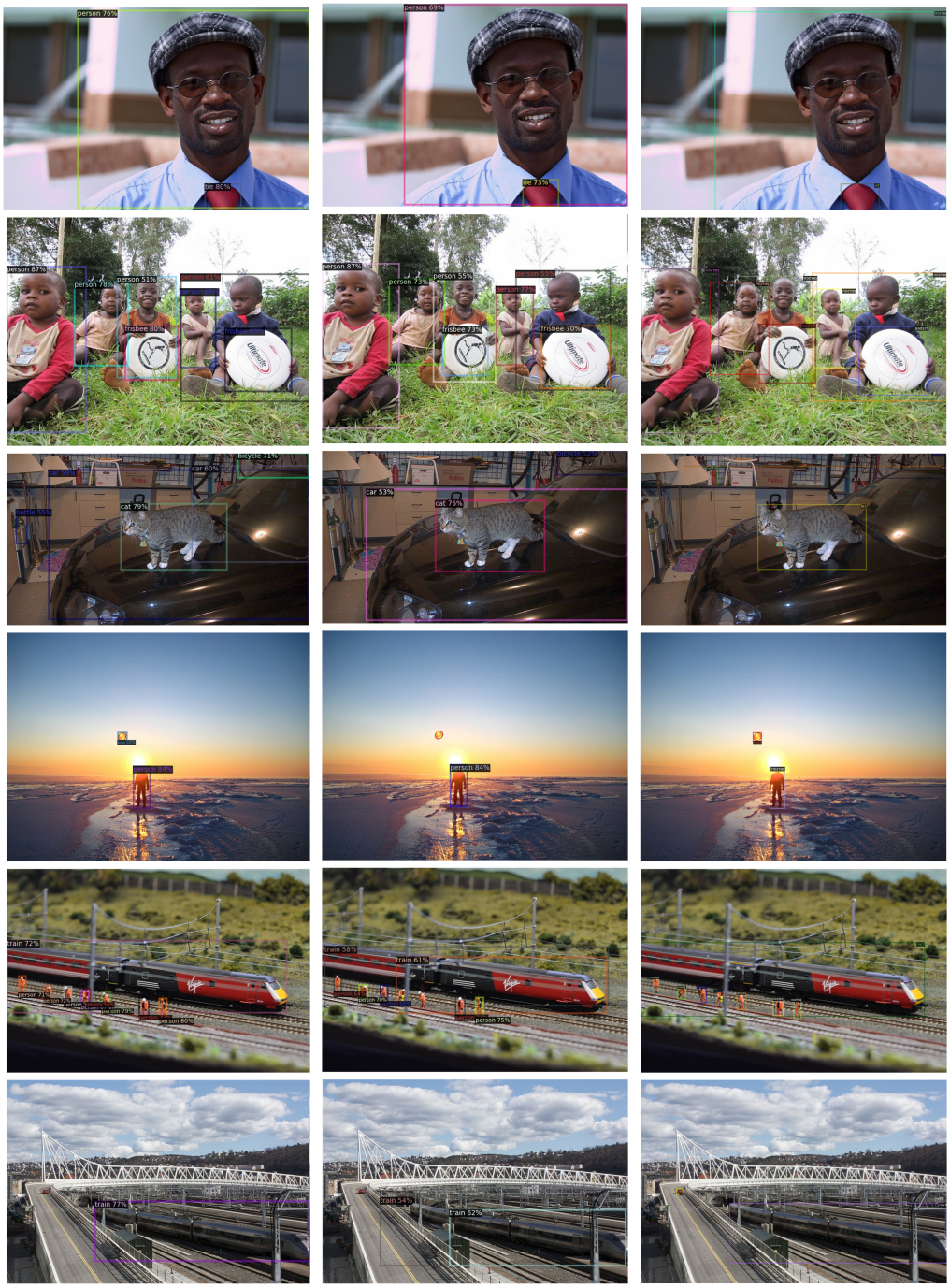

(a) Fine-Grained Dynamic Head (b) Conventional Head (c) Ground Truth

Figure 8: Comparisons of predictions between the proposed dynamic head and the conventional head. The predictions are generated from the FCOS framework with the specific head when using ResNet-50 backbone.

B Runtime

Table 5: The latency and computational complexity of the FPN heads on a Tesla V100 GPU. The computational complexity only accounts for the head.

Model	Dynamic Head	mAP(%)	$\mathrm{Latency}_{avg}$(ms)	FLOPs_{avg}(G)
FCOS-D6 Baseline	✗	40.4	46.8	298.1
Ours@Large	✓	**41.4**	53.6	117.6
Ours@Small	✓	40.6	**35.1**	**67.6**