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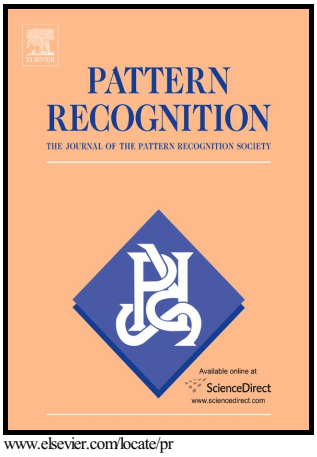

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Weakly Supervised Vehicle Detection in Satellite Images via Multi-Instance Discriminative Learning

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Abstract

Vehicle detection in satellite images has attracted extensive research interest with widespreading application potentials. The main challenge lies in the difficulty of labeling sufficient training instances (vehicle rectangles) across all resolutions and imaging conditions of satellite images, which degenerates the performance of vehicle detectors trained correspondingly. To tackle this challenge, in this paper we propose an intelligent and labor-light scheme for large-scale training of vehicle detectors. Our scheme only requires region-level *group* annotation, *i.e.* whether this region contains vehicle(s) or not, without explicitly labeling the bounding boxes of vehicles. To this end, a novel weakly-supervised, multi-instance learning algorithm is designed to learn instance-wise vehicle detectors from such "weak labels". In particular, a density estimator is firstly adopted to estimate the density map of vehicle instances from the positive regions. Then, a multi-instance SVM is trained to classify and locate vehicle instances from this map. We have carried out extensive experiments on a large-scale satellite image collection that contains various resolutions and imaging conditions. We have

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