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Omni-Modeler: Dynamic Learning for Pedestrian Redetection

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Abstract : This paper presents the application of the omni-modeler towards pedestrian redetection. The pedestrian redetection task creates several challenges when applying deep neural networks (DNN) due to the variety of pedestrian appearance with camera position, the variety of environmental conditions, and the specificity required to recognize one pedestrian from another. DNNs require significant training sets and are not easily adapted for changes in class appearances or changes in the set of classes held in its knowledge domain. Pedestrian redetection requires an algorithm that can actively manage its knowledge domain as individuals move in and out of the scene, as well as learn individual appearances from a few frames of a video. The Omni-Modeler is a dynamically learning few-shot visual recognition algorithm developed for tasks with limited training data availability. The Omni-Modeler adapts the knowledge domain of pre-trained deep neural networks to novel concepts with a calculated localized language encoder. The Omni-Modeler knowledge domain is generated by creating a dynamic dictionary of concept definitions, which are directly updatable as new information becomes available. Query images are identified through nearest neighbor comparison to the learned object definitions. The study presented in this paper evaluates its performance in re-identifying individuals as they move through a scene in both single-camera and multi-camera tracking applications. The results demonstrate that the Omni-Modeler shows potential for across-camera view pedestrian redetection and is highly effective for single-camera redetection with a 93% accuracy across 30 individuals using 64 example images for each individual.

Keywords : dynamic learning, few-shot learning, pedestrian redetection, visual recognition
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