Viewpoint Robust Knowledge Distillation for Accelerating Vehicle Re-identification

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Abstract

Vehicle re-identification is a challenging task that matches vehicle images captured by different cameras. Recent vehicle re-identification approaches exploit complex deep networks to learn viewpoint robust features for obtaining accurate re-identification results, which causes large computations in their testing phases to restrict the vehicle re-identification speed. In this paper, we propose a viewpoint robust knowledge distillation (VRKD) method for accelerating vehicle re-identification. The VRKD method consists of a complex teacher network and a simple student network. Specifically, the teacher network uses quadruple directional deep networks to learn viewpoint robust features. The student network only contains a shallow backbone sub-network and a global average pooling layer. The student network distills viewpoint robust knowledge from the teacher network via minimizing the Kullback-Leibler divergence between the posterior probability distributions resulted from the student and teacher networks. As a result, the vehicle re-identification speed is significantly accelerated since only the student network of small testing computations is demanded. Experiments on VeRi776 and VehicleID datasets show that the proposed VRKD method outperforms many state-of-the-art vehicle re-identification approaches with better accurate and speed performance.

Full Text

This preprint is available for download as a PDF.

Figures

Figure 1

Vehicle samples from the VeRi776 [1] dataset. Each row denotes vehicles of the same identity.

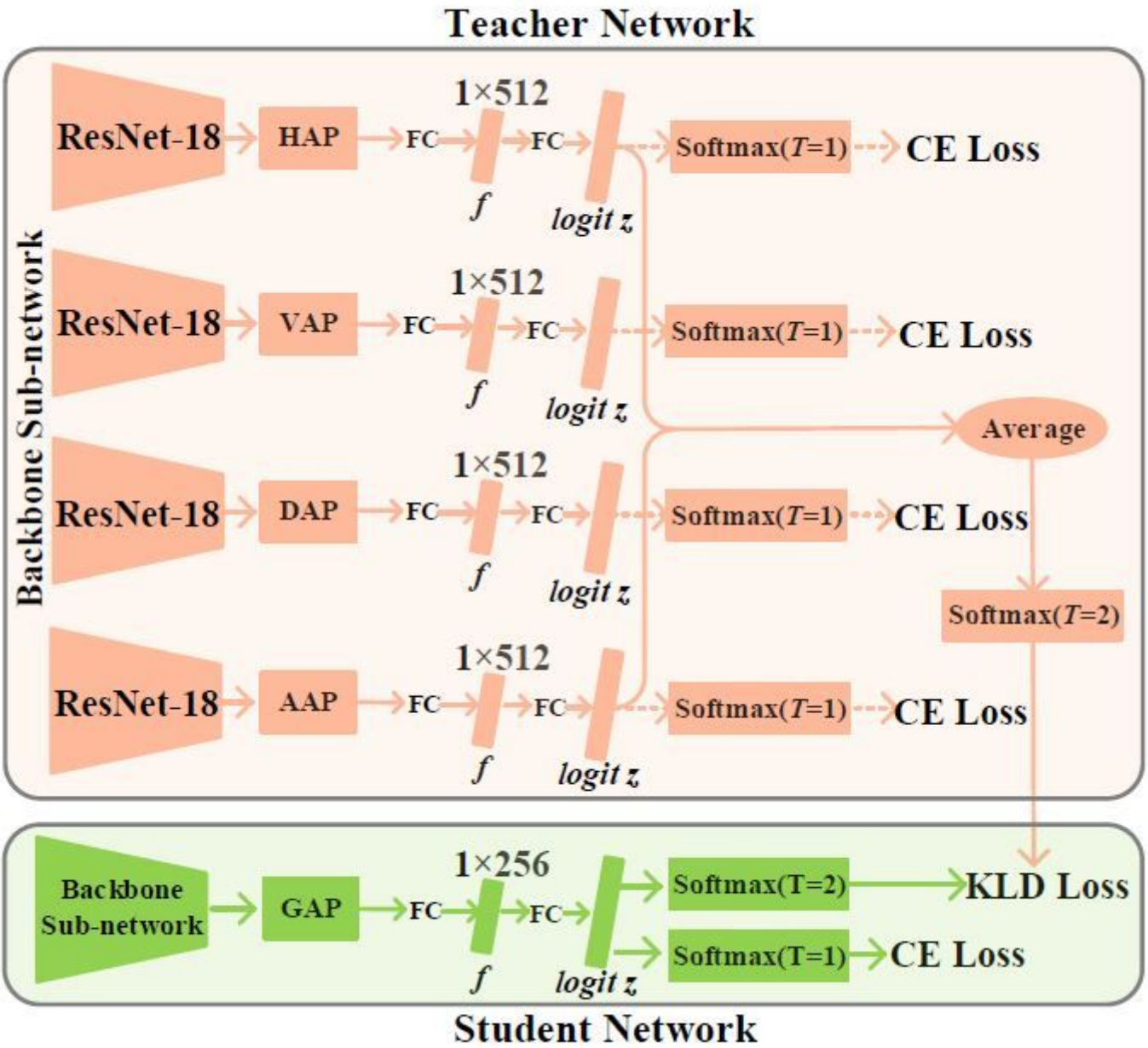

Figure 2

The framework of the proposed viewpoint robust knowledge distillation method. FC represents a fully connected layer. Dotted arrows denote those components only work in the teacher network's training process.

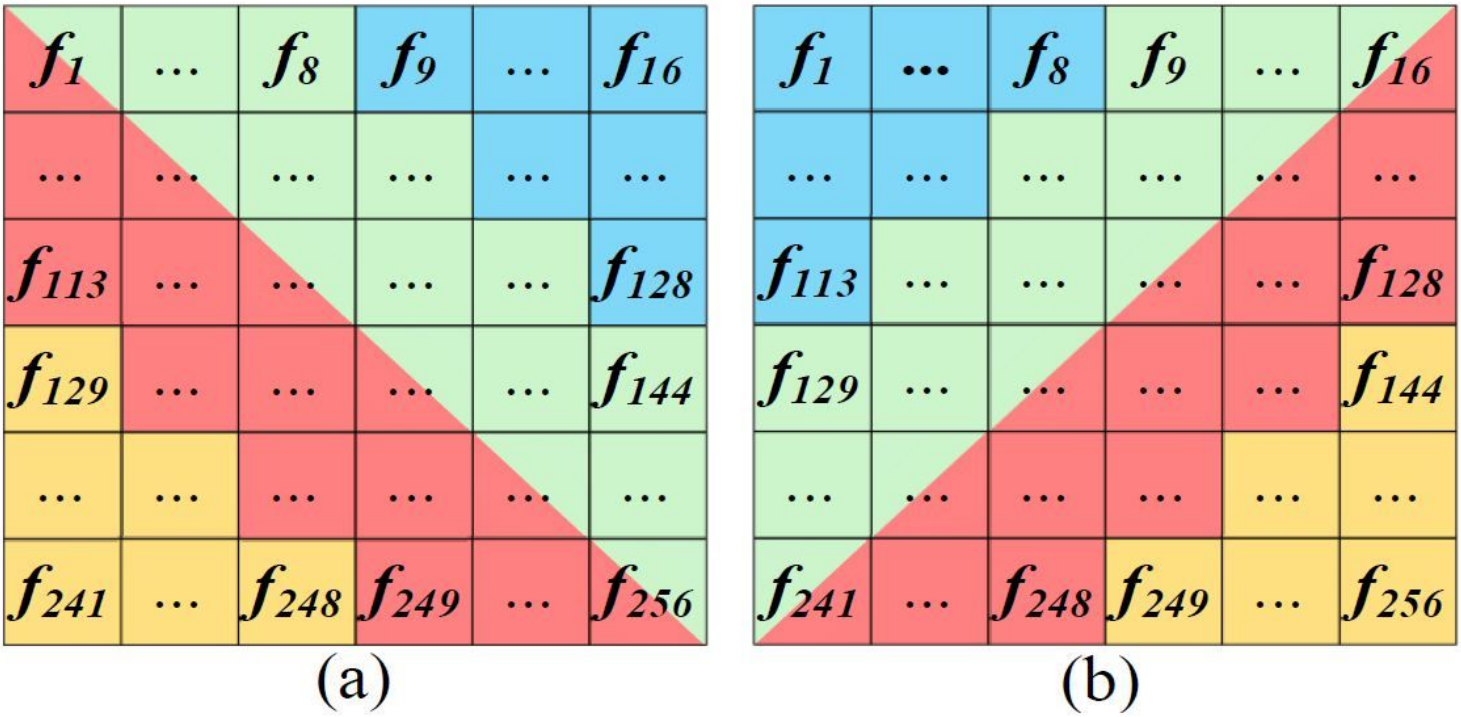

Figure 3

The diagrams of diagonal (a), and anti-diagonal (b) average poolings. Elements marked by the the same color are averaged.

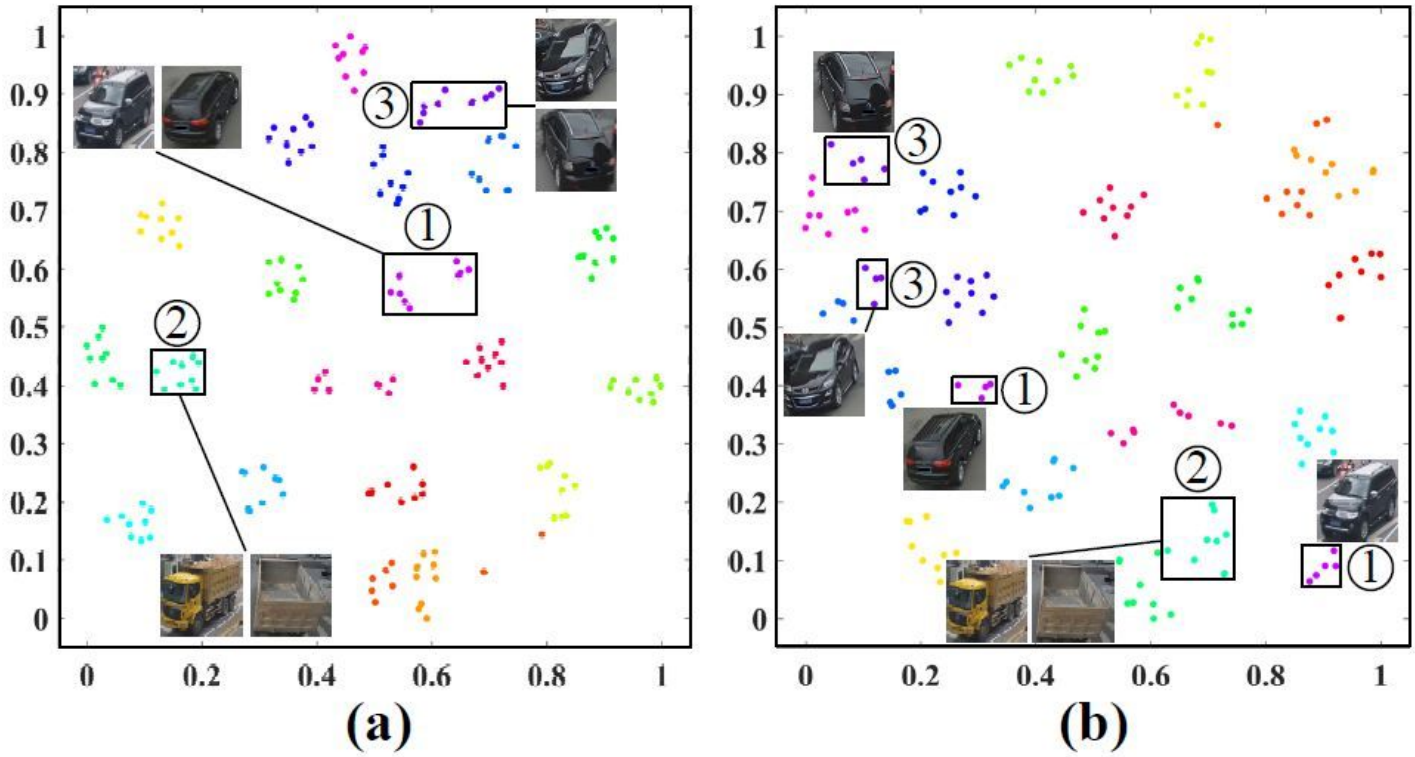

Figure 4

Visualizations of features resulted from SDC-CNN based student networks using (a) VRKD and not (b) using VRKD, respectively.

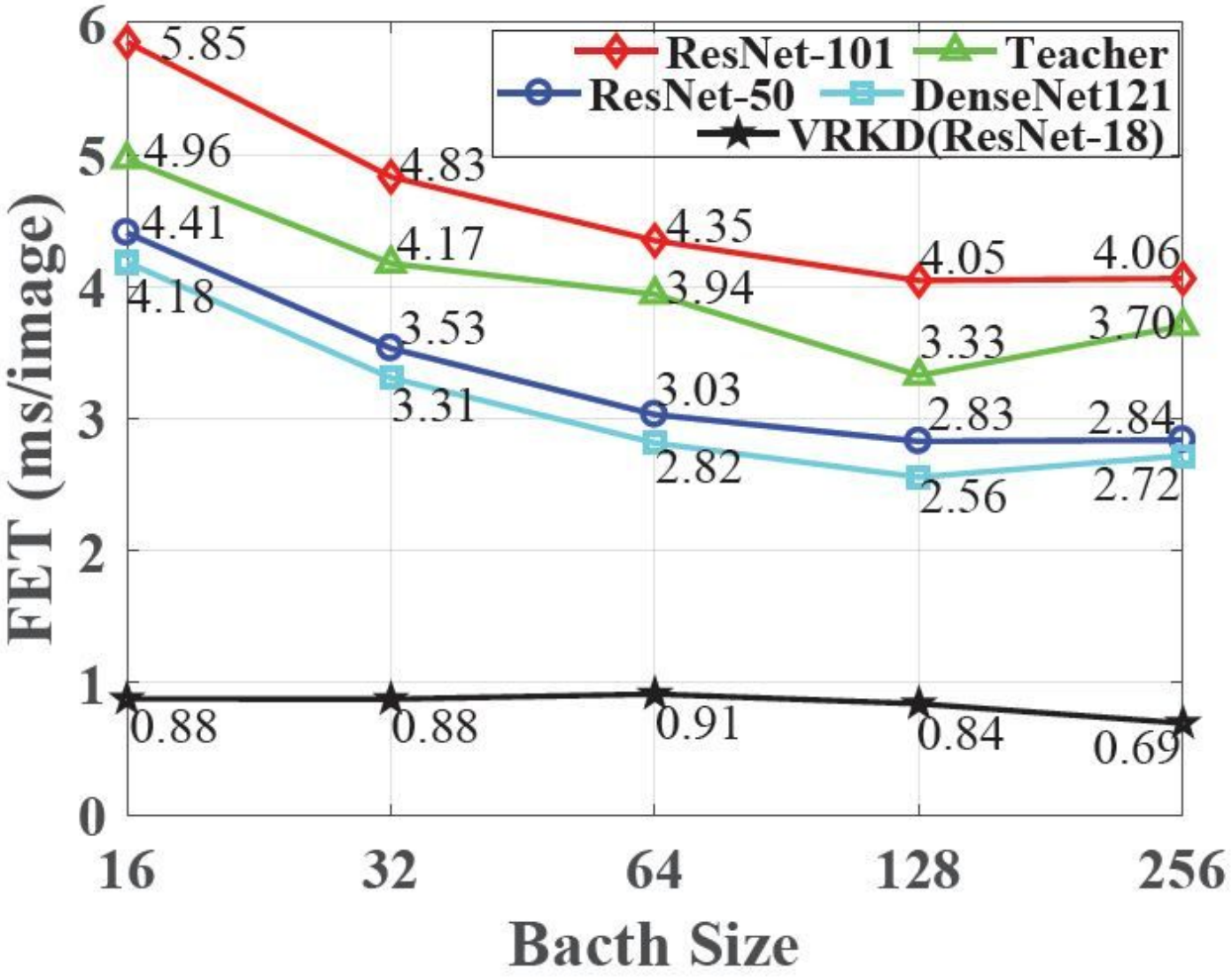

Figure 5

The feature extraction time (FET) per image comparison.

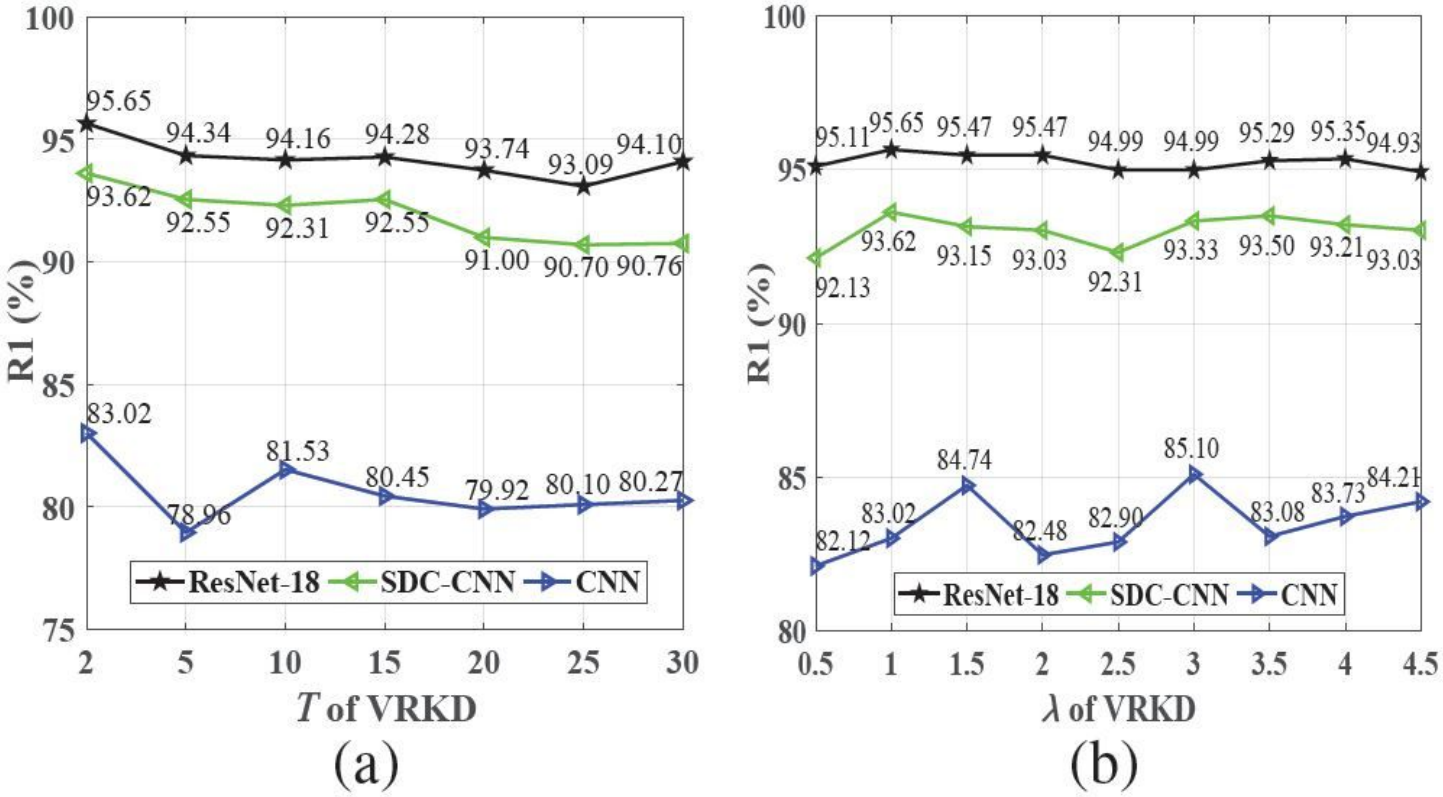

Figure 6

(a) Different student networks' R1 via varying distillation temperatures. Here, the KLD loss's weight (i.e., λ of Eq. (4)) is set to 1. (b) Different student networks' R1 via varying of KLD's weights (i.e., λ of Eq. (5)).