World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:16, No:10, 2022

Effective Stacking of Deep Neural Models for Automated Object Recognition in Retail Stores

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Abstract : Automated product recognition in retail stores is an important real-world application in the domain of Computer Vision and Pattern Recognition. In this paper, we consider the problem of automatically identifying the classes of the products placed on racks in retail stores from an image of the rack and information about the query/product images. We improve upon the existing approaches in terms of effectiveness and memory requirement by developing a two-stage object detection and recognition pipeline comprising of a Faster-RCNN-based object localizer that detects the object regions in the rack image and a ResNet-18-based image encoder that classifies the detected regions into the appropriate classes. Each of the models is fine-tuned using appropriate data sets for better prediction and data augmentation is performed on each query image to prepare an extensive gallery set for fine-tuning the ResNet-18-based product recognition model. This encoder is trained using a triplet loss function following the strategy of online-hard-negative-mining for improved prediction. The proposed models are lightweight and can be connected in an end-to-end manner during deployment to automatically identify each product object placed in a rack image. Extensive experiments using Grozi-32k and GP-180 data sets verify the effectiveness of the proposed model.

Keywords : retail stores, faster-RCNN, object localization, ResNet-18, triplet loss, data augmentation, product recognition
Conference Title : ICIAP 2022 : International Conference on Image Analysis and Processing
Conference Location : Paris, France
Conference Dates : October 27-28, 2022