Olympic Games Event Recognition via Adaptive Convolutional Neural Networks

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Introduction

Automatic event recognition based on human action is both interesting and valuable research topic in the field of computer vision and deep learning. With the rapid increase and the explosive spread of data which is being captured momentarily, the need of fast and precise access to the right information has become challenging task with considerable importance for multiple practical applications, e.g., image and video search, sport data analysis, healthcare monitoring applications, monitoring and surveillance systems for indoor and outdoor activities, and video captioning.

Problem Statement

Sport event recognition in Olympic game is still a challenging problem due to the pattern similarities in many sports. These similarities include outfit, equipment, and game field. For example, Tennis and Badminton as shown in figure 1, share numerous features including racquets, field outline and color, net, and outfit. Such scenario is confusing for most traditional CNN which makes it challenging task for convolutional networks to successfully classify correctly these types of sport events.

Fig.1. Illustration of similarities between Tennis (Group A) and Badminton (Group B) that can be easily misclassified.

Objectives

This research develops an adaptive content-aware convolution neural network with the capability of analyzing, recognizing and interpreting the sport event in the Olympic games based on human action. 20 of the 33 sports scheduled for inclusion in the Olympic Games Tokyo 2020 will be included in the newly collected dataset (OGED) to evaluate the proposed method. This method combines convolutional neural network (CNN) and transfer learning (fine-tuning method) to potentially achieve best performance with high accuracy and precision of event recognition.
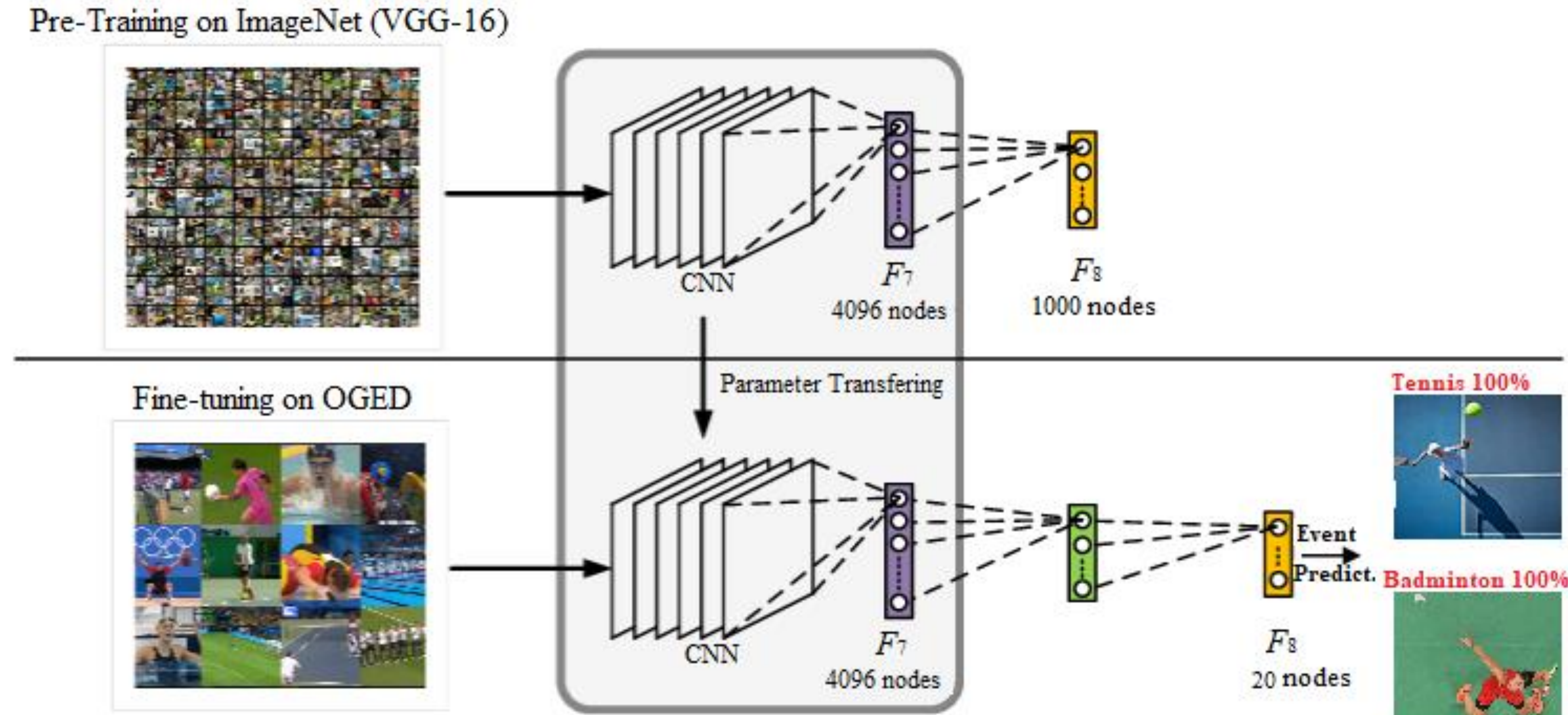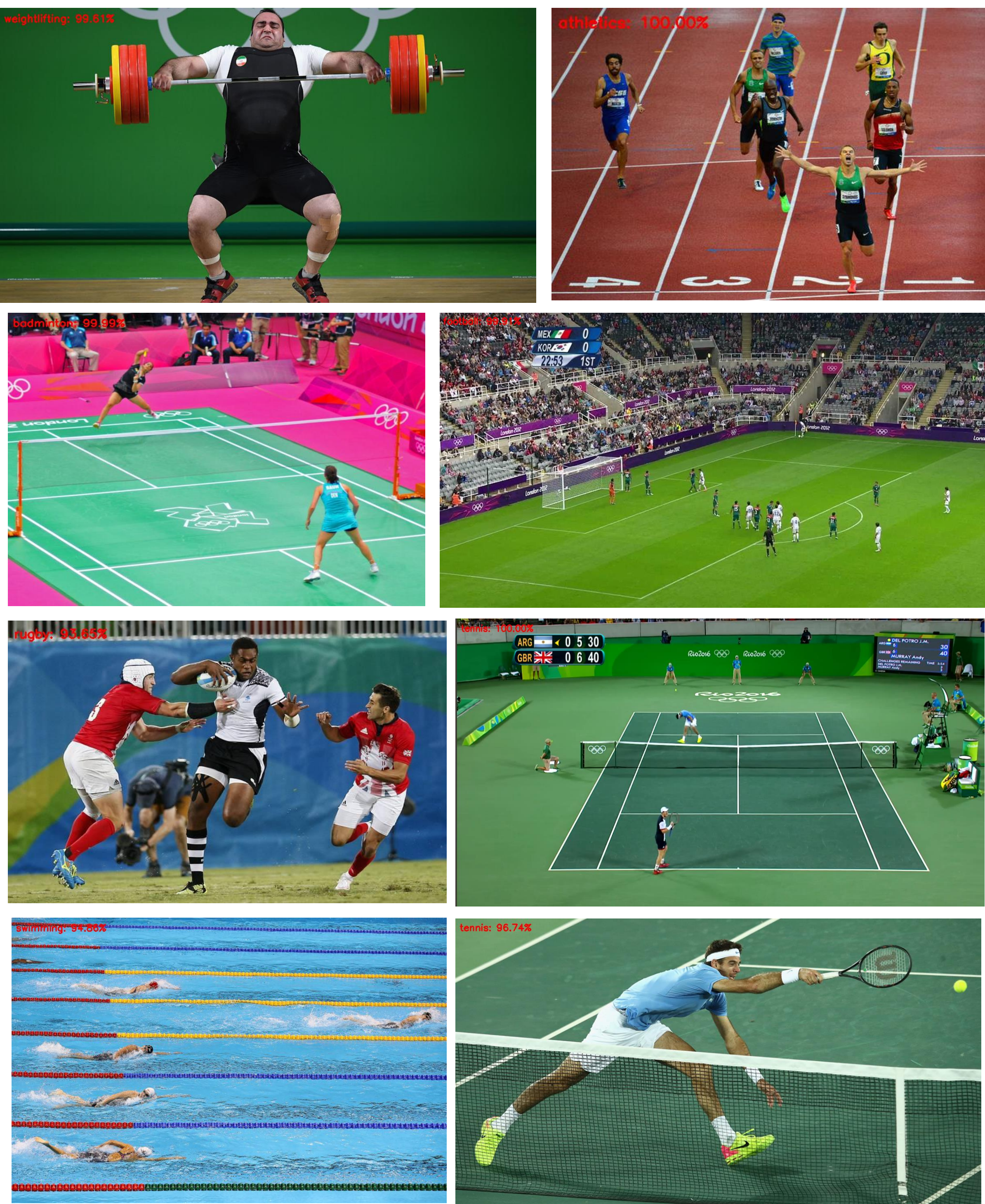
Classification Architecture

Fig. 2. The proposed method combines convolutional neural network (CNN) and transfer learning on VGG-16 to improve the performance and accuracy

Experimental Results (Fail)

Evaluation (Simple CNN without Transfer Learning)

	precision	recall	f1-score	support
athletics	0.67	1.00	0.80	18
badminton	0.86	0.89	0.88	28
basketball	0.79	0.90	0.84	30
football	0.87	0.80	0.83	25
handball	1.00	0.67	0.80	27
rugby	0.88	0.85	0.86	33
swimming	0.67	0.45	0.54	22
tennis	0.67	0.87	0.75	23
waterpolo	0.62	0.86	0.72	21
weightlifting	0.77	0.43	0.56	23
accuracy			0.78	250
macro avg	0.78	0.77	0.76	250
weighted avg	0.79	0.78	0.77	250

Experimental Results (Success)